

Woodlands

Drive - In

Nursery

"Guy & Betty Ball"

229 Hume Highway

Cabramatta

Sydney

A Large range of flowering  
Bromeliads.

displayed to advantage  
in hanging baskets & growing  
naturally on Jungle Wood  
Suppliers of: Tree Fern fibre  
Fern slabs. Ornamental Pottery  
Terra Cotta Pots.

## B R O M E L E T T E R

Vol. 1 .. No. 8

- 4 -

July-August, 1964

and last but not least, a Tillandsia, T. Wagneriana. There are others that are so far unidentified and could be new genus and still more that are almost certain to be new varieties yet to be attached to existing species. So stay with us and read about the first-hand descriptions in issues to come.

ED.

### MEMBERS -

"Bromeletter" is your Journal and you are invited to submit articles for publication. Your Editor, now assisted by the Editorial Panel, has set a high standard and in order to keep this, it is necessary to frame a set of simple rules in respect of copy which is submitted. The Committee has defined the duties of the Editor and the Panel in this respect. These are -

1. The Editor is entitled to correct grammatical errors and to punctuate copy only where necessary provided that the context or construction are not altered.
2. Copy may be rejected by the Editorial Panel and alterations made. However, copy which has been altered must be resubmitted to and approved by the author before publication.
3. Advertisements in "Bromeletter" must contain no references to plants other than Bromeliads as the Journal is a series of papers devoted to the study of this family of plants only. However, equipment and other aids may be publicised.
4. Articles on other plants will not be accepted.

"Bromeletter" is something of which we should be proud and in which we should always endeavour to put our best foot forward. The Society will be judged largely on its content.

### Committee

### SPECIAL NOTICE TO MEMBERS

#### "BROMELIAD SHOW"

Whenever the Society acting in unison displays Bromeliads, the benefits are soon obvious in increased membership. After the last Royal Easter Show here in Sydney, a considerable number of new members was admitted, which is quite understandable as the vast bulk of our people have never seen Bromeliads on display.

The Society, under the 'Display' management of Mrs. V. Small and Mrs. O. Ferris assisted by Mrs. J. White, is shortly to undertake a 'Public Display' at Normanhurst West Public School, cnr Dartford Road & Sefton Road, Normanhurst, Sydney, on SATURDAY, 18TH JULY from 10.30 a.m. to 8.30 p.m.

ADMISSION - ADULTS 2/-, CHILDREN 6d.

MORNING AND AFTERNOON TEAS AVAILABLE ON THE PREMISES

PRIZES will be awarded for the best Plant in each Genus.

ADVERTISING is being organised and the relevant information will appear in as many suburban and daily papers as possible.

One point we wish to make clear is that this will be entirely a Bromeliad

## B R O M E L E T T E R

Vol. 1 .. No. 8

- 5 -

July-August, 1964

Society Show with the Society making a special appeal to all local collectors to roll up with their plants, however large or small, potted or tubbed, as there is a very large space to fill and a massed effect is the aim.

Plants may be delivered to the School any time after 4 p.m. Friday, 17th. Some of the newer members who may not as yet have many plants are assured that their presence will be more than welcome in helping to staff the exhibit and handle enquiries.

PLANTS CAN BE SOLD to the viewers, thus allowing the disposal of any excess plants, with a small commission payable to the Society; also to those about to join the Society, this will enable them to acquire a 'beginner's' collection.

Please treat this as a matter of importance as this is yet another step forward in the development of your Society and Bromeliads in Australia.

ENQUIRIES - TELEPHONE 84.3646 - SECRETARY

THE SMALL GLASS HOUSE

by Dr. R.D. JOHNSTON

### Part 2

3. Humidity of the air may be referred to in several ways. Absolute humidity is the weight of water in a given volume of air. The maximum which can be held, the saturation value, rises steeply with temperature. Relative humidity, which is the term most commonly used, is the actual absolute humidity expressed as a percentage of the saturation value of that temperature.

Saturation deficit is the difference between the actual absolute humidity and the saturation value. Now, because the saturation value increases with temperature, it is common to see the relative humidity fall and the saturation deficit rise during the day, although there may be very little change in absolute humidity. For example, if the air is saturated at dawn when the temperature is 50°F and no further water vapour is added to it, by 2 p.m. at 80°F the relative humidity will be only 30% and the saturation deficit will have risen from nil to 21 gm./cu.m (=12 grains per cu.ft.) Usually the saturation deficit is the best indicator of the 'drying power' of the air; it is the saturation deficit which determines the rate at which benches, floors and plants dry out.

We are not normally concerned with decreasing the humidity of the glasshouse, and an increase is fairly easily achieved by watering floors and benches and reducing ventilation. As has been mentioned above however, reducing ventilation is likely to raise the temperature and this may not be desirable. Evaporative coolers simultaneously increase the ventilation and the humidity and decrease the temperature, but these are limited in application. An alternative method is to use fogging or misting nozzles, or some form of atomiser. These may be operated continuously, intermittently, or for a short period in the middle of the day. As with temperature, considerable variations of humidity can occur if air movement is too low, and some form of ventilation or fan circulation seems desirable; excessive ventilation will reduce the humidity below the optimum.

## B R O M E L E T T E R

Vol. 1 ... No. 8

- 7 -

July-August, 1964

end of the house so that there is a temperature gradient along the house. Similarly, fogging nozzles along one wall only will give a humidity gradient across the house, which can be modified by the amount of air circulation introduced, and planned use of shading or painting can give varying light intensities from roof to floor.

Then all that one needs is the patience to try the different plants in different spots, to observe their growth and to rearrange them until each is in its most favoured position.

### ERROR IN NOMENCLATURE

Your attention is drawn to an error in previous nomenclature. Referring to Page 27, Issue No. 4, re Aechmea bracteata. Omit word "pendant" and substitute "erect" inflorescence. Actually the inflorescence is "leaning" but is certainly not "pendant" on the plant in question.



15 Fisher Ave. Pennant Hills Sydney. N.S.W  
(Open Week-Ends) Tel. 84-1818

### Conversation Pieces.

A new and most attractive way of displaying Bromeliads in the home. Make a wooden picture frame to the desired size, and allow a deep recessing, building in a solid wooden back. Place the plant in position, and any additional pieces of fernery and decoration. This remarkable 'conversation piece' is further enhanced by building in a hidden fluorescent tube light. Bromeliads are adaptable and I will later pass on more 'tips' and information to growers.

I have recently imported some rare Vriesea seedlings which are now ready to come out of the community pots. Also, I have seedlings of Nidularium Fulgens and many other choice varieties. Some of the Bromeliads in stock are fully grown and I am sure would make most acceptable gifts, apart from additions to your collection. Many Bromeliads are very slow growers and it is my intention to offer the rarer sorts at seedling stage with the advantage to the buyer of obtaining really good plants about 12 months old at reasonable prices. I will have a new Brochure available shortly which will be sent post free on your request. Special attention to interstate and overseas collectors.

*John S Martins*

## B R O M E L E T T E R

Vol. 1 .. No. 8

- 8 -

July-August, 1964

### OUR EXPERIENCES IN GROWING BROMELIADS FROM SEED

by Olwen and Hilton Ferris

When we first started collecting our plants, we were growing them in a cold glasshouse and soon realised that something more than this was needed if we were going to raise our own seedlings. Hilton started planning for a small boiler-heated glasshouse, but owing to the wet winter, this proved to be a much longer project than was at first expected.

Seed ordered of Billbergia zebrina arrived and we had to start improvising, with the top of the hot water storage tank in the house soon proving a good spot for germinating the seed. I used a plastic seedling pan and a mixture of equal parts of tree fern fibre, sharp sand and peat moss, adding some charcoal too. The mixture was steam sterilised over a saucepan for 20 minutes before sowing the seed. The seed was sprinkled on top of the mixture and a few just covered, then well watered. They were then covered with glass, with germination starting on the fourth day. The covered seed took one week before showing signs of sprouting.

An improvised hot-house was then made, using a kerosene 'brooder lamp' to heat a dish of water, under a dish of vermiculite. The seedlings grew well for about a month, when suddenly they started to die off, until they were all lost. I blamed the 'lamp' at the time, but on reconsidering I am now sure that a light spraying with overstrong fertilizer caused the damage.

The next batch of seedlings was planted in late July/August of 1963 and included several Vriesea species, Neoregelia concentrica, and seed of Tillandsia stricta and germinated without any trouble. Soon a few of the other seeds being grown, Aechmea and Billbergia, started to show a white mould and were sprayed with 'Capthion'. Condensation on the glass was proving to be a full time job so I placed the seedlings in stiff plastic bags and now leave the tops open. (I wonder if the seeds mentioned were imported seed and need further cleaning before planting).

As the seedlings progressed, they were then shifted to the now heated glasshouse, where with the exception of T. stricta, they have thrived. When large enough to handle they were pricked out into community pots. Later, the stronger plants were again planted out into wooden seed boxes where leaf mould was substituted for peat moss in the mixture. Today, the seedlings are well 'hardened off' and being grown cold in rather dry conditions.

Being partial toward Tillandsias, I again tried T. stricta in the summer and successfully grew them to the 4-leaf stage, when along came a sudden cold snap and they once more dampened off. Nothing daunted, Hilton then made a unit from parts of an electric chicken brooder that gave an operating temperature of 70-80°F, with the side flap down. I lower the temperature at night by raising the flap. The unit is ideal for this purpose and holds 11 x 3 inch terra cotta pots.

Another heated germinating unit now in use using 12 volt power from a transformer holds the plastic pans and any other plantings we feel need a little extra warmth. The unit is 4'6" long, 14" wide and 14" deep and filled 1/3rd. full with vermiculite. All in all, a very exciting and satisfactory hobby, with both of us looking forward to the day when we can see the fruits of our efforts and the various plants in flower.

## B R O M E L E T T E R

Vol. 1 .. No. 8

- 9 -

July-August, 1964

### WELCOME TO NEW MEMBERS

Once again, we find ourselves in the happy position of welcoming some more new members, who we hope will put in an appearance at the monthly 'get together' plant meeting at the Society hall.

For those who are new to growing Bromeliads, these meetings will certainly put them on the right track, as there are always members present who are well versed in growing, and of course, there is always the chance of picking up that extra special plant at the auction.

For those who are a long way from Sydney, do not think that we don't think of you too, for whilst you may not be able to attend these interesting venues, there is always the mailbox which gives you the chance to air your views, and in due course, appear in this journal.

Welcome to -

|                    |  |
|--------------------|--|
| Mr. R.G.M. Friend  | 135 Avalon Pde, Avalon Beach, N.S.W.     |
| Mr. W. Linkenbagh  | 16 St. Elmo Pde. Kingsgrove, N.S.W.      |
| Mr. J.B. McWilliam | 80 Snape St. Kingsford, N.S.W.           |
| Mr. R. Kasteel     | 17b Crown Rd., Queenscliffe, N.S.W.      |
| Dr. C.E. Southee   | 250 Barrenjoey Rd. Newport Beach, N.S.W. |
| Mrs. J. Barnham    | 249 Kingsgrove Rd. Kingsgrove, N.S.W.    |
| Mr. F.M. Hundt     | 12 Diana Ave. Burleigh Heads, Q.         |
| Mrs. M. Williams   | 4 Denman St. Turramurra, N.S.W.          |
| Miss D. Saunders   | 38 Conder St. Burwood, N.S.W.            |

New Associates -

Mr. and Mrs. Willan 47 Cumberland St. Cabramatta, N.S.W.

Associate to Full Member

Mr. H. Ferris 55 Beresford Rd., Thornleigh, N.S.W.

Renewals from 1963 - Full Members -

Mrs. Beryl Allen 6814 10th. Street, Tampa, Florida, U.S.A.

Mr. T. McCann 32 Lancaster St. Coorparoo. Q.

\*\*\*\*\*

### DATES TO REMEMBER FOR 1964

The Meeting Place: The Seldon Hall,  
Address: 196 Liverpool Road, Enfield.

Situated on the corner of 'The Parade' and in the same building as Enfield Children's Library. Entrance is in 'The Parade'.

|                     |                 |
|---------------------|-----------------|
| Saturday, 4th. July | General Meeting |
| " 1st. August       | Plant Meeting   |
| " 5th. September    | Plant Meeting   |
| " 3rd. October      | General Meeting |
| " 7th. November     | Plant Meeting   |
| " 5th. December     | Plant Meeting   |
| " 9th. January,     | General Meeting |
| 1965                | General Meeting |

## B R O M E L E T T E R

Vol. 1 .. No. 8

- 10 -

July-August, 1964

### A MESSAGE FROM THE "SUNNY NORTH"

A cheery letter from N. Misso, of 25 Rokeby Terrace, Taringa, Q., and a copy of the Queensland 'Sunday Mail' in which was featured a comprehensive article on Bromeliads by Harry Freeman, 'Sunday Mail' Staff Photographer. (How about some of you local members contacting Mr. Freeman; he may care to join our mutual ranks and by the evidence of his article, he would at least be a very interesting person to meet).

It appears from the writer's comments that a number of Nurseries in Brisbane are now featuring Bromeliads among their sale lines, and it also follows that there must be an increasing number of people in Brisbane now growing them with some satisfaction. As a point of interest to you all, particularly those of you in out-of-the-way places, the Committee recently decided to allocate some funds for an advertisement in 'Your Garden' in the 'classifieds' and this should start to reach people in Brisbane as well as other places. Also, there appears an article was printed in the "Queensland Garden" recently, also about our favourite subject; many thanks for the note.

### AN INEXPENSIVE SERVICE TO MEMBERS

If you are in the habit of curling up from time to time with this journal, then you may have noticed that the covers are getting a little dog-eared; with this in mind, a member of the recently-established Editorial Panel came up with the bright idea of offering a neat little casing for Volume 1 issues. The case is constructed of stiff cardboard, neatly covered in maroon art paper, with the spine lettered with the Society name, Vol. 1, Nos. 1 - 10. This then means that the issues are protected and it can adorn your book case; not only that, it will be safe from small hands and careless cats. Priced at 8s.6d. and good value.

### AN ARTICLE FROM CHAS. M. TAYLOR

Having read the recent articles on Bromeliad culture, which have been very interesting, but my methods over a few years have been somewhat different, with continued good results.

I have been growing a number of species in a common house, namely Aechmea, Billbergia, Neurogelia, Vriesea, Tillandsia, in a very open glasshouse. The structure has a glass roof, south and west walls, but the east and north sides are completely open. The plants are all growing among the orchids and get watered and fertilised with the orchids. Those growing in a plastic house are in a similarly constructed building.

My experience has shown that a Bromeliad, if grown in a completely closed glass house, particularly if it is heated, or a very shady glass house or bush house tends to lose shape and colour. There is no doubt they will grow well in a closed glass house, but they lack lustre and fail to develop the beautiful shape and colouration that make these plants so attractive.

## B R O M E L E T T E R

Vol. 1 .. No. 8

- 11 -

July-August, 1964

Plants when grown 'soft' are very liable to attack by a particular fungus or mildew that they are susceptible to, leaving coloured marks on the leaves. Thus, your plant is no good for display until a new 'pup' has grown.

There are a few members of this family that do appreciate a little warmth in winter, but all of the abovementioned species do very well with good light and a free flow of air. Another observation is that when plants are grown in good light and all conditions, they appreciate frequent spraying with liquid manure, thus getting a faster and stronger growth and a disease-resistant plant.

If you have a glass house or a partly enclosed

bush house, then you need a spray system.

If you have a manually operated spray system,

then your plants will benefit from a

"WATERMATIC SPRAY CONTROLLER".

For details write to -

Watermatic Spray Controls  
P.O. Box 145, Chatswood, Sydney.

"WATERMATIC" patent pending.

The following piece of information was forwarded in from a member, with the request to remain anonymous. No wonder!

### DRINKING AT A PROFIT

Since you may not be able to refrain from drinking, why not start a hotel in your own home? You can be the only customer and you will not have to buy a licence.

Give your wife £7.12.0 to buy 4 cartons of bottled beer. There are 240 drinks in 4 cartons of beer. Buy all your drinks from your wife at 1/- a glass. At the end of 7 days (when cartons are gone) your wife will have £4. 8. 0 to put in the Bank and £7.12. 0 to buy 4 more cartons of beer. If you live another 20 years and continue to buy all your drinks from your wife, then die in your boots, your widow will have £4,576 - enough to bring up your children, pay off the mortgage on the house, marry a decent man, and forget she ever knew a no-hoper like you!

## B R O M E L E T T E R

Vol. 1 .. No. 8

- 12 -

July-August, 1964

### A LETTER AND AN ARTICLE FROM WESTERN AUSTRALIA

The West Australian Associate Vice President, Bernard Stonor, wrote recently, 'A glance at the list of members shows that you people in N.S.W. are just about monopolising the field; won't do at all. I will have to get busy right away and see if W.A. can't get ahead of certain other States for once. Local prospects for members are a little brighter, but possibly not until after winter has lifted.

Now this is a good point and well taken, Bernard. We really want some competition from you all in other places. There is a terrific potential membership in most States. We hope that the start of the already mentioned Society Ad. in 'Your Garden' will start something. Bernard has been busy on a project in the study of the leaf scale found in varying quantities on some Bromeliads in his collection, and it will be of interest to him as well as to all serious thinkers, that work along this path has been carried out; to what degree is as yet unknown.

One of the handy aspects of a National Society is that there are all kinds of people in the Society with particular strong points that come out in varying fashions. Dr. Doug. Johnston in Canberra, A.C.T. will in due course be able to enlighten us about any studies on the 'scale' and how far it has progressed.

Bernard wrote, "It involves a lot of work; detailed study of a scale may take an hour, with an unusual spell of fine weather keeping me flat out on the farm. I have to write a bit at a time, during meals whilst snatching a morning 'cuppa'. By the time I have finished I will be growing 'scales' myself. The sketches present a problem - for instance in the shape of Aechmea luddenmanniana I estimate the number of cells in an average scale to be close to 400. The number in species examined so far varies from 50 to 450. I propose including a few 'large scale' (hi!) sketches of a few representative types, as exact as possible in detail and providing detailed notes and statistics (cell size, shape, etc.) of a reasonable number of species, tabulated for ease of comparison. Later, I must have a shot at some photomicrographs as some of the small details are difficult to reproduce in a sketch. The whole study is proving of such interest that it is difficult to know where to stop. I am including various notes, not strictly on the subject perhaps, but all connected with the form of the scale."

There is a point which has come to my notice recently and that is the use of calcium carbide solution which on pouring into the centre of a pineapple, induces premature flowering. I believe it is used commercially on the pineapple fields.

Bernard's most interesting researches and accompanying illustrations will appear in the next issue; in the meantime, will somebody who has experience in the use of carbide on their Bromeliads write to the Editor. This will then be printed, we shall all know and Bernard will have his enquiry answered.

## B R O M E L L E T T E R

Vol. 1 ... No. 8

- 13 -

July-August, 1964

A CONCISE GLOSSARY OF BROMELIAD TERMS continued from Page 15, Issue No. 7

appendage .. an attached subsidiary or secondary part, as a projecting or hanging portion, an extension or extra part or process. The seeds of Pitcairnia are furnished with appendages.

appressed .. lying closely flat against one organ or part; not spreading. Often used in reference to hairs, as in certain Tillandsias.

arachnoid .. beset with cobwebby or tangled hairs

arcuate .. shaped or similar to a bow in form

aristate .. provided with a bristle-like appendage, especially on the floral bracts of an inflorescence. Certain Aechmeas have aristate floral bracts.

ascending .. upcurved; growing or directed upward

assymetrical .. not symmetrical; with no regular shape

attenuate .. becoming slender or very narrow; slender and long-tapering

awn .. a bristle-like, usually rather stiff appendage, especially found on the floral bracts. Certain Aechmeas have distinct awns

axis .. the stem on which the organs are angled

TO BE CONTINUED

A DOZEN PRONUNCIATIONS OF BROMELIAD GENERIC TERMS continued from Page 14,  
Issue No. 7

|                          |                             |
|--------------------------|-----------------------------|
| <u>Connellia</u>         | ( kon-nel-ee-ah)            |
| <u>Cottendorfia</u>      | ( kot-ten-dorf-ee ah)       |
| <u>Cryptanthus</u>       | ( krip-tan-thuss)           |
| <u>Deinacanthon</u>      | ( dye-nah-kan-thon)         |
| <u>Deuterocohnia</u>     | ( dew-ter-row-koe-nee-ah)   |
| <u>Dyckia</u>            | ( dik - ee - ah)            |
| <u>Encholirium</u>       | ( en-koe-lee-ree-um)        |
| <u>Fascicularia</u>      | ( fas-ik-you-lair-ree-uh)   |
| <u>Fernseea</u>          | ( fern-see-ah)              |
| <u>Glomeropitcairnia</u> | ( glom-ero-pit-care-nee uh) |
| <u>Gravisia</u>          | ( gra-vis-ee-uh)            |
| <u>Greigia</u>           | ( gree-gee-uh)              |

TO BE CONTINUED

## B R O M E L E T T E R

Vol. 1 .. No. 8

- 14 -

July-August, 1964

### NOTES FROM 'BEAUTIZONE'

This time a note from Mrs. Billy Powell of Beautizone Nursery at Myelstom (near Raleigh) about a grub that keeps eating her Dyckias. Alas, poor Dyckia 'Lad Cutak' is no more, and our advice to you is to try a little derris dust around and about. It would appear that arsenate of lead or any of the copper salts may be as disastrous as the pest.

Billy Powell is at the present time in the throes of indecision about Ae X Bert versus Ae fosteriana, with apparently some differently marked leaves. All we can suggest to you at this moment is to either wait for them to flower, sending them down to our Identification Officer, or send a whole leaf from each plant. Thank you, Billy.

Wal. Hudson of Sawtell, probably one of the keenest Bromeliad growers the writer has ever met, has been on the sick list, and is now back on the quest for bigger and better Bromeliads. Anybody going north should not miss calling on Wal. His collection has the maximum appeal to those who wish to grow their plants naturally.

Also, the same appeal in woodland setting and natural effect can be seen in the whole garden of Mr. and Mrs. G.A. (Don) Patterson at Coffs Harbour. Last Christmas the writer had the pleasure of staying a few days at the Patterson arbour, and I was frankly envious at the ease of growth of so many beautiful Bromeliads tied in crotches of trees and on stumps, etc. There is no doubt about it, a sub-tropical to tropical climate makes all the difference!

### BROMELIAD ROOT SYSTEMS - Final Article - BROMELIADS IN RELATION TO THEIR SURROUNDINGS (continuing from No. 5, Page 5)

#### Type 4 - Atmosphere-Absorbing Trichome

This continuing article deals with the Bromeliads that belong to the atmosphere absorbing group and relating to species in Trinidad. In numerous papers on the subject, these Bromeliads have been frequently described as 'extreme atmospheric' and as far as Trinidad is concerned, they are all species in the Tillandsia tribe, with no sign of the 'tank' habit and little evidence of an absorptive root system.

To avid collectors in this country, T.usneoides is a fair comparison as it is indeed an 'extreme atmospheric'. Water is obtained directly from the atmosphere either as dew or as actual rainfall, which in turn is absorbed through the mechanism of the scale or the 'trichome', noticed as the silver scaled appearance common on members of the Tillandsia tribe.

The nutrient supply of the Type 4 Bromeliads is a long-standing puzzle, and it is generally presumed that the mineral and organic nutrients are carried in the air as 'air borne dust' which is absorbed by the plant through the 'trichome'.

Certain of the species noted in Trinidad were examined for any possible nitrogen-fixing organs, and minute nodules were found on infantile roots - presumably with the function of nitrogen fixing. Later, these same roots when matured and therefore hardened, showed no further development of 'nodules' with the need apparently at an end for this presumed function.

## B R O M E L E T T E R

Vol. 1 .. No. 8

- 15 -

July-August, 1964

The possibility of these same 'nodules' being associated with nitrogen-fixing micro-organisms has not been fully investigated, but it seems reasonable because of -

- (i) The total absence of an absorptive root system which in other Bromeliads utilises humus on the branch on which they grow;
- (ii) The absence of a 'tank' in certain species which it has been shown impounds humus and organic material, with the express purpose of providing an 'interfoliar soil equivalent'.

(In 1925 a greenhouse experiment concluded with the evidence of a micro-organism associating with a Tillandsia root system (Volutella and T. dianthoides) being regarded as a symbiotic relationship, the mould providing the plant with nitrogen.

T. gardneri is one of the remarkable species that solves its nutritional problems in an unusual way, with the ingenious device of curling its leaves around the branch on which it grows, the absorbing trichomes then in intimate contact with the humus on the bark of the supporting limb. There are many Tillandsias which are 'intermediate' between the 'extreme atmospherics' as described in Type 4, and the 'true tanks'.

The intermediates are typically rosette in form, with the leaf bases liberally covered with a mat of absorbing trichomes; the leaves expanded to impound water with leafy matter, etc. These features are typical of Type 3 but the Type 4 'extremes' also have the characteristic trichome, developed to a greater degree and in most cases not only covering the leaf blades, but the whole body of the plant as well. T.fasiculata and T.utriculata are such species in the Trinidadian flora, in themselves 'intermediates' - utilising part tank habit and absorbing trichome.

### Type 4 - 'Atmosphere Absorbing Trichome Group'

- (a) Tank and Atmosphere-Absorbing Trichome (Intermediates)  
Tillandsia fasiculata, T.utriculata, T.didistichoides,  
T.subimbricata.
- (b) Atmosphere-Absorbing Trichome
  - (i) Rain Type - Tillandsia stricta, T.pulchella, T.juncea
  - (ii) Dew Type - T.gardneri, T.usneoides
- (c) Myrmecophilous Atmospheric - T.flexuosa

Note: 'Myrmecophilous' grows in the company of ants.

The Trinidadian Bromeliads that have been placed in the various types, i.e., 1, 2, 3 and 4, are distributed in Trinidad over a wide variety of conditions and it is the intention at this point to clearly establish where the areas are in relation to the topography map shown on Page 5, No.5, Jan-Feb. issue.

First and foremost, the reader must understand that the distribution of these Bromeliads in Trinidad is governed by a number of factors which are primarily climatic, and in turn broken down into sub-sections which deal

## B R O M E L E T T E R

Vol. 1 .. No. 8

- 16 -

July-August, 1964

with humidity, light, rainfall, and the almost endless number of micro-climates, which have their own cause and effect on growth.

A scientific expedition to Trinidad some years ago examined the distribution in great detail, making copious notes regarding the above factors and even went into detail about the numbers of plants per tree, the distribution of plants on a particular limb and how it was oriented to light and exposure. Two test strips were selected from the forest and a cacao plantation that were all within 300 yards of each other in the central portion of the island at some 1500 ft. altitude.

The trees in the first forest strip were heavily covered with growths of vine, which severely reduced the light intensity. The second was vine free but stood near the bend of a river so that the general area was strongly illuminated both vertically and horizontally. The two strips were identical in structure and floristic composition, but differing greatly in light intensity. The humidities were very similar.

Humidity measurements were made twice at ground level in the two forests with the resultant humidities of 96% and 94% in each strip. The greater exposure in the river bend strip was evidently offset by the proximity of the river and evaporation from it. The two strips were 200 ft. long and 20 ft. wide, with a ground plan made of the orientation of the major limbs of each tree. The trees were then felled one at a time and the epiphytic flora then mapped in detail onto the master plan, so giving a profile of the centre strip.

The cacao plantation strip (also 200 x 20) was mapped and since this was plantation, regularly weeded, with the epiphytic population easily seen. As referred to in the previous discussion, Erythrinas serving as shade trees were here in evidence, the shading sparse and the whole plantation very much more heavily illuminated than the native forest strips. The plantation was drier and yielded lower relative humidity readings as much as 6 to 8% below the others (88% av.)

It was obvious that in Strip 1 which was quite dark, there were fewer epiphytes than in Strip 2 which was more exposed. In Strip 3, the cacao plantation, there were more than in the other two - this last the most exposed of them all. The next discovery was that the flora where large enough to discern a definite trend in vertical distribution, was on the whole concentrated in the upper levels, this in Strip 2, the end farthest away from the river bend. The end immediately abutting the river of this same strip showed more epiphytes and a downward trend in keeping with high light intensity and high humidity. This heavy concentration of plants in the high humidity area nearest the river bank makes it very unlikely that the fall in humidity from Strip 2 to cacao plantation is responsible for the greatest density of plants. When the distribution of individual species is considered, striking differences are found between them and it becomes evident that in the gross correlation of abundance and vertical distribution with light intensity, does not apply equally to the entire flora.

## B R O M E L E T T E R

Vol. 1 .. No. 8

- 17 -

July-August, 1964

For convenience of handling and analysing the distributions, they are placed in three groups, which are distinguished by their vertical distribution, the groups stratified one above the other. It must be stressed however, that there are no absolute breaks between the distributions of the three groups, each of which contains species that show marked differences between themselves.

The Bromeliad Flora on two Forest Strips, differing in light intensity, and a Cacao Plantation.

|                             | Forest 1<br>Dark due<br>to Vines | Forest 2<br>Well lit<br>by River<br>at Side | Plantation<br>Driest and<br>Brightest |
|-----------------------------|----------------------------------|---|---------------------------------------|
| <u>EXPOSURE GROUP</u>       |                                  |   |                                       |
| Catopsis sessiliflora       | 0                                | 4   | 49                                    |
| " floribunda                | 0                                | 8   | 3                                     |
| Vriesea procera             | 8                                | 28  | 144                                   |
| " amazonica                 | 3                                | 5   | 5                                     |
| <u>SUN GROUP</u>            |                                  |   |                                       |
| (Tillandsia fasciculata     | 0                                | 1   | 61                                    |
| 1(Guzmania monostachia      | 8                                | 60  | 101                                   |
| (Aechmea mertensii          | 1                                | 5   | 0                                     |
| (Tillandsia bulbosa         | 8                                | 10  | 2                                     |
| 2(Gravisia aquilega         | 0                                | 28  | 142                                   |
| (Aechmea nudicaulis         | 6                                | 79  | 201                                   |
| (Guzmania sanguinea         | 0                                | 1   | 0                                     |
| (Hohenbergia stellata       | 0                                | 4   | 0                                     |
| <u>SHADE TOLERANT GROUP</u> |                                  |   |                                       |
| Tillandsia anceps           | 4                                | 34  | 0                                     |
| " monodelpha                | 1                                | 26  | 0                                     |
| Vriesea albiflora           | 0                                | 1   | 0                                     |
| " simplex                   | 1                                | 10  | 0                                     |
| Guzmania lingulata          | 48                               | 78  | 0                                     |

The above Table contains valuable information regarding possible sites in collectors' green houses for any of these species and varieties and does indeed illustrate the point made that because your collection may have more than one Vriesea, the successful growing of any of them is not necessarily restricted to the one bench or the same general conditions. Many times specialised conditions have to be provided to grow some of them and this is where full study and use of the micro climate, spacing of plants, elevation and shading often provide the small but vital change necessary to grow the plant really well.

## B R O M E L E T T E R

Vol. 1 .. No. 8

- 18 -

July-August, 1964

### THE EXPOSURE GROUP

Plants which occur in the highest levels of both Forest 1 and Forest 2 and under conditions of complete exposure to the sky, concentrated on the crowns of the trees.

In Forest 1 (which was very dark, because of vines) the epiphytes were found on only two extremely small leaved trees (microphyllous) both of which were free of vines.

In Forest 2 there was a marked general increase, still retaining their lofty perches nearest the crowns and the section of forest beside the river showed a general increase nearest the intense humidity of the water itself.

In the plantation, there was the greatest increase of all, with eighteen times as many epiphytes concentrated on the widespread and completely exposed limbs of the Erythrina. The cacao trees being regularly "weeded" of all epiphytic growths with Vriesea procera and Catopsis sessiliflora, the two species responsible for this huge increase.

All the members of the 'Exposure group' on the two Forest strips discussed here are 'tank species' (Type 3(a) Vol.1.No.5,P.8) with no tendency to the 'nest condition' Type 3(b) in which occurs the accumulation of leaf matter between the rosettes and the development of a root system to exploit this 'soil equivalent'. In the drier parts of the island the 'Exposure Group' becomes predominantly 'extreme atmospherics' as discussed in Type 4 restricted to Tillandsia.

### THE SUN GROUP

This is by far the largest in number of species and generally distributed throughout the upper levels. In the Bromeliad flora table, Forest 1 & 2 and Plantation, the Sun Group has been subdivided into three sub-groups, because of the different trends in vertical distribution. The two upper sub-groups, 1 and 2, from T.fasciculata to Ae.nudicaulis, showed the same pattern of increase from Forest 1 through Forest 2 to the Plantation. The 'Sun' Bromeliads in the forest are exclusively of the tank type and although there are several that are purely tank in character (Type 3(a) Vol.1 No.5 P.8) it is in the Sun group that the 'nest' habit is fully developed. The 'nest' habit is absent in the 'Shade Tolerant Group' of species and as already illustrated, in the 'Exposure Group'. The 'Sun Group' contains the largest species, holding the most interfoliar water.

### THE SHADE TOLERANT GROUP

This group and the lowest of the 'Sun Group' (3) show a very different distribution among the three profiles. All the species occur predominantly in the lower levels in the forest canopy, and actually penetrate to the heavy shade near ground level. They all show the same increase in density in the more illuminated Forest 2 over Forest 1; that was found true for

## B R O M E L I T T E R

Vol. 1 .. No. 8

- 19 -

July-August, 1964

the 'Sun' and 'Exposure' species. In the plantation, the 'Shade Tolerant' species were completely eliminated. One possibly acceptable explanation for this drastic avoidance of conditions is that the 'Shade Tolerant' species are predominantly 'ephemeral tank types' (Type 3(c) Vol. 1, No. 5, P.8) and as such have weak powers of retaining water and therefore under the relatively harsh conditions of exposure cannot survive. Guzmania lingulata is one of the shade tolerant forms that regularly retains some water, but even then holds little more than an egg-cupful.

### THE EFFECT OF HUMIDITY - The Bromeliad flora in different rainfall zones.

Trinidad is a large island, approximately 50 miles from north to south and 35 miles from east to west, lying some  $10^{\circ}$  north of the equator. The overall climate is surprisingly uniform, with some well marked variations in rainfall, both seasonal and geographic. The geographic distribution of rainfall is shown on Fig. 2, No. 5, P.1 with the general localities named on this same page and corresponding to the figures on the side of Fig. 1 on the topography map. The rainfall in Trinidad is determined by two factors, the direction of the north-east trade winds and the land barrier of the Northern Mountain Range. A major 'dry season' occurs from February to April and a major 'wet season' from May to August. Temperatures throughout the island are both moderate and stable. Average minima in the vicinity of  $68^{\circ}\text{F}$  to  $72^{\circ}\text{F}$  and an average maxima of  $83^{\circ}\text{F}$  to  $89^{\circ}\text{F}$ . The mean daily average therefore is about  $17^{\circ}\text{F}$ . The hottest months are in the major wet season, but there is little seasonal variation. Humidity maxima throughout the island are close to complete saturation. Seven climatic zones have been created and referred to as 'Zone A' through to 'Zone G', the limits set by changes in rainfall.

Zone A includes the peaks above 2500 ft. in the Northern Mountain Range, that is, the central areas of the shaded parts in Fig. 1, Bracket 1. The peaks concerned are virtually in perpetual rain up to a total of over 250 inches per year, with a temperature range of  $59^{\circ}$  to  $65^{\circ}\text{F}$ . There is almost incessant high wind in this area with a high evaporative rate, in spite of the rainfall.

Zone B is defined as true montane forest lying immediately below the peaks and represents the upper reaches of the valleys; here again, the rainfall is extremely high and in the region of 200 inches; approximate temperature range is  $62^{\circ}$  to  $68^{\circ}\text{F}$ . (Forest types, see Vol. 1, No. 4, P.20).

Zone C comprises two areas. The first, south and east of the foothills of the Northern Mountain Range, and the second, the eastern slopes of the Central Range (Bracket 3, Fig. 1). Average annual rainfall, 125 inches.

Zones D, E, F and G follow the rainfall map, D- $90^{\prime\prime}$  to  $110^{\prime\prime}$ , E- $70^{\prime\prime}$  to  $90^{\prime\prime}$ , F- $50^{\prime\prime}$  to  $70^{\prime\prime}$ , G-under  $50^{\prime\prime}$ .

The following Table deals with the geographic distribution in the rainfall zones of the epiphytic Bromeliaceae in Trinidad, and as such gives the collector and Society member reasonably exact information about the conditions which wherever duplicated may be expected to give interesting results.

B R O M E L L E T T E R

Vol. 1 .. No. 8

- 20 -

July-August, 1964

| TOTAL RANGE - FOREST & PLANTATION | 250" 59-65° Mtn. Peaks | 200" 62-68° Montane Forest | 125" Foot-hills | 90" - 110" 68-72° 86-89° | 70" - 90" 68-72° 86-89° | 50" - 70" 68-72° 86-89° | 50" & lower 68-72° 86-89° |
|-----------------------------------|------------------------|----------------------------|-----------------|--------------------------|-------------------------|-------------------------|---------------------------|
|                                   | A                      | B                          | C               | D                        | E                       | F                       | G                         |

EXPOSURE GROUP

Upper Twigs Level

|                           |     |     |     |     |     |    |     |
|---------------------------|-----|-----|-----|-----|-----|----|-----|
| Tillandsia didistichoides | XXX |     |     |     |     |    |     |
| Catopsis Berteroniana     |     | XXX | XX  |     |     |    |     |
| Vriesea amazonica         |     | XX  | XXX | X   |     |    |     |
| Catopsis sessiliflora     |     | XX  | XXX | X   |     |    |     |
| Vriesea procera           |     | XX  | XXX | XXX | XXX | XX |     |
| Catopsis florabunda       |     |     | XX  | XX  | XX  | XX |     |
| Tillandsia gardneri       |     |     |     | XX  | XX  | XX |     |
| Tillandsia pulchella      |     |     |     |     | XX  | XX |     |
| Tillandsia stricta        |     |     |     |     | XX  | XX |     |
| Tillandsia usneoides      |     |     |     |     | XX  | XX |     |
| Tillandsia juncea         |     |     |     |     | XX  | XX |     |
| Tillandsia utriculata     |     |     |     | X   | X   | XX | XXX |

SUN GROUP

Tree Top Level

|                               |     |     |    |  |  |  |  |
|-------------------------------|-----|-----|----|--|--|--|--|
| Vriesea johnstonii            | XX  |     |    |  |  |  |  |
| Glomeropitcairnia erectiflora | XX  |     |    |  |  |  |  |
| Vriesea Broadwayi             | XX  |     |    |  |  |  |  |
| Tillandsia micrantha          | XX  |     |    |  |  |  |  |
| Gravisia aripensis            | XX  |     |    |  |  |  |  |
| Tillandsia triticea           | XXX | XX  |    |  |  |  |  |
| Vriesea capituligera          | XXX | XX  |    |  |  |  |  |
| Tillandsia rubra              |     | XX  |    |  |  |  |  |
| Tillandsia complanata         |     | XX  |    |  |  |  |  |
| Aechmea portoedoides          |     | XX  |    |  |  |  |  |
| Guzmania sanguinea            | X   | XXX | XX |  |  |  |  |
| Vriesea splitgerberi          | X   | XXX | XX |  |  |  |  |
| Araeococcus micranthus        |     | XXX | XX |  |  |  |  |
| Vriesea platynema             |     | XXX | XX |  |  |  |  |

Upper Canopy

|                                      |    |     |     |     |    |    |   |
|--------------------------------------|----|-----|-----|-----|----|----|---|
| Aechmea dichlamydea var. trinitensis | XX | XXX |     |     |    |    |   |
| Vriesea macrostachya                 | XX | XX  | XX  | XX  | XX | XX |   |
| Gravisia aquilega                    | XX | XX  | XXX | XXX | XX | XX | X |

B R O M E L E T T E R

Vol. 1 .. No. 8

- 21 -

July-August, 1964

|                             | A   | B   | C   | D   | E   | F  | G  |
|-----------------------------|-----|-----|-----|-----|-----|----|----|
| <u>Upper Canopy (cont.)</u> |     |     |     |     |     |    |    |
| Tillandsia fasciculata      |     |     | XX  | XX  | XX  | XX |    |
| Tillandsia bulbosa          |     |     | XX  | XX  | XX  | XX |    |
| Hohenbergia stellata        |     |     | XX  | XX  | XX  |    |    |
| Aechmea lingulata           |     |     | XX  | XXX | XXX | XX |    |
| Aechmea nudicaulis          |     | XX  | XX  | XX  | XXX | XX | XX |
| <u>SHADE TOLERANT</u>       |     |     |     |     |     |    |    |
| <u>Lower Canopy</u>         |     |     |     |     |     |    |    |
| Tillandsia anceps           |     | XX  | XX  | XX  | XX  |    |    |
| Tillandsia monodelpha       |     | XX  | XX  | XX  | XX  |    |    |
| Vriesea simplex             |     | XX  | XXX |     |     |    |    |
| Vriesea albiflora           |     | XXX | XX  |     |     |    |    |
| Guzmania lingulata          | XX  | XXX | XXX | XX  | XX  |    |    |
| Vriesea longibracteata      | XXX | XXX | XX  | XX  |     |    |    |

X - Very uncommon XX - Common XXX - Very abundant

It will be realised from studying the preceding table that not all Tillandsias prefer low rainfall and great exposure. T.triticea, T.rubra, T.complanata, T.micrantha, growing in colder conditions with much moisture, in themselves 'Sun Group' types, and T.anceps, T.monodelpha, enjoying similar rainfall - but 'Shade Tolerant'.

In the treatment of "The Bromeliaceae of Trinidad and Tobago", Smith and Broadway, the following preliminary comments are made -

"The island of Trinidad ranks very high in tropical America for the thoroughness of its botanical exploration. Few of the West Indies can compare with it in this regard; Tobago is distinctly less known than Trinidad and has only about a third as many recorded species of Bromeliaceae. However, the much more uniform topography and smaller area of Tobago make it seem unlikely that further collecting will greatly affect this difference between the island floras.

The two striking regional features of the Trinidad Bromeliaceae are the strong development of the genus Bromelia on the 'Bocas Islands and Patos' between the north west corner of Trinidad and Venezuela and the localising of the rare Glomeropitcairnia erectiflora and most of the Trinidad endemics, Vriesea Broadwayi, V.Stenostachya, Gravisia aripensis and Aechmea portoedoides in the rain forest of the mountainous north coast. The two remaining Trinidad endemics, T.subulifera and Aechmea dichlamydea var.trinitensis are still too imperfectly known to be said to characterise any particular region. Slightly less than half of the species of Trinidad and Tobago reappear in Venezuela, but this is explained largely by the relative lack of exploration in the latter country".

To be continued -

## B R O M E L E T T E R

Vol. 1 .. No. 8

- 22 -

July-August, 1964

SERIES A.B. continued -

Billbergia continued -

The previous article in this series, 'The Helicoid Billbergias', was portrayed in table form and identified by the petal colours, shape of ovary and inflorescence details.

The illustrations accompanying this text are facsimiles of this most interesting 'sub genus Helicodea'. These Billbergias exhibit curiously shaped petals, all tending to spiral, some to such an extent that they entwine, with the whole mass of petals soon becoming an entangled "fuzz", hence the term 'helical', helicoid, Spiral or helix Spiral like a corkscrew. The plants are few leaved, forming tall and tubular shapes, invariably large scape bracts coloured shades of rose, the inflorescence always simple (not divided, in one piece) and generally pendant.

Most of the plants in this sub genus are confusingly alike, at least on outward appearance, with apparently little left to distinguish one species from another; however, two vital floral parts, ovary and sepal show different and therefore identifiable traits enabling us to name them with reasonable certainty, with these variations more pronounced than in most other Bromeliad genera.

Billbergia as a genus is considered to have developed on or near the eastern coast of Brazil, and as a side issue Aechmea is conceded to have approximately the same birth place. The greatest number of the Billbergia species are centred on this eastern coast line and have been described as "literally exploding" outward from this area; evidently as time went by, the seed carried further and further into other areas.

Billbergia is characteristically epiphytic and well adapted for an aerial life, since Mother Nature has equipped yet another of her offspring with environmental "tools" to use and successfully combat all that Nature in general has to offer. The tightly clasped leaves that form the 'tank' seem like 'hungry mouths agape for water', and the flotsam and jetsam of leaves, twigs, insects, etc. that congregate inside the tube.

Billbergias are rugged individualists and show outstanding preferences for both light and planting medium - many losses have been suffered by collectors, either in seedling stage or maturity by not considering their epiphytic origin and planting in an over moist medium or attempting to grow in too little light and air. Generally, one could say that the tough and leathery leaved Billbergias withstand considerable neglect and exposure, growing to their best shape and health, in fairly strong light with some movement of air. Probably the most startling change takes place in the strictly tubular types when transferred from the 'hard open' to the 'close confines' of an over shady green house, where there they soon degenerate into an unsightly straggle of long and flaccid leaves.

B R O M E L E T T E R

Vol. 1 .. No. 8

- 23 -

July-August, 1964

FIGURE NUMBERS & DESCRIPTIONS CORRESPOND TO NUMBERS ON ILLUSTRATIONS

Figure 1 - Billbergia zebrira. Note the tightly coiled - watch spring shape petal, turbinate (top shaped) ovary; the bare black areas appear on maturity of the seed. The ovary densely covered with a silver down. Described in 1826.

Figure 2 - B. rosea. Exhibits papulose (warty) sepals and ovary and said to have narrowly triangular, unequal sepals (unequal = unequal shape, size, degree). Dr. L.B. Smith in a notation mentions that it was "originally described in 1857 from cultivated material in Trinidad, but seems to have died out since." This is a very interesting comment, certainly applying to plants known in the Americas and would indicate that B. rosea is claimed on more than one enthusiast's growing bench, with the thought that any illuminating remarks from readers re this species would be of considerable interest, remembering that rosy coloured scape bracts are by no means conclusive proof of identity.

CHECK YOUR HELICOID BILLBERGIAS WHEN THEY FLOWER and compare the sepal and ovary shapes with these illustrations and colour of petals, inflorescence details with P.24-25 in No. 7 issue.

Figure 3 - B.venezuelana was described in 1914 and is said to have elliptic (an oval narrowing to rounded ends) equal sepals, the lowest floral bracts long and exceed the sepals. Note the 'warty' appearance of the sepals and ovary, being similar to B.rosea

Figure 4 - B.violacea has long tapering sepals - the ovary furrowed and densely white farinose (starch like, mealy)

Figure 5 - B.meyeri has floral characters very similar to B.violacea, also with long tapering sepals, in this case coloured lilac.

Figure 6 - B.alfonsi-joannis has a unique three pointed sepal, ending sharply and not seen elsewhere in the Bromeliaceae.

Figure 7 - B.decora produces an evenly rounded ovary, no ridging or furrowing, having attached to it, broad sepals with broad tips. Described in 1829.

Figure 8 - B.brasiliensis (B.leopoldii.syn) also has an evenly rounded ovary, no ridging or furrowing, broad sepals and broad tips. Sepals in this case are unequal. (See P.24-25 No. 7 issue for other details of all these species).

## B R O M E L E T T E R

Vol. 1 .. No. 8

- 24 -

July-August, 1964

Figure 9 - B.magnifica. Presently scarce in cultivation, has rounded sepals, sepals unequal, the ovary narrowly elongate and prominently ridged. Discovered in 1903.

Figure 10 - B.macrolepis; again, this plant produces broadly ovate sepals, sharp ending, a globular, prominently ridged and grooved ovary. Described in 1936.

Figure 11 - B.rubicunda has a thinly elongate ovary, heavily ridged and prominently grooved, sepals equal and long, red in colour, the apices of the sepals round and farinose (mealy). Known only from plants cultivated in Vienna - described in 1916. Natural habitat unknown and apparently to this day not re-discovered.

Figure 12 - B.cylindrostachya, a narrowly cylindric ovary and round apiculate sepals (sepals ending in a short, sharp, abrupt, soft tip). The sepals are also farinose (mealy). Apparently not in cultivation.

Figure 13 - B.velascana. The ovary stoutly ellipsoid (a regular oval), slightly ridged. Sepals acute (ending sharply and abruptly).

Figure 14 - B.porteana. The ovary elongate - prominently ridged, unusually short, broad sepals, densely farinose. Described in 1857.

Figure 15. B.cardenasii. A shortly bulbous ovary, the sepals equal. Note the small floral bract. Described in 1953.

Figure 16. B.pallidiflora. Shows a narrowly elongated ovary, prominently ridged and grooved. Sepals unequal. Described in 1854.

B R O M E L L E T T E R

Vol. I.. No. 8

July-August, 1964

BILLBERGIA. I82I

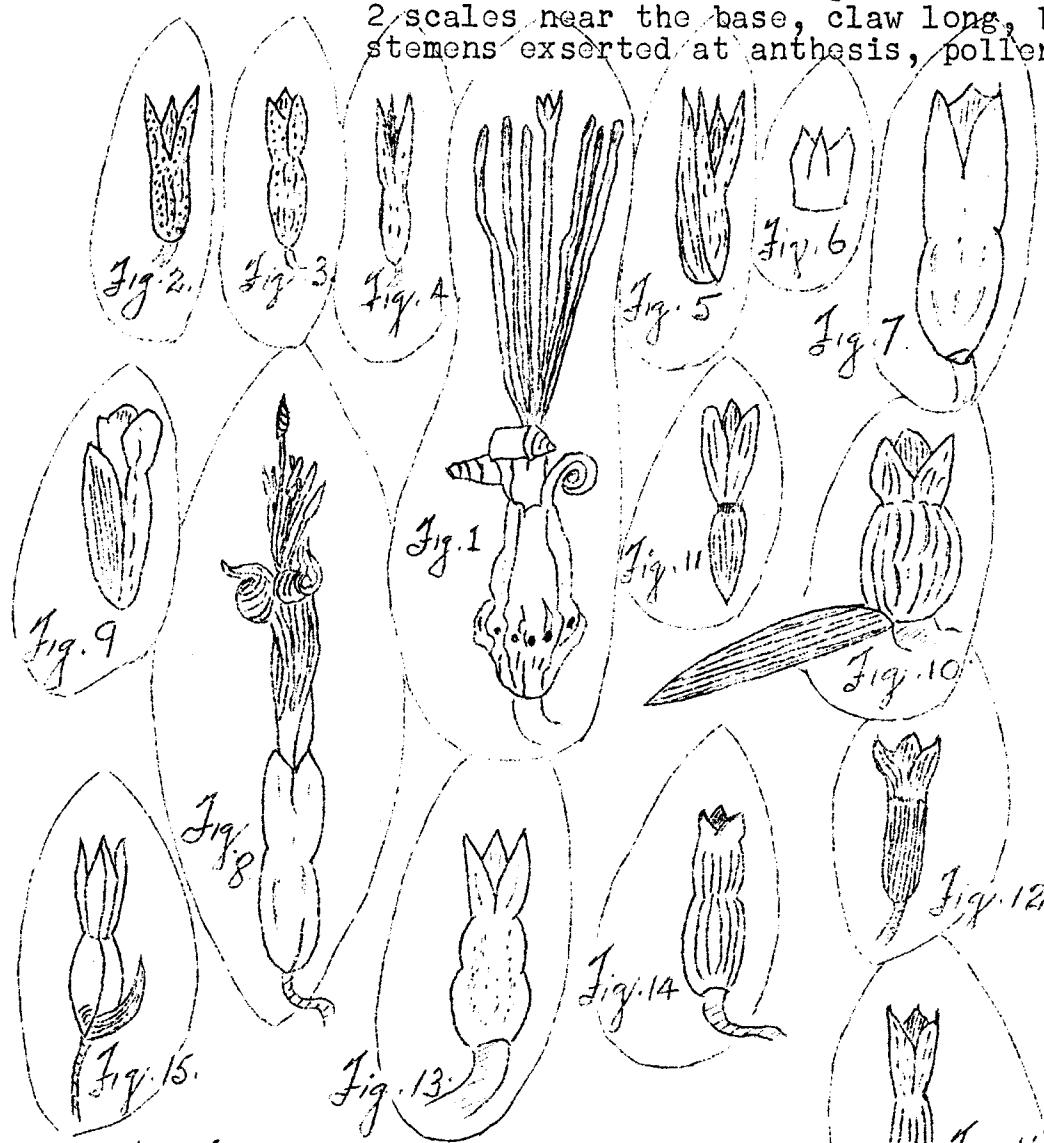
Eucallias. I838

Jonghea. I852

Cremnobotrys. I854

Helicodea. I864

Plants stemless; leaves rosulate, or rarely fasciculate, sheaths large, rarely ligulate scape erect or arching; scape bracts red, thin; inflorescence simple (in the Colombian species B. macrolepis, B. rupestris); petals free, spirally recurved at anthesis (subgenus Helicodea); bearing 2 scales near the base, claw long, blade narrow; stamens exserted at anthesis, pollen grains folded



Figures all natural size.

1. Complete Flower
2. Ovary + Sepals
3. Ovary + Sepals
4. Ovary + Sepals
5. Floral Bract, Ovary + Sepals
6. Sepal
7. Ovary + Sepals
8. Complete Flower

9. Floral Bract, Ovary + Sepal
10. Dist.
11. Ovary + Sepals
12. Ovary + Sepals
13. Ovary + Sepals
14. Ovary + Sepals
15. Floral Bract, Ovary + Sepals
16. Ovary + Sepals