# DRYANDRA STUDY GROUP

## NEWSLETTER NO 24

*Dryandra shanklandiorum*

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SOCIETY FOR GROWING AUSTRALIAN PLANTS

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Greetings to all members from the middle of a Victorian winter. I have just returned from a very pleasant week spent in southern South Australia, hence this Newsletter is later than I had hoped it would be. We spent most of our time around Goolwa on the Fleurieu Peninsula and only had one free day in Adelaide as I had to attend a conference on the Saturday. While in Adelaide we visited the Wittunga Botanic Gardens, the former home of Edwin Ashbyi (after whom Dryandra "ashbyi" was named. I must say that Liz and I were somewhat disappointed with the relatively small variety of proteaceae (even though the garden is claimed to have extensive proteaceae beds). What capped off the disappointment was a sign *D.nivea* in front of four *D. cuneata*! (although that must surely have been a mistake). They were a little nearer with their *D.nivea* on *D.brownii* but these were the only dryandras we saw.

As you can see from the last page, there are two tear-off slips this time. One is for our annual subscription which falls due in July each year. This year, because of rising costs of photocopying (so far the computer time and typist are still free!) we need to make the subscription $6.00 which I would ask everyone to pay to Margaret as soon as they can. The second is for a somewhat delayed second Dryandra Garden Get Together based on Stawell in central Victoria with Neiland Jane Marriott hosting us. The set weekend which was the only one available before garden display and other committments for Jane and Neil and conference committments for me, is Saturday and Sunday 4-5 September. Neil assures me that there will still be plenty of dryandras in bloom at several gardens we will visit (including his own magnificent display garden at White Gums). There will also be a slide night and discussion at Neil's "meeting room" after tea on the Saturday night to which everyone is invited to contribute slides and specimens. Please complete and return the tear-off sheet to me by Friday 21 August so we may finalise plans.

Once again, I trust that there is something for everyone in the Newsletter. I have included notes and information from members and I thank everyone who has written - it makes my job so much easier. Please keep up the good work. I have actuallt had to hold Margaret's report on the Cranbourne visit of May 30 which was most enjoyable for all those able to attend. Margaret still doesn't feel that it is "right" that some plants and species grow so much more luxuriantly at Cranbourne than in their home W.A.! David Randall has also provided a most magnificent index to all the dryandra species listed, mentioned or discussed (including the currently un-named ones) in all issues of the Newsletter. Thanks, David for a wonderful job. It is seven pages of compressed detail with additional comments byMargaret. I am currently organising for copies to be made which will inclde a cover of one of Margaret's drawings but we will have to charge $2.00 (including postage) to cover costs. I can bring copies to the Get Together but should anyone else require a copy, please contact me. Finally some of you may have seen the magnificent book on garden design by Diana Snape called *Australian Native Gardens Putting Visions into Practice*. Margaret has asked me to review it and I will do this for the January Newsletter.

I am attending the ASGAP Conference in Sydney (25 September to 1 October) and will be presenting a paper on the Monday afternoon and will also be helping Elizabeth George with 'manning' the Dryandra display Margaret has prepared. If you are attending the conference, please make yourself known to me. I look forward to meeting you.

Happy dryandra growing

Tony.

# CINNAMON FUNGUS AND NATIVE PLANTS

(Editor's note- I have extracted the following information from an article by Gretna Weste entitled "The cinnamon fungus. Is it a threat to Australian native plants? which was published in *Victorian Naturalist, 110*(2), pages 78 to 84. Gretna Weste is a Senior Lecturer in Botany at the University of Melbourne and both she and her research students have worked on the cinnamon fungus problem in Victoria for many years. A lot of her pioneering work has been carried out in the open forested areas of Victoria such as the Brisbane Ranges outside of Geelong, Kinglake National Park, Angahook National Park also near Geelong and the famous Wilson's Promontory National Park. It is a worrying story but as the final paragraph reveals, there may be some hope in the future. I would recommend everyone who can obtain a copy of this issue of the *Victorian Naturalist* to read this article).

## What is cinnamon fungus?

The cinnamon fungus, known scientifically as *Phytophthora cinnamomi* is entirely microscopic and consists of threads which infect intact plant roots and wounds in the base of the stems. It received its name because the fungus was first isolated in cinnamon plants in Western Sumatra in 1822. It thus appears to have been introduced into Australia although there is still some question as to whether it has always existed here. What is not always realised is that there are about 50 species of *Phytophthora*. Some, such as the one which caused potato blight in Ireland in 1845, attack only one or two closely related species of plant. Unfortunately, cinnamon fungus has been recorded from over 1000 species of plants, many of them Australian natives, and has led to what Weste calls an "epidemic attack" on our flora which is "unknown elsewhere in the world".

## How does cinnamon fungus kill plants?

The cinnamon fungus produces "sporangia" containing tiny kidney-shaped swimming spores. Masses of these are produced following warm, wet periods in spring. They swim or are carried in water or puddles and are attracted to roots. There they form a cyst-like body surrounding the roots and produce germ tubes which penetrate the root and kill the cells. The fungus will attack all roots, whether the species is susceptible or not, and is capable of producing a new crop of swimming spores in 24 hours. In resistant species, the destruction of root cells temporarily stops root growth but no permanent damage results. However in susceptible hosts the threads grow through the root tissue producing extensive root or collar rot. The primary sympton of cinnamon fungus attack is thus root rot which, however is invisible as it occurs in the soil. As a result of the destruction of the roots, water transport is inhibited and infected plants develop chlorosis (yellowing), dieback of the branches and eventually die from drought. These are the visible, secondary symptoms.

What makes *Phytophthora* such a problem is that it is virtually physically indestructible. In addition to the swimming spores, it also produces thick walled, resistant spores both in root tissue and externally in gravel or soil. These can survive dry conditions and remain alive for years in gravel heaps and similar. The life cycle of the fungus is complex (see figure below) but it is a very adaptable organism and will produce either swimming spores or resistant spores and these germinate in various ways depending on nutrient and water supply. Normally the fungus requires temperature greater than 10 degrees C and moist soil for growth, but heat, cold or dryness do not kill it, merely prevent active growth. The fungus can thus lie dormant for years waiting for the right combination of wetness and warmth which will favour production, dispersal and infection by swimming spores.

## What conditions favour its spread?

In addition to warm, moist soils which favour spread of the swimming spores, another requirement is the absence of soil microbes which are natural enemies for *Phytophthora*. Such microbes occur in soils rich in organic matter and the presence of microbes can thus minimise destruction of even susceptible species such as Mountain Ash. Unfortunately, many of Victoria's best wildflower areas occur in the open forests, woodlands and heaths characterised by shallow soils and poor drainage - and it is often the understory shrubs which prove susceptible to fungus attack as many eucalypts are resistant. The worst scenario for "epidemic" type attacks occurs with a warm, wet spring followed by warm summer rains. The spore population has two chances to grow and if the late summer and early autumn are hot and dry, then plants may die in epidemic proportions, such as occurred across southern Australia in 1970-1971. "The roots become infected during warm, wet conditions but the plants die in periods of water stress because insufficient water reaches the leaves. **Once the pathogen is present in soil and roots, there is no practical way of removing it from a native plant community**" although chemical treatments are available for commercial crops and orchards and possibly for a limited number of plants in a native garden.

The disease is spread predominantly by people, especially during construction activities involving the use of heavy equipment in the bush. Soil, gravel and mud adherinng to vehicles (and people's boots) from infected areas can readily spread the fungus to new areas. The other major means of spread involve drainage works. The rate of spread downhill of cinnamon fungus can be as much as 400 m. per annum so it is obviously very important to consider the positioning of roads and drainage run-offs in susceeptible country.

Effects of *Phytophthora* on the ecosystem.

Most of the work on the effects of cinnamon fungus on plant communities has been carried out in Victoria where seven major areas and parks are at risk and in Western Australia where destruction of Jarrah forest (Jarrah dieback) has a snowballing effect on all facets of water supply, the timber industry, the cut-flower trade, nursery sales and tourism. As Weste says "It is (also) a tragedy that (due to *Phytophthora*) so many rare, endangered, endemic species should be threatened with extinction in such a short time span".

In Victoria, the picture chronicled by weste is a depressing one. "The open forest with its sclerophyllus, shrubby understory becomes a sedge woodland after dieback disease. Victoria stands to lose some of its most attractive plant communities with colourful, scented, bird, mammal and insect pollinated flowers. They are replaced by drab communities of grasses and sedges which are wind pollinated" (and are resistant to cinnamon fungus). In Victorian plant communities, studies have shown losses of as much as 25% of the overstory and between 50% and 75% of the understory. It is not often realised that such destruction also leads to a reduction in the number of small mammals and birds in the area. In one study near Anglesea, it was found that the numbers of two species were reduced by 60% and 83% respectively. Other species require a floristically rich vegetation for survival. I am not aware of similar findings in Western Australia but as many of the smaller dryandras are pollinated by small marsupials, it is likely that their pollination will be adversely affected.

Dieback and death of Jarrah were first reported in 1922 but it wasn't until 1968 that the cause was shown to be *Phytophthora*. In the intervening years, the fungus was spread by logging, mining and road making and quarrying operations. At least now that the problem has been recognised, the Department of Conservation and Land Management (C.A.L.M.) strictly controls all off-road activities and enforces hygiene for forestry, mining and park procedures (all vehicles, boots and equipment are required to be cleaned before leaving infected areas, gravel is not to be taken from known infected areas, public access is sometimes restriced in known infected areas). The Department is well aware of the need to educate people about the dangers of cinnamon fungus and colourful brochures have been produced to highlight dieback risks.

The main dangers of the continued spread of *Phytophthora* are the destruction of the valuable commercial resource Jarrah timber, the destruction of the understory, especially the highly susceptible *Banksia grandis*, and the eventual loss of rare and endemic species. Already, all known populations of *Banksia brownii* are diseased although tissue cultures of this and a number of other disappearing species are maintained in Perth. Eighteen species of western banksia are known to be susceptible as well as 29 species of other rare myrtaceous and fabaceous plants. Not every area is affected but one research worker has estimated that of the near 4000 species in southwest Western Australia, 1000 are susceptible and some 300 are actually at risk. As previously noted, loss of flowering shrubs and trees means loss of habitat for birds and animals, some of which have an important pollination role. I have seen no figures or reports on the susceptibility of dryandras to cinamon fungus but they are probably just as vulnerable as banksias. Certainly, there have been losses of large, well established dryandras at Cranbourne which can only have been caused by *Phytophthora*. The losses cover a wide range of species so I don't believe at this stage that any dryandras are resistant.

And now for some good news

Even though as yet there is no magic cure on the horizon, there are a few encouraging signs. In Western Australia, occasional resistant Jarrah trees have been found. These have been cloned and may provide genetically-resistant stock for both future plantations and re-foresting devastated areas. In Victoria, Weste reports that nine new plants of *Xanthorrhoea australis* (a highly susceptible species) have appeared on a plot on which all plants of this species were killed 30 years ago. In other areas, new plants have appeared for the first time in over 20 years and surviving eucalypts are showing vigorous new crown growth. While it may be early days, these observations mat indicate that the disease can be overcome. Or, pessimistically, it might be a passing phase, with the disease again wiping out whole areas when conditions again are suitable.

Tony Cavanagh

## SOME NAMES FOR THE TED GRIFFIN AND WRIGLEY AND FAGG UNNAMED DRYANDRAS

Ted Griffin, a Western Australian botanist with a lot of field experience with dryandras, produced the first detailed study of the distribution, ecology and conservation status of dryandra. He used both herbarium specimens and field observations and was able to produce extremely useful distribution maps for all species. Griffin did comment that there were apparent gaps in the collections which probably represented under-collection rather than absence of plants in certain areas. In addition to the then 56 named species, he also produced information on ten species which were undescribed. As I was not sure of the exact relationship of the Ted Griffin unnamed species with Alex George's numbers, I asked Margaret how they related. The table below shows this:-

| Griffin Code | Alex George No. | Affinity |
|---|---|---|
| a | – | *mimica* |
| b | sp. 7 | aff *polycephala/hewardiana* |
| c | sp. 9 | aff *falcata* |
| d | sp. 16 | aff *mimica* (Hatter Hill) |
| e | sp. 10 | aff *armata* (Stirling Range) |
| f | sp. 12 | (Bluff Knoll) |
| g | – | form of *D. squarrosa* |
| h | sp. 11,20 | aff *armata* (11 is from Kalbarri, 20 from Three Springs) |
| i | sp. 15 | aff *hewardiana* |
| j | sp. 45 | aff *serratuloides* |

(Ted Griffin's article was published in *Western Australian Herbarium Research Notes*, No. 11, April 1985, pages 1-40)

In 1989, John Wrigley and Murray Fagg published their long-awaited book on the proteaceae, *Banksias, Waratahs & Grevilleas and all other Plants in the Australian Proteaceae Family* (Sydney, Collins). This is a most valuable book because of its coverage of every species of proteaceae in Australia and the treatment of Dryandra is quite complete and substantially accurate. A feature which helps identification is the leaf drawings for all species (although the drawing for *D. longifolia* I believe is incorrect). They had three unnamed species which Margaret suggested might be as follows (although she hadn't seen the specimens).

| W. & R. Code | Alex George No. | affinity |
|---|---|---|
| sp. Boyagin Rock | sp. 28 | aff *nivea* (mound form) |
| sp. Bindoon | sp. 28? | as above |
| sp. Newdegate | sp. 43 | aff *cirsioides* |

Tony Cavanagh

## SMALL MAMMALS AND DRYANDRA POLLINATION

The following information was provided by Margaret from a report produced by Worsley Alumina as part of a flora and fauna study on their leases. The two main small mammals studied were a species of pygmy-possum (*Cercartetus concinnus*) and a species of honey-possum (*Tarsipes rostratus*).

Pygmy-possums
These animals were found to carry pollen (and thus were capable of affecting pollination) but the amount was much less thAn that found on honey-possums. Analysis of gut contents revealed that these creatures feed on both insects and pollen/nectar. More significantly, it was found that *Dryandra nivea* was a significant seasonal source of pollen for these animals even though it was not locally abundant.

Honey-possums
It was found that honey-possums show a strong preference for the four types of dryandra found in the area (three forms of *D. nivea* and *D. carduaceae* which was the commonest species in the locality). As the graph below shows, while up to eleven species of plant were utilised, the dryandras figured most prominantly. In addition, the table shows the importance of dryandras during August to October.

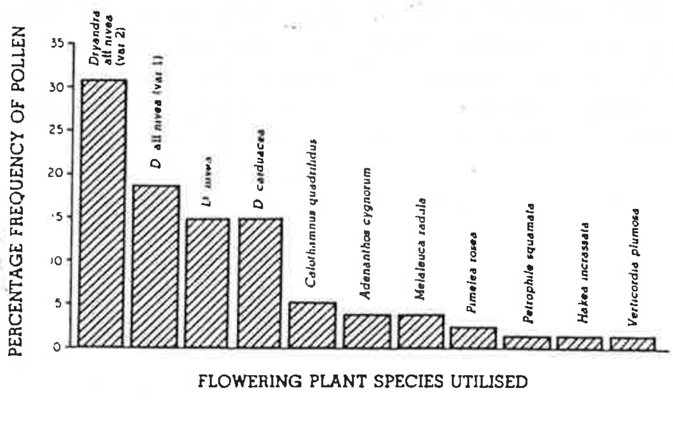



**Fig. B19.** Percentage frequency of pollen types identified in samples taken from the fur of Honey-possums *(Tarsipes rostratus)*, trapped in the Initial Mining Area during 1982.

**Table B11:** Pollen loads sampled from the fur of Honey-possums (*Tarsipes rostratus*) trapped in the Initial Mining Area during 1982. Data show numbers of animals caught per month and the species of flowering plant utilised.

| MONTH SAMPLED | SAMPLE SIZE (Number of Animals) | PLANT SPECIES UTILISED | | | | | | | | | | | NO POLLEN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Dryandra carduacea* | *Dryandra* aff. *nivea* (var.1) | *Dryandra* aff. *nivea* (var.2) | *Dryandra nivea* | *Adenanthos cygnorum* | *Petrophile squamata* | *Hakea incrassata* | *Calothamnus quadrifidus* | *Melaleuca radula* | *Verticordia plumosa* | *Pimelea rosea* | |
| JANUARY | 1 | | | | | ● | | | | ● | | | |
| FEBRUARY | 1 | | | | | ● | | | | | | | |
| APRIL | 1 | | | | | | | | ● | | | | |
| AUGUST | 16 | ● | ● | ● | ● | | | | | | | | |
| OCTOBER | 25 | ● | ● | ● | ● | | ● | | ● | ● | | ● | ● |
| NOVEMBER | 3 | | | | | ● | | ● | ● | ● | ● | | |

The authors commented that while birds frequently visited the upright *D.carduacea*, with its conspicuous flowers, they were never seen feeding on *D.nivea* which was relatively uncommon in th heath area studied and also has fewer inflorescences which are well hidden in the foliage. As similar observations have been made with the low shrubby *Banksia nutans*, the authors concluded that these low shrubs are preferred by the honey-possum because they provide nectar closer to the ground than most other species. In seeking nectar (and perhaps attracted by the musty or yeast-like odour of some of the proteaceae) these small mammals become effective distributors of pollen.

The practical implication of these observations is that many low or ground-level flowering dryandras (and possibly banksias) in urban environments are unlikely to be pollinated because of the absence of these small mammals. I have not had either *D. nivea* or *D. arctotidis* set seed for me here in Ocean Grove even though the plants are more than 12 years old. It is a similar story with *D. brownii*. Margaret also reports that few *D. nivea* and similar small dryandra seem to set seed in the Perth metropolitan area. However, Neil Marriot, in a rural setting, has reported seed-set which he has related to the presence in his garden of both fat-tailed dunnarts and yellow-footed antechinus (Newsletter 17).

It might be useful if we all could check whether any of the "nivea" type plants we are growing have set seed. Pull a few of the older capsules off and break them up to see if you have seeds. Please let me or Margaret know of your results and also perhaps observe your plants when they are in flower to see if any birds visit them. I doubt that they do but one never knows. It would be perhaps too much to ask to expect to find any small mammals in our dryandras but it could be worthwhile for anyone living in rural areas.

Tony Cavanagh

## THE DISCOVERY OF "BIG RED" (*DRYANDRA DRUMMONDII*)

(Editor's Note- Margaret has referred on several occasions to the large red-flowered form of *Dryandra drummondii* which she has christened "Big Red". She wrote me the following account of its discovery last year and I had misfiled her letter. It is indeed a spectacular plant but I have no records of anyone growing it).

In early January, 1992, Marion Blackwell and I were on our way to Albany and took a couple of back roads to look for some of the forms of *D. conferta*. East of Nyabing, we stopped on a gravel rise where the yellow-flowered variety of *D. erythrocephala* (No. 44) was in flower. Also occurring at the same location were *Dryandra* aff. *drummondii* (No. 38), "giant seneciifolia" (No. 5), *D. cirsioides* and *D. ferruginea*. Just a few metres further on we discovered some spectacular plants of *D. drummondii*. The leaves were the shape of typical *D. drummondii* as seen in the Stirling Ranges but at least twice as long, half as wide again and with a golden-brown indumentum on the newer leaves and petioles. The plants were huge - the biggest was almost two metres high and two metres wide, twice as big as any I've seen before. (I don't think we can match those dimensions here in the east, even at Cranbourne! - ed.) Imagine how thrilled we were to discover that they were in full flower, bearing in mind that typical *D. drummondii* flowers in November-December. Some plants still had flowers in bud but the most striking aspect was of them was the crimson styles. Many of the small floral leaves were entire, which seems unusual as well. These spectacular flowers are completely hidden in the larger shrubs but fortunately we noticed some young plants on the edge of the road with their flowers just visible. We would have missed them had we been driving past. I wonder whether this beautiful form has been collected before, although it wouldn't surprise me if some Study Group member from the Eastern states is already growing it!

Margaret Pieroni

(Editor's note- Yes Margaret, I believe Ken Stuckey was growing this or something similar on his property before the Ash Wednesday fire. I can remember seeing huge plants with leaves nearly one metre long although they were only a little over a metre high. They were spectacular foliage plants, with leaves a lovely blue-green colour and Ken at the time was developing a cut flower and foliage market in Japan. *Dryandra drummondii* leaves were highly sought after. I don't know about the flowers but the old flower buds were well hidden in the foliage. Just on colour, the first *D. drummondii* I ever grew had red styles giving the whole inflorescence a distinctly reddish appearance. However, it was a fairly small plant, never really healthy, and died after two years. I couldn't identify it at the time because of its red colour but Alex George named it from a slide).

## FORMS OF *DRYANDRA SUBPINNATIFIDA*

I wonder whether there are two distinct forms of *D. subpinnatifida*? I have only seen it in the wild at Dryandra where it is a rather tall upright but not very tidy shrub to 1.5 m. The one in my garden, in bud for the first time, seems to be of this type. Recent discoveries of plants at Boddington, west of Darkan (Val Crowley) and S.E. of Kojonup have been described as neat little mounds. I can't help remembering that row of little cushions in full flower at Cranbourne in May and the taller plant, not in flower, in an adjoining row. Certainly at first glance they have nothing in common but both forms are particularly interesting plants for the garden.

Margaret Pieroni

# THIRD TIME LUCKY

On 17 April last, Elizabeth George and I went back to Little Darkin Swamp hoping to find the "new" dryandra in flower (mentioned in Newsletter No. 23).

The location is south-west of York, between the Great Eastern and Brookton Highways, some 100 km. from Perth. North of the Brookton Highway, the route takes in a wide variety of habitats with several dryandra species. In the Jarrah forest there are the *D. nivea* form and *D. bipinnatifida* which are prostrate plants and, on gravelly rises, pure stands of *D. squarrosa*. In Wandoo woodlands there are patches of *D. armata* and the occasional granite outcrop has *D. fraseri*. *Dryandra praemorsa* and the northern, winter-flowering sp.aff. *drummondii* occur in small numbers.

We passed Darkin Swamp, an open, winter-wet area which is rich in Verticordia species - a spectacular sight in late spring - and areas of sand and open woodland which contain some of the typical sandplain plants far from their usual locations. Several "rare and endangered" plants occur in this interesting region which is not very well known except to a few Department of C.A.L.M. forest rangers. There are trial pine plantations scattered about the region to take advantage of the diversity of soil and vegetation types.

I thought I would be able to locate the dryandra plants immediately having been there twice before, but it took about half an hour. Last year, it was more than two hours before we located them. The area is not large but it is covered in small, dense melaleucas, not much more than knee high, with occasional bushes of *Hakea prostrata*. There are several kinds of prostrate plants growing among them, including a form of *D. nivea*, but they and the dryandra we were looking for are not visible from more than a metre or so distant so it was a case of combing the area for them. They are confined to a small section about 50 m. square.

The habitat is a swampy heathland of grey sand, quite dry at this time of year, surrounded by banksia woodland rich in plant species, including one of the rarer verticordias, *V. bifimbriata* which Elizabeth was keen to see and photograph.

Having finaly located the dryandras, I was delighted to find them in flower. Some were finished, some were in tight buds. The leaves, 30 cm. long and 5 cm. wide, are a pale blue-green with golden, tomentose ribs, similar to *D. pteridifolia* but only about half the size. The plants have underground stems with flowerheads at the ends of the branches at ground level. The perianth and limb of the flowers are covered in golden-brown hairs and the wide, felty bracts are rusty red. The yellow style splits from the base of each flower but curve only slightly and are more or less the same length as the perianth parts which, on opening do not relax so that the form of the flowerhead is what I like to describe as the "shaving brush" type. There are about 60 flowers per inflorescence. The whole flowerhead seems to glow with a deep golden colour making a lovely colour combination with the blue-green-greyish leaves. Altogether, this is a very attractive plant and a good one to try for the garden.

Very little seed was found. None of the few seeds I sowed last year germinnated and the one seedling the Kings Park Nursery had has since died, so we will be trying again this year.

The trip was very enjoyable, unhurried as it is not far from home, and successful in finding the plants in flower and obtaining what I believe to be the first photographs and good flowering specimens. I think it will turn out to be a new taxon. The plants resemble sp. No. 3 (form No. 5 in Newsletter 16) in habit but the leaves are more like a half-sized version of *D. blechnifolia* and the flowers are also similar. The flowering period is much earlier than *D. blechnifolia* and the similar sp. No. 22 which both flower in August-September.

Margaret Pieroni

# NEWS DROM MEMBERS

From Barbara Buchanan, Myrrhee, Victoria

I enclose an article from the Royal Horticultural Society journal *The Garden* which you may find of interest. (This is reproduced later, ed.). I assume Noel Kingsbury is the same English grower who refers to perfumed dryandras in the last newsletter. I suppose that once you get them happy in the garden they are mostly safe - but easy, as he implies, I can't agree with. Everyone around here lost plants over this last summer which was relatively wet and then was followed by a long dry spell. Neil Marriott who also lost a number of plants told me that he is trying out a product called Foli-R-Phos put out by R. Muir and Sons at the Footscray Market. At about $50.00 for 25 l., used at the rate of 5 ml.to a litre of water, it goes a long way. It is used by cut flower growers and injected into avocardo trees and I think I have read of jarrah trees being treated too. It protects against a range of root rots. (and , I assume, against cinnamon fungus as it apparently contains phosphorus acid or similar, ed.).

In the garden, I have lost a *D. drummondii* and a *D. calophylla*, the latter because it became overshadowed by a fast-growing *Acacia conferta*. All of my other losses are at seedling stage and identification of the remaining ones wasn't helped by the birds which pulled out all my labels while we were away! Most of my recent plantings are about 8 monttths old and so far, so good.

I have a large plant of the pink form of *D. praemorsa* which a member gave out during Margaret's last visit to Cranbourne. It flowered well last season initially but then seemed to stop and the buds all stayed green. Either they turned into leaf buds or have undergone some strange reproductive cycle. I can't be sure if the heads which feel to have seed in them were ever flowers but I have a gut feeling not all of them were. Has anything like this been recorded for dryandras? (I have seen *D. praemorsa* seed germinating in the capsules on the bush after a period of peculiar weather. However, when we tried to "transplant" them, they all died, ed.).

It was wonderful to see Margaret's garden last spring and see the results of her seeding directly into the ground. Iwas inspired to try the same but went back to tubes because here I would have to plant into old pasture, full of weed seed, whereas Margaret plants into more or less natural soil in a bush setting with trees and shrubs to control the drainage and where there is a minimum of weed seed.

I am still experimenting with the best time to plant out. I think seedlings survive better if one can get them into the ground before the heat of summer because with watered pots in the sun heating up, there is an ideal situation for fungal growth. However, I still have problems with anything small I put out and I need to put newspapers all around them to control the grass and clover better. My observations from last year's plantings was that I had better success with seedlings in the ground even though they were quite small.

From Christene Wadey, Eltham, Victoria.

We visited Western Australia last year in the spring and after spending some time with Margaret, we were given a lot of dryandra locations especially in the Stirling Ranges. While we tried to visit as many as possible, there just wasn't enough time but we spent a most enjoyable few days in the Stirlings and also at Buckleys Breakaway, Fitzgerald River N.P., then on to Cape Le Grande. The dryandras and other flowers were just fantastic.

I collected lots of seed and have had good success with it. Of 72 batches sown, 65 had at least some germination. I have lost some plants on days with a hot north wind but the very wet summer hasn't had much effect on the seedlings. I am hopeful that many of them will be big enough to plant out in autumn and others in spring although I think I will have to distribute some to interested friends as well to get rid of all my seedlings. I have been using "Green Wizard" potting mix which has given rapid growth to dryandras and other proteaceae that I have used it for.

The species which have germinated and remain healthy include:-

| | |
|---|---|
| *D. blechnifolia* | *D. foliosissima* |
| *D. brownii* | *D. nivea (many forms)* |
| *D. armata* | |
| *D. carlinoides* | *D. nobilis* |
| *D. ferruginea* | *D. pteridifolia* |
| *D. fraseri (forms)* | *D. hewardiana* |
| *D. drummondii* | *D. proteoides* |
| *D. shanklandiorum (several forms)* | *D. nervosa* |
| | *D. tridentata* |

I have had no success with:-

*D. fraseri (one form)*

| | |
|---|---|
| *D. serratuloides* | *D. nivea (1)* |
| *D. seneciifolia* | *D.vestita* |
| unidentified (2) | |

From Bob O'Neill, Wandin North, Victoria

Our garden is north facing on red soil, well drained with a rainfall averaging 37-38 inches. I currently have 10 speciesof dryandra in the garden with a further three in pots to go in when they are a little larger. I anticipate growing more dryandras as so far they have been successful for me. All the plants are growing well, and some are up to three years old but only *D.formosa* has flowered. The plants I am growing are:-

| | |
|---|---|
| *D. formosa* | *D. nivea* |
| *D. pteridifolia* | *D. drummondii* |
| *D. polycephala* | *D. praemorsa* |
| *D. proteoides* | *D. baxteri* |
| *D. tenuifolia* | *D. obtusa* |

From Elizabeth Brett, Corowa, New South Wales.

The following is an update on my dryandra growing over the last 12 months. I have tried different times for sowing including January, February and May. However, last year when I planted seed in February, I had trouble with seedlings collapsing. I think I may have partly overcome this problem by using a frame to lift pots off the ground as described below. David Randall suggested that June was a good time for sowing in our area so I may also try that.

I pot my seedlings on as soon as they emerge into fluted tubes which stand in a frame to keep them off the ground. This "air prunes" the roots and allows good drainage. The frames hold 20 pots with two frames per polybox which I use to keepthe temperature of the tubes as even as possible. With this arrangemet, so far this year (April) I have had no trouble with seedlings collapsing as in the previous year.

From last year's February sowing, I planted out the following species into the garden, potting up additional plants into 8 inch pots, some of which I have been able to give away. They went in in late January and so far, all are healthy with the ones in the ground being in many cases up to twice the size of those in pots. They are also showing no signs of yellowing. We had a very wet and cool spring followed by a wet and mild January - wonderful for Eastern Banksia but horrible for western proteaceae! It has been relatively dry since.

From February, 1992 sowing:
159 *shuttleworthiana*
186 *shanklandiorum*
223 *stenoprion*
465 ASG 41
500 *bipinnatifida*
sp. nova Kamballup
*calophylla*
*subulata*
*armata*
539 ASG 45
*polycephala*
*nobilis*
*shanklandiorum*
*ferruginea*
These didn't germinate - No. 221 (*tridentata*) and No. 115 (ASG 43) while No.219 (ASG 22) germinated but didn't survive.

Of my older plants, No. 501 (ASG 21), No. 488 (*brownii*), No. 233 (ASG 53) and No. 425 (*arctotidis*) from autumn, 1992 are looking very good. Both my *D. speciosa* died as did *D. drummondii* (rotted at ground level), *D. formosa* while *D. mucronulata* literally "dropped dead". *D.pteridifolia* has been flowering for months and *D. brownii* and *D. nivea* have lots of buds. *D. praemorsa* has flowered well and I was able to collect seed off both my plants event though they are quite small. Seed from one but not the other has germinated.

From LLoyd Carmen, Eden Hills, South Ausstralia.

In common with a lot of other areas, we have had very strange weather over spring and summer, mainly cold, wet and with too much wind. The extra rainfall seems to have boosted most plants in the garden including the proteaceae but there are problems. Because of all the sappy young growth, plants seem to wilt readily on hot days - let's hope it doesn't lead to too many losses.

My dryandras are doing well although unfortunately, we lost a large *D.proteoides* due to carelessness on the part of a tradesman. *D.drummondii* is in full flower (December) and it is nice with the soft young growth developing gracefully. Perhaps the most striking dryandra in the garden at the moment is *D.brownii* which has put on much new growth and is developing into a most beautiful foliage plant.

Most of us are familiar with the advantages of growing from cuttings and since early May, we have been trying out a wide range of species including a number of dryandras. The success rate has generally been high - perhaps the weather has helped. However, we found that cuttings taken from a couple of young seedlings of Ken Stuckey's *D. formosa* hybrid rooted quite quickly although cuttings from *D. brownii* and a *D.nivea* form still have no roots after six months. It looks like the younger the plant from which the cuttings are taken, the quicker that roots might form.

## DRYANDRAS AND BEES

I recently came across a book published by the Department of Conservation and Land Management in Western Australia in 1987 called *Bekeeping and Land Management*. There were several chapters on honeybees and native flora and I was interested to see that dryandras were an important source of pollen and nectar for bees.

Of major concern to bee keepers was the steady (in some cases rapid) depletion of bush and forrested land which were suitable for bees. To compensate them, the government set aside a major area of 90000 ha. of sandplain heaths and woodlands between Jurien Bay and Dongara known as the Beekeepers Reserve. More than 300 species have been identified in the area of which the bees utilise some 118 species. One of the most important species is *D. sessilis* although at other stages of the season several hakea species are also important. Relatively little is known about why bees choose particular species except that observation seems to suggest that they utilise some species which are common and flowering in abundance at the time. They continue to exploit these species as long as they can provide resources before they switch to something else. Such exploited species can havee a wide range of sugar concentrations in the nectar (from 20 to 39% in four banksias) and also wide variation in the crude protein content of the pollen (eg 12% in *Leucopogon striatus* to 29% in *Dryandra nivea*).

Some experimental work has been done in the heathlands near Badgingarra regarding pollen preferences for bees. Over a two year period during the months of June to September, some 26 species of plant were noted as being used by bees. Three dryandras were among these including, surprising *D.nivea* which was heavily utilised in late August to September. Generally, this plant does not prominently display its flowers so all I can think is that it is very prevalent and that perhaps the odour from this species is an attractant - we have already seen that this species has a high crude protein content in its pollen. *Dryandra tridentata* and *Dryandra carlinnoides* featured in late September and early October. Both these, but especially the latter, flower profusely and thus presumably attract bees. However, little is known in many other areas so there may well be other important dryandra honey plants.

Unfortunately, there is almost no work relating to possible pollination ability of honeybees. Hence, no one can say for certain whether any dryandras are largely or partly bee pollinated.

Tony Cavanagh

## SOME OBSERVATIONS ON THE PROBLEMS OF RAISING SEEDLINGS

From my own experience and from that of other Study group members who have generously contributed their observations, I am forming the opinion that the main cause of death of young seedlings in pots is from root rot when they receive too much water which doesn't drain away quickly enough, the type of potting mix notwithstanding.

I have written about my experience of last season but as it was the most successful method that I have tried so far in raising seedlings, it is probably worth repeating as some members may like to try it.

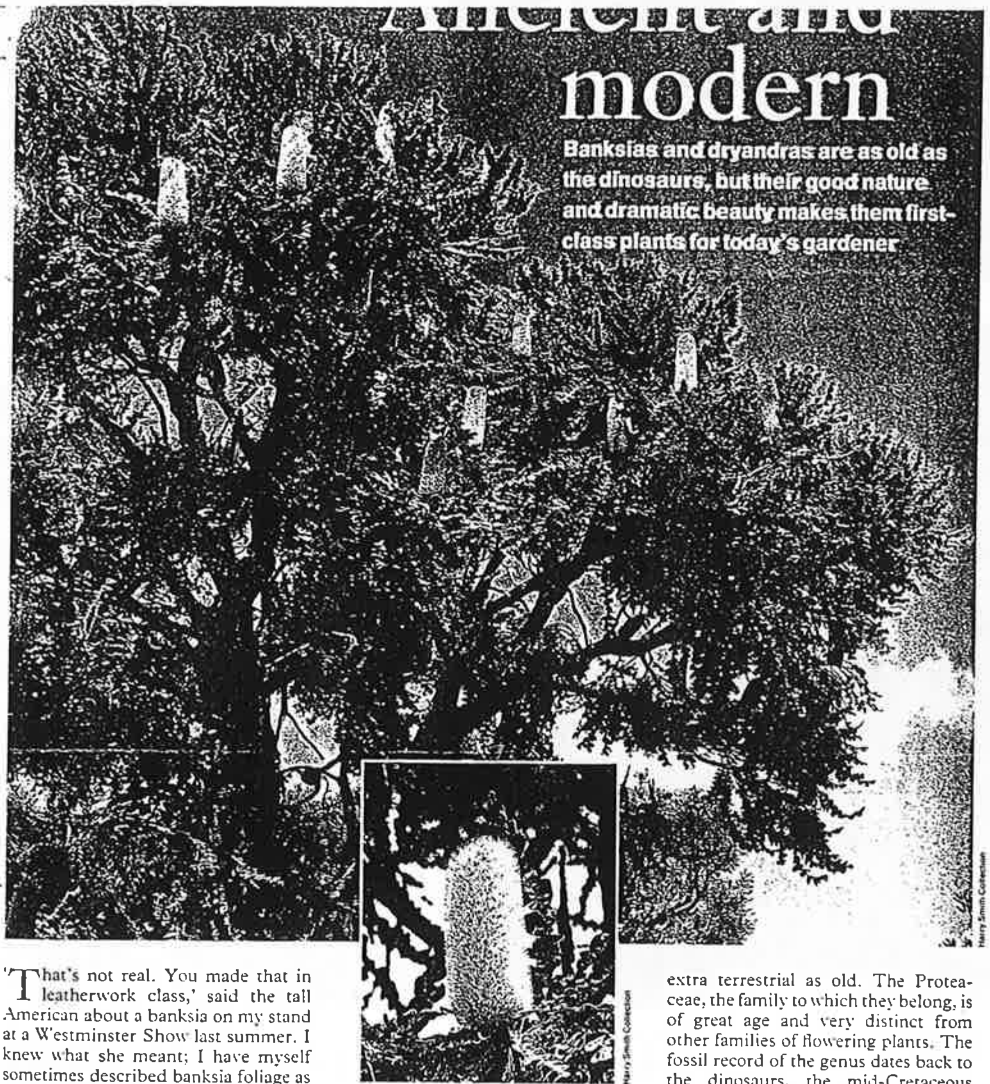
In the autumn which is the best time for sowing seed in W.A., I prepared small areas about 0.5 metre square in my garden. As you probably know, the soil here is sand over sand! I cleared the area of leaf litter and applied "Wettasoil" as the top layer of soil is so powder fine that it repels water. The treatment also means that water now penetrates the soil and doesn't run off the prepared seed bed. I sowed 6 or 8 seeds in each patch, of the species I was hoping would be established there. Upright sticks around the perimeter deterred cats and dogs and also reminded me where to water the seeds. Germination was very good and when the seedlings were about 4 cm. high, I potted up all except one into 10cm. pots.

There is of course, one major drawback with this method. When I am away the pots are fine for my husband to water as they are all together but the seedlings, being scattered all over the garden, are a problem as they still need to be watered at least every second day in hot weather. Two seedlings have died due to lack of water while I was away in summer but the rest are growing well. Those in the pots have generally grown much faster but some are stunted and a number have died. I water them in the morning only when the surface is dry and then only a dribble, perhaps a desertspoon full. They are in shade for half the day and if they seem to be taking too long to dry out, I move them into the sun. I saved one plant by doing this. It was at the back and the top of the plant was wilting. I nipped off the almost-dead leaves and when it dried out, the rest of the plant recovered.

I thought that although this method is fine for growing a few plants for my own garden, it is not practical from the point of view of, say, a nursery. But then, perhaps, it could be if there was sufficient room to direct-sow the seed and pot up the most vigorous plants. In the ground they will almost certainly not suffer from being overwatered, but once in the pot, they have to be very carefully watched and not allowed to become waterlogged.

For the plants in the garden, I applied "Wettasoil" when the weather warmed up. It is a bit of a chore watering each one every second or third day but when the rain comes in autumn, I don't expect to have to water them again whereas the ones in the pots will be set back when I plant them out (if they live that long) and I'll have to water them next summer. I have replaced the mulch around the seedlings and they get a certain amount of shelter and shade from existing plants in the garden.

Margaret Pieroni.




*Banksia grandis* growing in Western Australia. It also thrives outdoors on Tresco in the Scilly Isles

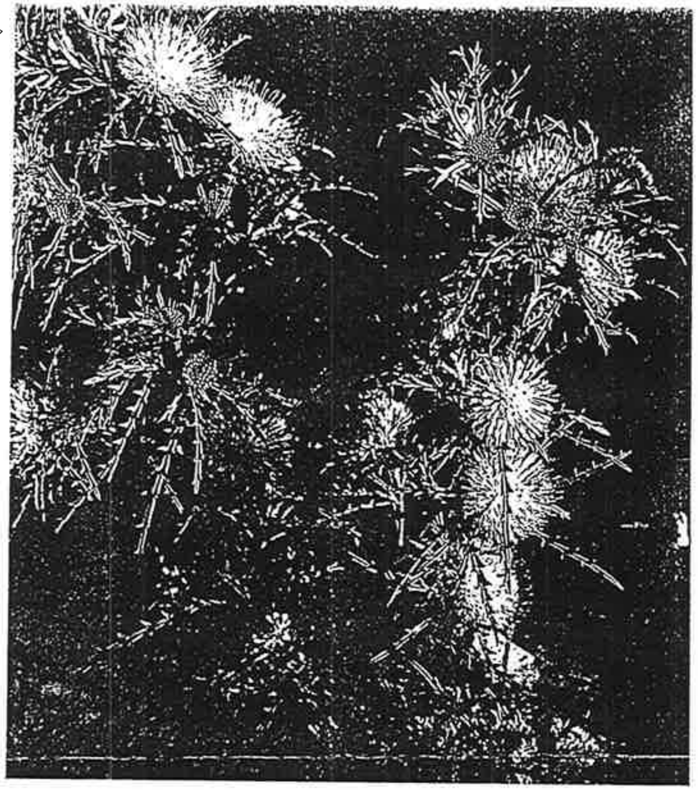
by Noël Kingsbury

'That's not real. You made that in leatherwork class,' said the tall American about a banksia on my stand at a Westminster Show last summer. I knew what she meant; I have myself sometimes described banksia foliage as like offcuts of green suede. Australian plants often do look very strange and banksias and dryandras strike many people as the most bizarre of all. They can jolt the senses, but few deny their dramatic beauty. They display an extraordinary variety of foliage form and texture, and the flowers confirm their apparent otherworldliness.

Of course, banksias are not so much extra terrestrial as old. The Proteaceae, the family to which they belong, is of great age and very distinct from other families of flowering plants. The fossil record of the genus dates back to the dinosaurs, the mid-Cretaceous period, about 100 million years ago. Fossils of banksias found in Australia, dated at 55 million years ago, are identical with species that are found today.

Banksias range in size from large trees to prostrate shrubs, and are distributed over much of Australia. Their close relatives the dryandras, on the other hand, are mostly small shrubs and are limited to the south-west. The ▶

This is called D. formosa on the next page


Harry Smith Collection

'flowers' of banksias are heads composed of many individual flowers; the prominent part of each one is the style. They are generally large and cylindrical, while dryandra flowerheads are smaller and flatter. Some species are insect-pollinated while others, especially the larger banksias, attract birds by tempting them with copious quantities of nectar. Still others entice marsupial mice with ground-hugging flowerheads and strange scents.

The first Europeans to marvel at banksias were the crew of Captain Cook's ship on his first voyage to the coast of eastern Australia in 1770. Sir Joseph Banks, naturalist with Cook, brought specimens back to Europe where Linnaeus named the genus for him. Dryandras were named for the Swede Jonas Dryander (1748-1810), the first Secretary of the Linnean Society, by Robert Brown in 1810.

Seed was soon introduced to Britain and banksias were among the first plants to be grown in the newly developed glasshouses. They, along with other 'New Holland' plants, enjoyed a brief period of popularity in the early years of the 19th century. They were soon displaced in the affections of glasshouse owners by the waves of plant introductions from the tropics, plants with more colour and softer beauty, less demanding on aesthetic sensibilities. Just over half the approximately 75 species of *Banksia* had been tried in Britain by the end of the century and some species were always available. A few dryandras were tried in the early years of the century but they were never grown widely.

Both banksias and dryandras have an undeserved reputation for being difficult in cultivation. Much of this is due to problems in growing species from western Australia in the more humid east of the country. However, growing them as container plants in cool greenhouse conditions in Europe seems very straightforward. I have no hesitation in recommending them as first-class conservatory plants. Their primary value is in their foliage, as many species can take a long time to reach flowering size. They are much more tolerant and problem-free than many indoor plants which are more widely available.

The frost hardiness of banksias has still to be determined. Young leaves are damaged by the slightest frost but mature growth is undamaged by drops of a few degrees below 0°C (32°F). The eastern species of *Banksia* are hardy enough to consider trying them outside in sheltered areas, and even the western species may survive the winter outside if kept dry. Dryandras do not appear to be so tough, however.

The eastern banksias tend to be large so that they are not very suitable as indoor plants, but their greater hardiness makes them an interesting possibility outside in some areas. They should be placed in a very warm, sheltered position, ideally with the protection of a south-facing wall. The high-altitude *Banksia canei* is the hardiest, withstanding temperatures down to −12°C (10°F), but is not very exciting to look at. *Banksia saxicola*, also from mountain areas and with striking silver-backed leaves, may also be frost-tolerant. The showiest eastern species is *B. ericifolia*, with bright red flowerheads.

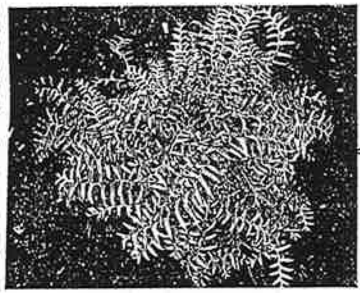
The banksias from south-west Australia are the most dramatic, and being compact are ideal conservatory plants. *Banksia blechnifolia* is one of the smallest, sending up deeply cut, leathery leaves from prostrate stems. Young growth is attractively clad in dense golden hair. Somewhat bigger, reaching 50cm (20in) after four years, is *B. dryandroides*, a favourite foliage plant of the 1820s. It has a mass of narrow leaves that appear to have been trimmed with crimping scissors. *Banksia speciosa* is another species that was popular 170 years ago. It is larger, up to 2m (6ft), with distinctive long silvery leaves. If you like quick results I recommend *B. grandis*, a species which has grown into small trees on Tresco in the Scilly Isles. It is a very fast grower, with zigzag leaves up to 50cm (20in) in size, and needs frequent cutting back. Of the species that flower when young, *B. baueri* is undoubtedly the best. Its flowerheads, which look like white busbies, last for up to six months.

Many of the dryandras are remarkably fern-like, and yet cope with the hot dry conditions in a greenhouse that would rapidly kill many ferns. *Dryandra pteridifolia* is particularly good, with a tight mass of somewhat spiky leaves growing to 30cm (12in). Young growth is covered in purple 'fur' which matures to an attractive dark green. *Dryandra drummondii* is a more open plant, with long, wavy-edged leaves spreading out from ground level. *Dryandra formosa* is taller, up to 1.5m (5ft), and the light green leaves have a feathery quality to them.

Dryandras flower when they are relatively young, but not always very conspicuously. *Dryandra praemorsa*, however, is worth growing for its flowers alone, the yellow thistle-like blooms produced throughout summer have a delicious lemon scent. *Dryandra carlinoides* is unusual for although both leaves and flowers are quite unremarkable, it has one of the most beautiful scents I have ever encountered.

Few plants have provided me so much enjoyment, interest or astonishment as these two. It is good to be able to recommend something so exciting and good natured in cultivation. G

**Noël Kingsbury** *is a garden designer and writer. He also runs a nursery near Bristol, specialising in unusual plants, with a particular interest in species that have become extinct in cultivation.*


Noël Kingsbury

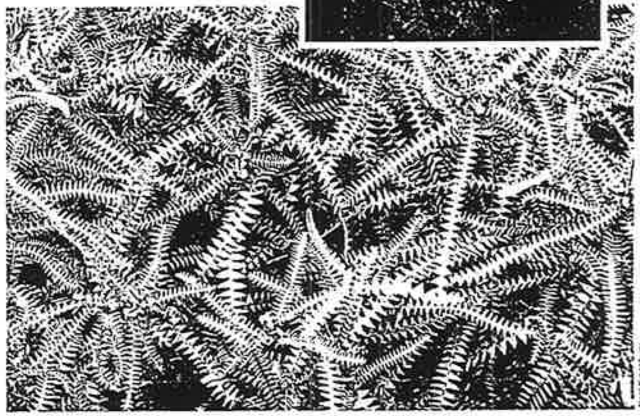
? D. nervosa.


Noël Kingsbury

polycephala

***Facing page: Dryandra ~~formosa~~. Left: Dryandra pteridifolia.*** ?
***Below left: Banksia baueri.***
***Right: Dryandra praemorsa.***
***Below: Banksia dryandroides***


Harry Smith Collection


Noël Kingsbury

## CULTIVATION AND PROPAGATION

Banksias and dryandras are adapted to live in very poor soils, often in areas of seasonal drought. The roots have such an efficient system of nutrient extraction that high levels of phosphorus can kill them. I have found that a compost based on sterilised loam or peat mixed with a good proportion (half to a third) of sharp grit is ideal, or a proprietary brand of ericaceous compost could be used with the same proportion of grit added to it. (These plants do not appear to be lime haters, but they would rarely encounter limestone in nature.) If peat is used some nutrients need to be added, but half the normal amount is quite enough. A diluted organic fertiliser such as Bio or Maxicrop is suitable, or better still I recommend using a slow-release fertiliser such as Osmocote which avoids the risk of poisoning the plant with an overdose.

Both genera are vigorous growers and can run short of nitrogen, indicated by yellowing tips; this can be corrected by potting on or feeding them with dried blood.

During the growing season the plants appreciate plenty of water, but are best dried out when growth stops during winter. Too much water at this time can cause root rot which, however, is not usually fatal. As plants of open environments, full sunlight is vital for healthy growth and they will benefit if stood outside in the summer. Greenhouse owners plagued by pests should note that I've never seen an insect so much as look at a banksia or dryandra.

Seed is the best means of propagation. It does not need a high temperature and germinates quickly, in about a month.

# DRYANDRA REPORT FOR 1992

As I mentioned last year, I have been planting a lot more seed, mainly Banksia and Dryandra. While 'full-time' teaching I always felt that my loss of seedlings was connected to my not being around often enough to give them the attention they needed. Now I cannot use that excuse, but I still have been experiencing huge losses, eg. 250 *D. formosa*, failing, one by one, sometimes, ten by ten, until now I have less than 50. Results with *D. praemorsa*, *B. baxteri*, *B. oblongifolia* & *B. speciosa* have been much the same.

In desperation I felt there had to be an answer somewhere in all the information I have collected on Proteacea over the years, including DRYANDRA STUDY GROUP NEWSLETTERS. So, much I my Christmas vacation was spent lying around reading. As 'yellowing' generally seemed to precede the deaths there seemed to be two possible solutions from the DRYANDRA STUDY GROUP NEWSLETTERS:-
No. 21, p.7 (molybdenum) and No. 20, p.6 (iron). As the only source of molybdenum that I could find was in Trace Element supplements I decided to go for the iron. In the past I have found that the results from iron chelates were not permanent so I was pleased to try the mixture you mentioned in Newsletter No. 20. I don't know how I made the mistake but, instead of zinc sulphate, I bought iron sulphate. So I ended up making up a container of iron chelates, iron sulphate and ammonium sulphate, 1:1:1. I then use three teaspoons of this mix with five litres of water which is equivalent to the mixture you suggest. Instead of spraying, I use the watering can. One dose seems to be all that is needed for 50 mm. and 75 mm. pots, but two or sometimes three are needed for the larger pots. The plants generally have greened up nicely and look healthy, except for a little bit of leaf burn on some plants. I think the solution might be a little too strong for those plants. There is now only the occasional loss of a plant and I have a theory, about the uptake of iron, (it's only a theory as I do not have the scientific facilities to test it) which seemed to fall into place as I was reading.

My theory is that: *'a fungus enters the root system of the plant, not killing it straight away but, blocking its ability to take up iron from the soil'*. A number of other observations of dying plants give me a feeling that there could be some truth in this. Now I add a fungicide (Fongarid) at the recommended rate to the above mentioned solution.

This autumn I hope to run some trials varying the ratios used in solution to see if I can come up with better ratios and possibly a mixture to be added to my potting mix when pricking out into the 50 mm. tubes.

1992 was another abnormal year as far as environmental conditions (namely rainfall) here go. Although the year's rainfall was average, only two months , April and June had near average rainfall and number of wet days. I use the range, *average plus or minus 10%*, as average.

This made me wonder whether *average* rainfall and weather are not the norm. I have put together my figures for the last eight years and my thoughts about them, on an enclosed sheet.

January, March, May and July were all very dry months, January and July with rainfall being less than half average. Of the other months, February, September and November were extremely wet.

Already, this year, January has been one of the wettest on record and the fact that areas, which are usually 'bone dry' by mid January, are still very moist, some areas of heavy soil still holding up to 100 mm. of water, which would account for the deaths of several well established Banksias and Dryandras.

**CORONET BAY:**

203 *D.drummondii*: continues to grow well despite the crowding from neighbouring plants. During the year I removed all the dead leaves and cut a couple of pieces out of it in an effort to find seed, but still no luck.

**THE GURDIES:**

8901 *D.sp. (D.11)*: still has not grown much and shown virtually no new growth.

8902 *D.sp. (D.11)*: is (was) doing very well and flowered in 1992. I was looking forward to more good results in 1993 but, with one of the 'downpours' in January, it ended up standing in water for a couple of days and now it does not look very healthy.

8600 *D.fraseri*: produced quite a number of flower and seeds in 1992. I hope to germinate the seeds this year.

8408, 8607, 8608 & 8609 all *D.bipinnatifida* still continue to battle the rabbits. Some netting and a depleted rabbit population is giving the plants a bit of a chance. 8610 & 8612 did not make it through the year, possibly due to overcrowding from neighbouring plants and misguided gardener's boots.

9002 *D.drummondii* continues its slow progress. 9003 & 9004 the two smaller D.drummondii both gave up during a damp spell.

8904 *D.'Kamballup'*: still doing very well and flowered (one flower) this year. Some of the older foliage got a bit yellow and spotty (something I noticed on plants in their natural habitat) but with the hotter weather the flush of new growth looks very green and healthy. Even the older foliage seems to pick up a better colour in the hotter weather.

8621 *D.brownii*: Produced a single flower and, if I can keep a *Banksia caleyi* from crowding it, will be a joy to observe as it is in full view from our living room window.

9200 *D. aff. falcata*: which I mentioned last year, was planted out and seemed to be going well, adding a few new leaves every now and then. Then during one of the hot spells, it dried out. Ironically it is only a few meters from the 8901 *(D.11)* I mentioned before as suffering from conditions that have been too moist this January.

A few other Dryandra seedlings planted out in spring did not get established. Of all the other seed planted in 1992, a few still survive and hopefully will be ready for planting out later in autumn. They are:-

| | | | |
|---|---|---|---|
| *D.obtusa* | (H)17 | *D.no.1 (hewardiana / squarrosa)* | 1 |
| *D.obtusa* | 4 | *D.No.23 (fraseri)* | 1 |
| *D.pteridifolia* | (H) 1 | *D.No.41 (calophylla / blechnifolia)* | 2 |
| *D.pteridifolia (P)* | (H) 1 | *D.No.42 (hewardiana)* | 5 |
| *D.subulata* | 1 | *D.No.49 (ferruginea)* | 2 |
| *D.tridentata* | 4 | *D.sp.H.* | (H) 1 |

The ones marked with 'H' are from my own seed source while the others are from seed sent from Margaret. I have enclosed the original list of seed planted last spring so you can see how many germinated compared with how many still survive.

Hartley Tobin

DRYANDRA GROWTH INFORMATION

HARTLEY TOBIN

CORONET BAY ########### — 31 1 93 ############

| No. | NAME | SIZE H-x-W | AGE | MULCH | MOIST | DRAIN | SUN | FLW | SEED |
|---|---|---|---|---|---|---|---|---|---|
| 203 | D.DRUMMONDII | 0.7x1.6 | 11 | YES | SAWS | GOOD | 50% | YES | NO |

*************************************************************

THE GURDIES ########### — 31 1 93 ############

| No. | NAME | SIZE H-x-W | AGE | MULCH | MOIST | DRAIN | SUN | FLW | SEED |
|---|---|---|---|---|---|---|---|---|---|
| 8412 | D.BAXTERI | 0.9x1.4 | 9 | YES | SAWS+ | GOOD | 80% | YES | YES |
| 8604 | D.BAXTERI | 0.7x0.5 | 7 | YES | SAWS+ | GOOD | 70% | YES | NO |
| 8408 | D.BIPINNATIFIDA | 0.3x0.2 | 9 | YES | SAWS+ | GOOD | 70% | NO | NO |
| 8607 | D.BIPINNATIFIDA | 0.1x0.1 | 7 | YES | SAWS+ | GOOD | 70% | NO | NO |
| 8608 | D.BIPINNATIFIDA | 0.1x0.1 | 7 | YES | SAWS+ | GOOD | 70% | NO | NO |
| 8609 | D.BIPINNATIFIDA | 0.1x0.2 | 7 | YES | SAWS+ | GOOD | 70% | NO | NO |
| 8621 | D.BROWNII | 0.2x0.6 | 8 | YES | SAWS+ | GOOD | 70% | YES | NO |
| 9002 | D.DRUMMONDII | 0.2x0.4 | 3 | YES | SAWS+ | GOOD | 70% | NO | NO |
| 8600 | D.FRASERII | 0.4x0.8 | 7 | YES | SAWS+ | GOOD | 70% | YES | YES |
| 8904 | D.'KAMBALLUP' | 0.3x0.6 | 4 | YES | SAWS+ | GOOD | 80% | YES | NO |
| 8206 | D.NOBILIS | 3.5x2.1 | 11 | YES | SAWS+ | GOOD | 80% | YES | YES |
| 8402 | D.PRAEMORSA | 3.2x3.0 | 9 | YES | SAWS+ | GOOD | 80% | YES | YES |
| 8631 | D.SESSILIS | 1.2x0.5 | 7 | NO | SAWS+ | GOOD | 60% | YES | NO |
| 8810 | D.TENUIFOLIA | 0.4x0.7 | 5 | YES | SAWS+ | GOOD | 70% | YES | YES |
| 8901 | D.sp. D.11 | 0.1x0.1 | 4 | YES | SAWS+ | GOOD | 70% | NO | NO |
| 8902 | D.sp. D.11 | 0.5x0.9 | 4 | YES | SAWS+ | GOOD | 70% | YES | NO |

SAWS = moisture summer, autumn, winter & spring -
(+) if there is added summer moisture.

MORE RAMBLINGS ON CLIMATE - or -

## ARE AVERAGE (NORMAL) WEATHER CONDITIONS A MYTH?

As I mentioned in my letter, I consider the range, *average plus or minus 10%*, as **average.**
Below, for the years - 1986 to February 1993, I have listed 82 months rainfall figures (September to December 1990 are excluded as I was away in W.A. during that time and only have their combined total). I couldn't resist including January and February of this year as those months have been two of our wettest. The figures are listed as a percentage of average, i.e. numbers greater than *110* indicate a **wet** month, numbers less than *90* indicate a **dry** month and *90* to *110* will appear as *'A'*(average).

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | YEAR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1986 | 78 | 56 | 16 | A | 138 | 136 | 117 | 82 | 78 | 159 | 63 | 113 | A |
| 1987 | 139 | 167 | A | 55 | 155 | 119 | 76 | 80 | 81 | 74 | 121 | 130 | A |
| 1988 | 88 | 59 | A | 40 | A | 132 | A | 124 | A | A | 167 | 126 | A |
| 1989 | 169 | 59 | 180 | 118 | 71 | 119 | 138 | 118 | 73 | 176 | 46 | 43 | A |
| 1990 | 32 | A | 58 | 119 | 40 | 87 | A | 133 | --- | --- | --- | --- | 89 |
| 1991 | 254 | 8 | 85 | 46 | 59 | 142 | 144 | 152 | 144 | 57 | 84 | 146 | 114 |
| 1992 | 33 | 163 | 81 | A | 78 | A | 46 | 117 | 138 | 116 | 148 | 89 | A |
| 1993 | 328 | 235 | | | | | | | | | | | |

SUMMARY:
82 Months = 11 Average - 38 Wet - 33 Dry

Despite so many wet or dry months, out of the eight years, one was slightly wetter than average, one was slightly drier than average while the other six were within the average range.

1988 is an interesting year in that five of the months recorded average rainfall whereas most other years are lucky to record one or two average monthly rainfalls.

With such a non-average (normal) rainfall situation, I wonder whether this is why, in this part of Australia, I have such a battle to keep some of my Dryandras alive. When I get a chance, I will try to get the rainfall figures for some of the key Dryandra areas in W.A. and compare them with those above.

1992

Hartley Tobin

| SPECIES | DATE PLANT | SEED No. PLNT | No. GERM | No. STILL 15/12 | No. STILL 28/02 | DAYS TO GERM | REF. | CODE | |
|---|---|---|---|---|---|---|---|---|---|
| D. ARCTOTIDIS | 170892 | 20 | 3 | 000 | 000 | 45 | H. | 0900161 | |
| D. aff. CONFERTA | 170892 | 8 | ##### | ##### | ##### | ##### | H. | 1015131 | |
| D. CUNEATA | 170892 | 15 | 7 | 2 | 000 | 29 | H. | 221 | |
| D. DRUMMONDII | 170892 | 13 | 5 | 3 | 000 | 42 | H. | 181 | |
| D. DRUMMONDII | 170892 | 8 | ##### | ##### | ##### | ##### | H. | 0100101 | |
| D. FERRUGINEA (P) | 170892 | 30 | ##### | ##### | ##### | ##### | H. | 091 | |
| D. FRASERI | 170892 | 9 | ##### | ##### | ##### | ##### | H. | 1201181 | |
| D. sp. H. (?) | 170892 | 16 | 6 | 5 | 1 | 39 | H. | 0200191 | |
| D. HORRIDA | 170892 | 10 | ##### | ##### | ##### | ##### | H. | 0945041 | |
| D. LONGIFOLIA (Demp) | 170892 | 11 | ##### | ##### | ##### | ##### | H. | 0400051 | |
| D. NIVEA (?) | 170892 | 18 | ##### | ##### | ##### | ##### | H. | 0945251 | |
| D. NIVEA | 170892 | 8 | ##### | ##### | ##### | ##### | H. | 1245211 | |
| D. OBTUSA | 170892 | 23 | 18 | 17 | 17 | 39 | H. | 0330291 | |
| D. aff PLUMOSA | 170892 | 3 | 3 | 2 | 000 | 43 | H. | 0145241 | |
| D. PROTEOIDES | 170892 | 35 | 4 | 3 | 3 | 45 | H. | 161 | |
| D. PTERIDIFOLIA (P) | 170892 | 17 | ##### | ##### | ##### | ##### | H. | 1020191 | |
| D. (?)SENECIFOLIA | 170892 | 15 | 7 | 000 | 000 | 42 | H. | 1245161 | |
| D. SUBPINNATIFIDA | 170892 | 8 | 3 | 1 | 000 | 42 | H. | 0840151 | |
| D. TENUIFOLIA (P) | 170892 | 32 | ##### | ##### | ##### | ##### | H. | 0200201 | |
| D. (?) | 170892 | 3 | 1 | 000 | 000 | 45 | H. | 1115061 | |
| D. (?) | 170892 | 12 | 10 | 3 | 000 | 42 | H. | 1045101 | |
| D. (?) | 170892 | 17 | ##### | ##### | ##### | ##### | H. | 0400291 | |
| D. (?) | 170892 | 6 | ##### | ##### | ##### | ##### | (?) | 1015251 | |
| D. BAXTERI | 180892 | 27 | 12 | 6 | 000 | 46 | H. | 0110211 | |
| D. CARDUACEA | 180892 | 1 | 1 | 000 | 000 | 44 | H. | 0145141 | |
| D. CONCINEA | 180892 | 7 | ##### | ##### | ##### | ##### | H. | 1100261 | |
| D. FERRUGINEA | 180892 | 8 | ##### | ##### | ##### | ##### | H. | 181 | |
| D. FERRUGINEA/ PREISSII | 180892 | 8 | 1 | 1 | 000 | 44 | H. | 0900101 | |
| D. NIVEA | 180892 | 15 | ##### | ##### | ##### | ##### | H. | 061 | |
| D. PTERIDIFOLIA | 180892 | 50 | 4 | 000 | 000 | 44 | H. | 1100221 | |
| D. PTERIDIFOLIA | 180892 | 12 | 6 | 5 | 1 | 44 | H. | 1000141 | |
| D. PTERIDIFOLIA (P) | 180892 | 8 | 1 | 1 | 1 | 51 | H. | 0400081 | |
| D. STUPOSA | 180892 | 3 | 3 | 1 | 000 | 44 | H. | 0830151 | |
| D. (?) | 180892 | 7 | 6 | 4 | 000 | 41 | H. | 1100191 | |
| D. ERYTHROCEPHALA | 110992 | 10 | ##### | ##### | ##### | ##### | MP | 478 | |
| D. FOLIOSISSIMA | 110992 | 7 | ##### | ##### | ##### | ##### | MP | 349 | |
| D. LONGIFOLIA | 110992 | 6 | ##### | ##### | ##### | ##### | MP | 432 | |
| D. OBTUSA | 110992 | 10 | 4 | 4 | 4 | 43 | MP | 397 | |
| D. SERRATULOIDES | 110992 | 7 | 1 | 1 | 000 | 31 | MP | 512 | B |
| D. SERRATULOIDES | 110992 | 3 | ##### | ##### | ##### | ##### | MP | 66 | M |
| D. SUBULATA | 110992 | 7 | 2 | 1 | 1 | 27 | MP | | B |
| D. TRIDENTATA | 110992 | 8 | 4 | 4 | 4 | 27 | MP | | E |
| D. No. 1 HEW/SQUA | 110992 | 7 | 3 | 3 | 1 | 47 | MP | 538 | |
| D. No. 12 sp.F | 110992 | 8 | ##### | ##### | ##### | ##### | MP | 421 | B |
| D. No. 20 sp.H AMAT. | 110992 | 6 | ##### | ##### | ##### | ##### | MP | 368 | |
| D. No. 23 FRASERI | 110992 | 11 | 9 | 6 | 1 | 23 | MP | 499 | T |
| D. No. 31 CONFERT | 110992 | 7 | 1 | 1 | 000 | 27 | MP | 547 | |
| D. No. 41 CAL/BLECH | 110992 | 11 | 2 | 2 | 2 | 38 | MP | 465 | |
| D. No. 42 HEWARD | 110992 | 11 | 7 | 6 | 5 | 18 | MP | | 3 |
| D. No. 47 PLUMOSA | 110992 | 8 | 3 | 3 | 2 | 92 | MP | | |
| D. No. 49 FERRUG | 110992 | 5 | 2 | 2 | 2 | 56 | MP | | S |

# GRAMPIANS GET-TOGETHER
## Saturday and Sunday 4-5 September, 1993

The weekend is planned as an informal get-together and will involve garden and nursery visits on the Saturday, with a pub tea on Saturday night followed by a slide night and discussion at Neil and Jane Marriotts. Further garden visits will follow on the Sunday. Planning is tentative at this stage as it will depend on numbers. You will need to make your own arrangements for accommodation, but Neil suggests Halls Gap as a good central point and there are several motels, units and caravan parks in the area. Neil and Jane Marriott will be our hosts and I suggest we meet at White Gums Nursery (directions in Neil's advertisement in the Vic. Region SGAP Newsletter) by 10.30 am on the Saturday. Neil has arranged for us to see some great gardens and we would anticipate breaking around 3.00 pm on Sunday.

Please let me know by phone (052 272555 (W) or 052 551180 (H) or complete the attached form and post it to me. I need to know by 21 August **at the latest**. A final program (Including a map of the area) will be sent to all pa rticipants in late August.

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**Grampians Get-Together : 4-5 September, 1993**

I/we ______________________________ will be attending the Grampions Get-Together. There will be ____________ people in our party. We expect to arrive at White Gums Nursery at __________ am on the Saturday.

Please post to: Tony Cavanagh
16 Woodlands Drive
OCEAN GROVE Vic 3226 BY **21 AUGUST, 1993.**

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## SUBSCRIPTIONS FOR 1993 - 1994

The group's year runs from July 1, 1993 to June 30, 1994. Subscriptions are $6.00 for Australian members and $10.00 for overseas. Please make cheques payable to the Dryandra Study Group and forward to Margaret. Thanks to all those who have already paid.

Name: ______________________________________

Address : ______________________________________

______________________________________

COMMENTS OR SUGGESTIONS FOR INFORMATION :

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