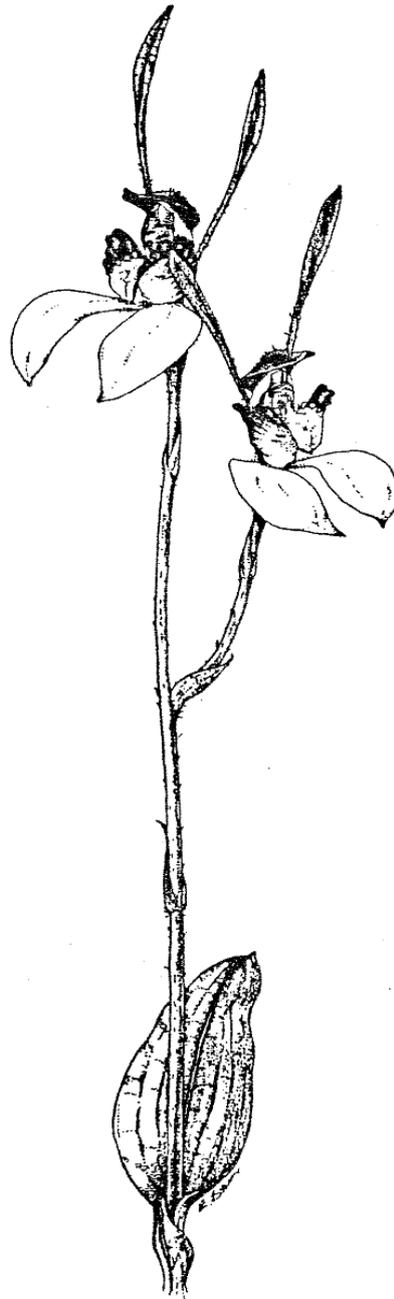


NATIVE ORCHID SOCIETY

of

SOUTH AUSTRALIA INC.

JOURNAL



Caladenia menziesii R.Br.

NATIVE ORCHID SOCIETY OF SOUTH AUSTRALIA Inc.

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NEXT MEETING

Remember there is no meeting in January, or a January issue of the Journal. The next meeting of the Society will be Tuesday 24 February 1987.

!!! SEASONS GREETINGS !!I

The President and Management Committee extend to all members and their families the compliments of the Season and wish all a successful and satisfying year in 1987.

NEW MEMBERS

Mr K.S. Bennett	Lakemba, N.S.W.
Mr & Mrs R. Biddell	Parkholme, S.A.
Mr & Mrs A. Monks	Glengowrie, S.A.

COMING FIELD TRIP - "*Spiranthes Special*"

Saturday February 7th. Meet Yundi turn-off, on Willunga-Mt. Compass Road, at loam. We will visit three or four separate swamps to see a range of *Spiranthes* forms.

LIBRARIAN

Our current Librarian will be retiring from this position in March, and the committee would appreciate volunteers for this important role. Please contact the President or Secretary.

NEW BOOK AVAILABLE

The, book by the W. Aust. Native Orchid Society is available from the Treasurer at monthly meetings for \$6.50. Alternatively write to the Treasurer for your copy and add \$1.00 for postage.

REPORT OF NOVEMBER MEETING

PLANTS BENCHED:

Epiphytes -

Bulbophyllum crassulifolium, *Cadetia taylori*, *Cymbidium canaliculatum*, *C. suave*, *Dendrobium discolor*, *D. fleckeri*, *D. lichenastrum*, *D. monophyllum*.

Sarcochilus hartmanii, *S. Lois* (*S. hartmanii* x *S. ceciliae*), *S. Melba* (*S. hartmanii* x *S. falcatus*).

Terrestrials -

Caladenia dilatata var. *stricta*, *Cryptostylis subulata*, *Diuris aurea*, *D. brevifolia*, *D. emarginata*, *D. punctata*, *D. venosa*, *Microtis parviflora*, *Orthoceras strictum*, *Prasophyllum drummondii*, *Pterostylis biseta*, *P. cf. rufa* group - collection of five unnamed Western Australia species, *Spiculaea ciliata*.

Commentary on epiphytes was given by Les Nesbitt, who noted that the end of the flowering season was clearly visible in the much reduced number of plants benched this month. Les noted that the *Dendrobium discolor* benched was already a large plant and would continue to become even taller - a problem in average height glasshouses. However, the flowers were long lasting and quite spectacular. It was noted that the *Dendrobium fleckeri* benched had distinctly large orange flowers. Les noted that this species had been utilised in hybridizing in the Australian native dendrobiums to increase flower size and that many features of *D. fleckeri* were clearly visible in its hybrid offspring. A drawback in the use of *D. fleckeri* was that it reduced flower count in hybrids.

On examining the two plants of *D. monophyllum* benched, Les noted that one was a superior form to the normal. Considerable debate was generated after the close of the meeting as to whether the plant was indeed *D. monophyllum* - unresolved.

Don Wells' magnificent *Cymbidium suave* rated comment as usual. Carrying 38 spikes, with an average of 35 flowers per spike, Les noted that this plant was as spectacular as he had ever seen.

Commentary on the terrestrial orchids was given by Bob Bates who noted that the majority of plants benched were from one of two main groups mainly the swamp-types, which will usually be green and active until about the end of the December and the dry-land types, where flowering utilised goodness and moisture conserved since winter and whose foliage was by now dry and withered. Bob also noted that there was no dominating genus present. Bob noted that in a dry country such as Australia the swamp orchids, in particular, were endangered as a result of mans need for wet areas for pasture or cultivation and that by now, several species were confined to limited swampy areas of national parks e.g. *Diuris venosa*. Bob noted that *Diuris emarginata* from coastal Western Australia swamps was a worthy species, growing tall to compete for light with other swamp plants and reproducing vegetatively. He noted *D. brevifolia*, another damp environment diuris, was a robust species which imparted significant disease resistance in its hybrids.

CULTURAL CERTIFICATE - AWARD NO. 17

Our latest award was given to a specimen *Cymbidium suave*, most beautifully flowered by Don Wells. Growing in a 4 foot clay pipe, the plant had 33 spikes each carrying an average of 35 flowers. Someone from the back of the hall suggested that the plant was growing so well because a secondhand pipe had been used.

INDUCTION OF 'SIDE SHOOTS' AND KEI-KEIS ON AUSTRALIAN *DENDROBIUMS*

In early October, our President, Reg Shooter, was demonstrating repotting of Australian native dendrobiums. As his subject, Reg had a sizable clump of the

hybrid *D. Pennyann* (*D. kingianum* x *D. x gracillimum*). At the end of the demonstration there were several clumps of healthy green leafless canes which Reg said "You'll never get them to strike". That did it - I decided they were worth trying. I had read an article in the "Australian Orchid Review", Spring 1986 edition, pages 21 to 26 inclusive regarding the induction of "side shoots" on vandaceous plants to the virtual resurrection of clones from dying leafless canes. After a short hunt through the advertisements in the A.O.R. I found three potential sources of Kei-kei promoting pastes:

1. Bacto Laboratories Pty. Ltd.
P.O. Box 295,
LIVERPOOL
N.S.W: 2170 Telephone: (02) 602 5000
2. Orchid Enterprises,
P.O. Box 2398,
SOUTHPORT QLD. 4215 Telephone: (075) 531 924
3. Orchid Media Laboratories,
Fisher Street,
MALVERN S.A. 5061
P.O. Box 201,
KINGSWOOD, S.A. 5062

Since Orchid Media Laboratories was a little closer than either of the other two sources I decided to obtain some from that source (\$3.00 for about 3 grams of paste).

Accordingly, every node on the canes from base-most to uppermost, received a little paste, applied with a toothpick. The, by now, sticky collection of canes was then potted into a small pot of sieved "orchid grade" pine bark and benched under 50% sarlon along with the rest of my orchids. Shortly before the December meeting of NOSSA, the watering hose dislodged the pot and revealed the basal nodes were producing most robust shoots. Accordingly, in good humour, the backbulbs with sideshoots were taken along to the December meeting for proof of action.

One event such as this does not prove that kei-kei paste was solely responsible for the induction of shoot-growth on those back bulbs. However Reg assures me that he has tried unsuccessfully to strike back bulbs of that same plant on several occasions. There is a suggestion then that the Kei-kei paste may have contributed then, in this case. The more of us that try the technique, the more likely we are to determine whether it works or not. I am still experimenting anyway give it a go.

K. Western

SARCOCHILUS HARTMANNII 'KERRIE' AM/AOC-OSNSW

Sarcochilus hartmannii 'Kerrie' is characteristic of a form once common in the Blue Knob region of the MacPherson Ranges of New South Wales. It has pure white filled in flowers with a red labellum. The leaves are deeply channelled and quite thick.

We were lucky enough to get a piece in Sydney some years ago, it was a small plant which started growing very strongly after getting used to the change in climate. We have to grow the plant in between our miniature and intermediate cymbidiums as it was still getting burnt even though we have 80% shadecloth on our orchid house.

We repotted it into a 10" squat pot but found the plant dropped back and the leaves started shrivelling so we cut the squat pot down to 6 inches high and replaced the plant which has not looked back.

We used our cymbidium mix which is a mixture of red gum chips, sand and rice hulls to which was added a small quantity of scoria. 'Kerrie' is fed the same as our cymbidiums with aquasol, fish emulsion and slow release fertiliser. With a lot of care we hope this plant will grow into a specimen plant.

Coral Badman

(Winner of popular choice, October meeting)

ON *SARCOCHILUS* AND ITS HYBRIDS

Last October's article by Stewart Penman reminded me of the instant appeal of the fragrant, crystalline purity of the white *Sarcochilus hartmannii* flower that is touched with maroon. On closer inspection of the three clones growing here at Forest Range in a solar conservatory, I was delighted to discover that they are all flowering in this second week in November. I've noticed some interesting variations in the maroon colouring of both the flower stem and the pedicel as well as the patterning surrounding the labellum on the sepals and petals on both front and reverse sides of the flower.

The 'normal' clone of *Sarc. hartmannii* which is growing in a scoria, bark and polystyrene balls mix in a polystyrene foam container with drainage holes in the bottom, has roots growing in all directions. It is the largest plant and thus has most flower spikes. The flower stem is green and pendulous with eight flowers on a greeny white pedicel spotted with maroon. This flower is randomly spotted on both sides around the labellum and on both the petals and sepals.

The 'Blue Knob' clone, (named after a well picked site near Nimbin), is a medium sized plant with four growths in a 5" terracotta pot. Its leaves have deeper channelling, are longer and more upright. The roots grow into the scoria, marble, charcoal and bark mix and upwards. There are twelve magnificent flowers on one stem that is maroon all over. The pedicel of each flower is green with maroon spotting. The flowers are pure white with maroon colouring only the inner labellum. There is no spotting on the reverse side of the flower either.

The third clone is 'Tabulam', which is named after another region in the Mt. Warning caldera complex, in N.S.W. This is a young plant growing in a wooden slat basket with a mixture of pieces of polystyrene foam, scoria and cork. The roots are evident all through the mix and out over the slats. The flower stem is pendulous but not as floppy as the 'normal' clone. It also is maroon all over. The individual pedicels are white with maroon spots and each flower has maroon marking on the inner, lower sepals of the white flower and on the reverse side is spotted on the labellum surround. There are eight sweetly scented flowers per stem. I've also a clone of *Sarcochilus hartmannii* 'alba' Tumblegum growing but not flowering as yet.

This versatile flower has been well used in hybridising beginning with I.A. Butlers primary hybrid *Sarcochilus* Canary, (*hartmannii* x *olivaceous*) and also *Sarc. Fitzhart*, (*fitzgeraldii* x *hartmannii*) both registered in 1963. Then in 1966 came *Sarc. Lois*, (*ceciliae* x *hartmannii*), *Melba*, (*falcatus* x *hartmannii*), and *Minuet*, (*hillii* x *hartmannii*). The first intergeneric hybrid was Ira Butler's *Sarcophiza* Dorothy in 1965. This crossing was *Rhinerrhiza*

divitiflora x *hartmannii*. The first intergenerics with *Sarc. hartmannii* and *Phalaenopsis schilleriana*, Federal Monarch and Aristocrat were registered by Cannons in 1970. They are *Sarconopsis* Jean Cannons, Macquarie Lilac and Macquarie Sunset respectively.

Cannon also registered *Sarcovanda* Suzanne in 1970 (*Sarc. hartmannii* x *Vanda* Poepoe). This terete leafed plant has not yet flowered for me. *Sarcocentrum* Little Sue was another *Sarc. hartmannii* x *Ascocentrum curvifolium* crossing made at this time. Other primary hybrids include *Sarc.* Southern Cross - *Sarc. hartmannii* x *australis*, *Sarc. weinhart* = *Sarc. hartmannii* x *weinthallii*. The latter has just finished flowering after three weeks and the former flowered in September. Another intergeneric is *Sarconopsis* Lavinia = *Sarc. hartmannii* x *Phal. amabilis*, which produces quite a larger flower than *Sarc. hartmannii* on its own.

Secondary hybrids like *Sarcochilus* Pinkhart = *Sarc. hartmannii* x *Lois*, *Sarcochilus* Jewel = *Sarc. weinhart* x *Sarc. fitzgeraldii* and the ones that have just opened for me are *Sarc. Lois* x *fitzgeraldii* red. and a *Sarc. Mavis* x *falcatus*.

These show the wide range of possibilities in crossings to enlarge the flower, improve the texture and colouring and make it more upright in presentation. May the sweet daily fragrance of the *Sarcochilus hartmannii* flowers enrich your life as they do mine.

Edda Viskic

INCREASING ORCHID COLLECTIONS - ARTIFICIAL TECHNIQUES - Part 2

(Continued from September 1986 issue)

B. Production of entirely new plants

- 1) This process required pollination of plants either artificially or naturally (more often by artificial means) leading to the production of seed. Plants used for such breeding should be of good quality and free from defects or undesirable qualities. It may even be advantageous to self pollinate good clones. Ideally, flowers should be pollinated shortly after opening. Plants which do not normally flower at the same time may be crossed with each other by storing pollen under refrigeration until needed. This is best done by taking the pollen from several flowers soon after the flowers have opened. The pollen is placed in clean, dry glass containers and stored open in a warm airy position to dry. Once dry (2-4 days) the lid is secured onto the bottle, the bottle is labelled (name of source plant and date of collection) and is placed in the ordinary section of the refrigerator until needed. The stored pollen can be applied using fine tweezers or by dipping a toothpick in the stigma then using the sticky substance of the stigma to 'glue' the pollen to the toothpick while transferring pollen to the stigma. (Refrigerated pollen may remain viable for at least 18 months).
- 2) If the pollination process is successful, a seed pod will form where the ovary swells with the developing fertilized seed. Eventually the pod approaches maturity, when it will open and release its seeds (2.5-4 months for many dendrobiums and often 10-14 months for native cymbidiums).

When the pod shows signs of yellowing or splitting - usually close to the columnar end of the pod, it is advisable to keep a close watch and either take the pod and remove its contents (this requires previous experience to be able to gauge impending maturity) or to place a loosely fitting paper (not plastic) bag or fine mesh nylon stocking over the pod to catch seed released when the pod opens.

- 4) The collected seed should be either sown immediately or, more commonly, be kept spread thinly on tissue or paper in a warm location away from draughts to dry for 3-4 days.
- 5) The dried seed may then be transferred to a clean, dry glass container with air tight screw-cap to prevent entry of moisture (Label container with details of the crossing and the date of seed collection).
- 6) The seed stored in dry sealed containers is kept in the ordinary (non-freezer) section of a refrigerator until needed for sowing.

C. Sowing orchid seed

Seed can be sown to germinate in one of two basic ways:

- i) In a non-sterile fashion, utilising fungi growing in association with adult plants or,
- ii) a) Aseptically, using totally sterile culture media comprising sugars and minerals essential for growth, or
 - b) Under sterile conditions where a tested strain of fungus is introduced onto sterilized organic media along with the seed.

Consider the non-sterile sowing mode. There are two techniques - one for terrestrial growers and the other for epiphyte growers.

1) Terrestrials:

- a) Stored seed is sown immediately adjacent to parent plants in the early growing season, amongst the litter on the pot soil. (Late April to about mid-July in Adelaide - depending on rainfall and cool weather).
- b) With luck, the seed will be invaded by the symbiotic fungus which is associated with the parent plants. If this happens there is a chance that the seed will be germinated and if the soil is kept continually moist then the seedlings will continue to develop and produce a tuber (or several) before summer arrives.
- c) This technique is essential for growers of non-vegetatively reproducing *Caladenia*, *Glossodia*, *Diuris* etc. where it generally works reasonably reliably.
- d) It seems advantageous, if anticipating seed sowing to avoid repotting of the parent plants and to omit or reduce the addition of fertilizer (eg. Blood & Bone), else the symbiotic fungi may be so active as to invade and 'consume' the seed rather than cause their germination.

2) Epiphytes:

- a) At the time of pollinating the parent plant(s), a small area of sphagnum moss or hessian is firmly affixed to the mount immediately adjacent to or over a small section of the parent plants root system (eg. 3" in diameter and about 1 cm deep - see Diagram No. 5).
 - b) The sphagnum or hessian is wetted each time the parent plant is watered and may receive foliar fertilizer.
 - c) Seed may be sown late winter to spring and is sown onto the sphagnum or hessian. Once sown care must be taken when watering, not to flush the seed from the sphagnum or hessian.
 - d) The sphagnum or hessian should face southwards and be sheltered from drying winds.
 - e) The sphagnum or hessian will hopefully be invaded by the symbiotic fungi from the roots of the plant and in turn will invade and cause germination of the seed.
 - f) If successful, young seedlings will result first appearing as round green protocorms then as tiny seedlings with first leaves. Weak frequent foliar fertilizer applications will promote rapid growth.
3. a) Seed of terrestrial orchids can be germinated fairly reliably under laboratory conditions, providing the laboratory has strains of mycorrhizal fungi which are known to be capable of germinating seeds of the species concerned.
 - b) The seed is sterilized by soaking in 0.5% chlorine solution for 10 minutes.
 - c) Seed is rinsed in sterile distilled water, then transferred under sterile conditions to a sterile medium of 0.25% flaked oats in 1% agar. (If mature green seed-pod is used, then the pod is surface sterilized with 'White King' and opened under sterile conditions).
 - d) A small amount of a colony of tested symbiotic, mycorrhizal fungus is added and within one week to some months germination occurs.
 - e) Plantlets may be transplanted under sterile conditions to fresh sterile medium to grow until large enough to be deflasked.

The problem in this technique is primarily the gathering and testing of fungi used to germinate and grow the seed.

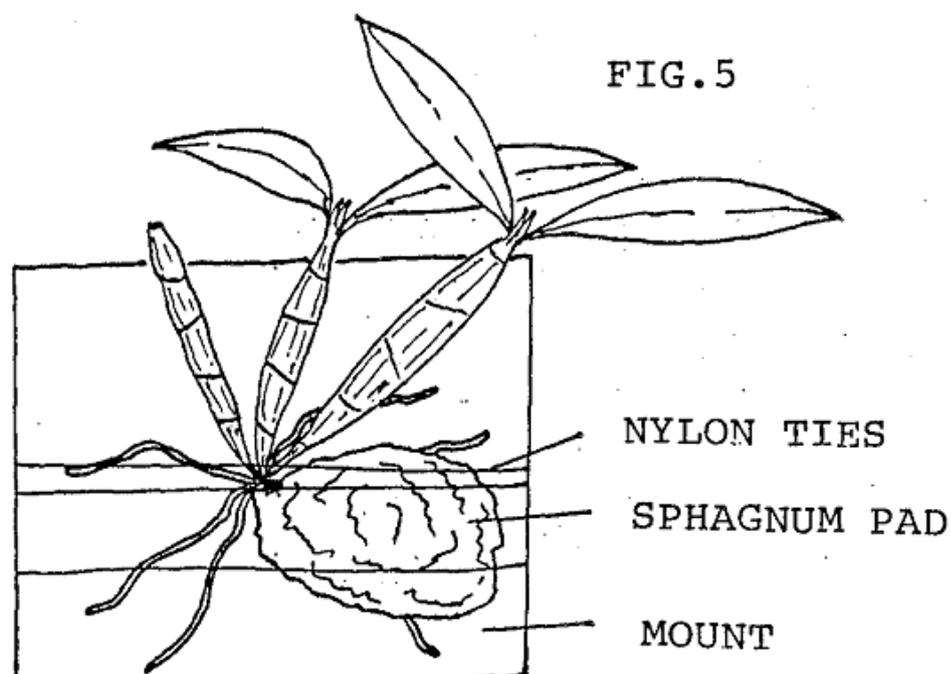
Pterostylis and *Diuris* seem to be quite amenable to cultivation by this technique and deflasking. Seedlings are best planted out in early winter, along with some medium, into dry bush soil which is wetted thoroughly just before planting out the seedlings, and which is then stood in a shallow tray of rainwater for about one week after sowing. I use pots of about 2.5" diameter x 4-5" deep and *Pterostylis*

and *Diuris* seem to fare well enough. After about 2 weeks under shelter, I place them out with the rest of the terrestrial orchids, under 50% shadecloth.

4. Epiphytic seed

- a) Seed of epiphytes will generally germinate on sterile media containing sugar and essential minerals without the need for symbiotic fungi.
- b) Dry seed may be sterilized as for dry seed of terrestrial orchids or seed may be aseptically removed from surface sterilized mature green intact seed pods and sown directly on to germinating medium.
- c) Once germinated seed has progressed to form distinct small plantlets. The plantlets are related under sterile conditions, on to new medium for growth and root development.
- d) When large enough, young seedlings are deflasked, their roots washed reasonably free from medium and are planted out into a compost of the same composition as is used for mature plants of the same genus or species, but of somewhat finer size.
- e) "Hardening off" of newly deflasked seedlings is not a problem during winter in Adelaide provided that at least 80% shade is given and plants are protected from strong air movement on warm days (above 20°C) for the first 4-8 weeks.
- f) At other times of the year it is prudent to provide newly deflasked seedlings with some additional humidity. Plastic bags over the pots which have holes made and enlarged weekly over a 4-8 week period works well as do aquariums with a 2-3 inch gravel layer on the base and containing water to just below the gravel level and adjustment of effective humidity is achieved by progressively increasing the air gap at the top of the aquarium by means of sliding cover-glasses or plastic sheet. The aquarium should never be entirely closed. Without air exchange fungi pose a problem.
- g) After the 4-8 weeks the plants should be kept still under about 80% shade until about one year old, when they can be treated as for other similar mature plants.

K. Western



CULTIVATING *PTEROSTYLIS* HYBRID

Despite strong opposition from the species growing purists there are now available at least twenty *Pterostylis* hybrids and each year sees new ones brought into cultivation, both man-made forms and recently tamed wild ones. Why grow *Pterostylis* hybrids? - With some 80 species of greenhood to choose from, ranging from midgets to monsters, from deep red through green and brown to almost white flowered forms, it would seem particularly perverse to bother with hybrids, the flowers of which are all rather less than distinctive. I have yet to see a hybrid with flowers larger than both its parents so there is no advantage there. Why then do we have this invasion of hybrids?

Firstly, many do exhibit exceptional hybrid vigour. Their flowers may not be larger but they are of heavier texture and usually displayed on taller stronger stems.

Secondly, they are generally more floriferous, quite often giving 100% flowering.

Thirdly, they tend to be more disease resistant than their parents and fourthly many increase at a phenomenal rate, up to 600% per annum.

Hybridists who put thought into what they are doing tend to cross large flowered species with brightly coloured smaller flowered ones (i.e. *Pt. baptistii* x *Pt. rogersii*) hoping to produce a large, colourful hybrid.

A good example of a successful cross is *Pterostylis* x Cutie. This cross has the large flowers and tall stems of *Pt. baptistii*, with the sturdiness and colour tones of *Pt. cucullata*. In addition it is free flowering, disease resistant and multiplies faster than its parents. Unsuccessful hybrids include *Pt. plumosa* x *Pt. curta* and *Pterostylis*, of the 'rufa' group' crossed with 'non rufa' species. The results in each case have been untidy flowers, runty plants and susceptibility to disease.

How to get the best from your greenhood hybrids:

1. Repot annually, each year into a larger pot, spacing tubers carefully, largest ones in the centre. When you do have a hundred or so tubers, make up a specimen pot with plants closer together. Save a few tubers to put in smaller pots with different soil mixes, or give them different conditions to see what suits the hybrid best.
2. Hybrid *Pterostylis* increase most quickly if put in a very friable, airy potting mix, but do remember that the lighter the mix, the more peat moss or other moisture retainer you will have to put in to avoid tuber desiccation.
3. Hybrid *Pterostylis* in general do like fertiliser; Blood & Bone is recommended in the mix. Weak foliar feeding or liquid fertilizer can be applied early in the growing season, but should cease once flower stems start to elongate, otherwise floppy flowers will result.
4. Watering: Do not begin watering too early. If watering is begun in January or February, yellow leaves, early damping off, insect attack etc. will result. Start watering in March-April for healthiest growth. The larger plants can be kept growing into early Summer. The more tubers will result but avoid soggy soil in hot weather.

5. Bacterial or fungal rot is rare in hybrid *Pterostylis*, but if it does appear, perhaps as a result of snail bait dropped on a leaf, it is usually necessary to remove only the affected leaf, not quarantine the whole pot.
6. The more light you can give them the stronger will be the flower stems. Avoid turning or shifting pots once flower stems start rapid growth or unsightly twists and bends will result.
7. Control of slugs, snails and caterpillars is important and surprisingly many hybrids need to be protected from pollinating fungus gnats. I have trouble with these pollinations, especially on *Pt. X ingens* which are often visited the same day they open and begin to close the following day. After waiting all year for a perfect pot it is infuriating to have a mix of buds, a few flowers and lots of seed pods. Perhaps you have an easy solution to this problem.

We should see at least six different *Pterostylis* hybrids on the tuber bank this year. Why not try some, they really are the easiest orchids to grow!

Bob Bates

TUBER BANK ORDER FORM.

Post to: W.L. WaF.^Hscheck, R.M.B. ';;,7, BLACKWEX)I , S.A. 5157

Lot No.

- | | |
|--|---------------------------------------|
| 1. <i>Ptst. curta</i> | 24. <i>Ptst. fischii</i> |
| 2. <i>Ptst. nana</i> | 25. <i>Ptst. alata</i> |
| 3. <i>Ptst. pedunculata</i> | 26. <i>Acianthus exertus</i> |
| 4. <i>Ptst. pedunculata</i> "red form" | 27. <i>Corybas dilatatus</i> |
| 5. <i>Ptst. nutans</i> | 28. <i>Corybas fimbriatus</i> |
| 6. <i>Ptst. x ingens</i> | 29. <i>Corybas diemenicus</i> |
| 7. <i>Ptst. truncata</i> | 30. <i>Glossodia major</i> |
| 8. <i>Ptst. off. decurva</i> | 31. <i>Chiloglottis formicifera</i> |
| 9. <i>Ptst. furcata</i> | 32. <i>Eriochilus cucullatus</i> |
| 10. <i>Ptst. ophioglossa</i> | 33. <i>Microtis "alba"</i> |
| 11. <i>Ptst. x toveyana</i> | 34. <i>Microtis unifolia</i> |
| 12. <i>Ptst.</i> ("Nodding Grace") | 35. <i>Thelymitra rubra</i> |
| (<i>curta x nutans</i>) | 36. <i>Thelymitra ixioides</i> |
| 13. <i>Ptst. scabra robusta</i> | 37. <i>Lyperanthus suaveolens</i> |
| 14. <i>Ptst. cucullata</i> | 38. <i>Caladenia latifolia</i> |
| 15. <i>Ptst. baptistii x ingens</i> | 39. <i>Caladenia menziesii</i> |
| 16. <i>Ptst. furcata x ingens</i> | 40. <i>Caladenia carnea</i> |
| 17. <i>Ptst. curta X pedunculata</i> | 41. <i>D. longifolia</i> |
| 18. <i>Ptst. robusta</i> | 42. <i>D. sulphurea</i> |
| 19. <i>Ptst. obtusa</i> | 43. <i>D. Pioneer "Megalon"</i> |
| 20. <i>Ptst. biseta</i> | 44. <i>D. longifolia X brevifolia</i> |
| 21. <i>Ptst. acuminate</i> | 45. <i>D. brevifolia</i> |
| 22. <i>Ptst. concinna</i> | 46. <i>Ptst. russellii</i> |
| 23. <i>Ptst.</i> ("Cutie") | 47. <i>Ptst. longicurva</i> |
| (<i>cucullata X baptistii</i>) | |

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ADDRESS:

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