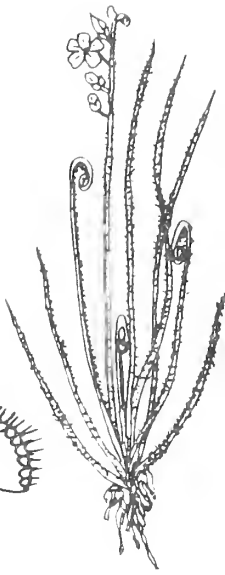
CARNIVOROUS PLANT NEWSLETTER



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EDITORS' CORNER --

We certainly cannot say there was less work involved in preparing this newsletter than anticipated, but the work was more than countered by the pleasure of at last beginning to fill a void among carnivorous botanists: A regular channel of informal communication. We are extremely encouraged by your response thus far.

This first issue is necessarily somewhat lopsided. What we hope to be a key section in the future, NEWS AND VIEWS, does not even appear here. This will be the section where continuing observations, ideas, questions, dialogues, reports of field trips, visits to collections, and hypotheses sent in letters by the readers be primarily located. We especially wish to encourage this sort of exchange, and when you are considering whether it would be worth sharing some thoughts in this publication and you have any doubts about them, a good rule would be to send it in anyway! We fully realize that some sections of some issues will be of more value to certain readers than others.

Of course, the NEW SUBSCRIBERS section is large and lists all subscribers who wrote in before "press time". If you are not mentioned but did receive this first issue, you will be in the next one--Your subscription probably arrived late. Finally, the literature review section is quite large this first issue. We have attempted to list and briefly annotate most of the recent papers of the past few years, and hereafter we will emphasize papers coming out the previous quarter. Since the literature of our subject is quite sparse, we would like to mention any other papers or books you might feel important.

We would like to give special thanks to Ritchie Bell of UNC who arranged for the printing and the bannerhead at his institution, and to Don Schnell's unflinching secretary who did the bulk of the typing.

NEW SUBSCRIBERS --

HENRY W. ALLEN(P.O. Box 73, Loma Linda Calif.) is constructing a special greenhouse specifically for growing Nepenthes for research purposes. We would like to see the plans and facilities for that as well as know how it works out.

C. RITCHIE BELL(Dept. of Botany, Univ. Of North Carolina, Chapel Hill, NC 27514) certainly needs no introduction to carnivorous botanists. Dr. Bell has had special interest in Sarracenias for twenty years. He would like to see regular cultural notes for raising species from seed, this quite probably representing the ultimate best effort in conservation as bulldozers and drainers relentlessly march on.

HENRY J. DEMMINK(2965 East Leonard, Grand Rapids, Mich. 49505) has primary interests in Nepenthes species but is interested in working on some exchanges.

HARVEY F. DICKLER(150 East 58th St., New York City) grew a very fine collection of Nepenthes which he has since donated to Longwood and New York Botanical Gardens. He has had considerable experience with all phases of culture, including cuttings. Perhaps he will share good ideas with us.

DR. R. O. FLAGG(Carolina Biological Supply Co., 2700 York Rd., Burlington, NC 27215).
LIBRARY OF THE GRAY HERBARIUM(22 Divinity Ave., Cambridge, Mass. 02138)

ROBERT GRIESBACH(404 S. Cumberland, Park Ridge, Ill., 60068) is attempting to induce polyploidy in Droseras.

ADOLPH HECHT(Dept. of Botany, Washington State University, Pullman, Wash. 99163)

Y HESLOP-HARRISON(Royal Botanic Gardens, Kew, Surrey, England) has been doing work with native Pinguiculas, including electron scan photomicrography and cytochemical detection of enzyme activity which he intends to extend into leaf glands of other genera. He is presenting a paper entitled, "Photoperiod and temperature interactions in the control of development in Pinguiculas" for presentation before a joint meeting of the Society for Experimental Biology and British Photobiology Society in April. Incidentally, Heslop-Harrison recently designed a special presentation of his Pinguicula work for the visiting Emperor of Japan and sent us a copy of the program in Japanese and English.

A. T. HOTCHKISS(Dept. of Biology, University of Louisville, Louisville, Ky. 40208)

S. L. JACOBSON(Dept. of Biology, Carleton University, Ottawa, Canada) has been doing research into the sensory system of Venus's Flytrap. His work is well described in some reprints he sent us and these are mentioned later.

M. J. JAFFE(Dept. of Botany, Ohio University, Porter Hall, Athens, Ohio 45701) has studied the biochemical and biophysical mechanisms of rapid movements in plants, principally in Droseras and Dionaea. He has promised material for future newsletters.

MR. PETER R. JOHNSTON(4 Warrina St., Berowra, N.S.W. 2081 Australia) is growing a large number of North American species.

KATSUHIKO KONDO(Dept. of Botany, University of North Carolina, Chapel Hill, NC 27514)does a lot of work in chromosome studies of carnivorous plants. The work has provided some notable insights into speciation hybridization and several of his papers are mentioned later. Katsu comes from a family of well known carnivorous plant enthusiasts.

ROBERT D. LEUTHY(Wildlife Productions, 2880 Story Road., San Jose, Calif. 95127)was kind enough to send a long and well thought out letter of suggestions for this newsletter, and this is the sort of thing that is welcome. These will be seriously considered. Leuthy wants to begin hybridization experiments, having done the same with orchids for some 17 years.

ADMINISTRATION DEPT., LONGWOOD GRADENS(Kennett Square, Pa. 19348)
GEORGE MACKIE(Dept. of Biology, University of Victoria, Victoria, British Columbia)
ALLAN D. MARMELSTEIN(2945 Hewitt Ave., Silver Spring, Md.)
SIDNEY McDANIEL(Dept. of Botany, Mississippi State University, State College, Miss. 39762)

TED A. MINTON(P.O. Box 1245, Greenville, NC 27834) has a very large collection of North American species, occupying some two greenhouses with several outside plant beds. He is interested in expanding into new species.

HUGH N. MOZINGO(Dept. of Biology, University of Nevada, Reno 89307) studies Dionaea mainly and has had good success in culturing them from seed. A paper mention appears later. He has several other North American species and Australian Droseras.

JOSEPH G. O'MARA(208 Life Sciences, Pennsylvania State University, University Park, Pa 16802)
BOB PEMBERTON(1249 14th Ave., San Francisco, Calif. 94122)
JAMES PIETROPAOLO(Geneva High School, Geneva, N.Y. 14456)

MARVIN L. ROBERTS(Dept. of Botany, Ohio State University, Columbus, Ohio, 43210) is interested in the taxonomy, ecology and geography of aquatic plants and has a paper coming up in "Michigan Botanist"; he promises a reprint.

RUTH ROGERS(Dept. of Biological Sciences, Kent State University, Kent, Ohio, 44240) manages the greenhouse where she grows a small collection for study and demonstration. She is able to grow Nepenthes in her mixed greenhouse in a plastic enclosure that maintains humidity.

JOHN B. WHITNEY(Dept. of Botany, Clemson University, Clemson, SC 29631) grows Dionaea as follows: Planted in about three inches of native soil along with Sphagnum moss with which he found the plants growing. He uses 12 x 15 inch dishpans(plastic) with drainholes at the surface only. He is able to water with tapwater and says the plants are as fine as when collected over three years ago.

WARREN P. STOUTAMIRE(Dept. of Biology, University of Akron, Akron, Ohio 44304) has been collecting and studying carnivorous plants for many years, including many non-native species. He has contributed a short note later in the newsletter on the subject of salts content of various growing media.

Finally, we would like to mention that the Insectivorous Plant Society of Japan has indicated interest in our newsletter and their members may be subscribing in the future. Katsu Kondo has promised to tell us something of this large and active society in a future newsletter.

SPECIAL NOTICES --

Henry Allen wishes to obtain quantities of Nepenthes pitcher fluid for experiments. The fluid would be sent in a benzoate preservative which he would supply. Contact him for further details.

Katsu Kondo has a book being published in Japan which will feature some very fine photographs along with much information.

Hugh N. Mozingo would like to know some reliable sources for seeds or plants of Cephalotus, Nepenthes and Aldrovanda. Ditto on the latter genus for Don Schnell, too. I understand Aldrovanda is now protected in Japan where it grows prolifically in some areas. However, the plant is successfully cultivated in backyard pools by many people and I am sure information could be furnished on culture.

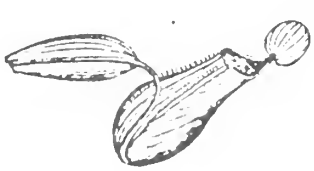
Warren Stoutamire has expressed interest in viable seeds of some of the epiphytic South American Utricularias. He describes the seed coat as transparent, like an envelope in which the embryo can be clearly seen. The seeds must be kept moist. They grow from the leaf bases of bromeliads natively and have some rather spectacular flowers.

LOOKING AHEAD --

Many of our initial subscribers have expressed an interest in developing some sort of plant and seed exchange setup. If anyone has any special needs or offerings, this could be done in our SPECIAL NOTICES section, or we could assign a volunteer to handle an exchange with master lists on file and seeds in the refrigerator, much as the orchid, fern and bromeliad societies do. Let us know how you feel on this idea.

One of the key areas in study of carnivorous plants is that of total environmental biology which seems so obvious and has so many large questions unanswered that it seems to be neglected. The exact niche definition of most of these plants remains elusive and certainly is not as simplistic as once conceived.

How about some work on the carnivorous fungi?



SHORT NOTES

DROSOPHYLLUM LUSITANICUM

by J. A. Mazrimas

The monotypic plant of the Droseraceae family, Drosophyllum lusitanicum, is a carnivorous plant that grows on the open, gravely hillsides of coastal Portugal, southern Spain and Morocco. These plants can be found growing in rocky acid soil along with heather (Erica umbellata), thyme (Thymus caespiticius), rockrose (Cistus sp.) and the Brooms (Genista sp.). For example, on a mountainside outside of the coastal town of Oporto, Portugal, the slopes are covered with loose irregular quartz-like stones scattered over the dry surface. When it rains, little of the water seeps through the hard-baked and dry surface but runs rapidly off the slopes into small arroyos. The hot, dry conditions during the day are frequently counteracted by the foggy, coastal mists during the cool nights thus affording Drosophyllum an opportunity to regain some of the life-giving moisture to its linear leaves.

The plant grows about a foot tall, with a woody stem and long fibrous roots that penetrate deeply into the crumbly soil. From the terminal end of the upright stem, narrow, linear leaves about six to eight inches long unfurl like fronds of a fern. One of the major differences that distinguishes Drosophyllum from Drosera are the stalked tantacles, which are immobile and trap small gnats on the sticky secretion of its tentacles. Another set of sessile glands then take over by secreting various enzymes when in contact with nitrogenous matter. By this means the plant obtains the nitrogen necessary for growth and seed production.

In the spring, the plant produces loose panicles of bright sulfur-yellow flowers about an inch across. Later in the season, the black pear-shaped seeds can readily be seen through the translucent cone-shaped seed pod. When the seed matures, the pod dries and splits open into a star-shaped structure exposing the seeds to dispersal by the coastal afternoon breezes.

Drosophyllum is usually started from seed which are lightly scratched over fine sandpaper and soaked overnight in water. They are sown the next day on a medium of 50% sphagnum moss - 50% perlite mix. In about two to four weeks over half the seeds will germinate during this period after which they are carefully removed and planted in individual five inch pots with the above mix. During this period of rapid growth, the seedlings should receive plenty of sunlight. Water should be added only when the growing medium shows a definite sign of dryness as the young plants are highly susceptible to damping off. When the stem achieves a semi-woody appearance, most of the problems with damping off have disappeared. Some precocious seedings will try to produce flower buds but these should be removed as they draw needed strength from the plant.

In the second season, the large plant with its numerous linear leaves densely covered with reddish glands, produces an abundance of the yellow flowers. Each flower can be self-pollinated followed several months later by the production of viable seed. The seeds can be sown immediately after ripening or stored in a cool, dry place up to a year. The plants should be grown individually in pots since there seems to be a mutual inhibition between plants when grown together. It is interesting that despite the abundance of seed, the plant never grows in dense patches in the field but prefers to remain scattered over a large area. After flowering and producing seed, the plant seems to languish and soon perishes. Although the literature records the plant as a perennial, I feel that more information should be

gathered on this aspect. At any rate, under horticultural conditions, it seems to be a biennial and new plants must be started from seed. Investigations in my greenhouse reveal that unlike Drosera, leaf cuttings are not adventitious. If a grower wishes to have plants on hand at all times, new seeds should be sown from the previous year's crop.

MONITORING SALT LEVELS IN BOG POTTING SOILS

by Warren Stoutamire

Bog orchids and carnivorous plants have been cultivated in the University of Akron greenhouses for 6 years with varying success. Soils suitable for most greenhouse plants are quickly lethal to the majority of bog plants and although there may be several reasons for this they all have one thing in common--a relatively high release rate of soluble salts. Soils in which pitcherplants and sundews flourish are low in such soluble compounds. Much of the bog plant material cultivated here is grown in mixtures of Sphagnum, brown peat, perlite, white silica sand and very small quanitities of topsoil, producing constantly low salt levels when properly watered.

A simple method of determining the quantity of dissolved salts in soils involves collecting the water draining from the pot after watering and determining its conductance in terms of micromhos (µMho) by means of a conductance meter. Conductance (Mho) is the reciprocal of resistance (Ohm) and µMho = 1/Ohm x 10^6. Such instruments vary in price, but tend to be expensive. Anyone with a knowledge of electronics should be able to put together a usable instrument for less than those commercially available. All utilize a simple electrode assembly which is placed in the solution to be tested, conductance being read through a bridge circuit. Because conductance readings vary with temperature they must be made at a standard temperature. Conductance determinations will give no information as to the kinds of salts present in solution but measure total ionized material. Los soil water conductance is associated with good carnivorous plant growth here and conductance measurements have been very useful both in spotting developing soil problems and in making up new potting mixes.

Examples of conductance determinations in different water sources (20°C):

		µMho
1.	Double distilled water	2
2.	Distilled water	3
3.	Mixtures in which Sarracenia, Drosera and Sphagnum mosses grow	20-40
4.	Fresh commercial greenhouse potting soil	230
5.	Akron tap water (120ppm total hardness)	250
6.	Soil in non-bog greenhouse ornamentals, showing toxic salt levels	1000-1500

OBSERVATIONS ON SARRACENIA OREOPHILA

by Don Schnell

This species is certainly not the best studied of the Sarracenias. It is commonly held that its range is a rather narrow area in Northeast Alabama. Randy Troup of Guntersville, Alabama, spent many years carefully tracing down all reported stations in an attempt to authenticate the range. He found that the species was rather common in its area, and that the range actually extends south of Bermingham. I had an opportunity to visit several stations with Randy and have since revisited these and some others. As is the case with S. flava, one is struck by the variation present within the species, but doubly so since the plant was felt to be rare and rather monotypic for so many years. In spite of the variation, species characteristics were clear and uniformly present, particularly the flower, shape of the hood and character of the winter leaves.

There would appear to be two rather common variant patterns. One is typified by the plants that grow along the Little River just over the line from George, on the Sand Mountain plateau. These plants grow right on the edge of the water, the soil being extremely sandy and rocky. At first glance they appear to be etiolated, with rather pale green pitchers that are tall and lanky, little or no vein coloration and narrow mouths. The other type is best seen in an open field which is dishlike in contour with a natural pond in its center, and is located about fifteen miles further west. Here, the plants do not grow "with their feet in the water" but occur in a ring around the pond in definitely wet peat-sand soil some fifteen to twenty feet from the edge of the water, but well below the highest elevation of the field where the trees begin and the soil is drier. These plants are rather stout, the pitchers often having deeply colored veins, coppery colored lids and wider mouths.

Plants were collected from both stations and grown under identical conditions (including washing of roots and replanting in the same formulated soil). One would expect that the changes noted above could very well be environmental, but the variant characters held true, the river plants maintaining their rather lanky, pale habitus and the field-collected ones their more hardy appearance for at least two subsequent seasons.

S. oreophila is a problem in culture, the plants tending to wane and pine away in time, under conditions where other transplanted Sarracenias thrive. My impression is that they do better if collected with a good ball of sod around them, the entire mass being put into a tub with the roots relatively undisturbed. But even then their lifespan in culture seems limited. Much more needs to be learned of the factors possibly present in native soils and/or waters that are necessary for the health of this plant and that probably need renewing.

CHRYSAMPHORA CALIFORNICA

by J. A. Mazrimas

This monotypic carnivorous plant of the family Sarraceniaceae can be found growing in wet habitats from the Sierran mountains (Nevada county Cal.) through the northwest into Oregon's Lane county. In certain locations, the plants grew so extensively, that several old townships were named after the genus, Darlingtonia, which are merely place names today in both California and Oregon. Chrysamphora can be seen growing on shallow sloping hummocks in wet sphagnum moss and in sandy soil around lake shores at 600-6500 ft. elevation usually facing the northeast sun. Winter rainfall usually amounts to 40-60 inches annually but the dependable water supply during the dry summer is the cold running spring water which runs over sterile sand or volcanic silt. Temperatures in the high elevations can plunge quite low during winter nights frequently with negative Farenheit values. Summer temperatures can reach 100 degrees F. occasionally but usually are in the eighties and low nineties. The soil seems to be loose and gravely containing large amounts of organic debris such as decayed fir and pine needles. Large granite and serpentine rocks can be found interspersed throughout the black sandy soil. Frequently, one can find the Western Azealea (Rhododendron occidentale) associated with growing mats of the carnivorous plants.

Chrysamphora is a sparsely-rooted plant with thick pinkish to white roots emerging from the growing end of the long rhizome. The tubular pitchers which grow upward with a half-twist have a height of 15 to 40 inches and fang-like projections from the hood of the leaf accounts for the other common name "cobra lily". On this fish-tail-shaped appendage near the pitcher opening are found nectar glands which produce a liquid which attracts insects. Insects then eventually enter the opening and either slip down into the pitcher bottom or attempt to fly upward into the translucent spots along the top of the pitcher hood. Either way, the insect falls to the bottom prevented from climbing out by the downward pointing hairs along the inside walls.

Between April and June, solitary red-petalled flowers are borne on scapes that rise about a foot above the pitchers. It is an overwhelming sight to view an entire acre or two of flowering plants modding their stalks in the breeze. If the flowers are cross-fertilized, the enlarged cone-shaped seed capsule is ready to split open in August or September releasing hundreds of the light brown hairy seeds to the wind.

In cultivation, Chrysamphora can best be grown in large pots filled with sphagnum moss sitting in a saucer of water. A sphagnum peat and perlite mix would also work satisfactorily. Plants should be grown in a cool, airy and light shady atmosphere. I would recommend a 60° to 65° F. temperature during the day and 5° to 10° F. lower at night. Water the pots daily including sprinkling the pitchers. In the field, the most vigorous growing plants can be found in the coolest water-soaked soil in a partly sunny area. Most of the season's pitchers are formed in the spring following the flowers. Plants that are grown around the cool, coastal cities of San Francisco, California and Sidney, Australia grow and flower very well. The cool ocean breeze helps to temper the summer temperature in these areas allowing the plants to do their best. In the field, of course, the temperature is controlled by the spring waters that are quite cold as they emerge from underground reservoirs. At some distance from the water source, the plant colonies gradually fade out as the sun heats the shallow streams percolating down the meadow slopes. Seasonally, about two to four short, narrow rhizomes grow outward from the main rhizome terminating in new plants with their own roots. This vegetative propagation results in clonal clumps surrounding the mother plant and becomes the principal method by which this carnivorous plant spreads throughout the bog.

Ripe seeds should be soaked in water for one week changing the water daily. Most of them sink to the bottom after this time. They can be sprinkled on the surface of pure sphagnum moss or peat moss and covered with polyethylene or glass until germination begins. The rate of germination depends on how much time has elapsed when seeds were harvested. Fresh seed germinates quite rapidly while older seed seems to germinate after a long wait of several months or more. It is good practice to germinate the seeds in a cool area (below 60 degrees F.). A flowering plant can be obtained from seed in about 4-5 years.

Chrysamphora is reported to have a somatic chromosome number of 30 while the genus Sarracenia has 26. Many attempts to make an intergenerie cross resulted in failure. The other member of this family is Heliamphora whose karyotype is not known. It would be interesting to know its chromosome number because of the evolutionary implications that may result.

A recent newspaper reported that an area around Gasquet, California received a rainfall of 14 inches in 48 hours! This area is rich in Chrysamphora and I am certain that the plants survived the storm and relished the abundance of water that had fallen on them. With the spring reservoirs full, I look forward to a new season of many tall, healthy pitchers swaying in the breeze.

RECENT LITERATURE

Benolken, R. M., Jacobson, B. L.: Response Properties of a Sensory Hair Excised from Venus's Flytrap, J. Gen. Physiol., 56: 64-82, 1970

Multicellular sensory hairs excised from Dionzez leaves were subjected to a destructive dissection technique, disclosing a sensory layer of a radial symmetrical rosette of 20-30 apparently identical cells organized in a plane normal to the long axis of the hair. Intracellular glass electrode probing disclosed a resting membrane potential of about -80 mv. Response to a mechanical stimulus consisted of a graded response and an action potential, the latter similar to that which propagates over the leaf surface. The upper and lower membranes of a single sensory cell are electrically symmetrical in the absence of stimulation, and become asymmetrical with stimulus. Limiting values for the response symmetry were calculated on the hypothesis of an electrical model consistent with the histology of the sensory cells.

Bernob, G.: Paper wasp nest in pitcher plant, Sarracenia purpurea L. Entomol. News Vol 80 (6), p 148 1969

On August 1, 1968, a living pitcher-plant leaf was found to contain an active nest of the common paper wasp. The observation was made at a typical bog habitat near Ashburrham, Mass.

Burgess, L., Rempell, J.: Collection of the pitcherplant mosquito, Wyeomyia smithii from Saskatchewan. Can. Entomol. Vol 103 pp 886-887 1971

Larvae of the above mosquito were collected from pitcher-plants Sarracenia purpurea in swamps near Nipawin, Little Sandy Lake, and Waskesiu. Pupae and adults also were collected at Nipawin.

Fabian-Galan, G., Salageanu, N.: Considerations on the nutrition of certain carnivorous plants (Drosera capensis and Aldrovanda vesiculosa). Rev. Roum. Biol. Ser. Bot. Vol 13 (4) pp 275-280 1968

These two plants were fed radioactively labelled Daphnia. In Drosera, the autoradiographs showed the digested Daphnia were transported in the long run to the rest of the plant. In Aldrovanda, the animal food is transported from the mature traps to the growing point of the plant. The highest radioactivity in Drosera was found in glucose, aspartic and glutamic acids.

Favard, A.: Experimental localization of organs responsible for apical dominance in Drosera intermedia at the time of transition from the vegetative to the inflorescence stage. C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Natur (Paris) Vol 272 (26) pp 3283-3286 1971

Decapitations and leaf bud removals were made at various levels of the terminal bud in the above species. At the time of transition to the inflorescence stage, as in the vegetative stage, apical dominance was partially exerted by the terminal meristem and partially by small leaf buds with a size between 1.7 and 0.4 mm. Apical dominance varied according to plant vigor.

Gibson, M., Warren, K.: Capture of Schistosoma mansoni miracidia and cercariae by carnivorous aquatic vascular plants of the genus Utricularia. Bull. WHO Vol 42 (5) pp 833-835 1970

The author finds an apparent inverse relationship between the presence of the disease schistosomiasis and abundance of Utricularia in the waters of various Caribbean islands. The plants capture the infected miracidia and therefore offer a possible control measure.

Harder, R.: Utricularia as an object for investigations of heterotrophism of flowering plants. A Pflanzenphysiol. Vol 63 (2) pp 181-184 1970

IN GERMAN

The development of sterile light-grown cultures of Utricularia Minor was followed as a function of different combinations of sucrose and acetate in the medium. Optimal growth with sucrose took place with a concentration of 2% and with acetate 0.05%. The highest dry weight was reached with a combination of 2% sucrose and 0.01% acetate in the light. The author advocates using this flowering plant to study processes of carbon chemistry rather than the traditional unicellular algae.

Heslop-Harrison, Y.: Scanning Electron Microscopy of Fresh Leaves of Pinguicula, Science, 167: 172-174, 1970.

Fascinating electron scanning photomicrographs with interpretations are presented, the Pinguicula leaf surface maintaining hydration for at least 4-5 min. after facuum has been attained. The stalked capturing glands which secrete mucilaginous materials forming into tenacious holding cables as the insect struggles, and the sessile enzyme secreting digestive glands are clearly shown in new perspective and are described. A method for the examination is described.

Heslop-Harrison, Y., Knox, R. B.: A Cytochemical Study of the Leaf-Gland Enzymes of Insectivorous Plants of the Genus Pinguicula, Planta (Berl.), 96: 183-211, 1971.

Enzyme analyses and their secretion from various cell layers of both types of surface glands are discussed. Evidence shows that suitable nitrogenous substance cause secretion of enzymes and fluids onto the leaf surface within one hour, and these enzymes are then found depleted from the intracellular sites of sessile glands. Within two hours, digestive products enter the leaf as

indicated by 14-C autoradiography and move to the margins. Movement out of the leaf begins in 12 hours. Microautoradiographs showing a concentration of digestion products around the bases of the sessile glands and in the cells of the gland head, indicate absorptive function as well as secretory.

Jacobson, S. L.: Recepter Response in Venus's Flytrap, J. Gen. Physiol, 49: 117-129 1965

It has been reported that the action potentials crossing the surface of the trap of Dionaea always precede trap closure and are propagated by stimulus. Occurrence of non-propagated receptor potentials is reported here, and these always precede action potentials, the former coupling mechanical stimulation phase to the latter in the preying sequence. The tip of the hair was cut off, exposing the medullary tissue and electrode measurements were made directly in the sensory cell region. Evidence is presented that the positive and negative receptor potentials originate from independent sources. Further, the hypothesis that the positive receptor potential is the generator of the action potential is consistent with the data relating mechanical stimuli to the magnitude of receptor potentials, and the latter to the action potential.

Jacobson, S. L.: A Method for Extraction of Extracellular Fluid: Use in Development of a Physiologic Saline for Venus's Flaytrap, Can. J. Bot. 49: 121-127 1971

Extracellular fluid was extracted by centrifugation from the tissue of Dionaea. This fluid was subjected to extensive physioco-chemical analysis and the results were compared to a similar analysis of exudation sap. These results further were a basis for formulation of a physiological perfusion fluid which was compatible with the plant's tissue. The methods for extraction and analysis are described and the efficacy of the extraction method is discussed.

Judd, W.: Studies of the Byron Bog in southwestern Ontario xxxix Can. Field Natur Vol 83 (3) pp 233-236 1961

The author observed that flies were captured much oftener than other insects on D. intermedia and D. rotundifolia. Insects collected are tabulated, showing 5 orders, 15 plus families, and 19 plus species. Forty-four leaves of D. intermedia and six leaves of D. rotundifolia held a total of 64 insects.

Kondo, K.: Chromosome numbers of carnivorous plants. Bull. Torrey Botanical Club Vol 96 pp 322-328 1969

This paper reports that of the 450 species of carnivorour plants, only 53 species and 5 hybrids have had their chromosome numbers determined. Mr. Kondo has added 7 more new species to this growing list. What makes this report interesting is the fact that all 60 or so species are listed with their chromosome numbers. Drosophyllum lusitanicum and Pinguicula lusitanica have the lowest number of somatic chromosomes-12. On the other hand, D. Spathulata can have as much as 80. There are two notable genera whose numbers should be determined and those are Heliamphora and Byblis. Knowledge of the karyotype for both might answer some interesting questions on the evolutionary relationships within their respective families.

Kondo, K.: A new species of Nepenthes from the Philippines. Bull. Torrey Botanical Club Vol 96 pp 653-655 1969

A new species of Nepenthes named N. beilii is morphologically similar to N. gracilis. It is not thought to be a hybrid of N. gracilis due to the doubt attached to any record of this plant being found in the Philippines.

Kondo, K.: Chromosome number of Utricularia resupinata B. D. Greene Journ. Jap. Bot. Vol 46 No. 1 pp 26-29 1971

The chromosome number of U. resupinata was determined to be 2N=18. This same basic chromosome number is also found in many other species (N=9) although polymorphism in this genus is well known. Because Utricularia species can exhibit extreme morphological variations with differences in habitat, observations of chromosome numbers should clarify the natural relationships between species.

Kondo, K.: Chromosome numbers in Drosera and Dionaea in N. Carolina. Journ. Jap. Bot. Vol 45 No. 5 pp 139-144 1970

Five species of Drosera (capillaris, filliformis, intermedia, leucantha, rotundifolia) and Dionaea muscipula were taken from various locations in North Carolina and the chromosome numbers were determined. It was reported that the basic chromosome number of Drosera is 10 (N=10) while in the pollen mother-cells of Dionaea it is 16 (N=16). The karyotypes of both genera are similar which indicates that they are closely related and may remain in the same family.

Kondo, K.: A review of the Drosera spathulata complex. Journ. Jap. Bot. Vol 40 No. 11 pp 321-326 1971

The ancestral race of D. spathulata probably originated in New Zealand (2N=20), and spread outward, into Australia by doubling the number of chromosomes (20 x 2=40). As the distribution proceded northward, the species doubled again (40 x 2=80) and with backcrosses between octaploid and tetraploid plants, the hexaploid plants (40 +20=60) are now found growing in Japan on Honshu. Here, the species is sympatric with D. rotundifolia (2N=20) and various hybrids between these two species is possible. A pentaploid D. spathulata was found and thought to be a hybrid of D. rotundifolia (N=10) and D. spathulata (N=40). This enabled this plant to migrate into the eastern temperate zone of the Honshu Pacific coast. The hexaploid D. spathulata is found on the western Pacific coast of Honshu.

Kondo, K.: A comparison of variability in Utricularia cornuta and U. juncea. Amer. J. Bot. 59 (1) pp 23-37 1972

Although Utricularia cornuta Michx. and U. juncea Vahl, sympatric in the southeastern United States, have been considered conspecific by various authors, the present biosystematic approach shows them to be separate species. The taxa are seasonally isolated. While both have the same chromosome number (n=9), strong internal isolation is apparent since artificial hybrids cannot be produced by standard methods. In Utricularia cornuta the mean values of characters studied quantitatively are much higher than those of U. juncea though the extremes of the ranges may overlap. Utricularia juncea has both cleistogamous flowers and chasmogamous flowers while U. cornuta has only chasmogamous flowers. The flowers are self-fertile and apparently are usually, if not always, self-pollinated, even though they are highly adapted to specialized insect pollinators.

Kondo, K.: Germination and developmental morphology of seeds in U. cornuta and U. juncea. Rhodora Vol 73 pp 541-547 1971

Since these two species are so closely related, the author examined the possibility of distinguishing the two species by differences in morphology of the seedlings. Seeds germinate with high percentages on Moore's solution under sterile culture. Indeed, it was found that the two species differ as seedlings morphologically. U. juncea usually has one chlorophylose cotyledon and a second cotyledon that is capable of developing into rhizome and bladders. The angle between these structures determines the differences between the two species when grown on the above medium.

Krajina, V. J.: Sarraceniaceae, a new family for British Columbia.
Syesis Vol 1 pp 121-124 1968
Many large plants (number not stated) of S. purpurea were found in a peat bog about 20 miles south of Fort Nelson, B. C., near Jackfish Creek. The Alaskan highway 97 is found nearby. This station extends the range of this species so that it has now the largest distribution of all the pitcher plants. However, this locality is still east of the Rocky Mountains and belongs to the Boreal white and black spruce biogeoclimatic zone.

Lebrun, J.: New localities and chorology of vascular plants of Africa.
Bull. Soc. Bot. Fr. Vol 166 pp 367-375 1970
A new locality is given for a rare carnivorous plant from tropical Africa, Aldrovanda vesiculosa.

Mackie, G.: Neuroid conduction and evolution of conducting tissues.
Quart. Rev. Biol. Vol 45 (4) pp 319-332 1970
Neuroid conduction refers to the propagation of electrical events in non-nervous cells. Dionaea and Mimosa are two genera that provide examples of neuroid conduction. The former plant possesses trigger cells which function in an analogous way to certain animal receptors. Transmission from cell to cell is thought to be electrical via low-resistance pathways. The author discusses the evolution of these excitable cells in various plants and animals.

McDaniel, Sidney: The genus Sarracenia (Sarraceniaceae).
Bull. Tall Timbers Research Sta. No. 9 September 1971
This report deals with the morphological, ecological and taxinomical treatment of the genus Sarracenia. Excellent drawings of each species vegetative and floral structures accompany this work. They are noted for their accuracy and attention to detail. Interestingly, the significant statement that the author makes is in denying the existence of S. jonesii as a distinct species or subspecies. Instead, it is recognized in this report as a severe morphological diverse species under S. rubra.

Mozingo, H., Klein, P., Zeevi, Y., Lewis, E.: Venus's flytrap observations by scanning electron microscopy. Amer. J. Bot. Vol 57 (5) pp 593-598 1970
Observations of the digestive glands, trigger hairs, epidermal surface, nectar glands, touch receptors, and stomata of Dionaea were carried out by means of electron microscopy. Previously undescribed details of the surface topography were resolved which may correlate with certain functions of the plant.

Pinner, E.: Unusual caterpillar grows on the carnivorous Dorsera capillaris.
Naturwiss Rundsch Vol 20 (11) 479 1967
A caterpillar was found on the leaves of the above species eating the sticky plant material on the tentacles and pupates there. The species was Trichoptilis parvulus.

Raju, M. V. S.: Development of floral organs in sites of leaf primordia in Pinguicula vulgaris. Amer. J. Bot. Vol 56 (5) pp 507-514 1969
Plants of this species have either clockwise or counterclockwise spiral phylotaxy. The inception of floral primordia occurs in leaf sites as a normal sequence of development. The apical meristem continues to produce leaves in the vegetative phase and flowers in the reproductive phase, and thus the plants show a monopodial growth. In a long-lived plant one or the other genetic spiral is

maintained in spite of the interruption caused by the appearance of flowers in leaf sites.

Rao, T. A., Shanware, P. G., Tribedi, G. N.: A note on the pitcher plant habitat in Assam. The Indian Forester Vol 95 (9) pp 611-613 1969
This report describes the ecological features of N. khasiana as it grows on the Khasi hills in India. Soil samples were analyzed for many physical-chemical characteristics such as pH which was about 5.3 in the sandy soil. The most vigorous growing plants were related to the amount of moisture they receive than to any other measured parameter.

Rothfels, K., Heimburger, M.: Chromosome size and DNA values in sundews (Droseraceae). Chromosoma Vol 25 (1) pp 96-103 1968
Relative DNA content has been determined for root tip nuclei of Drosophyllum (2n=12), D. rotundifolia (2x=20), D. intermedia (2x=20), D. linearis (2x=20) D. binata (3x=32), D. capensis (4x=40), D. spathulata (8x=80). The relative DNA values per diploid genome for Drosophyllum and diploid, triploid, and higher polypoid Drosera were approximately as 16:4:2:1. These values are terms of a geometric series and are compatible with a multistranded (polyneme) interpretation of chromosome structure.

Scala, J., Iott K., Schwab, D., Semersky, F.: Digestive secretion of Dionaea muscipula. Plant physiol. Vol 44 (3) pp 367-371 1969
In about a 7-10 day digestive cycle in Dionaea, the author found that maximum secretion of enzyme occurs within the first three days. Phosphatase, proteinase, nuclease and amylase have been observed in the secretion.

Schmid, R.: Nepenthes studies: Homologies of the operculum, lid, and apex (calear, spur). Bot. Jahrb Vol 90 (3) pp 275-296 1970
IN GERMAN
By examining carefully the formation of the Nepenthes pitcher lid and spur, the author observed that the two-lobed lid appears before the spur or apex. According to many other authors, the spur is considered to be the true apex of the leaf and the lid, the apical part of the lamina. These observations are correlated with the evolution of species in the genus.

Schwab, D. W. Simmons, E. and Scala, J.: Fine structure changes during function of the digestive gland of Venus's flytrap (Dionaea muscipula). Amer. J. Bot. Vol 56 (1) pp 98-100 1969
Changes in the structure of the digestive glands cells of Dionaea during the digestive process have been studied with light and electron microscopy. Essentially, the various organelles such as mitochondria show physical enlargement which is indicative of an elevated biochemical activity. Changes also take place in the cell wall and membrane which are associated with secretion of the digestive fluid. The author discusses these and other complex changes during the 7-10 day digestive cycle.

Sievers, A.: The outer epidermal wall of the sensitive hairs of Dionaea muscipula. Planta Vol 83 (1) pp 49-52 1968
IN GERMAN
The author found under the electron microscope the presence of numerous radially arranged fibrils in the cuticular layer of the sensitive hair. These fibrils possibly make the sensitive hair elastic and enable it to undergo repeated bendings.

Sorenson, D.: The utilization of paramecia by the carnivorous plant Utricularia gibba. Planta Vol 82 pp 166-170 1968

U. gibba. bladders capture large numbers of paramecia within a short period of time under controlled conditions. This results in an increase in the number of bladders and permits a direct evaluation of the role of entrapped animals in the nutrition of this plant.

Subramanyam, K.: Studies on the traps of some Indian species of Utricularia. Bull. Bot. Surv. India Vol 9 pp 201-205 1967

The morphology of the traps of the following native carnivorous plants were studied: U. baouleensis, bifida, graminifolia, kumaonensis, scandens, and squamosa.

Swales, D.: S. purpurea as host and carnivore at Lac Carre, Quebec. Natur. Can. Vol 96 (5) pp 759-763 1969

In the fluid of pitchers, spiders and insects of 21 families were found partially digested, while mites and dipterous larvae of 3 genera were living unharmed by the enzymes secreted by the plant. A tentative explanation for difference in reaction of the two groups is put forward.

Williams, M., Mozingo, H.: The fine structure of the trigger hair in Venus's flytrap. Amer. J. Bot. Vol 58 (6) pp 532-539 1971

The trigger hairs of Dionaea were examined under the electron microscope. The author points out the various complicated number of organelles within the three regions of the trigger hair which differ in size, shape and cytoplasmic content. The possible functional significance of these structures is discussed.

A BOOK REVIEW

Erickson, Rica: PLANTS OF PREY Lamb Publications Pty, LTD. 94 pages Pub. 1968

This little book provides a comprehensive survey of the carnivorous plants growing in Australia. The writer gives a fund of information about these fascinating plants in a simple sytle that will be of great value to both the general reader as well as the botanist. She describes in detail the various species which are accompanied by excellent colored plates, black and white sketches and information about the localities where they may be found. A possibly controversial section of the book "lumps" the previously accepted eight species of Australian Nepenthes into one, and reasons for so doing are offered.

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EDITORS' CORNER

A quick glance down the list of subscribers in CPN numbers one and two will quickly demonstrate the gratifying response we have received in our little endeavor to provide voice and a common meeting ground for carnivorous plant people. We now have a total near one hundred at press time and the number is still growing as the word gets around. We were very pleased with comments and constructive criticisms of the first issue, and no two people were more critical than the editors themselves. We think you will appreciate several improvements this time out.

But being a subscriber is not enough. We need news, we need short notes, we would like to hear from everyone so that we do not become provincial. Just a line or two on something you saw, did or are doing will serve. This issue comes right in the middle of the field season, for North Americans at least, and we would like to hear about your excursions into where it really is.

We enthusiastically welcome the large number of subscribers who are also members of the Insectivorous Plant Society of Japan. These people have been organized and bulletinized for years and Katsu Kondo has a brief introductory history of this active group in the SHORT NOTES section. We are certain that a great deal of valuable knowledge and experience will be exchanged.

We would also like to thank and acknowledge David Kutt who supplied many of the fine little drawings in this issue and who has agreed to do more of them for us.

NEW SUBSCRIBERS

GREG JAKES (7170 Gratiot, Saginaw, Michigan 48603) is a high school student just getting started in the field. He is currently raising some plants in a light box in his home. He is a student of Fred Case.

DAVID M. KUTT (7000 Woodell NE, North Canton, Ohio 44721) has just recently made a week long trip to the North Carolina coastal plain and stopped to visit one of your editors along the way.

D. B. LAWRENCE (Dept. of Botany, Univ. of Minnesota, Minneapolis, Minn. 55455) is Professor of Botany at his institution.

ROBERT BYE (Botanical Museum of Harvard Univ., Oxford St., Cambridge, Mass. 02138) is mainly interested in the taxonomy and ecology of Drosera.

ERNEST WILSON (Associate Prof. Biology, Box 291, Virginia State College, Petersburg, Va. 23803) is a plant physiologist who teaches. He laments the usual general lack of interest in Botany by college students but mentions that carnivorous plants do spark some life into the class. One of his students is attempting to measure the threshold potential of closing flytraps.

ROBERT A. CAMPBELL (Dept. of Botany, Indiana Univ., Bloomington, Ind. 47401) is subscribing out of general interest only, he says. The bug will bite him after a few issues.

PETER TAYLOR (Royal Botanic Garden, Kew, Surrey, England) has made field trips to Trinidad and Florida, andhas stopped in the Durham-Chapel Hill (North Carolina) area to get information on New World Utriculariaș this spring. He is a world famous Utricularia taxonomist who has a lot of papers, and he is going to review New World species soon after his return to Kew.

GEORGE JOHNSON (1312 Page St. #1, San Francisco, Calif. 94117) is interested in carnivorous plants, especially in the causes of variegation and fasciation.

DAVID SCHROEDER (1175 Potrero Blvd., San Francisco, California).

DAN ANDAYA (7725 Bonniewood Ct., Dublin, Calif. 94566) is interested in producing effects in Dionaea by spraying solutions of gibberelic acid on them. He would like to obtain other plant hormones to experiment with in order to study the effects on Dionaea and other species.

CHARLES MOORE (Box 8, Brevard, North Carolina).
BERNARD KLEIN (1347 West Isabella Rd., Midland, Michigan 48640).

FREDERICK CASE, II (7275 Thornapple Lane, Route 180, Saginaw, Michigan 48603) needs no introduction. He is well known in the art of growing native American orchids as well as growing and writing about carnivorous plants. Sarracenia species and hybrids are his favorite subjects. He has written and grown all of them for many years and so we welcome his subscription and hope his vast experience in this area will be revealed in the pages of CPN and elsewhere.

C. D. BRICKELL (Director, R. H. S. Garden, Wisley, Ripley Woking, Surrey, England).

ANTON M. CHRIST (Manager, Botanical Garden, Univ. of California, Berkeley, Calif. 94720) manages this large garden noted for its cactus and succulents. They have a rather large collection of carnivorous plants which the public is invited to see. In the tropical house, the Nepenthes always seem to have numerous large pitchers dangling over the sides of hanging baskets. The lath house has a nice display of Chrysamphora and numerous species and hybrids of Sarracenia.

STEVE CLEMESHA (18 Wesson Rd., West Pennant Hills, N.S.W. 2120 Australia) wrote an article for this issue. He has a large collection of Sarracenia and hybrids as well as the local native plants. He is very good in growing plants to flowering stage from seed. He managed to grow from seed a flowering plant of Chrysamphora in four seasons.

ROBERT COOMBS (220 Aviada Ave., Millbrae, Calif. 94030) is a teacher who is interested in these plants.

RAUL HERNANDEZ (1387 Skyline Drive, Daly City, Calif. 94015) works in the San Francisco Golden Gate park in the Conservatory where among the thousands of tropical plants, Raul grows Dionaea and Drosera capensis. The latter plant is used effectively to control white fly and gnats especially in the glass case that houses the orchids.

WILLIAM R. JOHNSTON (4526 Thompson St., Oakland, Calif. 94601) works in the University of Calif. Botanical Garden where among the many plants that he is responsible for are the carnivorous plant collection. He has had a lot of practice growing many species from seed. Also, he is doing an excellent job of maintaining the many species under his supervision.

MRS. ALICE KALE (9460 Oakwilde Ave., Stockton, Calif. 95205).

WAYNE RODERICK (166 Canon Dr., Orinda, Calif. 94563) also works in the U.C. Botanical Garden. He found the southernmost location for Chrysamphora growing in this state. He is very interested in the ecology of this plant species, and he has seen numerous stations where this plant grows.

GIFFORD SUN AND RANDY SUN (116 Merced Ave., San Francisco, Calif. 94127) are two brothers who are very interested in growing these plants. They are beginners but are enlarging a small collection by growing their plants from root and leaf cuttings of several species of Drosera and Cephalotus.

BRIAN WHITEHEAD (P. O. Box 118, Dapto, N. S. W. 2530 Australia) is a teacher and also has a fine collection of Utricularia and Sarracenia species as well as local native plants.

CHESTER F. NAVE (2555 West Ave. 134, San Leandro, Calif 94577) has been growing Sarracenia species since 1965 and is now getting ready to start his program of hybridizing the various species.

RAY C. NASH (77 Coromandel Par., Blackwood, South Australia, Australia 5051) grows a few American species of Sarracenia and Drosera. He grows about eight species of Utricularia and eight species of native Drosera from South Australia. Among the latter, he found the Western Australian plant Drosera stricticularis in a new location in South Australia.

JOEL HAGGARD (165 Upland Dr., San Francisco, Calif. 94127) recently returned from a year stay in Australia where he observed several collections. He also found plants of Drosera growing in the field where he collected seed and is now growing them successfully.

JAMES A. WARR (2947 Hewitt Ave. #399, Silver Spring, Maryland 20906).

ISAMU KUSAKABE (5-14-6, Chitosedai, Setagaya-ku, Tokyo 157, Japan) is interested in cultivation of carnivorous plants, and has been growing some species for more than 40 years. He is the chief editor of IPSJ.

SADASHI KOMIYA (Department of Biology, Nippon Dental College, 1-9-20, Fujimi, Chiyoda-ku, Tokyo, Japan; Private address: 345-11, Fujima, Kawagoe-City, Saitama Pref. 356, Japan) is one of the founders of IPSJ, and is interested in ecological and systematic work on the Lentibulariaceae. He recently received his Doctor of Science on the subject of systematic studies in the Lentibulariaceae. The business office of IPSJ is located in his laboratory.

FUMIWO NEZU (6-29-9, Seijo, Setagaya-ku, Tokyo 157, Japan) is the president of IPSJ. He has been working on breeding of Sarracenia for 25 years.

TSUNEWO SAITO (4-20-11, Kamiogi, Suginami-ku, Tokyo 167, Japan), who is one of the founders of IPSJ, is interested in cultivation of Drosera and Utricularia.

KIYOMICHI HANABUSA (2-7-14, Seijyo, Setagaya-ku, Tokyo 157, Japan) is a biochemist. He is interested in enzyme studies in carnivorous plants, and grows Sarracenia and Cephalotus.

KIYOSHI SHIMIZU (5-16-35, Midori-machi, Koganei City, Tokyo 184, Japan) is a high school teacher and professional photographer, having done a pictorialized book, "Insectivorous Plants Illustrated", published by Seibundo-Shinkosha Publishing Co.

KAZUHIRO KASAHARA (5-18-3, Kamisaginomiya, Nakano-ku, Tokyo 165, Japan), who is a high school teacher, is interested in cultivation of carnivorous plants as his hobby. He is an author of the book "Miracle Carnivorous Plants" in Japanese, and is looking for plant exchanges.

ICHIRO SAKANASHI (Nagoya-Higashiyama Botanical Garden, Tashiro-cho, Chikusa-ku, Nagoya 464, Japan) is a horticulturist interested in tropical carnivorous plants. Nagoya-Higashiyama Botanical Garden has a large collection of Nepenthes in a special Nepenthes greenhouse donated by Mr. Tokuyoshi Kondo.

TSUNEWO KOIKE (2936-1, Shirasuga, Kosai City, Shizuoka-Pref. 431-04, Japan) is a high school teacher and does a lot of work in ecological studies of carnivorous plants. He has several articles to his credit, and three carnivorous plant books published by himself.

MASAZI HIRANO (1-24-3, Taira-machi, Meguro-ku, Tokyo 152, Japan) seeks someone who can exchange carnivorous plants. He grows a large, well cared for collection.

GINJI SHIKATA (1-24-2, Minowa, Taito-ku, Tokyo 110, Japan) is also one of the founders of IPSJ.

MASAMI TOYOSHIMA (88 Fukakusanishidate-machi, Fushimi-ku, Kyoto City, Kyoto-Fu 612, Japan) has been to the Philippines, Borneo, Cambodia, Malay Pen., etc. for collecting Nepenthes and has a fine collection.

HIROSHI ATSUMI (5-14-1 Yoyogi, Shibuya-ku, Tokyo 151, Japan) is a co-editor of the Journal of IPSJ.

JIRO NAGAMOTO (30-1, Kurahashi-cho, Maizuru City, Kyoto-Fu 625, Japan) is working on breeding of Drosera as his hobby.

HIROSHI OHOE (1-64, Sasazuka-cho, Shibuya-ku, Tokyo 150, Japan) is a nursery man who sells carnivorous plants.

HIROSHI ISHIZU (212, 2-chome, Yamate, Kokura-ku, Kitakyushu-City, Fukuoka-Pref. 802, Japan) has been collecting carnivorous plants for 20 years, and is currently breeding Sarracenia.

YOSHITERU OHONO (3-20-7, Mejiro, Toshima-ku, Tokyo 171, Japan), who is a meteorologist, has been collecting carnivorous plants for 40 years as his hobby.

YOSHIWO TOYODA (3-22-3, Soya, Ichikawa City, Chiba-Pref. 272, Japan) has a large collection of Nepenthes and Sarracenia. He made a trip to Mt. Kinabalu, Borneo, for collecing Nepenthes in 1971.

MAKOTO HONDA (1489, Kumisawa-cho, Tozuka-ku, Yokohama City, Kanagawa-Pref. 244, Japan) is interested in taking ecological pictures of carnivorous plants in the field.

KITARO KAYABA (1-5-31, Odawara, Sendai City, Miyagi-Pref. 983, Japan) is a medical doctor and has been studying native Drosera in his local area as a hobby.

SHIGEWO YAMAMOTO (11 Shoda, Miai-cho, Okazaki City, Aichi-Pref. 444, Japan) has been cultivating Nepenthes for seven years.

GAKUSABURO YAMAKAWA (8-56, Kumoi-cho, Nishinomiya City, Hyogo-Pref. 662, Japan) is a high school teacher, and is interested in exchange of carnivorous plants.

KUNIMASA WAKITA (6-2, Takami-cho, Chikusa-Ku, Nagoya 464, Japan).
TETSUYA ISHIMARU (1-21, Katasaka-cho, Mizuho-Ku, Nagoya 467, Japan).
HITOSHI SUWA (4-21, Amatsuka-cho, Nishi-Ku, Nagoya 451, Japan).
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HARUHIKO NAKAGAWA (7-7-14, Okuzawa, Setagaya-Ku, Tokyo 158, Japan).
TAKASHI MARUOKA (1-6-5, Naka-machi, Hoya City, Tokyo 188, Japan).
YOSHI-AKI KATAGIRI (3-1-8, Inaba, Kameda-machi, Naka-Kanbara-Gun, Niigata-Pref. 950-01, Japan).

YASUKO SHIMOMURA (2-22, Tsuruha-cho, Showa-Ku, Nagoya 466, Japan) grows carnivorous plants for 5 years as her hobby.

KAZUO HAYASHI (233-43 Onotaniguchi, Kurimoto-cho, Kurita-Gun, Shiga-Pref. 520-31, Japan) is interested in cultivation of carnivorous plants.

SEIJI HOSHINO (220 Higashiyama, Minami-Sakae-machi, Toyohashi City, Aichi-Pref. 440, Japan) has been collecting carnivorous plants for 10 years.

MASATO YOKOI (709 Goh-naka, Terano-cho, Tsushima City, Aichi-Pref. 496, Japan).
AKIRA OOHASHI (Nagoya Teishin Hospital, 3-10, Higashi-Kataha-cho, Higashi-Ku, Nagoya 461, Japan).
KOHSHI SAWADA (Kokutetsushukusha No. 2, 3-2, Matsubara-cho, Yokkaichi-City, Mie Pref. 512, Japan).
TSUNETOSHI KADOWAKI (3972, Mutsuura-machi, Kanazawa-Ku, Yokohama 236, Japan).
SHIGEWO KURATA (1-36-9, Izumi, Suginami-Ku, Tokyo 166, Japan).
KATSUHIKO FUJITAKE (178, Ohoizumi-Gakuen-cho, Nerima-Ku, Tokyo 177, Japan).

SABURO KITO (6-3, Takami-cho, Chikusa-ku, Nagoya 464, Japan), who is a high school teacher, is interested in cultivation of carnivorous plants.

TAKAMI GOTO (1, Showa-cho, Gifu City, Gifu-Pref. 500, Japan) has been cultivating carnivorous plants for ten years.

YASUSHI SATO (49-1, Naka-kawabe, Kawabe-cho, Kamo-Gun, Gifu-Pref. 509-03, Japan) grows carnivorous plants.

SKIRA ISAKA (1447, Ishiyakushi-cho, Suzuka City, Mie-Pref. 513, Japan), who is a high school teacher, is interested in field botany, especially observation of carnivorous plants.

SHIN-ICHI ISHIKAWA (Nakakaido, Sakurai-cho, Anjyo City, Aichi-Pref. 441-11, Japan) has been collecting carnivorous plants for 10 years.

MASASHI EGUCHI (1-chome, Kochino-shin-machi, Kohnan City, Aichi-Pref. 483, Japan) has been cultivating carnivorous plants for 6 years.

SUSUMU KUMON (240 Wakamiya, Hyogo-machi, Saga-City, Saga-Pref. 840-01, Japan).

SHIGETOSHI YAMANAKA (5-18-15, Okuzawa, Setagaya-ku, Tokyo 158, Japan).

MASAHIDE NISHIDA (Dormitory of Minami Kyushu University, Hibarigaoka, Takanabe-cho, Koya-Gun, Miyazaki-Pref. 884, Japan).

NEWS AND VIEWS

The Cactus and Succulent Information Exchange was kind enough to mention CPN in their bulletin and we would like to return the favor. Those of our readers who are also interested in cacti and succulents, write Mrs. Grace Rollerson (Editor), 5512 Clinton St., Burnaby 1, British Columbia. They have a fine bulletin.

Mr. Isamu Kusakabe has noticed that cats are apparently attracted by odor to his Drosophyllum. They break into the greenhouse and step all over his other plants in order to get to Drosophyllums. He and we would be interested to know if anyone else has observed this phenomenon.

It has been suggested that we compile a list of public access gardens and institutions that have carnivorous plants in their collections. This would be of some help to subscribers who are traveling and would like to visit one of the collections that might be in their vicinity as they roam about. If you run into a collection that is not well known, send us a note and tell us about it.

During 1970 and 1971, Mr. Y. Musashino (three times) and Dr. N. Takaki (once) made field trips to Sumatra, Indonesia, sponsored by Mr. Tokuyoshi Kondo, and they collected all the native species of Nepenthes in Sumatra for Kondo's collections. These are in very good condition in Kondo's greenhouses. Some more trips to Sumatra for Kondo's collections will be expected, Mr. T. Kondo said. (News from Nagoya, Japan, sent in to us by Katsu Kondo.)

Regarding the paper by Kress and reviewed in the current lit section, as well as much of the other chromosome work in pitcher plants, Joe Mazrimas writes, "As was reported previously, all species of Sarracenia have a diploid number of chromosomes of 2n=26 while Chrysamphora was reported to have a chromosome number of 2n=30. The recent work of Dr. Kress shows that at least one species of Heliamphora has a chromosome set of 2n=42. I may infer from this report that the basic set of chromosomes in this family of plants is n=7. Thus, through the common pathway of simple polyploidy, the present species of Heliamphora came about by duplication to form the present hexaploid plant. In the genus Sarracenia, this tetraploid species is complicated by possible fusion between non-homologous chromosomes after the occurrence of polyploidy. An extra chromosome pair in the genus Chrysamphora, which is also tetraploid, could arise from fragmentation or reduplication. Although further evidence is required to differentiate among these mechanisms, nevertheless, simple and secondary polyploidy remain as important sources of species formation and evolutionary development in plants.

"As a matter of interest, Rodidula, a non-carnivorous plant, has the same chromosome number as Drosophyllum, 2n=12!"

Incidentally, Joe has reported errors in taxonomy of Nepenthes obtained from various sources, including at least one well-known botanical garden. Of course, this would not be the first time that collections of families and species were mislabeled. But your other editor has had some difficulty keying out many of these domestically obtained plants. We expect that the basic problem is that most Nepenthes (in the U. S., at least) have been perpetuated in collections from the heyday of breeding and

collecting bizarre plants back in the latter part of the last century. As we all know, it was a status symbol as well as accepted pastime to create hybrids. Many of these have possibly been recrossed, and along with the confusion in recognizing variation in native areas so that too many species were named (re Erickson's recent lumping of the Australian Nepenthes "species" into one), and the old problem of someone presenting an individual as one of a recognized species when he does not know the difference, the identity of most of these individuals in U.S. collections is in serious doubt. We would propose that they all be considered cultivars until proven otherwise. What is needed is an extensive new botanical survey of "Nepentheana" with a great deal of collecting and comparative taxonomy along the way. One such expedition over the entire area could probably map out the whole business in true perspective as opposed to bits and pieces work. However, given the expense involved nowadays in addition to the political and military unrest in Nepentheana, we have little hope for such a survey.

Katsuhiko Kondo, currently with the University of North Carolina at Chapel Hill, will soon have a new book coming out in Japan. We are told it features many excellent photographs of carnivorous plants.

Growers of Byblis gigantea may have difficulty getting pollen from their plants if they are growing them under glass or other protection from insects. Warren Stoutamire noted that the flower has a structure similar to some non-carnivorous plants that require vibration of the anthers by the wings of bees and other insects for dehiscence to occur. Joe Mazrimas tried this and obtained abundant pollen.

Another pollen problem. Some of us growing Heliamphora heterodoxa in the United States under glass note lack of pollen production. Here the problem seems to be one of lack of production from precursor cells rather than dehiscence. Cotton blue stains by at least one of us indicate no pollen granules at all let along viable-nonviable differentiation. If anyone has noted a similar problem with this or any other Heliamphora species or has overcome it, drop a note to CPN.

Dr. Kress from the Munchen Botanical Garden believes that the primitive basic chromosome number of Drosera is n=5 as opposed to a value of n=10 which was reported in CPN 1, 12 (1972). But in the family of Droseraceae, one series of Drosera has a basic number of x=5 and shows species ranging from 4x to 16 x. At x=6, (Drosophyllum: 2x); x=7 by D. whittakeri 4x. At a basic number of x=8, there is D. binata 4x, D. auriculata 4x, Dionaea 4x, and Aldrovanda 6x.

David Kutt writes: "On May 5, 1972, leaving Canton, Ohio with my wife, brother, and good friend, Joe Falasco, I headed for southern North Carolina. On a field trip for the purpose of collecting and observing carnivorous plants, my first stop was to pay a visit to Don Schnell, co-editor of "Carnivorous Plant Newsletter". Don was very hospitable. He took a whole Saturday afternoon of his time to show us his greenhouse and a small bog a few miles from his house in Statesville where I obtained specimens of purpurea, flava, "catesbaei", and Drosera rotundifolia. He also advised me as to where to look for plants along the southern coastal plain around the Wilmington area (our next stop).

We arrived in Shallote Saturday night, and after breakfast the next morning, we got an early start along route 211 heading north. Stopping frequently, we found 3 or 4 species of Drosera in very great abundance beside the roadside areas and along the drain ditches. Also, along the ditches we found Sarracenia flava, purpurea, rubra and hybrid catesbaei. About 15 miles south of Bolton along 211 on the left side of the road, we found an enormous swamp some 2 miles long in which flava grew in great abundance. The plants were well developed and in flower. It was really something to see.

"Monday, May 8, off 211 on one of the small dirt backroads, we found Dionaea in a surprisingly dry savannah type of area. Tuesday, May 9, about 8 miles north of Shallote on 130 we found Dionaea growing heartily in wet sphagnum moss along the roadside in drainage ditches. These were larger than the flytraps that grew in the dryer areas. We also found Drosera rotundifolia growing with intermedia in a very sandy wet area around pools of water a small distance off 130 and on another small back road. Some of the rotundifolia had a diameter of 2 and 1/2 inches!"

SPECIAL NOTICES

Joe Mazrimas is prepared to trade seed of the following: Sarracenia minor, Chrysamphora californica, Dionaea muscipula, and Drosophyllum lusitanicum.

Many readers would certainly like to read entire papers out of some of those we review each issue but may not have access to a good library. Most of the authors are now CPN subscribers and they may be able to supply reprints. (Note to those not experienced with dealing in reprints: It is a good courtesy to send a stamped, self-addressed envelope along with your request.) If the reprint supply is exhausted or you cannot find an author's current address, you may write a library for a Xerox copy. One very complete and cooperative library is associated with the New York Botanical Garden. They will make Xerox copies, bill you the very nominal charge per page, and send copies promptly. If the journal is too far out even for them, they will refer you on to another library that does have the journal. Send complete bibliographic data to: Mrs. Lothian Lynas, Associate Librarian, New York Botanical Garden Library, Bronx 10458.

A frequent request in letters from subscribers has been for information on where to obtain plants. We hope to continue to provide information about those who are willing to trade or give plants or seed among our subscribers. We are listing below some commercial sources and are only doing so for general interest. The listing itself does not constitute editorial endorsement.

Name and Address	Catalogue Price	Genera
1. Peter Pauls Nurseries	25¢	Dionaea Drosera Sarracenia Pinguicula Chrysamphora Utricularia

	Name and Address	Catalogue Price	Genera
2.	Armstrong Associates, Inc. P. O. Box 127 Basking Ridge, New Jersey 07920	25¢	Dionaea Drosera Sarracenia Pinguicula Chrysamphora
3.	Insectivorous Botanical Garden 1918 Market Street P. O. Box 3322 Wilmington, North Carolina 28403	25¢	Dionaea Drosera Sarracenia Pinguicula Chrysamphora
4.	Arthur E. Allgrove NSY North Wilmington, Mass. 617/658-4865 01887 281 WOBURN ST.	25¢	Dionaea Sarracenia Pinguicula Chrysamphora
5.	International Growers Exch. P. O. Box 397 Farmington, Michigan 48024	$2.00	Dionaea Drosera Sarracenia Pinguicula Chrysamphora
6.	Peter and Pam P. O. Box 4415 San Fernando, Cal. 91342	free	Chrysamphora Sarracenia Dionaea
7.	Roehrs Exotic Nurseries Farmington, New Jersey 07727	house plant list 25¢	Nepenthes
8.	King's Park and Botanic Garden Perth, Western Australia 6005	apply	Drosera seeds Byblis seeds Cephalotus seeds
9.	Carolina Biological Supply Burlington, North Carolina 27215	inquire	Utricularia Pinguicula Sarracenia Chrysamphora Drosera Dionaea
10.	Geo. W. Park Seed Co. Greenwood, South Carolina 29646	free	Nepenthes seed Chrysamphora seed
11.	~~Pearce Seed Co.~~ ~~Moorestown, New Jersey~~ 08057	free	Sarracenia seed
12.	Carolina Insectivorous Plants P. O. Box 1245 Greenville, North Carolina 27834	10¢	Sarracenia species and hybrids, Drosera, Dionaea, Utricularia, Chrysamphora, Pinguicula and seeds

SHORT NOTES

DROSERA BINATA

by Stephan Clemesha

This interesting plant is in my experience the most satisfactory Australian Drosera to cultivate. It is the first insectivorous plant that I ever cultivated and my original plants are still growing. I found that three distinct forms of it exist. Two of these are plentiful while the third is a rare plant found in a very specialized habitat.

Curiously, it is the rare form which I have had longest and it was the only form I had for about five years. In that time, it has flowered each spring, set seed, and then its leaves withered and died in the autumn. The original plant was collected quite unintentionally in a square of soil with a delicate ground orchid. The latter plant died soon after collection but the pot was not discarded because of the Drosera. Its distinctive habit is its leaves and petiole which are roughly T-shaped and the lead ends never fork dichotomously into four or more segments as do those of the more common form.

As young plants, the common form produce T-shaped leaves also and even mature plants will occasionally produce the T-shaped leaves and so it took a long time before I realized its distinctiveness. Even plants grown from seed in the U.S.A. proved that it was true to its type, that is, the leaves were always T-shaped even in the flowering plant. At first, I believed the lack of dichotomous leaves to be my growing conditions so I tried all sorts of things to improve them. All failed but fortunately I did not kill the plant.

Finally, I collected a few plants of the common form and these continue to produce dichotomous leaves though still produce an odd T-shaped leaf especially at the beginning and end of the season. I then looked everywhere I knew where D. binata grew in order to try and determine the commonness of the two forms. I saw the dichotomous form in abundance but did not see the T-shaped form again for about two years. I looked in coastal and mountain swamps, in wet rock crevices, in very wet habitats, rather dry ones, in full sun and heavy shade but always found only the dichotomous form. A few times I thought that I found the T-shaped form but I was disappointed when the dichotomous leaves soon followed. In the meantime, plants of the dichotomous form I sent to the U.S.A. were causing excitement as being new and different from the T-shaped form which had become well established in cultivation and was accepted as the common form.

I failed to find another specimen of the T-shaped form in the area where I first found it because it was blocked for a time, but I was able to visit areas only 100 yards or less away. The area is a cliff face (sandstone) with many caves and wet crevices. Climbing down the winding trail, I could see D. binata growing on many wet surfaces and some grew in overhanging caves. However, these all turned out to be the dichotomous form. Finally, when I was able to return to the original cave, I found only a few weak plants in wet mud and sphagnum and with it the orchid. The area is heavily shaded accounting for the weak growth.

I have since found it in another area about 10 miles away. Here it grows in a cave in a rock crevice but receives more light than the other area so the colony is a large one. The presence of small plants of the dichotomous form in a colony makes finding a pure strand of this rare form more difficult. This is the only information I have on this type in Australia.

The third form of D. binata was found in open swamps on Stradbroke Island (20 miles by 8 miles) off Brisbane Queensland. This area is about 600 miles north of my Sidney collecting areas. This form is the only one I observed in the area. It differs from the local dichotomous form in having leaves which fork more and earlier giving this form a curious spider-like appearance. Its petioles and leaves carry much more of a reddish pigment than those of the other two forms. Even the leaf hairs are reddish. When I first saw it, I suspected it was the result of its habitat but cultivated plants have shown no sign of reverting back to the other form. It continued growing right through the winter unlike the other two deciduous forms and possibly is more free flowering than the other forms.

All forms of D. binata are easily cultivated in pots of sphagnum which must never be allowed to dry out and look best when standing in water. All forms can be propagated from root cuttings or leaf cuttings on pots of wet material in shade though I had no success with leaf cuttings of the T-shaped leaf form. More studies in distant areas are desirable to find out the possible ranges of the three forms.

A HISTORY OF THE INSECTIVOROUS PLANT SOCIETY OF JAPAN

by Katsuhiko Kondo

This society was founded in Tokyo on November 20, 1949. The founders were all amateur botanists: Dr. M. Toyoda, Mr. G. Shikata, Mr. T. Saito, Mr. S. Ohotaki, and Mr. S. Komiya. The first meeting was held at the Koishikawa Botanical Garden at Tokyo University on December 25, 1949, and a charter and by-laws were made. The first edition of their bulletin was published on January 30, 1950. Without Mr. T. Saito's help, this edition would not have come out. The first field trip was made on May 3, 1950. On November 26, 1950 the society had its first anniversary and viewed the French film, "Insectivorous Plants" at the National Science Museum at Tokyo. On April 8, 1951 Mr. O. Hirose, who introduced living Sarracenia to Japan and produced numerous hybrids of them as a pioneer of cultivation of insectivorous plants, gave a seminar about cultivation of Sarracenia. On April 27-29, 1951 "The First Carnivorous Plant Show" was held at Mitsukoshi Department Store. Since then, carnivorous plant shows have been one of the society's main attractions. The first president, whose tenure was 15 years, was Dr. M. Toyoda who died in 1964. After his death, from 1964 to the present, Dr. F. Nezu has filled the position as the second president of the society.

Almost from its inception the society felt the need for a permanent headquarters of its own. However, this seemed an impossibility.

Mr. S. Komiya, through his enthusiastic participation in the society, established the permanent headquarters of the society in his office, Department of Biology, Nippon Dental College, 1-9-20, Fujimi, Chiyoda-ku, Tokyo, Japan.

The editor of the Bulletin of IPSJ is now Mr. K. Kusakabe, and the co-editor is Mr. H. Atsumi. The society is now 23 years old, and still keeps a sense of perspective regarding the source of its membership from amateurs and professionals alike. Its bulletin has accumulated more than 55 volumes, and the society has more than 300 members at present.

Along with this large society, there is a local association at Nagoya, founded in 1966. It is somewhat like a chapter of the IPSJ, but is essentially independent. Its headquarters is located in the Nagoya-Higashiyama Botanical Garden. It has its own shows, contributions, etc., using newspapers and television. It is supported partially by the City of Nagoya.

IPSJ and IPSN cooperate with each other and contribute to carnivorous plant studies, mainly regarding cultivation of carnivorous plants and sharing knowledge.

They hope many more people will come to enjoy carnivorous plants, understand them, and protect their environment in the field.

Chapel Hill
May 15, 1972

CORRECTION OF ERRORS

As much as we try to avoid it, errors seem inevitable. There are undoubtedly some in this issue, even after careful proofreading. We wish to correct all errors brought to our attention, and here are several from the first issue.

Y. Heslop-Harrison, far from being a "he", is Yolande Heslop-Harrison.

Relative quantitation symbols were omitted from Warren Stoutamire's short note. In the table, double distilled water should be less than 2, and distilled more than 3. You may wish to make the appropriate notations in your copy.

Ritchie Bell tells us that it was Katsuhiko Kondo at UNC who actually designed and drew up the CPN bannerhead, and not he. Ritchie still handles the printing chores for us, and we are grateful to both.

LOOKING AHEAD

As we did in the first issue, we would like to continually put forth suggestions for notes or ideas on some problems or specific interests of our readers. For instance, there have been requests for exchanging experiences with carnivorous plants in various controlled or atypical environments, such as under fluorescent lights in simple setups or environmental chambers.

Next issue, we will have a note on the carnivorous plants of the Illawarra area of New South Wales, by Brian Whitehead. We will do the note which is rather lengthy in its entirety rather than split it between two issues. We hope to have more notes and news from many of you.

Editorial deadline for the October issue of CPN (Vol. 1, No. 3) is 15 September 1972. Write!

RECENT LITERATURE

Boodley, James W.: Soiless mixes. Horticulture, Jan. 1972 pp 38-39
All of us use various components in our growing mixes which we tend to think of as "inert". In this article, the author mentions that vermiculite releases small amounts of potassium, calcium and magnesium. Perlite releases sodium and aluminum. While the quantities are apparently "small" and might not give a significant electrical conductance reading, we wonder if they might not be large enough for physiological effects.

Brower, John H. and Brower, A. E.: Notes on the biology and distribution of moths associated with the pitcher plant in Maine. Proc. Entomol. Soc. Ont. Vol 101 pp 79-83 (1970)
The distribution and habits of 3 species of moths that feed on S. purpurea shows that: E. rolandia feeds on the leaves, P. appassionata tunnels in the rhizome, and E. daeckeana utilizes the seed capsule. The complex interrelationships which have evolved between these insects and their host plants are discussed.

Dunsterville, G.C.K.: Zygosepalum tatei in Brazil. Orchid Digest Vol 35 pp 241-245 1971
Right on the boundary between Brazil and Venezuela at Cerro La Neblina (means mist), on the Brazil side of Rio Negro, at an 8,000 ft. elevation, the above orchid was found growing in very boggy soil along with a new species of Heliamphora. Pitchers were tall enough to tip water into the tops of the boots. Mid-October temperatures had night lows of 43° F. and daytime was 78° F. in the shade. A formal description of this plant and its new name will be published soon by Dr. Julian Steyermark.

Gouveia, A. P., Figueiredo, M. G., DaSilva, A. M., and De Gouveia, A.J.A.: Plumbagin and related compounds. Mem. Acad. Cienc. Lisb. Cl. Cienc. Vol 14 pp 303-325 1970
IN ITALIAN
Plumbagin, a naphthoquinone derivative, was isolated and analyzed. It could be extracted from Drosera intermedia and Plumbago zeylanica.

Harder, Richard: Effect of Daphnia decoction on five species of Utricularia. Beitr. Biol. Pflanz Vol 47 (1) pp 53-62 1970
IN GERMAN
When various concentrations of Daphnia were injected into the five species (U. minor, ochroleuca, exoleta, vulgaris, stellaris), the dry weight of the first three species increased. Flowering was promoted only in one species, U. exoleta. The Daphnia have less effect on growth and flowering than sugar and acetate solutions.

Jentsch, J.: Enzymes from carnivorous plants (Nepenthes). Isolation of the protease Nepenthacin. FEBS Letters Vol 21 (3) pp 273-276 1972
The author describes the extensive isolation and properties of nepenthacin from unopened, sterile pitchers of Nepenthes. This protease is analogous to the animal enzyme pepsin in that its maximum effect takes place at a pH of 2.9. The main difficulty in isolating the pure enzyme is the presence of high concentrations of carbohydrates and other materials in the pitcher fluid.

Komiya, S.: Systematic studies on the Lentibulariaceae. Publ. Department of Biology, Nippon Dental College. 149 pp 1972
This is a D. Sc. dissertation. Although the Lentibulariaceae has been well studied by P. Taylor and S. J. Casper recently, systematic citations for this family were still from the classical works of Kamienski or Barnhart. Komiya's work proposes a new systematic treatment for this family; e. g., Subfamilies, Pinguiculoideae, Genliseoideae, Utricularioideae. Relationships of glands between genera in the family are studied in this work. He also describes two species of Pinguicula and ten species of Utricularia from Japan as a review work. Since polymorphism in some species of Utricularia is very common and some morphological variations of vegetative structures of species can be correlated with differences in habitats, biosystematic studies could prove quite valuable in this area.

Kondo, K.: Chromosome number of Drosera burmanni Vahl from Borneo. Journ. Jap. Bot. Vol 45 (5) pp 159-160 1970
The chromosome number of a red flowered form of Drosera burmanni from Borneo was counted as 2n=20. This number was same as of normal white flowered individual reported by Venkatasubban (1950).

Kondo, K. and Whitehead, B.: Chromosome number of Drosera arcturi Hook. Journ. Jap. Bot. Vol 46 (11) p 344 1971
The chromosome number of Australian Drosera arcturi was reported as 2n=20. According to Diels (1906), this species is placed in Subgenus I. Rorella DC., Sect. I. Psychophilia Planch., but chromosome numbers recorded indicate this species might be related to species which are placed in Sect. VII. Rossolis.

Komiya, S.: Exotic species of the Lentibulariaceae in Japan. Journ. Jap. Bot. Vol 47 (3) pp 83-95 1972

Since 1913, many exotic species of the Lentibulariaceae have been introduced from overseas to Japan. Thus, twenty-five species of them were identified and recorded in this article. On page 84 in this article, Komiya identified and cited a name Pinguicula clivorum Standly et Steyermark for a Pinguicula from Oaxaca, Mexico. This must be wrong: Kondo suggests that this individual must be Pinguicula oblongiloba A. DC. This was arrived at when the record of the above individual and a specimen of P. oblongiloba (Kondo 01021; 01022) identified by Casper were compared with each other. Pinguicula clivorum is a doubtful species rejected by Casper (1966).

Kondo, K. and Whitehead, B.: The chromosome numbers of Utricularia dichotoma var. uniflora and U. lateriflora. Phyton Vol 29 (1/2) pp 95-97 1972

The chromosome numbers of Utricularia dichotoma Labill. var. uniflora (n=28) and U. lateriflora R. Br. (n=14) were reported for the first time. Morphological structures of U. dichotoma (diploid, which is reported in CIS 13) are always larger than those of U. dichotoma var. uniflora (tetraploid). Evidently this is a case of reduction of quantitative characters from the diploid species to the tetraploid species caused by chromosome doubling. A comparison of the chromosome numbers of U. lateriflora and U. dichotoma with that of U. dichotoma var. uniflora indicates that these two species might be closely related to each other.

Kondo, K.: Chromosome number of Utricularia subulata L. Journ. Jap. Bot. Vol 47 pp 31-32 1972

The basic chromosome number of Utricularia in the New World is n=9. U. Subulata has n=15 and U. gibba n=14 and both species are also found in Europe and Asia as well as the New World. This indicates that the Asiatic population of Utricularia may have many races with heteroploidy.

Kondo, Katsuhiko: A comparison of variability in Utricularia cornuta and Utricularia juncea. Am. J. Bot Vol 59 (1) pp 23-37 1972

Various authors have considered these two plants conspecific in the past. The author shows that while both have the same chromosome number, and even though they are sympatric, that they are separate species. Reproductive isolation is present and is strongly seasonal. There are also floral and other consistent differences discussed in this thorough, well worked up paper.

Kress, A.: Cytotaxinomic studies on some insectivorous plants. Ber. Dtsch. Bot. Ges. 83 (2) pp 55-62 1970

IN GERMAN

The author has determined the chromosome number of seven more species of insectivorous plants. Byblis gigantea 2n=18, Drosera madagascariensis 2n=40, D. whittakeri 2n=28, Heliamphora nutans 2n=42 and Roridula gorgonias 2n=12. See News and Views in this issue for a comment on these results.

Roberts, Marvin L.: Wolffia in the bladders of Utricularia: an "herbivorous" plant? Mich. Bot. 11 pp 67-69 1972

While exploring and collecting along ponded bays on Lake Erie the author noted that many bladders of U. vulgaris contained ingested Wolffias (duckweeds). Digestion did not occur in those plants taken to the laboratory for observation; rather, some of the victims apparently proliferated within the traps. The ingestion was suggested as fortuitous, during nonspecific disturbances by waves, wind. etc.

Shibata, C. and Komiya, S.: Increase of nitrogen contents in the leaf of Drosera rotundifolia fed by protein. Bulletin of Nippon Dental College, General Education Vol 1 pp 55-75 1972 (IN JAPANESE, SUMMARY IN ENGLISH)

Absorption of peptides in the leaf of Drosera rotundifolia was observed quantitatively, using nitrogen measurement. All the results of measurement show some increase of the nitrogen contents in the leaf after feeding. In every case, the majority of nitrogen absorbed into the leaf is transferred soon to the other parts of the plant, and therefore, accumulation of nitrogen in the leaf does not exceed about 10% increase. Change of nitrogen content in the leaves fed by protein over 1 to 24 hours was investigated. After a large amount of nitrogen is absorbed into the leaf within 1 to 3 hours, the nitrogen contents reduce rapidly. Transference of decomposed peptone to the other parts of the plants is extremely slow in contrast with the absorption of it, and therefore, a high residual quantity is observed. The quickest transference is observed with egg albumin.

Subramanyam, K. and Kamble, N. P.: Chromosome numbers in certain Indian species of Utricularia 1. (Lentibulariaceae). Proceedings of the Indian Academy of Sciences 68 (Section B) (5) pp 221-224 1968

Chromosome numbers from meiotic studies have been reported for the following species of Utricularia: U. aurea Lour. (n=21); U. baouleensis A. Chev. (n=10); U. caerulea L. (n=20); U. inflexa var. stellaris (Linn. f.) P. Taylor (n=21); U. minutissima Vahl (n=8); U. scandens Benj. (n=6, 7); and U. stricticaulis Stapf (n=7). There are two cyto-races in U. scandens. This result indicates that the Asiatic Utricularia may have many races with heteroploidy.

Swales, D. E.: Sarracenia purpurea L. as host and carnivore at Lac Carré, Terrebonne Co., Quebec. Part II. Naturaliste Can. Vol 99 pp 41-47 1972

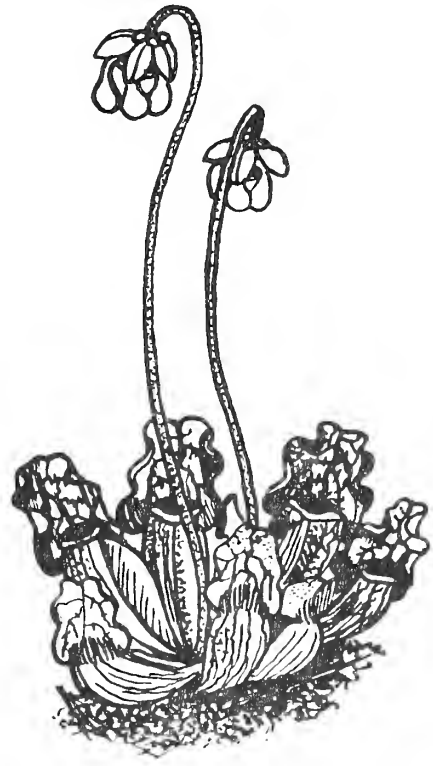
Rotifers, nematodes and copepods are added to the previously recorded list of inquilines in Sarracenia purpurea. About one-third of the larvae of Metriocnemus knabi Coq. and Wyeomiya smithii (Coq.) were killed by winter conditions, and no Blaesoxipha fletcheri (Ald.) survived that season. The most numerous mite, Anoetus gibsoni (Nesbitt), over-wintered in the hypopal stage. Two roundworm parasites of grasshoppers were found in a late summer collection and nine insect families are added to the previous list of victims. Two species of Blaesoxipha seemed to be important agents of pollination of the host plant.

Williams, Stephan E., Pickard, Barbara G.: Receptor potentials and action potentials in Drosera tentacles. Planta (Berl.) 103 pp 193-221 1972

Stimulation of the heads of Drosera intermedia by inert, chemical or living objects results in a low receptor potential followed by action potential, the frequency of the latter varying with the strength of the former. There is variation of amplitude of action potentials and this may be due to variation of resistance in receptor membranes.

Williams, S. E., and Pickard, B. G.: Properties of action potentials in Drosera tentacles. Planta Vol 103 pp 222-240 1972

Action potentials of Drosera tentacles resemble those of vertebrate peripheral nerves in that they appear to be comprised of relatively uniform spikes, variable shoulders or negative after-potentials, and variable positive after-potentials. The peaking of the spike corresponds to a period of great refractoriness, while action potentials of low amplitude may be fired readily during the negative after-potential. The action potentials fired during the negative after-potential appear to be unlike those of peripheral nerves in that they are of abnormally brief duration. Also apparently different from the case in peripheral nerves is the dependence of the duration of an action potential on the interval separating it from the preceding action potential. Action potentials propagate from the neck of the stalk to its base at about 5 mm s^{-1} at room temperature. Propagation may be reversed artificially, consistent with the possibility that the neuroid cells are electrically coupled.



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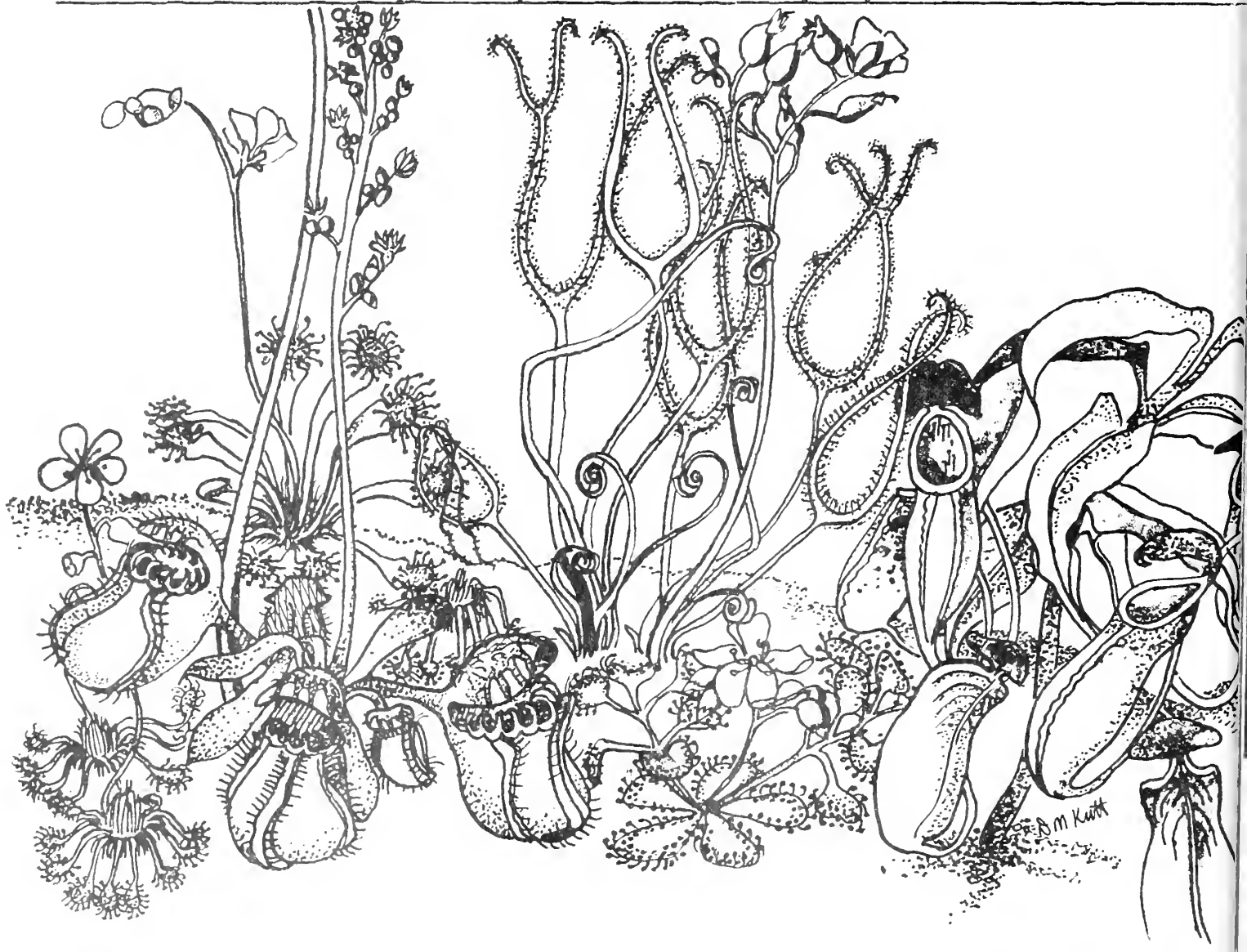

DAVID KUTT

A U S T R A L I A

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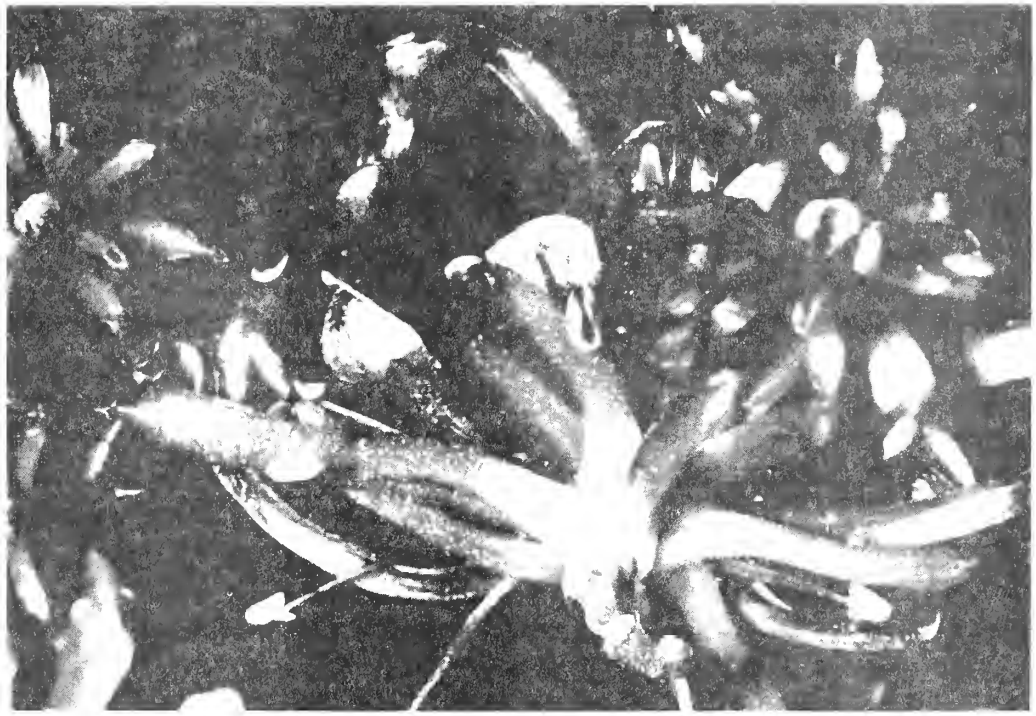

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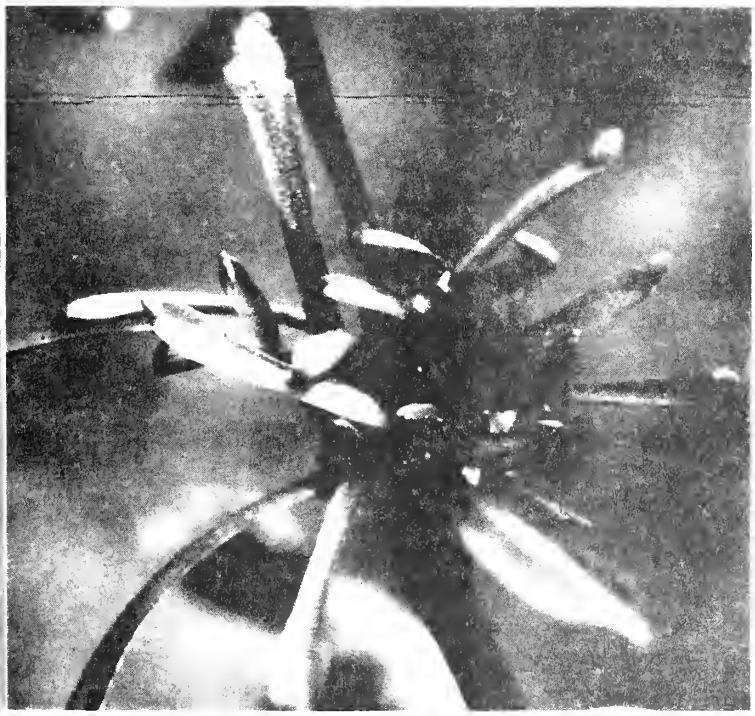


3.

4.

THE COVER -- David Kutt's montage on the cover is a dedication to Australia who carries the honor of the greatest species diversity of carnivorous plants. We are going to try some cover photos, and these are samplers. Photos 1-3 refer to the short note by Minton and Jeffreys in this issue. No. 4 is an aberrant trap on one of Joe Mazrimas' Dionaeas that seemed interesting.

NEW SUBSCRIBERS

MR. AND MRS. CHARLES COLE (Rt. 2, Box A-218, Statesville, N. C., 28677) operate a local pet shop and are interested in much native flora besides, carnivorous plants included.
MITSUHIRO FUJIMOTO (623-3 Nagabuse, Mishima-City, Shizuoka-Pref. 411, Japan).
HIROAKI NAITO (736-2 Kajiya, Naka-cho, Taka-Gun, Hiyogo-Pref. 679-11, Japan), who is a professional horticulturist at Osaka-Tennoji Botanical Gardens, is interested in cultivation of carnivorous plants.
MRS. A. R. HARTNESS (Rt. 7, Box 70, Mocksville, N. C., 27028).
MIKE GODFREY (Rt. 3, Box 72B, Hillsborough, N. C., 27278) has done a lot of native plant photography and will be doing some photos of carnivorous plants in natural settings. He is also interested in paleobotanical studies, and we are told he will have an article out soon on the subject of carnivorous plants.
RUSSELL L. KOLOGISKI (Botany Department, North Carolina State University, Raleigh, N. C., 27607).
ROBERT P. TUELINGS (N. C. Division of State Parks, P. O. Box 27687, Raleigh, N. C., 27611).
DAVID R. HILL (Biology Department, Belmont College, Nashville, Tennessee, 37203).
JAMES F. MATTHEWS (Department of Biology, University of North Carolina-Charlotte, UNCC Station, Charlotte, N. C., 28213).
JOHN J. BARBOUR (1138 Kessel Avenue, Akron, Ohio, 44310).
ADOLF CESKA (University of Victoria, Department of Biology, Victoria, British Columbia) is a botanist and ecologist interested in native Utricularias.
ROBERT W. ALLISON, JR. (4708 Westwood Court, Richmond, Calif., 94803) is interested in macrophotography of carnivorous plants and their cultivation.
ERNIE PYLE (859 Lucille St., Livermore, Calif., 94550) is mainly interested in field work and has explored meadows of Chrysamphora and Drosera, taking many photos as he goes along.
ROBERT M. HAYNES (2428 Hillside Avenue, Berkeley, California, 97404).
LORETTA CHANCE (903 Winchester #22, San Jose, Calif., 95008) has just begun her collection and wishes to enlarge it by exchange.
SHOSABURO MORI (2731, Ichimiya, Ichimiya-cho, Chyoseigun, Chiba-Pref. 299-43, Japan), who is a teacher, is a member for his local native carnivorous plant protection. He also has been cultivating carnivorous plants for ten years.
KICHIGORO SUZUKI (2222 Tomioka-cho, Kanazawa-ku, Yokohama City 236, Japan), who is a well known nurseryman selling various carnivorous plants and interesting alpine plants, has his own book "How to Collect and Cultivate Carnivorous Plants".
SUTEWO ORIHARA (Sheijutaku No. 5, 467, Sugahara-cho, Toyosato, Higashi-Yodogawa-ku, Osaka 533, Japan) is a nurseryman who is interested in carnivorous plants.
MISS YOSHIKO YAMADA (2-10-16, Minami-Ogikubo, Suginami-ku, Tokyo 167, Japan) is a college student and is interested in cultivation of carnivorous plants.
TAKEWO NOMOTO (4-13-2, Midorigaoka, Agewo City, Saitama-Pref. 362, Japan).

RYO INOUE (1-69, Ichirizuka, Gokashoo, Uji City, Kyoto-Pref. 611, Japan).
TOSHIKAZU MAEZIMA (c/O Mr. A. Karibe, 2-9-14, Ohozi-cho, Abeno-ku, Osaka City 545, Japan).
KOSHIRO KAWASE (2-28-17, Kosobe-cho, Takatsuki City, Osaka-Pref. 569, Japan).
MICHIWO ARAI (The Botanical Garden at Hokkaido University, Nishi-8, Kita-3, Chyuwo-ku, Sapporo 063, Japan).
SHUICHI YABUMOTO (1-ku 16, Kyo-machi, Matsuzaka City, Mie-Pref. 515, Japan).
KOICHI TAKEFUJI (2-2-20, Takawa, Minato-ku, Tokyo 108, Japan).
TETSUWO YAMAMOTO (3-2-17, Senba-cho, Kawagoe City, Saitama-Pref. 350, Japan), who is a high school teacher, is interested in research on meristem culture of carnivorous plants as his project.
SABURO SHIBATA (3-37-11, Uehara, Shibuya-ku, Tokyo 151, Japan).
HIDEKAZU TANAKA (4-5-4, Midori, Sumida-ku, Tokyo 130, Japan).
MUNEAKI HOSOKAWA (16-22, Hikari-cho, Beppu City, Ohoita Pref. 874, Japan).
MASUNORI USAMI (468, Oomachi, Ichikawa City, Chiba Pref. 272, Japan).
LEO C. SONG, JR. (Department of Biology, California State University, Fullerton, Calif., 92631) is mainly interested in the rarer species such as Cephalotus, Heliamphora and Australian Droseras. He is willing to purchase and trade.
ART MANN (2966 26th Avenue, San Francisco, California, 94132).
D. W. TAYLOR (The Everglades, 76 Crosslands Avenue, Norwood Green, Southall, Middlesex, England) is actively growing carnivorous plants and is interested in expanding his collection, particularly with Sarracenias and Droseras (including Australian bulbous forms). Write him if you are interested in working out exchanges. Mr. Taylor tells us there is a wide interest in carnivorous plants in England which is just surfacing.
HIROMASA SUGIURA (1436, Nishi-coisumi-machi, Nerima-ku, Tokyo 177, Japan).

NEWS AND VIEWS

WARREN STOUTAMIRE is in Australia for four months to study orchid pollination. We imagine he will be looking at carnivorous plants as well.

STEVE CLEMESHA is heading up a study group which will be primarily concerned with native Australian plants. They plan a newsletter and seed and plant trades.

Regarding our recent list of commercial sources, Pierce Seed Co. is out of business. We received many favorable comments on these addresses but several places were overwhelmed with mail and temporarily ran out of catalogues. More checked out sources are: Merry Gardens, Camden, Maine, 04843 for Dionaea and Sarracenia. Siskiyou Rare Plant Nursery, 522 Franquette Street, Medford, Oregon, 97501 for Darlingtonia. We would like to express thanks to Ernie Pyle for giving us these addresses.

JOE MAZRIMAS would like to share with readers of CPN a method of pollination in Byblis gigantea that is unlike any other carnivorous plant. The stamens are unequal in size and are bent into a definite curve. Dehiscence occurs by way of apical pores or short slits at the tips. In order to release pollen, he had to vibrate the stamens vigorously by using his forceps like a tuning fork. This results in a cloud of yellow pollen that is deposited on the surface of the purple petals. Undoubtedly, the stigma, which is supported on a long curving filiform style, attracts the fine dust-like pollen. When the flower closes at night, the stigma picks up more of the pollen from the petals. One can only speculate that some bee or butterfly vibrates its wings against the anthers when seeking flowers for pollen. He can find no mention of this mechanism of pollination for Byblis in the literature. Also, new plants can be started from root cuttings about one inch in length which are placed on the surface of sphagnum moss, lightly watered, and covered with a plastic bag. The larger roots seem to be better than the small feeder roots. Several weeks later small green shoots appear on the succulent roots and these can be planted individually in a 1:1 mixture of sphagnum moss and perlite. By this method one can propagate many plants from root cuttings as they become available.

Byblis gigantea plants will attract many aphids because of its yellowish-green color in the leaves and stem. The very young growing leaves are sometimes covered with hundreds of these bugs because they are attracted to yellow colors and the glands on the young shoots are still immature and not capable of trapping and digesting them. A spray from the garden hose will remove them very easily but this must be repeated quite often since others take their place very quickly.

We are proud to announce that we have about 132 CPN members with more subscriptions coming in every day. We are amazed to see how many of you are interested in growing and reading about these plants. Tell us about any field trips you went on this summer or any special collections of plants that you think are worth noting. Others may also be interested in visiting these collections too.

ERNIE PYLE visited a Chrysamphora bog and says: "On July 22, 1972, I went up to a pine bog in Plumas Co., California to observe Chrysamphora. The bog was created by a natural spring flowing over a very steep hillside, then under the logging road used to get to the plants into a large meadow covered with grass and surrounded by pine trees. The Chrysamphora was quite easy to see, as they were only a few yards from the road. Two interesting things I noticed. First, there were two growing situations: plants growing under direct sunlight and plants growing under filtered. The Chrysamphora growing out in the meadow in direct sunlight averaged about 12 inches high, while the Chrysamphora underneath pines and other tall plants grew to heights of 2-3 feet. The plants in the meadow had many red veins covering the hood but the plants under the trees had none. Also, to my surprise, I found Drosera rotundifolia growing everywhere underneath the Chrysamphora. The Drosera was completely red in color. They would grow at any angle. One Drosera I found was growing on the side of a soggy cliff, nearly vertical to the ground. I also found one D. rotundifolia with a yellow flower. All the other Drosera I observed had white flowers."

We summarize some recent comments FRED CASE has to make concerning a rare variant of Sarracenia purpurea: "Concerning S. purpurea heterophylla, I have had certain bogs where it occurs under study for 25 years. I first heard of the existence of the form in northern Michigan from another "orchid hunter nut", but he did not tell me exactly where. We were both working the same territory and eventually I blundered onto the station, then found five more in the vicinity. There is no question in my mind but what the plant is merely an anthocyanin free mutation--there are no other structural differences in any way from the typical. But it may involve more than one gene, for there are, in these bogs, plants which are more orange than "normal" plants from other bogs, suggesting that these orange forms are backcrosses between the normal and yellow forms. If normal color were a single gene dominant, I would not expect to be able to tell the heterozygous yellow-reds from pure reds. I favor the term or taxonomic category variety over forms here, because the yellow form is seemingly increasing in number and is most abundant in wooded areas of the bog--implying an evolutionary significance to the variety--probably a greater photosynthetic significance in shade than the red form, where the anthocyanin may mask the chlorophyll and restrict the growth in shade. I do not agree that heterophylla should be a full species--there are no structural differences, only color. NOW, if the only purpurea you were well acquainted with were the southern form and then you saw the yellow northern form, you might well think them distinct. I do agree with Dr. Wherry that the southern coastal plain and the northern bog purpureas are distinct to the subspecific level. They differ in structure in several ways. The Carolina mountain form is somewhat intermediate and probably ancestral to both. The published description of forma heterophylla from Junius, N. Y., was undoubtedly based upon a shade form with deformed, elongated leaves, then moved to sunlight where new leaves appeared. This then was described, without ecological comment. Therefore, the name heterophylla, i.e. two kinds of leaves. This does not hold in the stations."

STEVE CLEMESHA has commented on the Sarracenia oreophila short note which was in the first issue of CPN. He states that the plant grows quite easily in the Sidney area, in fact, better than many others. He has propagated a small initial plant into several that flower regularly over the past two years by division and backcutting of the rhizome. The seeds also germinated profusely with seedlings having pitchers more reclined as in S. purpurea and no flat leaves the first year. He grows the plant in plastic pots of peat or Sphagnum standing in saucers of water in the sunniest part of the yard. He has further noted the tendency for S. oreophila pitchers to wither earlier than those of other species, followed by production of the "winter" leaves. Don Schnell confirms this tendency in the plant's natural habitat as well, but Steve says he will experiment with growing conditions, such as more shade, to see if this succession can be altered. Steve tells us that he lives 20 miles inland at an elevation of 500 feet, that there are tempering northeast breezes and the daily high temperature only rarely exceeds 90. The presence of a wide day-night temperature difference may be of some benefit, and may further explain why

S. oreophila has not advanced more to the coast in the Southeastern United States.

Commenting further on S. oreophila, DON SCHNELL reports that since his original note was prepared, his plants have indeed adapted to local growing conditions in piedmont North Carolina where they are now grown in Sphagnum. He revisited an S. oreophila station on Sand Mountain Plateau in northern Alabama in early August of this year and noted that late summer withering of pitchers was in progress, in shade and full sun. The typical flat, curved leaves were abundant. There, the plants grow in a very heavy, moist to nearly soggy (seeming to prefer the former) sand-clay soils around a small pond. Other plants grow along the shores of a shallow, sandy river running through a State Park, the plants very nearly in the water. Further, "dog days" are well known in Alabama with long periods of sweltering days and nights, even on the plateau. So, there seem to be a wide latitude of conditions acceptable to the plant and success would seem to depend on adhering to basic principles of Sarracenia culture along with patience while the plants adapt from their uprooting.

In the recent San Francisco Flower and Garden Show which took place at the end of August, several species of carnivorous plants were displayed belonging to the collection of RAUL HERNANDEZ. The tall pitcher plants such as S. leucophylla and Dionaea plants were centrally displayed near the entrance. Many visitors were seen looking for flies and bugs to feed the plants which were protected under a cage. Inside, Raul received honorable mention for his Cephalotus and D. rotundifolia plants. Because there wasn't any class open for these plants, they couldn't be judged fairly and thus the honorable mention. Other plants there were Pinguicula vulgaris and D. capensis. We hope that next year a special category for this class of plants will be established so that other growers may participate and stimulate some competition.

Several CPN members are actively searching for seed of the rare South African plant, Drosera regia. As some of you know, this plant has leaves that resemble those of D. capensis except that they are reported to be over two feet long. Only two small stations remain for this nearly extinct plant but we are encouraged that a source for seeds may have been found. The plant grows in cool, moist atmosphere at 3000 feet. After it flowers, it then sheds seed by the end of March toward the end of summer. It dies down in winter months but renews its growth in spring.

JOE MAZRIMAS recently completed trips to Chrysamphora bogs and noted heavy deer depredation, the pitchers standing around decapitated and looking almost like so many Heliamphora far out of place. MR. ISAMU states that deer attack the plant to get salt since Chrysamphora apparently concentrates this compound. The plants are sometimes known as deerlicks.

Another salty problem. KATSU KONDO says that he has indirectly heard that application of dilute sodium chloride solutions to pots of Cephalotus follicularis is beneficial. We would like to hear if

anyone has direct experience with this technique and some of the details if so. By the way, we would like to hear from anyone growing C. follicularis successfully, we mean beyond the "holding its own" stage and to the point where actual proliferation and flowering is vigorously taking place.

SPECIAL NOTICES

A place to see carnivorous plant collections: BERKELEY BOTANICAL GARDENS--located on Centennial Drive (N. Canyon Road) one mile beyond the university stadium. An hour long tour is given on weekends at 1:30 and 3:00 p.m. It is free and open between 8:00 a.m. and 5:00 p.m. weekdays, 10:00 a.m. to 5:00 p.m. weekends.

KATSU KONDO recently announced his book Carnivorous Plants came out from The Bunken Publishing Co. of Japan. This book is written in Japanese, but includes a lot of fine photographs of carnivorous plants which are universal language. If you are interested in this book, write to Katsuhiko Kondo, Department of Botany, University of North Carolina, Chapel Hill, N. C., 27514 or The Bunken Publishing Co., Ltd., 4-128, Daido, Tennoji-ku, Osaka City, Japan. The price for each copy and its postage is as follows:

Book price when you buy it at book stores.....	$4.40
Book price when you buy through Katsu.....	$3.50
Postage.....	$5.50 (Air Mail)
	$1.70 (Surface Mail)

Toward the end of the growing season, JOE MAZRIMAS usually has substantial growth of several Drosera species. At the present time he can offer to CPN members leaf cuttings of Drosera filiformis var. tracyi while they last. Please send a stamped and self-addressed envelope with a baggie. Out-of-state members should have it sent Airmail. Like most Drosera plants, this species is particularly easy to start from leaf cuttings. One inch leaf cuttings are pressed to the surface of sphagnum peat moss that is kept evenly moist by covering the pot with a plastic bag. In about 4-6 weeks new buds will emerge from the leaf cuttings. In about two years the plants will grow rapidly to flowering size. (Address at head of CPN.)

SHORT NOTES

CARNIVOROUS PLANTS OF THE ILLAWARRA AREA
by Brian Whitehead

The Illawarra area is the area on the east coast of New South Wales, Australia from the northern suburb of Wollongong south to Nowra (about 60 miles) and west to a point about 30 miles inland. Although many of our local carnivorous plants are unobtrusive for varying periods of the year, careful investigation over a period of time should reward the observer with a total of nine species in the area. The

habitat for carnivorous plants is usually one which has either permanent moisture or a moisture level which is well above average for surrounding areas for a long period.

Plants which use the trap method of insect capture belong to the genus Utricularia. They are known by the common name of "Bladderworts" and there are four species in this area. The mechanism that they use to secure their prey is complicated, and the trap is usually minute, in most (but not all) cases no greater than 2 mm. in length. The trap consists of a hollow body with a "door" hanging down in front which can be sprung by an unwary minute insect or organism releasing a kind of trip mechanism inadvertently. By a process brought about by the plant, the pressure inside the trap is less than that outside, so that when the door is released, water rushes into the trap carrying the organism with it. It has been said that the trap is complicated and this is further emphasized when it is realized that the plant can expel water through the sides of the trap and also reject the remains of the organism after it has been digested.

Utricularias are therefore associated with very wet places, and are to be found in swamps and mud. One of the local species is a free floating plant with no attachments to the ground found in deep or shallow water in permanent swamps. Except for the free floating species, e.g. U. aurea, the Utricularias are completely unobtrusive when not in flower. Leaves are minute, 1-10 mm. in length depending on the species, usually forming a dense mat in mud or in mud under water, and the bladders are found on tiny stalks on the roots. In their season, a flowering stalk with blue, mauve, pink, yellow or white flowers is produced. The flower shape is distinct, and many species are easily distinguishable from other flora by their tubular spur which forms part of the underside of the flower.

The following species can be found in suitable habitats in the Illawarra district:

1. Utricularia aurea Lour.

This is a free floating plant with a prominent central stem around which are arranged finely divided leaves. The whole plant lies horizontally in the water. In the case of this species, it is the leaves which bear the bladders in great profusion on their fine segments. The plant is found only in permanent swamps, and flowers in late summer. In the local plants, flowers do not appear to be freely produced, but when they do occur, they are golden yellow and very fragile, as I have found that if water is allowed to touch the flower, this will cause the flower to wither at that point.

This species may be observed in its natural habitat at the western end of the Wingecarribbee Swamp in deep water

2. Utricularia lateriflora R. Br.

This is the commonest local species. Its small spathulate or rounded leaves (1-2 mm.) are almost inconspicuous and would need close examination of the ground to be discovered. It is more obvious when in flower, and flowers can be found depending on climatic conditions from

about January till April or May. The flowers are pale or dark blue, sometimes even whitish, and are arranged separately on a stalk which may be from 1-6 inches in height. The traps on this species are usually underground, minute and not easily observed. The plant can spread by means of runners which take root and produce new leaves, so that patches where the plant is found can be quite dense with leaves.

A peculiarity of the plant which does not appear to have been previously reported is its ability to regenerate a new flowering stem from the still living remains of an old stem that has previously flowered and partly died back in a dry period. The new part that is produced will then produce fresh buds and flowers. Its habitat is sandstone, areas on the edges of swamps, or wet areas on flat rocks or rock shelves, often among moss and soil. This species may be observed in its natural habitat in the swamps and heaths behind Mt. Keira.

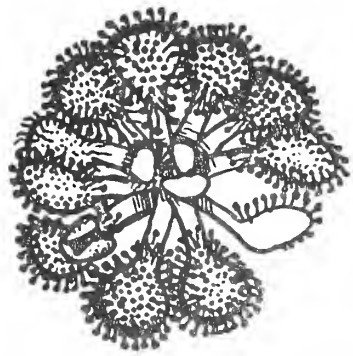
3. Utricularia dichotoma Labill.

The flowering spike of this species is by far the most conspicuous of local members of the genus, and may reach 12 inches or more in height. It is most abundant in highland areas in swamps and wet places near swamps. Again the leaves are small, up to 10 mm. and occur in dense patches. The flowers in this species are grouped near the top of the flowering stem, and this feature and its height distinguish it from other local species. Flowers are blue, sometimes with yellow ridges on the palate. This plant, unlike U. lateriflora, is often found in areas which are completely submerged by several inches of water, and the flowering stem will rise above the water. The traps attached to the roots lie on top of the soil or mud, and on examination, large numbers become obvious. This species may be observed in its natural habitat near Burrawang and in the swamps in the Belmore Falls area.

4. Utricularia dichotoma var. uniflora.

Although named as a variety of the above, the plant differs in general appearance first by the presence of only one flower at the extreme top of the stem and by the shape of the inflated spur on the under section of the flower. Other differences are apparent but not so easily observed.

The flower is of dainty and delicate appearance, and the flowering stalk may reach 6 inches, but is usually less. In the Illawarra, specimens in the highlands where it occurs mostly are pink or pinkish white, thus differing markedly in color from specimens in sandstone areas around Sydney which have blue flowers. The tiny (2-3 mm.) leaves of this species are almost circular, occurring in dense patches. Traps are underground. The flower has also 4-5 prominent yellow ridges on the palate. The habitat of this plant is the margins of swamps and in swampy heathland areas where no great depth of water lies for any period of time. This plant may be observed in its natural habitat in swamps on Jamberoo Mountain.



PART 2 - THE DROSERAS

Most of us are familiar with the plants known as Sundews, as their glistening "dew" makes them quite conspicuous in the bush. The sticky secretion produced by the plant on the leaf hairs holds small insects, preventing them from escaping, while these tentacles and others nearby, having had impulses transmitted to them, slowly curve forward to secure their prey. Digestive juices are produced from a gland at the end of the tentacle and the captured insect is slowly disintegrated until only the hard parts of it remain.

Droseras (the Sundews) inhabit damp areas, and some species may be found in association with certain species of Utricularias. Many thousands of Droseras may be found in suitable areas and often they are the dominant plant in a particular area.

There are five species which might be found in the Illawarra, of which one appears to be limited in distribution or else, being an annual plant, has not been frequently observed. Two types of root growth are to be found, depending on the species. Some are fibrous rooted plants, others regenerate from a reddish underground bulb. Species to be found locally are:

1. Drosera spathulata Labill.

The red rosettes of this species, up to 5 cm. in diameter, are conspicuous in every suitable habitat, especially in heaths on sandstone. Its leaves are spathulate, tapering gradually to the base, and in summer the flowering spike is produced. Flowers are generally bright pink and produced only on one side of the flowering stem. Plants growing in heavily shaded situations may lose their characteristic reddish color and become green. This is a fibrous rooted plant, reproducing from seed. The species may be observed in its natural habitat in almost any local heath or swamp on sandstone.

2. Drosera pygmaea D. C.

Easily distinguished from the above species by its small size when mature (rosettes up to 2 cm. in diameter but usually smaller) and its leaf shape. The leaf consists of a distinct stalk with a circular blade on the end which is covered with dark red tentacles. The flower stalk is tiny, the flower single and white, up to 2 mm. in diameter, but often less. Flowers are produced during summer and autumn. The plant is fibrous rooted and reproduces from seed and asexually by the production in winter of gemmae, small green oblong objects which are produced from the center of the plant and eventually form new plants on contact with the soil.

Dense colonies may occur in suitable areas, giving a pinkish appearance to the ground when observed from a distance. The plant also favors wet heaths, particularly in shallow soil over rocks. The plant may be observed in its natural habitat in suitable areas at the top of Jamberoo Pass.

3. Drosera glanduligera Lehm.

This is a species which appears to reproduce annually by seed, and which therefore is not present for many months of the year. It is a rosetted

plant whose leaves consist of a distinct stalk with an oval blade at the end bearing the tentacles, or glandular hairs. The color is yellowish-green and the species is further distinguished by the dish-like hollow in the oval leaf blade. Several bright red flowers are produced in spring on the flowering stalk which emerges from the center of the rosette.

The plant is not common locally, but may be observed, usually after a search, on wet heaths west of Nowra where it grows with D. spathulata but in much smaller numbers.

4. Drosera peltata Smith

This plant begins its life cycle in late autumn or early winter by producing a rosette of leaves from a red, underground bulb. After the rosette has grown to a reasonable size (about 2-4 cm. in diameter), a central stem is produced bearing leaves equipped with the usual dewy tentacles. At the top of the stem (which may reach 20 cm. in favorably situated plants but is usually less--8-10 cm.), white flowers are produced in spring. The plant becomes dormant after production of seed and re-commences its life cycle the following winter from the bulb.

The presence of the central erect stem, bearing dewy leaves, distinguishes this plant from all other local species. It occurs in heaths on sandstone and on heavy soil in swampy areas. The plant may be observed in its natural habitat in the swamps and heaths behind Mt. Keira.

5. Drosera binata Labill.

The linear leaf blades, borne on a long smooth stalk and divided into two or four narrow segments, assist in the easy identification of the species. It also produces conspicuous white flowers on a tall stalk in summer. The flower stalk may reach 40-50 cm. in height.

The habitat of the plant is varied; it may hang down from rock crevices, or from moss near waterfalls, or it may grow as a stout erect plant in heavy swampy soil.

The leaves are produced vigorously in summer, but in late autumn they die off and all that remains of the plant are the thick black roots from which a new plant is produced the following spring or summer. The plant reproduces by seed, and vegetative reproduction can be induced along the leaf blades where, if kept under water for a long period of time, numerous tiny plants appear. It is not yet known if this method of reproduction occurs commonly or at all under conditions of natural growth. This species may be observed in its local habitat in swamps on Jamberoo Mountain.

MODIFIED FLORAL PARTS OF DIONAEA

by Ted A. Minton and Dr. Donald B. Jeffreys

Most botanists would agree that floral parts are basically modified leaves. There is nothing unusual about the flower of Dionaea. However, if the flower is abnormal, and if the floral parts become small leaves instead of petals, sepals, stamens or carpels, this causes an

interesting situation. In Dionaea the leaf is, of course, a flytrap. So the modified floral part is either a flytrap or something between a flower part and a flytrap.

Modified inflorescences were first described by Herschberger in 1904 and other than one case on a herbarium sheet at the University of North Carolina at Chapel Hill, there has been no mention of this occurrence since. We first observed modified inflorescences about four years ago on some plants cultivated in a prepared plant bed. The unique thing was that about 90% of the plants showed this form of development. This outside plant bed had been allowed to dry up and become infested with weeds. In the summer of 1970 four field plants with abnormal inflorescences were collected in Carterett and Onslow Counties of North Carolina. More occurred on cultivated greenhouse plants in June of 1971.

These observed floral parts varied a great deal from plant to plant. In some cases the sepals were in the form of small traps and in others the carpels, stamens or petals were modified. Some formed almost perfect traps and others were crudely shaped. In the most perfect ones the traps resembled those found on young seedlings.

One such trap was measured for electrical impulses which registered at 20 millivolts. This is very minute compared to a large trap from a mature plant, but it does show that it could be possible for such a modified petal to capture an insect!

The cause of this unusual occurrence is not completely understood. However, we are inclined to think that the growing conditions at the time of blooming is largely the cause. In each case the collected plants were growing in dry conditions and neglect in letting our cultivated ones dry out must have had some effect.

We have also found that these units of modified floral parts are capable of producing roots and growing if placed in wet peat. Perhaps this is a sort of survival factor for this species.

Hopefully more study can be made in the future.

(Editor's note--I first noted this phenomenon in Ohio where there were some Dionaea muscipula on a window sill over winter. In March, as the days lengthened, the plant came to bloom in the warm daytime sun coming in through the window. At night, the outside temperature fell to below freezing still, and the window sill would of course cool below ambient temperatures elsewhere in the room. I next noted the formation of little plantlets (there must be a term for this; I do not believe apomixy would be correct here) in flowers here in piedmont North Carolina in some plants kept outdoors over winter. Spring weather is very mercurial in this part of the state with daytime temperatures going into the high seventies and sometimes dropping to near freezing or frost levels at night. Practically all of the inflorescences bore plantlets in one particularly tricky spring. Photos 1-3 on the inside front cover are of these. Note in photo 1 that the plantlets formed

of the perianth parts are very rudimentary. In photos 2 and 3, we see that there are good trap primordia formed from stamens and carpels. Roots sprouted from these, they were planted, and grew as apparent 2n plants with their own normal flowers later. One may hypothesize that cold treatment could be a factor, or co-factor, if applied during flower bud initiation--DES.)

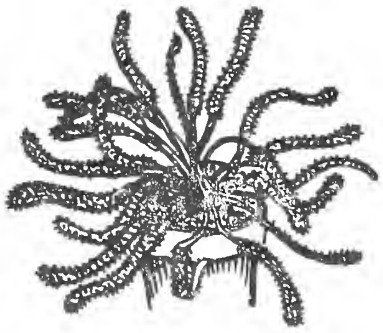
AMERICAN DROSERAS IN SIDNEY

by Stephan Clemesha

In Australia where a large number of hard to grow tuberous Droseras grow, it is pleasing to have a few from elsewhere which are easily handled. One group includes the American species D. filiformis, its var. tracyi, intermedia, rotundifolia and anglica. Cultivationwise, I treat D. capillaris a bit differently and it grows well too. I grow it in pots of short tufted moss over sandstone. They are kept in the sun all year round.

The other group I grow in pots of peat topped with sphagnum (I prefer a fine species as it tends to overgrow the plants less). The pots stand in saucers of water in a position which receives sun most of the day. While they are growing, the only attention they receive is arranging the sphagnum to stop it from overgrowing the plants. In March near the end of the growing season I repot the plants and set them with the crown well above the sphagnum level. Soon after they form a bulb and at the end of April the pots are taken out of water and put on a cement slab on the cold southern side (northern side in U.S.) where they remain all winter. Here, the only attention necessary is an occasional check to see they are not getting overgrown with sphagnum and also to be sure they don't dry out. In spring they are put back in the sun and growth quickly resumes. Loss of bulbs over winter is very small.

All are propagated by leaf cuttings which are put on sphagnum and covered with plastic and shaded. Leaves of D. anglica, rotundifolia and intermedia produce plants faster than D. capillaris, filiformis and its var. tracyi. D. filiformis flowers and seeds so freely that there appears little need for leaf cuttings. Plants reach flowering in one season so it would even be practical to treat it as an annual. Strangely though, while D. filiformis flowers very freely, its var. tracyi so far has not flowered at all. I have read of these plants being difficult to cultivate because of their intolerance to tap water. This is not true here as mine are only watered with tap water.



LOOKING AHEAD

How about something on the effects of air, water and soil pollution on carnivorous plants, especially potential differential effects of various pollutants?

The next issue of CPN will include an important note by Warren Stoutamire detailing his experiences with sterile culture of seeds. From this we will learn that there may be a lot of life left yet in those older seeds that just do not germinate with standard methods.

The next issue (the fourth and last of the first volume) will be mailed in January, and the editorial deadline for submitting material is 15 December 1972.

RECENT LITERATURE

Anonymous: Swamp weed might hold cure for cancer. The Mississippi Press August 2, 1972

Dr. D. Howard Miles, assistant professor of Chemistry at Miss. State University, is currently engaged in a two-year study trying to isolate various drugs from the rhizomes of Sarracenia plants that appear to have inhibiting qualities in combating the growth of cancerous tumors. The natives of this area have been concocting a brew made from "moonshine" alcohol and the stem of this genus for many years contending that it had curative powers. The National Cancer Institute apparently is convinced by the preliminary evidence to award Dr. Miles $30,000 to find the drug or drugs from the alcoholic extract that are responsible for the anti-tumor activity. We are happy to report that Dr. Sidney McDaniel, a CPN member, has aided the professor in identifying the plants and has helped gather them for the experiments currently underway at MSU.

Franck, Daniel H.: Early ontogeny of the adult leaves of Darlingtonia californica and its bearing on the interpretation of epiascidiate foliar appendages. Amer. Journal of Botany Vol 59, p 678 (1972) Abstracts

Ontogenetic studies show that the primordium arises by a monopodial rather than a sympodial mode of growth, as previously reported. Following the formation of a small, erect primordium, a restricted adaxial meristem is initiated and expands both adaxially and upwards. A ring or "doughnut" meristem is established around the apical area of the incipient tube just below the primordial hood and mouth. Growth of this ring meristem and maturation of the subjacent portions cause elongation of the young leaf.

Godfrey, Michael A.: Flowers that kill to eat. National Wildlife 10: 10-13 August-September 1972.

A brief popular article on southeastern U. S. species with some color photos.

Hotchkiss, Neil: Common Marsh, underwater and floating-leaved plants of the United States and Canada 1972 Dover Publications, Inc., 180 Varick St., New York, N. Y. 10014
This guide is designed for identification of marsh plants without recourse to technical botanical keys. Drawings and descriptions are sufficient to identify most of the plants. About 13 species of Utricularia are discussed in this book along with drawings which an amateur may use for his benefit.

Komiya, Sadashi: Exotic species of Lentibulariaceae in Japan. Journal Jap. Bot. 47: 83-95 March 1972
The author reviews the nomenclature, provides brief descriptions and some photos and drawings of lentibuliads that are basically exotic to Japan since they have been introduced into collections.

Kondo, K.: The chromosome number of Heliamphora heterodoxa. Journ. Jap. Bot. 47 (8), 238 1972

Courtesy of Dr. D. E. Schnell, North Carolina, the author could count the chromosome number of Heliamphora heterodoxa. This species has the somatic chromosome number 2n=42 which is the same number as of H. nutans.

Kondo, K. and Whitehead, B.: The chromosome number of Utricularia dichotoma (Lentibulariaceae). Chromosome Information Service 13 pp 6-7 1972
Utricularia dichotoma shows fourteen bivalent chromosomes at metaphase I of meiosis in PMC's. The same chromosome number (n=14) was previously counted in Utricularia biflora Lam. (Kondo, 1971) which was placed in the genus Utricularia by Barnhart (1915). This chromosome number does not indicate any morphological correlation in character between these species. Utricularia biflora is aquatic to sub-aquatic, and U. dichotoma is terrestrial to sub-aquatic. However, this chromosome data does not support Barnhart's segregation of genera in the Lentibulariaceae. There is no chromosome relation between Utricularia dichotoma and the New World endemic species of Utricularia studied.

Kondo, Katsuhiko and Whitehead, B.: The chromosome numbers of Utricularia dichotoma var. uniflora and U. lateriflora. Phyton 29: 95-98 1972
The chromosome numbers of U. dichotoma var. uniflora (n=28) and U. lateriflora (n=14) are reported for the first time.

Swamy, R. Dore and Ram, H. Y. Mohan: Studies on growth and flowering in axenic cultures of insectivorous plants. Z Pflanzenphysiol Vol 65 (4) pp 315-325 1971
Flowering in Utricularia inflexa was actually inhibited when stolons were grown on White's liquid medium fortified with

various proteins, amino acids and vitamins. Exposure to 20 cycles of 16 hour dark and 8 hour light periods initiated the inflorescence primordia and resulted in normal flowers, and seed set. Kinetins and giberellic acids were used in conjunction with the above inductive conditions.

Wan, A. S., Aexel, R. T., Ramsey, R. B., and Nicholas, H. J.: Sterols and Triterpenes of the pitcher plant. Phytochemistry Vol 11 (1) pp 456-461 1972
In N. albomarginata, the authors found seven free sterols such as cholesterol and ten esterified sterols in the plant. Sitosterol was the major sterol in both the free and esterified fractions.

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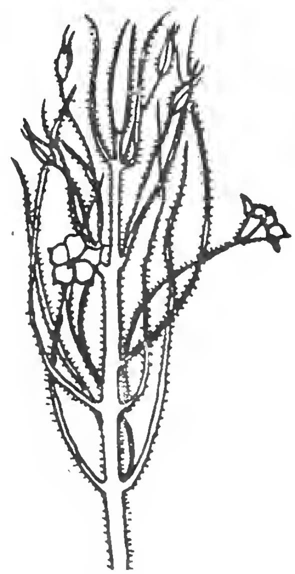
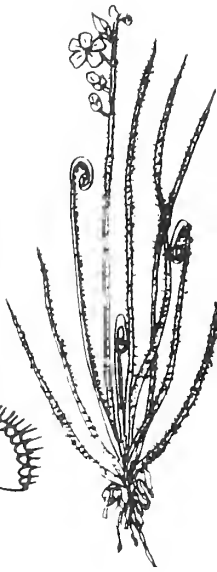


CARNIVOROUS PLANT NEWSLETTER



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CO-EDITORS: D.E. SCHNELL, RT. 4, BOX 275B, STATESVILLE, NC 28677
J.A. MAZRIMAS, 329 HELEN WAY, LIVERMORE, CAL. 94550

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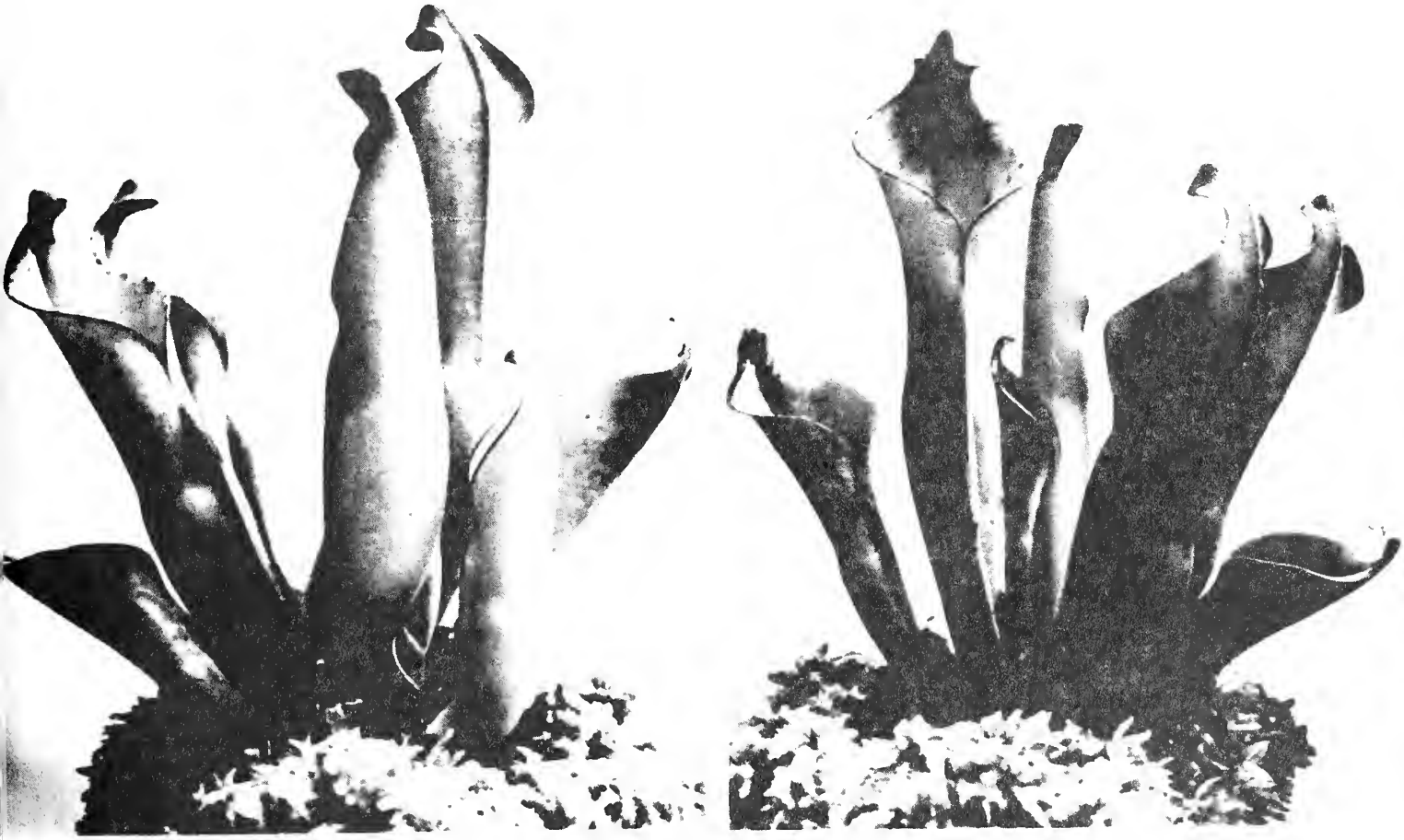

HELIAMPHORA HETERODOXA

In spite of dire predictions to the contrary, this plant has proven rather easy to grow in several greenhouses in the United States. It has lately been introduced into Australia. The species propagates readily by offshoots. Although the plant flowers abundantly, pollen has never matured in cultured plants to our knowledge. This is apparently true of many Heliamphora spp.

EDITORS' CORNER

We would like to again remind our current one year subscribers to send in their renewal if they have not done so. The printing of the first issue of the next volume will be based on the resubscription rate by press time and we would not want to disappoint late renewers by not having enough copies. You may use the renewal form in the last issue, or just send your name and address with the appropriate subscription fee, mentioning in your note that you are renewing.

Both editors have been asked about books on carnivorous plants. We are sorry to say that the situation in English language books is rather barren. There is the well-known, dated but still useful book by Lloyd, and of course there is the book by the Pooles which is largely intended for children. The former is long out of print but may be found in used book stores. The latter book is commonly available through several of the commercial sources mentioned a few issues ago. The Smithsonian Institute Press has a brief, but rather nice pamphlet that they apparently send free if only single copies are requested. Carolina Biological Supply Co. had an offprint of a series of articles from their Carolina Tips newsletter listed in their catalogue until the current one, and it is apparently out of print. The last two articles in the series by Plummer were especially interesting in summarizing the current thoughts on physiology in Sarracenias. However, the situation in Japan is quite different. There are several excellent books available in Japanese, with good photos, many of them titled with the Latin names of the plants. As a service, Joe Mazrimas has taken it upon himself to order these en bloc for those who are interested, the prices being exactly what they will cost him plus postage. There are more details in the Special Notices section of this issue. If there is still an American publisher left willing to put publishing art back on at least an equal footing with conglomerate profit motive, we might hope that some of these books would appear in translation.

NEW SUBSCRIBERS

T. LAWRENCE MELLICHAMP (Botany Department, University of Michigan, Ann Arbor, Michigan 48104) is interested in the ecology and systematic relationships of carnivorous plants.
SANDRA Z. DuMOND (Route 2, Box 361CCC, Wilmington, North Carolina 28401).
RICHARD SIVERTSEN (PSC 1 Box 305, Offutt AFB, Nebraska 68113) has visited many bogs throughout the American continent, especially those around Biloxi, Mississippi and northern California. He is a careful observer of the plants growing in the field and we hope to benefit from his knowledge.
GEOFFREY WONG (4639 Scotia Avenue, Oakland, California 94605). His main interest at this time is to cultivate selected species to perfection under artificial light. He hopes to work out a system that requires little care and can be looked after by "anybody" by simply following a set of definite instructions.

LARRY LOGOTETA (2700 West Newell Avenue, Walnut Creek, California 94595) has been growing carnivorous plants for a little while but apparently he is doing very well with them. He tells us that he can grow Dionaea inside his home on a window sill and obtains huge traps on his plants.
C. EDWARD SCOFIELD (Box 107, Dansville, New York 14437).
MARY JEAN GROSE (Route 8, Box 336, Statesville, North Carolina 28677).
MASAMI SAITO (4055 Kawara-Machi, Iwata City, Shizuoka Pref. 438, Japan).
NOBUWO TAKENO (4-30, Oonari-cho, Oomiya City, Saitama Pref. 330, Japan).
SADAWO SATO (23 Gennai, Joban-Fujiwara-Machi, Iwaki City, Fukushima-pref. 972, Japan).
SHIGEKI OKAMURA (932-58, Tsuruma, Fujimi-City, Saitama Pref. 354, Japan).
TAKAWO SATO (2-5-1, Funadoyama, Kameda-Cho, Nakakanbara-Gun, Niigata Pref. 950-01, Japan).
DELBERT E. WILLIAMS (Department of Botany, University of North Carolina, Chapel Hill, N. C. 27514) is a chemotaxonomist and is interested in Carolinian native carnivorous plants.
J. R. MASSEY (Curator, Herbarium, Department of Botany, University of North Carolina, Chapel Hill, N. C. 27514) is especially interested in plants growing in swampy areas, including carnivorous plants. He is planning to make a boggy garden with a lot of carnivorous plants in his yard. He will tell us about herbarium collections of carnivorous plants at U.N.C.
NORMAN LEFKOVITZ (617 Treeside Drive, Akron, Ohio 44313).
ALLAN A. SWENSON (P. O. Box 127, Basking Ridge, N. J.) has just completed a book on organic gardening which is due in February, 1973. Now he is preparing and researching material for a book on carnivorous plants. He is associated with Armstrong Associates Inc., a firm which sells carnivorous plants.
ARTHUR COLEMAN (3416 Park Boulevard, Oakland, California 94610).
CRAIG GEE (2361 Marineview Drive, San Leandro, California 94577).
TEDD PAYNE (1283 Rosario Street, Placentia, California 92670).
KEITH A. CURRY (Department of Biology, Humboldt State College, Arcata, California 95521) is a greenhouse manager and is growing many interesting carnivorous plants, some of which grow locally at Big Lagoon.
KAZUMASA OKUYAMA (Ooaza-Nakanogo, Hachijyo-cho, Hachijyo Isl., Tokyo 100-16, Japan) is a nurseryman who sells carnivorous plants, including 26 species of Nepenthes.
INAZO SHIOSE (24 Aza-Terasaka, Yabe, Shinshiro City, Aichi-Pref. 441-13, Japan) is also a nurseryman selling carnivorous plants.
MASAAKI ISHIWARA (Kuriai, Misaka-cho, Higashi-Yatsushiro-Gun, Yamanashi-Pref. 400-14, Japan).
HIROYUKI HIROSE (2222-6, Higashikunikubo, Fuji City, Shizuoka-Pref. 417, Japan).
TERRY L. LAUVER (Dept. of Botany, University of Maryland, College Park, Maryland 20742) is a graduate student engaged in research on the onto-genetic development of the tentacles of Drosera.
DOH FUMISHIMA (7-21-10, Todoroki, Setagaya-ku, Tokyo 158, Japan).
DAVID T. WARREN (1597 Dianda Drive, Concord, California 94521).
MRS. ALLEIN STANLEY (Route 8, Box 32, Statesville, North Carolina 28677).
STEPHEN E. WILLIAMS (Genetics, Dev. & Physiol., Plant Science Building, Cornell University, Ithaca, New York 14850).
STEVEN LEFKOVITZ (617 Treeside Drive, Akron, Ohio 44313).

NIALL McCARTEN (18013 Topham, Reseda, California 91335).
JIM DANIELS (10092 Mann Drive, Cupertino, California 95014).
G.A. SERGEANT (24 Station Avenue, Walton-on-Thames, Surrey, England).

NEWS AND VIEWS

STEVE CLEMESHA writes us about Cephalotus follicularis, "It grows along a crescent-shaped front of the south coast of Western Australia with Albany as the center. It grows in swamps that are wet all year and so requires a good water supply at all times; my pots stand in dishes of water. This section of coast is 35° south so the hours of daylight would be nearly the same as North Carolina. The soil is peaty and the plant frequently occurs among many reeds, etc. Many of the swamps receive quite a bit of salt spray from the ocean and although the soil about them contains a moderate amount of salt in some areas, the plant does not require salt and I never give mine any. Sphagnum does not occur in Cephalotus swamps and in fact is very rare in W. A. I have found that the plant grows better in peat moss (I use German peat). This requires a topping of Sphagnum or pebbles to prevent peat splashing during watering. Most of SW Australia has a cool wet winter with light frosts while summer is hot and dry. Rain other than a few storms is rare and the humidity is quite low in summer. The Cephalotus area tends to have a more severe winter and in summer there are more overcast days with occasional drizzly rain. Sometimes the temperatures may exceed 100°, but humidity is higher among the reeds. In culture, I grow Cephalotus in the sun with most of the American plants. In winter growth stops but the pitchers remain green. The plants are not affected by freezing. Mine were once frozen hard and there was a film of ice over the water in the tray in which they were standing, but the plants were not damaged at all. In winter the plants have a reddish color. With the coming of spring, the plants first produce a rosette of flat leaves followed by pitchers and the flowering stem. Pitchers continue all spring and summer and into autumn and are green until the weather cools."

The salty aspects of growth requirements in Cephalotus which have been alluded to in these pages brought this comment from RICHARD SIVERTSEN: "I read someplace that the best Cephalotus plants grow in sand among the few weeds that grow there, getting diffuse light. But the salt content was up to ten times stronger than most plants can take!"

GEOFFREY WONG had an opportunity to visit several central and northern European botanical gardens this past summer and presents this assessment of their carnivorous plants: "Kew, Royal Botanic Gardens, London: This is one of the most extensive anywhere. Nearly every genus is well represented by large numbers of specimens of all sizes. If a species is not in the greenhouses, then it can be found preserved in the herbarium. There is also a separate greenhouse each for the Nepenthes collection and for a public display of familiar species. Most of the plants are not on public view, but talking to the right people will solve the problem.

"Botanical Gardens, Bergen: The collection is small, but it and the greenhouse might be worth seeing if one is in Bergen.
"Botanical Gardens, Cologne: Their collection is larger than Bergen's and is presented in a large glass case, which allows close inspection while insuring the plants' safety.
"Botanical Gardens, Zurich: A free standing display case houses this most impressive collection of Drosera, Sarracenia, Pinguicula, Dionaea, and Chrysamphora. The simulated bog is open to the air via wire mesh and is thickly planted with almost two dozen species. It is one of the best public displays of these plants."

Here are two versions of rooting Nepenthes cuttings, HENRY DEMMINK first: "I usually allow the plant to run up for a year or so and then in the fall I break the growing tip out. When the plant just starts to break, I remove the whole length, leaving just enough on the parent plant so I can get several breaks. I cut the stem into three or four joint pieces and remove the bottom leaf, shortening the rest. I coat all cut surfaces with Rootone and pot in moist Sphagnum in 2 1/4" square pots. They are placed in a frame or case at 76° F. and they are carefully watered only when they dry out. Overwatering can cause troubles. When the cuttings start to break, I remove them from the case and water sparingly but always keep them moist. Overattention and a heavy hand with the hose means trouble."

Now JOE MAZRIMAS on Nepenthes cuttings: "Four to six month old stems are selected and cut up into six-inch pieces. The leaves are shortened so that they are about one-third as long. I fill six-inch pots with Sphagnum into which I can stick four to six cuttings firmly. Usually I bury them three to four inches because they must not move while rooting since the young roots are brittle. They are always watered with tap water at a temperature of 75° F. to maintain even moisture. I place two or three bamboo stakes around the inside rim and the entire pot is inserted into a large plastic bag which is tied at the top. This setup is then placed on several sheets of asbestos board at temperatures of about 80° F. and this holds the heat for several hours during the night. I rely on sunlight during the day to heat the air inside of the bag. I use vitamin B_1 with root stimulant with every other watering. It is best not to overwater during this process of rooting. New leaf growth about three to four weeks later indicates that rooting has started, but it takes three to four months to have fully rooted and established plants."

We can confirm both of the above methods. Note the risk of rot with overwatering which we have found to be real. Also, those of us who have a full sunlight advantage in our greenhouses where Nepenthes are grown, may note that more moderate conditions are necessary for successful rooting of cuttings, after which the plants can be adapted to the usual conditions.

ERNIE PYLE has been growing under lights: "Under 40W fluorescent lights which are on a sixteen hour light cycle, the plants grow fine but

basically the following changes develop: the red veins of S. flava, S. minor, etc. fail to develop. The wing of the pitchers becomes much larger at the expense of the tubular portion, and the leaves become narrower and longer. When I collected Drosera rotundifolia, they were red and the leaves long and the spoon section wide. Now under lights, they are all green with the stem section shorter. I suggest the plants need at least 100W fluorescent and 40W incandescent. The fluorescent lamps supply the blue and some red rays while the incandescent supplies red and far red rays."

KATSU KONDO conducted a seminar at the Department of Botany, Duke University, on November 1, 1972. Its title was "Some Taxonomic Problems in Utricularia." The contents were (1) Review of taxonomical treatments of the Lentibulariaceae. (2) Biosystematic studies in the Lentibulariaceae. (3) Seed anatomy in Utricularia. (4) Chromosome relationships between species in Utricularia. Before the seminar, our CPN was introduced.

Katsu also held an exhibition of photos from his new book, Carnivorous Plants in the Department of Botany, University of North Carolina, during the month of December.

Updating our list of domestic U.S. commercial sources, we neglected to give Peter Paul's address which is Canandaigua, New York 14424. Also, Richard Sivertsen informs us that Rhoers no longer handle Nepenthes or any other carnivorous plants.

A new address for DR. ROBERT CAMPBELL: Forest Products Lab., Department of Environment, Ottawa, Ontario, Canada.

T. LAWRENCE MELLICHAMP was particularly interested in the note by Minton and Jeffreys in the last CPN and adds some of his observations on plantlet formation by floral parts: "My first encounter with fly-trap leaves in the inflorescence came on June 20, 1969 along NC 211 in Brunswick County, North Carolina. There I found, growing in several inches of water at a pond margin, a Venus' Flytrap with seven little cups (modified sepals) for an inflorescence. Inside each cup was a miniature Venus' Flytrap plant with perfectly formed little traps. I don't know what phenomenon could have caused this, as there were no other such plants in the vicinity, some even completely inundated by the water. I believe that at that time, I thought the seeds had germinated still in the capsules to produce these little plants above the high water mark! I have observed this same phenomenon in the inflorescence of Sarracenia purpurea in northern Michigan along the sandy, marly beaches just west of Mackinaw City at the Straits. The inflorescence (?) was no taller than the rather compact, neat pitchers and it consisted of a rather disfigured rosette of pitcher leaves, instead of floral parts sitting upon the peduncle. What environmental trigger could have caused this, I don't know, because there were many normal plants around. As you may know, there is a situation not too uncommon in Trillum

grandiflorum where a disease caused by a mycoplasma-like particle infects the plant and can cause the flower to go completely mad and instead of producing a normal flower, it will have a completely green flower, or a variegated colored flower, or leaves instead of normal floral parts."

In referring to the production of 2n plantlets asexually by flower parts, we grow weary of cumbersome phrases, mentioning "the phenomenon," and so on. So we asked RITCHIE BELL if he could come up with the WORD. Here are his thoughts on it: "The word that might fit the asexual production of 2n plantlets in flowers of some carnivorous plants is probably "Apospory - the condition found in some higher plants in which a diploid embryo-sac is formed directly from a somatic cell of the nucellus or chalaza and an embryo is then formed without fertilization." But are seeds formed? And if so, are we sure that the plantlets are not just from germinating seeds still in the capsule? It would take a bit of work with sectioned material to pin down the real story here. If seeds are not formed at all "apomixis" and "vivipary" are the only two words that come to mind." "Apospory" is the best thing we've heard so far. Gross examination indicates that the plantlets originate from other flower parts as well as the carpels, so this would seem to eliminate classical vivipary and apomixis. On the other hand, we have read the modified term "vegetative apomixis" applied to phenomena that seem very much like our problem here.

A few CPN's ago, we mentioned the polymorphous character of many Nepenthes species, and that many former "species" had been aggregated into forms or varieties of one species. This is particularly evident with the Australian N. mirabilis which Danser first recognized as one species and which had formerly been specifically designated as eight different plants. Now with continuing exploration of the Philippines, we are recognizing that N. alata is also polymorphous and that several "species" such as N. boschiana may go by the wayside. Representative samples of material for herbarium specimens are obtained only with difficulty and some arbitrary decision from the long, trailing tangled vines, and then some of the finer characters are lost in dried specimens. More observation is needed with living plants in the field and in various collections.

ISAMU KUSAKABE also has some comments on the Nepenthes taxonomy problem: "According to a recent letter of yours, N. boschiana is a type of N. alata. N. boschiana Korthals is restricted to southern Borneo, and is insufficiently known in science. In Japan, the most popular species is called Nepenthes hybrida and named "a bottle gourd Nepenthes" in the Japanese language. But, in my opinion, it is also a type of N. alata. N. alata is a very polymorphous species and has many synonyms in science, and it must be cultivated under various names in gardens. In the case of artificial hybrids, we find many wrong names, but I cannot say what really is the true name. Even though I collected many of the original descriptions of hybrids from "Gardener's Chronicle", I cannot make a

strict determination because the descriptions are too simple. For example, according to Masters, N. wrigleyana has a pitcher with green color, but our species of the same name has a red colored pitcher.

"We imported many hybrids from Marcel Lecoufle in France. Someone labeled the same species with several names. N. coccinea came as N. henryana, N. intermedia, and N. coccinea. I determined the exact species from a woodcut picture in Regel's Gartenflora. But these Taplin's seedlings are not clear so I wonder what is true.

"These same errors must occur in your country also. I find many mistakes in the various collector's lists and even in books like the photographs of Nepenthes in "Exotica". Even in my collection there may be mistakes. In my opinion, N. kosobe is a type of N. alata. We need to exchange all species for exact determination. In one cross, there are many seedlings that are a result of a particular cross. Each seedling has a slight difference but they are all named similarly. In some cases, extreme types are given different names. For example, a stumpy pitchered type of N. dyeriana was called N. Sir F. W. Moore by Veitch. But the pitchers of intermediate type were named N. dyeriana. We need full descriptions of hybrid Nepenthes. I hope that these observations will be heeded by CPN members."

JOE MAZRIMAS has also observed the polymorphous character of Utricularia vulgaris with plants grown natively at high altitude (6500 ft.), intermediate (3200 ft.) and established at sea level. Basically, the plant is larger with bladders up to 1/4 inch at the highest elevation with decreasing size in all parameters as altitude decreases. Since the lowest altitude plant was established rather than native, this suggests that the growth types are ecophenes rather than ecotypes, but this would have to be confirmed with further homogeneous environmental growth experiments since both genetic and environmental factors may be operating together in different degrees.

The tuberous Droseras present an immense challenge in culture. We understand that our Australian friends have equal difficulty with these plants. In the U. S., WARREN STOUTAMIRE and JOE MAZRIMAS have had considerable experience with these species. The plants require (probably among many other factors unknown) an alternate dry-wet cycle which must be closely monitored to prevent rot on the one hand, and to promote vigorous growth and propagation on the other. After the stems die back, water should be withheld gradually until dry and this state maintained for three months or more. Then, depending on the species, watering is resumed to stimulate growth, or is resumed when new growth appears from the tuber planted in a well-drained mixture. Joe observes that most of the time, the tubers rot and only a decreasing percentage survive from year to year, these showing less and less vigor until the average life-span of three years in culture is ended. He mentions that a possible difficulty is formation of a special root called a "dropper" from which new tubers form annually as seasons go by. This seems

deficient in culture. Thus there is no food store restoration and the existing tubers are eventually exhausted.

MR. KUSAKABE also notes difficulty with the Australian tuberous Droseras in culture: "We have had a bitter experience trying to cultivate tuberous Drosera. We have difficulty in finding ways to propagate these plants without seeds. It is then necessary for us to find a method of non-sexual propagation. These tubers are actually a subterranean stem similar to the potato. Therefore, I am chopping the tuber of D. peltata and covering it with Sphagnum moss. Now, I'm keeping an eye on the pot and I hope for good results."

LEO SONG feels that growth temperatures are important in managing these species: "With regards to the tuberous Drosera problem, I'm trying the D. auriculata outside under lath. Since this species is also found in New Zealand, I think they would do better under cooler conditions since most of these types of Drosera grow during the cooler part of the year. The problem you seem to have with a gradual diminution in size with each passing year seems to be one where they are grown at high temperatures which increases the respiration rate and probably decreasing the rate of photosynthesis. At cooler temperatures, they respire less and may be in a more favorable range of temperatures for maximum photosynthesis resulting in more accumulation of carbohydrate which would be necessary for proper tuber formation. You might try growing the tuberous forms you now have at lower temperatures during the fall-spring season, protecting only against freezing, then letting them go dormant as summer approaches, watering only enough to prevent the tubers from totally drying out. Too much summer watering will most likely result in rotting since these plants seem to be adapted to being dry during the warmer months."

BOB BYE is currently in Chihuahua, Mexico doing extensive field work of ethnobotanical nature. He has seen Pinguiculas and is trying to relocate Utricularia livida which is described from both Africa and eastern Mexico.

SHORT NOTES

ASEPTIC SEED GERMINATION IN CARNIVOROUS PLANTS
by Warren P. Stoutamire

Terrestrial orchids have been grown from seeds at the University of Akron, using most of the standard techniques used for raising the commercial tropical epiphytes. These methods also work for many carnivorous plants and there are some advantages to keeping slow-growing species groups, such as Sarracenia, on sterile nutrient agar for several months. The greenhouse problems resulting from pathogens, watering problems, temperature problems, and insect pests are largely eliminated. We have successfully grown seedlings of species in the genera Sarracenia,

Darlingtonia, Heliamphora, Drosera, Utricularia, Byblis, Nepenthes and Pinguicula on sterile nutrient agar and find the procedures useful for our purposes. Speculation as to the causes of germination failure is reduced if the seeds are placed in an aseptic and highly visible environment. One knows after a suitable period whether the seeds are viable or not, there being no question of pathogens having eliminated them.

We routinely use a modified Knudson C agar, in which the following are placed in one liter of distilled water: monopotassium acid phosphate 0.25 gm; calcium nitrate 1.00 gm; ammonium sulfate 0.50 gm; magnesium sulfate 0.25 gm; ferrous sulfate 0.025 gm; manganese sulfate 0.0075 gm; sucrose 20.00 gm. and agar 8 gm. The agar-sugar-mineral mixture is slowly heated with constant stirring to near boiling to dissolve the agar. Failure to stir can result in scorched agar on the bottom of the container. Twenty-five milliliters of the hot solution is then poured into 100 cc square bottles, this amount producing an agar layer 1/4 inch deep when the bottles are placed on their sides after autoclaving. Any heat-resistant glassware will serve, so long as it can be plugged with sterile cotton plugs or rubber stoppers having a hole (also plugged with cotton) for pressure release during autoclaving. We use one-hole rubber stoppers in which a short length of glass tubing is inserted, a small cotton plug inserted into this tube. The projecting tube serves as a convenient handle when transferring seeds or seedlings.The bottles are steam sterilized at 15 lbs. pressure for 20 minutes, removed from the autoclave and placed on their sides to cool and harden. They are then ready for planting. The final pH will vary but is not critical for these plants.

Seeds are placed in small stoppered vials and covered to several times their depth with a calcium hypochlorite solution (10 gm in 140 cc water) which has been filtered to remove the insoluble suspended material. The vials are shaken for 20 minutes to continually wash seed surfaces with the hypochlorite solution. Vials are then carefully opened using aseptic technique and the surface-sterilized seeds are removed with flamed bacteriological wire loops and carefully placed on the sterile surface of the agar. Some familiarity with bacteriological technique is assumed at this point. Anyone who has grown orchid seeds on one of these standard agar media will have little difficulty handling seeds of insectivorous plants. The bottles are labeled, placed in diffuse daylight on a window sill or under fluorescent lights (we use daylight white tubes six inches above the bottles, light values being around 250 foot-candles at the bottle surface).

The bottles should be examined daily for 10 - 14 days, to check for contaminants which entered during the seed transfer or which were inside the seed coat and grew out into the medium. Sarracenia seeds are especially prone to fungal contamination because of the presence of these organisms under the seed coats during transfer. When fine filaments are seen growing out of any seed the entire seed and supporting agar may be lifted out with a sterile loop or the uncontaminated seeds

may be transferred to a fresh bottle. Usually only a few seeds are contaminated in any bottle but these must be removed or transferred when contaminants appear.

Germination time varies with species, Sarracenias and some Droseras appearing within four to six weeks of sowing. Drosera rotundifolia seeds will not germinate unless seeds are refrigerated in the flasks for several weeks. Byblis gigantea seeds may require a year before germination begins. Some tuberous Australian Droseras germinate quickly and grow prodigiously in bottles, especially D. auriculata and D. peltata. They will flower in flask if not removed in time. Drosera pygmaea and Pinguicula lusitanica also flower in flask. Other Drosera species either germinate irregularly or not at all, such as D. gigantea, D. macrophylla and D. stenopetala. It would be very informative to relate seed germination behaviour to ecology in some of these species of specialized habitats.

Seeds which have grown well in flask are ultimately transferred to the greenhouse and grown to maturity. We find these procedures useful, the seedlings requiring much less attention than their pot-grown equivalents in the greenhouse. The initial trouble of media preparation and planting is offset by the months of freedom from greenhouse work which follow. I would be interested in hearing the experiences of others in using specialized approaches to seed germination of these or other insectivores.

GROWING ALDROVANDA VESICULOSA
by Tsunewo Saito

Aldrovanda vesiculosa loves acid (pH around 6) and fresh water, the same as other aquatic carnivorous plants such as Utricularia. The shape of the shoot apex of this species may tell you whether or not it is in healthy condition. Thus, if the shoot apex is rounded and onion bulb-shaped, it is in quite good condition in the right pH and environment. This species loves sunshine or high light intensity. Since you may be cultivating this species in small containers, water movement wouldn't be expected and you must watch the temperature in the container under sunlight. They do not like temperatures up to 32° C. (90° F.). The container must be earthenware instead of glass or metal. The best water temperature for Aldrovanda vesiculosa may be 25 to 30° C. where most flowering occurs. Acidity is very important for the cultivation of this species. You may put dead stems or leaves of grasses or sedges (especially rice grasses) in the water used for cultivation of Aldrovanda vesiculosa to promote acidity. Whenever the water color changes to yellow, it is a sign that the water is acid. If you have a pond with aquatic plants, like Japanese Iris, rushes, sagittaria, etc., and keep the water acid and abundant with organic compounds, it might be great to use it for Aldrovanda cultivation. If you use distilled water for Aldrovanda cultivation, you would have to add the following chemicals

as a medium:

$(NH_4)_2SO_4$	24 mg/l
K_2SO_4	64
$MgSO_4$	44
KNO_3	55
K_2HPO_4	25
$Ca(NO_3)_2$	29
Citric acid	3

Algal growth may inhibit Aldrovanda growth in which case add desiccated alum and change the water frequently.

NEPENTHES AND I - MT. KINABALU (BORNEO, MALAYSIA) TRIP

by Yoshiwo Toyoda

Mt. Kinabalu, located in Saba State, North Borneo, Malaysia, is the highest mountain in southeastern Asia, 4101 m. alt. (13,455 ft.). Since this area is called Mt. Kinabalu National Park (433 km^2 wide), the Malaysian government supports this park and protects its wildlife, animals and plants. This mountain is very famous as a Nepenthes source, especially four endemic species.

A chance to go there came to me in 1971: the governmental office of the park was looking for a person who could make a field trip for Nepenthes collecting with some workers there. I applied and they were very cooperative with me. I joined their field trip from April to May, 1971. According to previous literature, most of the Nepenthes in Mt. Kinabalu grow in the zone between open mixed forests (alt. 900-1800 m.) and moss forests (alt. 1800-3150 m.), called the Nepenthes zone. We planned a visit to this zone first and then to Marei-Parei where the king of Nepenthes, N. rajah grows.

First of all, we reached the headquarters of Mt. Kinabalu National Park (alt. 1615 m.). Around this foggy area, we found Nepenthes tentaculata, the first species of the trip. Next day, we left the 9100 base camp for further searching. Nepenthes stenophylla was found in a grassy area along the trail by the electric power station, alt. 2145 m. Soon after that, hundreds of beautiful Nepenthes tentaculata were seen along the trail. Then we entered into the moss forest with thousands of mosses, orchids, and many other tropical plants and N. tentaculata in wonderful natural gardens. If you could see it, you would never forget it. According to our observations, the humidity was 50% and the temperature was 23.5° C.

After that, in the next zone, we found Nepenthes lowii which was climbing up trees. Pitchers of this species were very peculiarly shaped. In this area the humidity was 40%, temperature 25° C. Soon after we saw the building of the radio station (Radio Sabah, alt. 2590 m.) and found another species, Nepenthes villosa. Then at 3:00 p.m. we reached our first camp (alt. 2654 m.). The next day, at altitude around 3047 m., there was the biggest population of Nepenthes villosa we have ever seen.

Another day, we left the base camp for Marei-Parei. After two hours' walk on the second day, we found Nepenthes tentaculata and knew we were already in the Nepenthes zone. Later, Nepenthes rajah was found. In a sunny wet boggy area N. edwardtiana was seen. Three hours after we left the first camp we arrived at Marei-Parei, alt. 1828 m. There was the biggest population of Nepenthes rajah (800 m^2) I have ever seen. Thousands of seedlings of N. rajah were there. There was also a good population of Drosera spathulata. It was the shortest day in my whole life when I found Nepenthes rajah. Readers might understand my feeling for a time when I found something new that I wanted if you have had similar experiences to this.

SPECIAL NOTICES

JAPANESE CARNIVOROUS PLANT BOOKS

The following books were written in Japanese on the subject of carnivorous plants. These books can be ordered from our offices by sending in your check or money order made out to J. A. Mazrimas before March 1, 1973. I will order the books at that time and there may be a delay of two months or more before you receive your books. The books have pictures in black and white and color as well as line sketches, many captions being in standard Latin nomenclature as well as Japanese.

	Author	Title	Pages	Price*
1.	Shimizu	Insectivorous Plants (Photo. Illust.)	154	$9.00
2.	Suzuki	Insectivorous Plants (Cult. and Collect.)	168	$1.80
3.	Kasahara	The Wonder of Insect. Plts.	242	$1.25
4.	--------	Aldrovanda vesiculosa at Hanyu-city	32	$2.10
5.	--------	"New Flower" Magazine (Special edition)	86	$1.20
6.	Komiya	Systematic Studies on Lentibulariaceae (English)	124	$7.60

*Price includes overseas and domestic postage and represents cost only.

NORMAN LEFKOVITZ (617 Treeside Drive, Akron, Ohio 44313) would like to directly communicate with anyone who is or has grown carnivorous plants under artificial lights, or who is interested in doing so. Norman is gathering quite an experience in this area.

RECENT LITERATURE

Amagase, S.: Digestive enzymes in insectivorous plants. III. Acid proteases in the genus Nepenthes and Drosera peltata. Jour. Biochem. 72. pp. 73-81 1972

Nepenthes crude secretions had four proteases, the purified extracts one, the latter similar in electrophoretic mobility to the purified extract of D. peltata. Characterizations with pH

and temperature variations and use of inhibitors were made. The site of peptide bond splitting was also determined and was the same for the purified extracts from both plants.

Amagase, S., Mori, M., and Nakayama, S.: Digestive enzymes in insectivorous plants. IV. Enzymatic digestion of insects by Nepenthes secretion and chitinolytic activities. Journ. Biochem. 72. pp. 765-767 1972

The authors purified and studied the properties of acid proteases from the secretion of Nepenthes and an extract of Drosera peltata. They also demonstrated a chitinase enzyme which solubilizes the external skeleton of ants and other insects. At the present time, it was not established if the latter enzyme is formed by the plant or by some symbiotic microorganism living in the Nepenthes fluid.

Darling, Thomas, Jr. and Shetler, S. G.: Sarracenia x catesbaei Elliott (pro. sp.) in the Pocono Mountains of Pennsylvania. Castanea 37 (2). pp. 133-137 1972

Four separate instances of apparent spontaneous hybridization between the native Sarracenia purpurea L. and introduced S. flava L. at Bear Lake in Lackawanna County, Pennsylvania, are described. This hybrid has been known for a long time under the name S. catesbaei Elliott.

Kondo, K.: A paper chromatographic comparison of Utricularia cornuta and U. juncea. Phyton 30 (1/2) pp. 43-45 1972

Although many of the constituents are common to both Utricularia cornuta or U. juncea, certain spots are found only in U. cornuta or U. juncea. Paper chromatographic observations lend support to the conclusion that U. cornuta and U. juncea are quite closely related to each other but still are separate species.

Kondo, K.: Chromosome numbers of some angiosperms in the United States. II. Phyton 30 (1/2) pp. 47-51 1972

Among new chromosome number counts of ten species, four species of Utricularia were reported for the first time: Utricularia biflora (n=14), Utricularia fibrosa (2n=28), Utricularia gibba subsp. gibba (n=14), Utricularia radiata (n=14). Since U. radiata is taxonomically closely related to U. inflata it is sometimes called U. inflata var. minor. Studies by Reinert and Godfrey (1962) indicated that the taxa were biosystematically distinct. Indeed they are, for the chromosome numbers of the species are different: n=9 or 2n=18 and 36 for U. inflata (Lewis, et al., 1962), n=14 for U. radiata.

Ragetli, H. W. J., Weintraub, M., Lo, E.: Characteristics of Drosera tentacles. I. Anatomical and cytological detail. Can. J. Bot. 50 (1). pp. 159-168 1972

Distinct features on the surface and inner structure of the tentacle were described in detail which could explain the various functions carried out by this complicated organ. The transport of metabolites,

the extreme permeability of the head and the bending of the tentacle were attributed to various types of cells and intercellular spaces.

Schmid-Hollinger, R.: Nepenthes studies: II The hair of the Nepenthaceae and its phylogenetic significance. Bot. Jahrb. 91, pp. 61-90 1971

IN GERMAN

There are four types of hair forms varying from simple types to branched forms. Species of Nepenthes with simple hairs have a restricted distribution while species with simple and branched hairs often are widely distributed. Many species with simple hairs are found in the regions of Sumatra and the Malay Peninsula while Borneo, on the contrary, shows many species with derived hairs.

Schnepf, E.: Membrane flow and membrane transformation. Ber. Deut. Bot. Ges. 82 , pp. 407-413 1969

IN GERMAN

As a model for studying membrane function, the author observed the glandular mucous cells of Drosophyllum and concentrated on the transport mechanisms between compartments in this plant.

Slee, John: The Meateaters. Garden News (England) page 7 Sept. 1, 1972

Here is an article by Mr. Slee which expressed some uncommon information about carnivorous plants. He discusses the native Droseras, Dionaea, Pinguicula and Nepenthes. In regard to the last named species, he mentions that a tropical house is necessary for all the species except N. rajah which will do well in a cool house with 45 to 50 degrees. I would like to express my thanks to George Johnson for sending in this article.

Smith, Alan P.: Survival and seed production of transplants of Dionaea muscipula in the New Jersey Pine Barrens. Bull. Tor. Club. 99 pp. 145-6 1972

In 1948 Haas transplanted Dionaea to a bog in the New Jersey coastal plain. In 1958 the original plants had been removed by vandals, but seedlings remained, and in 1970 three large plants were found, all adult and one in seed. Four seeds were removed and were proven viable under lab conditions. The survival of viability of seedlings of Dionaea 528 km. north of its northernmost limits would indicate that macroclimactic factors have less importance in limiting the plant's range than might have been suspected.

Swales, D. E.: Sarracenia purpurea L. as a host and carnivore at Lac Carre, Quebec. Nat. Can. 99 (1) pp. 41-47 1972

Rotifers, nematodes and copepods are now added to the previous list. See CPN 1, 15, 1972. In the collection found in late summer were nine more insect families added to the previous list of victims.

Williams, S. E., Pickard, G. B.: Properties of action potentials in Drosera tentacles. PLANTA (Berl.) 103 (3) pp. 222-240 1972

Action potentials of Drosera resemble those of vertebrate peripheral nerves in that they appear to be comprised of uniform spikes, variable shoulders or negative after-potentials, and variable positive after-potentials. They propagate from the neck of the stalk to its base at about 5 mm/second at room temperature.

Williams, S. E.: Receptor potentials and action potentials in Drosera tentacles. Planta (Berl.) 103 (3) pp. 193 - 221 1972

In D. intermedia, receptor potentials can be detected with electrodes applied to the mucilage surrounding the head of the tentacle, if the head is stimulated with an insect or mechanically or salt solutions. Action potentials can be detected with electrodes applied to any region of the stalk, and occur at a frequency dependent on the magnitude of the receptor potential. Inflection of the lower stalk follows the occurrence of action potentials.

DO NOT FORGET YOUR RENEWAL IF DUE

Sarracenia flava

Drosera intermedia