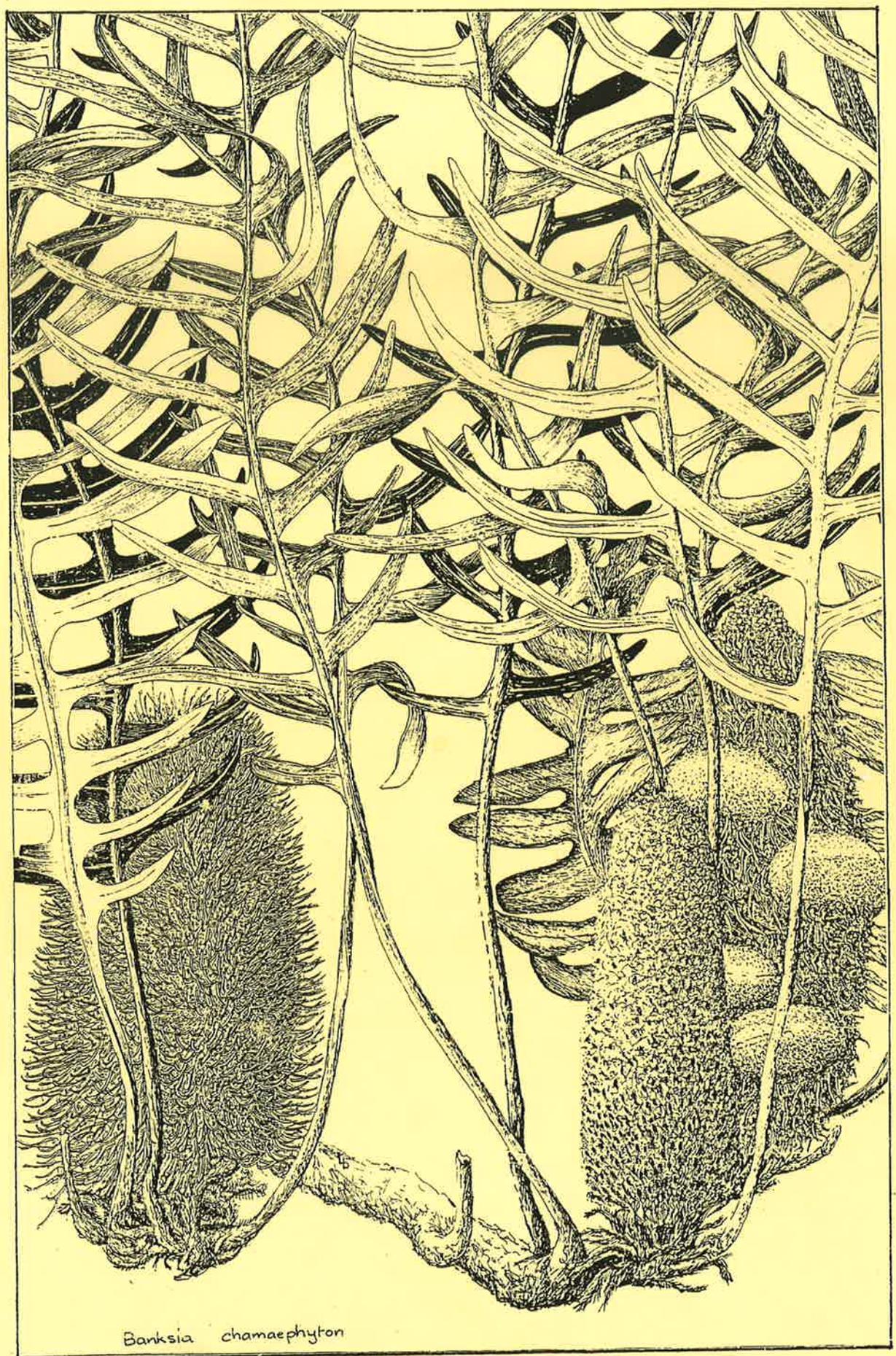


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BANKSIA STUDY



Banksia chamaephyton

BANKSIA STUDY REPORT NO. 7

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GRAFTED BANKSIAS - Doug McKenzie

INTRODUCTION

Of all the genera that I have tried to graft, the genus *Banksia* has proved to be the most fickle. Notwithstanding this fact, this genus has probably received more attention from experimenters in grafting than any other genus of native plants. At times the failures that one comes to expect with grafted *Banksias* can be most frustrating when a 1 or 2 year old plant dies after performing well in its early stages. It was therefore heartening to be shown recently a copy of Kew Garden's Catalogue of Australian Plants growing at the gardens in the 1880's which described a grafted specimen of *B.solandri* on *B.integrifolia* that was 20' in height and over 12 inches in diameter at the base!

The purpose of the trial grafts dealt with in this paper was to quickly screen a large number of possible combinations in the genus. The method of selecting candidates for trial was largely subjective, though the revision of the genus recently completed by A.George was consulted and due regard to relationships between species in the genus was considered. It is interesting that those combinations which do look promising do not closely correlate with the expected results. Indeed, if anything the reverse has turned out to be the case. Certainly, it is not possible to predict on the basis of intra-generic relationships, the outcome of a combination.

METHODS

All grafts were done at the cotyledon stage using the method detailed in "Australian Plants" Dec. 1981: pp.228-330, with slight modifications.

Because *Banksia* in general have fairly sturdy hypocotyls, the method would be fairly easy to learn by inexperienced grafters. This is particularly so for *B.serrata* which has a rather thick seedling stem. The other stock species are a little more difficult but can be grown on for a few weeks and grafted when the hypocotyl has thickened. In this case, the small plant will have also developed several true leaves but these may be cut off and the stock inserted between the cotyledons.

Using this method of grafting, it has been found that the problem of stock shooting has not been evident, at least in the first few years. This has been reported to be a common problem with species that are prone to shoot from the base. This includes *B.serrata* which tends to throw shoots from the lignotuber. In several specimens of the combination *B.burdetti*/*B.serrata*, several shoots have had to be removed at approx.4 years. The shoots were noticed after the scion had stopped growing during a dry summer. When the plants are actively growing, this does not happen and may not necessarily indicate a real problem.

It has been found that plants freshly grafted may be placed under mist without ill effect. This is surprising, since *Banksias* are notorious for fungal troubles at the seedling stage. My usual procedure has been to cover the freshly grafted plants with small throw-away plastic graduated medicine glasses, changed daily, for the first week after grafting. This is followed for 2-3 weeks on the heated misting bench, before hardening off very carefully. This method yields a success of up to 95% with an average success of about 75%-80%.

In the tables below, the plants that have been included have been those that have survived the first 5-6 weeks. Those that died before being fully hardened off do not figure, since death has been almost certainly due to something other than incompatibility. In desperation with some plants like B.coccinea which have failed on all the obvious stocks, I have tried some very wild attempts at discovering a compatible rootstock united and grew for a few months before stopping growth and dying. This seemed to indicate that the cotyledon stage grafting method will allow plants that would not successfully graft with conventional methods could unite at least for a short time and that failures after this could be attributed to incompatibility and not to a problem connected to technique of grafting.

B. INTEGRIFOLIA

This has probably turned out to be the stock that has been the most successful. From the table below it will be seen that approximately 14 of the thirty scion species tried have been more or less successful. Of these 14 species a number are rather slow growing, and are unlikely to be of horticultural or commercial interest.

The most successful scions on B.integrifolia are:-

B.GRANDIS
B.SOLANDRI
B.VERTICILLATA
B.LEMANNIANA
B.LITTORALIS

I have one very good specimen of B.grandis grafted onto B.integrifolia. This was done at the cotyledon stage. The plant which is approx. 2.5 years old is 2 metres high and healthy. I have however had quite a problem in keeping these plants alive in the first few weeks after grafting. B.grandis seems to dislike the humid conditions that are necessary during the early stages. My percentage of successful grafts with this species is less than 10%! In this case, conventional grafting methods may be more successful.

In the case of B.solandri, plants look very healthy. Two plants were approach grafted several years ago when seed was not available. These plants have made very good growth and at 2.5 years are over 1 metre in height and growing very vigorously. Since this time seed has become obtainable and I have grafted a number of other plants at the cotyledon stage. These, at 1 year are growing very quickly, with no sign of incompatibility.

B.verticillata seems to graft quite well onto B.integrifolia. A plant of this combination is growing in Ringwood (Victoria) and is more than 7 years old and over 8 metres in height.

The related species B.littoralis also seems to be successful, though rather slow, but this could be because the sites where they have been planted are very dry.

I have planted out several specimens of B.lemanniana grafted onto B.integrifolia. One of these has grown very well but the other is very slow.

Most of the other scion species are rather slow when grafted onto B.integrifolia. The pattern seems to be one of fast initial growth, slowing down at about one year and then in the following years the plant is very slow to begin its growth phase at the beginnings of the growing season. The plants that exhibit this syndrome are shown in the table below. The grafted specimen of B.benthamiana is over 5 years old but is less than one foot high! Unfortunately, some of the really desirable species also are very slow.

TABLE 1: STOCK: BANKSIA INTEGRIFOLIA

SCION SPECIES	COMPATABILITY	INCOMPAT. SYMPTOMS	NO GRAFTED	NO SURVIVING	AGE. OLDE-ST.PL.
<u>B.baxteri</u>	No	Slow growth: stem with.	4	6	4m
<u>B.benthamiana</u>	Yes	Very slow growth.	3	1	5y
<u>B.brownii</u>	Yes	Slow growth.	40	20	5y
<u>B.burdettii</u>	No	Stem break.	2	-	6m
<u>B.coccinea</u>	No	Slow growth: stem break.	3	-	10m
<u>B.grandis</u>	Yes	Nil	6	3	2y
<u>B.laevigata</u> <u>ssp.laevigata</u>	Yes	Slow growth.	2	1	5y
<u>B.laevigata</u> <u>ssp.fuscolutea</u>	Yes	Slow growth.	13	7	5y
<u>B.lanata</u>	Yes	Slow growth.	2	1	2y
<u>B.laricina</u>	No	Stem break	24	1	22m
<u>B.lemanniana</u>	Yes	Nil	2	2	4y
<u>B.leptophylla</u>	No	Slow growth	2	1	18m
<u>B.lindleyana</u>	No	New growth wilted.	2	-	8m
<u>B.littoralis</u> <u>var.littoralis</u>	Yes	Slow growth	3	1	3y
<u>B.littoralis</u> <u>var.seminuda</u>	Yes	Slow growth	3	3	2y
<u>B.media</u>	No	Slow growth: death.	1	-	30m
<u>B.micrantha</u>	No	Slow growth: death.	2	-	18m
<u>B.occidentalis</u>	Yes	Slow growth: yellowing	35	30	4y
<u>B.oreophila</u>	No	Stem break	1	-	8m

TABLE 1 (Cont'd)

SCION SPECIES	COMPAT- ABILITY	INCOM- PAT. S'MPTS	NO. GRAF- TED	NO. SURV- IVING	AGE. OLDE- ST.PL
<u>B.pilostylis</u>	Yes	Slow growth.	4	1	4y
<u>B.praemorsa</u>	No	Slow growth: yellowing.	2	-	20m
<u>B.prionotes</u>	No	Stem break	2	-	12m
<u>B.scabrella</u>	No	Slow growth: stem break.	9	1	22m
<u>B.speciosa</u>	No	Slow growth: stem with.	7	-	18m
<u>B.sphaerocarpa</u>	No	Stem break	2	-	18m
<u>B.telmatiaea</u>	No	Stem break	2	-	12m
<u>B.verticillata</u>	Yse	Nil	3	3	3y
<u>B.victoriae</u>	Yes	Slow growth	6	3	5y
<u>B.violacea</u>	Yes	Slow growth	3	3	3y
<u>B.sceptrum</u>	No	New growth wilted	4	-	9m
<u>B.solandri</u>	Yes	Nil	25	20	1.5y

B.SERRATA

Approximately 7 scion species have lasted for more than 2 years grafted onto B.serrata. Unfortunately all are very slow growers. Of these the following seem to be the most successful:

B.BURDETTI
B.SPECIOSA
B.MENZIES II

Even though these are the three scion species that are most successful, they are still fairly slow, and it is doubtful if they could be considered as of commercial interest.

B.burdetti has grown quite well, and has set a bud at about 3 years (although the bud aborted during a very dry summer). A specimen of this combination is also growing at Ringwood, and has flowered.

GRAFT. BANKSIAS

B.speciosa is successful though rather slow to grow. The National Botanic Gardens has a vigorous specimen of this combination.

TABLE 2: STOCK: BANKSIA SERRATA

SCION SPECIES	COMPAT- ABILITY	INCOM- PAT. S'MPTS	NO. GRAFT- ED	NO. SURV- IVING	AGE. OLDE- ST-PL
<u>B.baueri</u>	No	Slow growth: death	1	0	12m
<u>B.baxteri</u>	No	New growth: wilted	2	0	5m

TABLE 2 (Cont'd)

SCION SPECIES	COMPAT- ABILITY	INCOM- PAT. S'MPTS	NO. GRAF- TED	NO. SURV- IVING	AGE. OLDE- ST-PL
<u>B.burdettii</u>	Yes	Slow growth	38	15	3y
<u>B.caleyi</u>	No	Slow growth: death	1	0	18m
<u>B.candolleana</u>	Yes	Slow growth	1	1	2y
<u>B.chamaephyton</u>	No	Stem break	1	0	4m
<u>B.elderana</u>	No	Stem break	1	0	5m
<u>B.lemanniana</u>	Yes	Slow growth: yellowing	1	1	2y
<u>B.menziesii</u>	Yes	Slow growth	7	4	3y
<u>B.incana</u>	No	Stem break	1	0	5m
<u>B.leptophylla</u>	No	Stem break	1	0	4m
<u>B.pilostylis</u>	No	Slow growth	2	1	18m
<u>B.prionotes</u>	Yes	Very slow growth	2	1	3y
<u>B.speciosa</u>	Yes	Slow growth: yellowing	12	9	3y
<u>B.victoriae</u>	Yes	Slow growth: stem shoot	6	2	3y

BANKSIA SPINULOSA

This species and its varieties will support several of the scion species tried though like other stock species, the resulting plants are rather slow growers. The best scions appear to be:-

B.ELDERANA
B.PRAEMORSA
B.BROWNII
DRYANDRA. PRAEMORSA

It is interesting that Dryandra praemorsa is just as vigorous as most of the Banksias tried. None of the combinations tried could really be considered as having commercial possibilities.

TABLE 3: STOCK: BANKSIA SPINULOSA var. COLLINA

SCION SPECIES	COMPAT- -BIL- ITY	INCOM- PAT. S'MPTS	NO. GRAF. TED	NO. SURV- IVING	AGE. OLDE- ST-PL
<u>B.ashbyi</u>	No	New growth wilted.	2	-	3m
<u>B.brownii</u>	Yes	Slow growth	3	2	6y
<u>B.laricina</u>	Yes	Slow growth	1	1	5y
<u>B.laevigata</u>	No	Slow growth: death	2	0	18m
<u>sp.fuscolutea</u>					

TABLE 4: STOCK: BANKSIA SPINULOSA var. SPINULOSA

SCION SPECIES	COMPAT- -BIL- ITY	INCOM- PAT. S'MPTS	NO. GRAF- TED	NO. SURV- IVING	AGE. OLDE- ST-PL
<u>B.brownii</u>	No	Slow growth: death	2	0	12m
<u>B.burdettii</u>	No	Stem break	3	-	m
<u>B.elderana</u>	Yes	Slow growth	3	2	3y
<u>B.lindleyana</u>	No	New growth wilted	2	-	9m
<u>B.littoralis</u> var. <u>littoralis</u>	No	Stem break	2	-	4m
<u>B.nutans</u>	No	Slow growth: death	2	-	15m
<u>B.occidentalis</u>	No	New growth wilted	2	-	4m
<u>B.pilostylis</u>	No	Slow growth: death	2	-	15m
<u>B.praemorsa</u>	Yes	Slow growth: yellowing	5	3	3y
<u>B.prionotes</u>	No	New growth wilted	3	-	4m
<u>B.sphaerocarpa</u>	No	Stem break	2	-	18m
<u>B.verticillata</u>	No	Slow growth: death	2	-	8m
<u>B.victoriae</u>	No	New growth wilted	1	-	4m
<u>B.violacea</u>	No	Stem break	2	-	6m
<u>Dry.polycephala</u>	No	Stem break	2	-	5m
<u>Dry.praemorsa</u>	Yes	Slow growth	8	5	6y
<u>Dry.proteoides</u>	No	Stem break	3	-	8m
<u>Dry.quercifolia</u>	No	New growth wilted	1	-	5m

BANKSIA MARGINATA

As this is a most variable species, it would be unwise to draw too many conclusions from the results tabulated below. The seed of B.marginata used was collected locally at Ocean Grove. This form is rather large, attaining small tree proportions. It has a tendency to shoot from the base and this has been a problem.

TABLE 5: STOCK: BANKSIA MARGINATA

SCION SPECIES	COMPAT -BIL-ITY	INCOM-PAT. S'MPTS	NO. GRAF-TED	NO. SURV-IVING	AGE. OLDE-ST-PL
<u>B.grossa</u>	Unknown	Slow growth	1	1	18m
<u>B.lanata</u>	Unknown	Slow growth	3	2	18m
<u>B.laricina</u>	Unknown	Slow growth	3	1	18m
<u>B.nutans</u>	No	Stem break: yellowing	1	0	12m
<u>B.oreophila</u>	No	Stem break	2	0	5m
<u>B.praemorsa</u>	No	Stem break: yellowing	1	0	4m
<u>B.sphaerocarpa</u>	No	Stem break	1	0	6m

BANKSIA ERICIFOLIA

Only a very few trials have used this as a stock species. Only B.nutans has survived for more than 2 years.

TABLE 6: STOCK: BANKSIA ERICIFOLIA

SCION SPECIES	COMPAT -BIL-ITY	INCOM-PAT. S'MPTS	NO. GRAF-TED	NO. SURV-IVING	AGE. OLDE-ST-PL
<u>B.coccinea</u>	No	Stem break	1	-	4m
<u>B.nutans</u>	Yes	Slow growth	1	1	4y
<u>B.occidentalis</u>	No	Stem break	4	-	6m
<u>B.sphaerocarpa</u>	No	Stem break	2	-	18m
<u>Dry.praemorsa</u>	No	Stem break	1	-	6m
<u>Dry.polycephala</u>	No	Stem break	2	-	6m

BANKSIA VERTICILLATA

A small number of plants using this as stock have been grafted. The main reason for choosing B.verticillata was to test its compatibility with other more desirable banksias; since it was known to be compatible with B.integrifolia, it may be possible to use it as an inter-graft between B.integrifolia and a species that will not unite with B.integrifolia. B.coccinea is the only plant to survive, and again the resulting plant looks yellow, is very slow growing and continually shoots from the base below the graft.

TABLE 7: STOCK: BANKSIA VERTICILLATA

SCION SPECIES	COMPAT -BIL-ITY	INCOM-PAT. S'MPTS	NO. GRAF-TED	NO. SURV-IVING	AGE. OLDE-ST-PL
<u>B.coccinea</u>	Yes	Slow growth: Stock shoot	2	1	3y
<u>B.elderana</u>	No	Stem break	1	-	6m
<u>B.micrantha</u>	No	Slow growth: death	1	-	8m
<u>B.oreophila</u>	No	Stem break	1	-	6m
<u>B.scrabella</u>	No	Slow growth: death	1	-	10m

OTHER STOCK SPECIES TRIED

Three other species have been tried as stock. B.robur should be a good stock to try since it is so hardy, but most forms tend to produce a lignotuber and for this reason it was tried only once.

B.saxicola is certainly worth trying as a stock. Even though it appears to be closely related to B.integrifolia, several of the plants tried on B.saxicola are performing better than on B.integrifolia.

TABLE 8: STOCK: OTHER STOCK SPECIES

SCION SPECIES	COMPAT -BIL-ITY	INCOM-PAT. S'MPTS	NO. GRAF-TED	NO. SURV-IVING	AGE. OLDE-ST-PL
<u>STOCK: BANKSIA LEMANNIANA</u>					
<u>B.burdetti</u>	No	Stem break	1	-	4m
<u>B.oreophila</u>	No	Stem break	1	-	4m
<u>B.ROBUR</u>					
<u>B.oreophila</u>	No	Stem break	2	-	5m
<u>B.SAXICOLA</u>					
<u>B.incana</u>	No	Slow growth: death	1	-	12m
<u>B.leptophylla</u>	Yes	Slow growth	5	2	2y
<u>B.scabrella</u>	Yse	Slow growth	2	1	2y

FERTILIZATION IN THE GENUS BANKSIA

by A. Saikin

It is more than probable that the first person to note the discrepancy between the profusion of flowers on a banksia spike and the paucity of seeds set was the spanish botanist Antonio Joseph Cavanilles. If he was not the first to notice it he must have been the first to put this observation into print. In the ANALES DE HISTORIA NATURAL No. 3 of March 1800 he comments on the flowers and fruit of Banksia serrata collected at Port Jackson in 1793 by Luis Ney the botanist on the Malaspina expedition of exploration and scientific research.

"How prodigal nature appears to be in adorning each spike with so many flowers in order to produce some twenty seeds, and how admirable in enclosing these between such thick hard walls; in creating such corpulent fruit from ovules so tiny they can hardly be seen!"

The mystery commented on by Cavanilles in 1800 is still a mystery today. What it is that controls seed set in Banksia species is not known. Indeed, having perused the literature and written to people who might be expected to know, it would appear that practically nothing concrete is known about banksia breeding systems other than various myths and speculations regarding pollinators and reasons for seed set or lack of viable seed. For three flowering seasons I have attempted to hand pollinate banksia flowers of a number of species and so far have obtained no success. Hand pollination to obtain fertilization is the first major step in beginning to understand a breeding system, but there are however other aspects that can be investigated which may help to shatter some of the myths.

It has always been assumed that banksias like many other members of the PROTEACEAE are bird pollinated. If we regard pollination as the transfer of pollen from an anther to a stigma or from one flower to another or from one plant to another, then birds can certainly be observed doing this. The anomaly exists however that the spike may subsequently set no seed, a few seeds, or masses of seed.

Because birds are large and visit flowers in daylight they tend to be regarded as the only visitors, closer observation however reveals that banksia flowers are visited by day by many insects including bees and ants and at night by moths and small marsupials. Furthermore banksia flowers have as permanent residents whole colonies of Rove Beetles (Staphilinodius sp.).

There are strong arguments for regarding either birds or long tongued moths as pollinators, the most persuasive being the distance between the work and the reward. The nectar for instance in B.ericifolia is 40mm from the stigma. Bees and other small insects working the flowers for nectar do not come in contact with the stigma whereas birds and large moths do; although as I have suggested pollination may have nothing to do with fertilization.

This raises what is perhaps the most curious aspect of banksia breeding systems. From a very early stage pollen develops in direct contact with the stigma. This occurs in an organ known as the limb. The limb is the bulbous end to the 4 petals and when it opens and the petals curl back the pollen remains attached to the stigma. Microscopic examination reveals

that there is a barrier between the pollen and the stigma in the form of a phenolic compound which appears also to separate the pollen grains, but its function may be to ensure that the grains remain stuck together and to the stigmatic surfaces. The notion that this is a device for self pollination is very strong. If banksias produced seed without the aid of a pollinating agent they would not be unusual, many orchids have what appear to be elaborate mechanisms for cross pollination and yet set seed without the flowers opening. I am also aware of one example of a banksia that does this. Rodger Elliot of Montrose author of "An Introduction to the Grampians Flora" and an accurate observer, records that a Banksia lemanniana growing in his nursery regularly sets seed without the stigma emerging from the limb.

Apart from these observations of Rodger Elliot, there are other reasons that one could advance for believing that banksias are self-pollinated. There is the conservative nature of the genus. There are to my knowledge no documented cases of garden hybridization. There are, it is true, what are called natural hybrids but having grown many of these from seed the definition of hybrid can not be applied to them. The seed is fertile and plants grown from seed do not produce "swarms" but identical seedlings. Having grown other hybrids and being aware of the variation that can be obtained in seedlings I am doubtful about the so-called B.ericifolia x B.spinulosa, B.integrifolia x B.marginata.

One other line of evidence that might be considered is the lone banksia in a garden many miles from other banksias of the same species. Some of these regularly set seed. One could use the argument that pollen may be brought from long distances but it is unlikely to be brought by birds who generally have small territories. Pollen may of course be transferred from the stigma of one flower on the spike to the stigma of another flower but this once again is self-pollination and no exchange of genetic information is accomplished. The results would be the same:- a very stable population.

There is a fairly simple way of establishing if banksias need a pollinating vector and if indeed the pollen on the stigma at limb dehiscence is the pollen that fertilized the flower; that is to prevent any bird or large insect getting near the flower by placing a bag over the flower.

This year I will be "bagging" as many species, and as many flowers as I can with bags made of fine nylon. This may, I hope, establish conclusively whether banksias, or some species of the genus are capable of self-pollination - but, of that other mystery noted by the Abbe Cavanilles - that of selective control of the flowers that will produce seed; that may prove to be a little more difficult.

NOTES FROM AUST. POLLINATION AND ECOLOGICAL SOCIETY - David McFarland
Nectar production in two species of Banksia (B.integrifolia and B.spinulosa) was studied in New England National Park, N.S.W. The inflorescences of both species exhibited a high degree of temporal variability in nectar production. Availability varied with inflorescence age and time of day. Even when these factors were controlled productivity per inflorescence was still variable. This variability was accentuated by the effects of weather (rain, wind and minimum overnight temperature). The inconsistency in nectar supply appeared to have both short - and long-term effects on the honeyeaters (foraging behaviour, community structure and size) which could influence the reproductive success of the banksias.

GROWTH RATES OF EASTERN BANKSIA SPECIES ON
STERILE SAND AND CLAY LOAM

Comparisons of the growth rate of plants at two different locations can be attended with many difficulties. To be able to predict how banksias will perform on clay as opposed to sand without being able to control other variables such as associated plants which provide shelter, shade, and in the care of legumes a source of organic nitrogen is often a difficulty which is too often overlooked.

While studying variation in eastern banksias I was able to plant out banksias at two locations which were as close to ideal as one might find. The sand area was at Cranbourne in the Royal Botanic gardens Annexe and the sand was what had been left after sand mining. Plants from over 200 provinces were planted here with at least 4 plants from each province. The clay loam area was at Harkaway 12 km away, the property of Mr. G. Price, and consisted of a well drained area under pasture which had been rotary hoed Ph 5 to 5.5. Plants here were grown from the same seed batches as those planted at Cranbourne, however in comparison to Cranbourne where in most cases there were 4 replicates, at Harkaway there was only 1 plant from each seed batch, but as there was more than one plant of each species this is compensated for to some degree.

The following tables give the basic information of plants measured after five years of growth.

All Measurements in Metres

B. marginata

Cranbourne 4 plants of each.

Harkaway 1 plant of each.

<u>Height</u>	<u>Width</u>		<u>Height</u>	<u>Width</u>
1.2	1.2		2.6	1.4
1.5	1.0		3.5	1.4
2.0	0.9		3.0	2.7
.5	1	average	3.0	1.8

It is fairly clear that the soil with the higher nutrient level and greater water retention has given the better overall growth.

B. integrifolia var compar. was also more vigorous on the heavier soil.

Cranbourne 2 plants.

Harkaway 1 plant.

<u>Height</u>	<u>Width</u>		<u>Height</u>	<u>Width</u>
4.5	2		5	2
4.0	1.6			

Although in this case the difference is less striking.

B. canei showed the most marked difference in that on the sandy soil only a small percentage of some forms survived, usually succumbing in the hot dry months of the year.

Figures for the Kybean Range form are:-

<u>Height</u>	<u>Width</u>	<u>Height</u>	<u>Width</u>
0.7	1.1	2.6	2.3
		2.8	3.0

The Kybean Range term is not suited to sandy soils unless given summer water or is in an area where it can get its roots down to the water table.

The early form where there has been success at Cranbourne has been the Snowy Mountains form, all other forms have eventually succumbed.

The Banksia spinulosa complex shows some interesting results and these results indicate that some forms are better adapted to sand than others even though growth figures favour those plants grown on loam. Plants grown on sand had noticeably more flower spikes. In many cases B.spinulosa var. spinulosa had produced no flowers after five years of growing on loam whereas on sand they had produced four flower spikes after only three years of growth and though small in their fifth year many had more than twenty large spikes.

The figures for B.spinulosa var spinulosa are:-

Cranbourne 4 plants of each. Harkaway 1 plant of each.

<u>Height</u>	<u>Width</u>	<u>Height</u>	<u>Width</u>
0.3	0.7	1.3	1.5
0.6	1.2	1.3	1.6
0.7	0.9	average 1.3	1.55
0.7	1.0		
1.2	1.3		
0.7	1.02		

B. spinulosa var. collina.

0.8	1.0	1.9	2.0
0.7	1.0	1.6	2.0
0.7	1.3	1.75	2.0
0.73	1.1		

As can be seen B. var. collina is generally of more upright growth regardless of whether it grows on sand or loam and has a slightly better growth rate particularly on loam.

B.spinulosa var. cunninghamii. This variety showed variable growth both on sand and loam and had the best overall growth rate.

1.3	1.0	1.8	1.6
1.4	1.2	2.3	2.3
1.7	1.7	4	2.5
1.46	1.3	2.7	2.1

Summarising the figures.

<u>B.spinulosa</u> var. <u>spinulosa</u>	0.7 x 1.0 - 1.3 x 1.5
" var. <u>collina</u>	0.7 x 1.1 - 1.8 x 2.0
" var. <u>cunninghamii</u>	1.5 x 1.2 - 2.7 x 2.1

Western Banksias at Cranbourne

It is now four years since the experimental planting of western banksias was begun at the Royal Botanical Gardens annexe at Cranbourne. This has been time enough to get some idea about the possibilities of the site. The establishment of some species has not been without problems but the majority of species have not only grown but look healthy and have flowered and set seed. Most of the species have been established and there are replicas of up to 10 plants in the case of small plants like B. meisneri.

As can be seen most of the newly described species are included and the possibility of establishing nearly a complete collection is very good.

	<u>Comments</u>
<u>aculeata</u>	small seedlings
<u>ashbyi</u>	growing slowly but healthy
<u>attenuata</u>	" "
<u>audax</u>	" "
<u>baueri</u>	flowered. 1m high.
<u>baxterii</u>	1 m high.
<u>benthamiana</u>	flowered - only one spec.
<u>blechnifolia</u>	growing well
<u>brownii</u>	only one spec. healthy.
<u>burdettii</u>	" " " "
<u>caleyi</u>	growing well
<u>candolleana</u>	" " buds.
<u>chamaephyton</u>	small seedlings
<u>coccinea</u>	plants not difficult to establish - but produce are affected by wind. leaf growth but do not flower.
<u>cuneata</u>	small seedlings.
<u>dryandroides</u>	healthy.
<u>elderana</u>	flowered 1 m. high.
<u>elegans</u>	are promised from Bill Cane.
<u>gardneri</u> var. <u>gardneri</u>	healthy.
var. <u>brevidenta</u>	plants yet
var. <u>hiemalis</u>	seedlings
<u>goodii</u>	healthy
<u>grandis</u>	1m high
<u>grossa</u>	growing well
<u>hookerana</u>	not as healthy looking as some
<u>ilicifolia</u>	healthy
<u>incana</u>	no plants yet
<u>laevigata</u>	1 metre healthy flowered
<u>lanata</u>	30cm but healthy
<u>laricina</u>	50 x 50 cm but not flowered yet
<u>lemniana</u>	1m high no flowers yet
<u>leptophylla</u>	only one seedling
<u>lindleyana</u>	reasonably healthy 50 cm.
<u>littoralis</u> var. <u>littoralis</u>	70cm
" var. <u>semi nuda</u>	3m
<u>lullfitzii</u>	70cm
<u>media</u>	over 1m. flowering
<u>meisneri</u> var. <u>meisneri</u>	30 x 50 cm very healthy
var. <u>ascendens</u>	no plants yet.

Comments

<u>menziesii</u>	1.5m flowering well seed set
<u>micrantha</u>	seedlines 20cm.
<u>nutans</u>	healthy and flowered no seed set
<u>occidentalis</u>	2m high flowering continuously
<u>oreophylla</u>	1.5m flowering but unhealthy
<u>petiolaris</u>	flowered but no seed set
<u>pilostylis</u>	" " " 1m high
<u>praemorsa</u>	1m high buds
<u>prionotes</u>	2m flowering
<u>pulchella</u>	seedlings
<u>quercifolia</u>	no plants yet
<u>repens</u>	healthy
<u>scabrella</u>	70cm and flowering
<u>scepterum</u>	1m high but not very healthy
<u>solandri</u>	flowered 1m high
<u>speciosa</u>	2m high flowered seed set
<u>sphaerocarpa</u>	seedlings healthy
var. <u>caesia</u>	" "
var. <u>dolichostyla</u>	" "
<u>telmatiaea</u>	seedlings healthy
<u>tricuspis</u>	1m high healthy
<u>victoriae</u>	
<u>violacea</u>	70cm high flowered seed set.

BANKSIASNotes on their Occurrence, Characteristics and CultivationSpecies

In Eastern Australia there are 15 species and 7 varieties which are named and others which are intermediate between recognized species. In Western Australia there are 58 species and 8 varieties.

Habitat

In Eastern Australia Banksia spp. are found from Eyre Peninsula in the west to Cape York in the north. While a few species are found in low rainfall areas none are found in the inland basin. Only one species Banksia dentata is common to Eastern and Western Australia. Its distribution being across the whole of tropical northern Australia. In Western Australia they are found in the fertile coastal crescent with one species B.dentata in the Kimberley Range and an increasing number of species being found as one progresses southward. The cut-off point is Cape Arid; the dry calcareous Nullabor Plains appearing to form a natural barrier along the coast to the southern distribution of the species.

Soil Types on which Banksias Grow

Most species favour well drained light soils that are deficient in minerals in particular phosphates. B.marginata the most widespread and adaptable species is found on many soil types including clays and aluvial soils. Like B.robur B.asplenifolia and B.paludosa B.marginata will tolerate wet conditions and may be found in swamps. A number of species such as B.elegans favour calcareous soils but it has not yet been firmly established the role that calcium plays in Banksia nutrition.

Cultivation requirements

Banksias favour open conditions in light well drained soils but a great deal of success has been had with built up beds. Most species respond to slow release fertilizers but this needs to be a fertilizer that contains low amounts or no phosphate. Roots are best left undisturbed and a mulch is recommended to keep weeds down.

Propagation

Banksias can be grown from seed or cuttings but cuttings taken from semi-ripened wood, say 6 months after new shoot growth has commenced are most successful.

Where seed is available this is probably the most useful way of propagating species. Failures with banksias from seed is usually due to seed that has already been infected by fungus. Where seed is uninfected; provided the medium is perfectly drained, most species will germinate in from 1 to 4 weeks. Higher temperatures usually increase speed of germination but a few species in the Eubanksia in particular B. canei and B. saxicola require stratification a 10 week period of cold and wet. Seeds planted in May germinate in September or alternatively the seed may be stratified artificially by placing in a plastic bag on wet paper and left in the crisper section of the refrigerator for 10-14 weeks.

Size of Plants: There are four main classes:-

1. Prostrate with stems lying on the ground - 6 species, 2 varieties.
2. Trees above 3m about 7.
3. Medium to tall shrubs about 30.
4. Low shrubs below 2m about 20.

Horticultural Features

Leaves of prostrate spp. Outstanding flower and foliage plants with a range of flower colours from black through green to yellow with red orange as well as blue in some species. One of the most attractive features is the gradual development of the spikes over a long period and the presence of silky hairs which give the buds unusual textures. Some species have a very high number of flower spikes and all are "bird flowers" producing copious quantities of nectar for honey eaters.

Banksias which have proved hardy in a range of garden conditions.

B. marginata, B. integrifolia, B. spinulosa, all varieties, B. aemula, B. littoralis
B. media, B. occidentalis, B. petiolaris, B. blechnifolia

Outstandingly Attractive Flowers

B. ornata, B. serrata, B. ericifolia and the other eastern Oncostylis with some colour forms better than others. Most western banksias have outstanding flowers both in size and colour but the following is a range of their colours. Red, B. coccinea; Pink B. menziesii, Orange, B. prionotes; B. hookerana, B. victoriae.

BANKSIA CULTIVARS

Unlike Grevillea species there are few Banksia cultivars. This is probably due to the fact that banksias invariably inbreed.

As far as I know the only registered Banksia cultivars are:-

Banksia canei, Celia Rosser.
Banksia 'Giant Candles'.

There is one other which is in the process of being registered. This is Banksia spinulosa var cunninghamii, 'Lemon Glow'.

This is a form selected from the wild with a clear lemon colour. There are a number of other banksias that I know of, regarded as cultivars, but having checked with Geoff Butler of the Australian Cultivar Registration Authority these are not registered.

These unregistered cultivars are mainly selected from the wild. Certainly many of the Austraflores cultivars fall into this category. Bill Molyneux tells me that he has not registered these cultivars because he feels they require more testing. The ones that he regards as cultivars of some potential are:-

Banksia serrata shrubby from Green Cape N.S.W. Grown from seed only a percentage are shrubby.

Banksia spinulosa var spinulosa prostrate from Schnapper Point, N.S.W (30cm x 1m sq.)

Banksia ericifolia var ericifolia shrubby (less than 1m) from the Blue Mts. and another B.ericifolia from the Kanangra Wall that has an orange pink flower.

Bill is also aware of another potential cultivar. This is a prostrate Banksia occidentalis.

There is also a B.marginata prostrate form from Cape Liptrap, Vic. All of these are selected plants from the wild. Perhaps the most unusual of the Austraflores cultivars is a prostrate Banksia integrifolia, this came up in a batch of seedlings.

Two other cultivars have come to my notice, both are forms Banksia ericifolia. One mentioned in an article "The New Natives" in 'Going Native' 1983 is called "Burgundy" and as the name suggests and the photo confirms it has wine (red) coloured bristles. The other B.ericifolia has been given the name of "Purple Pygmy" and has small purple foliage. I have a plant of this in a pot and also one at Cranbourne which was given to me by Peggy McAlister. As far as I know nobody has flowered it.

All of these cultivars are the result of genetic sieving by the environment or throwbacks to a more primitive form. There has been some speculation that for instance in "Giant Candles" that this is a cross between B.ericifolia and B.spinulosa but there is no certainty that this is so. Seedlings of the so called hybrid do not segregate but breed true. This is not the case with true crosses I collected of B.integrifolia x B.paludosa. F2 plants show a range of variation.

Having done considerable collecting from the wild and planted out seedlings at Cranbourne it is to be expected that particular seed batches should show some potential as cultivars. One of the putative hybrids of B.ericifolia collected from the Blue Mts. has very large spikes and is no doubt the same as the registered cultivar "Giant Candles".

There are however others that have some garden potential and perhaps in suggesting this I am aware that if we only select these we defeat the aim of preservation by cultivation. Nevertheless I will list them.

1. A form of B.integrifolia from Cape Patterson from the B.integrifolia - B.marginata ecotone. (The region between two ecosystems) which has an almost prostrate habit with the flowers held above the foliage.
2. A B.marginata with a peach coloured limb from the Kanangra Wall.
3. A B.robur with a very low habit.
4. A putative B.robur x B. oblongifolia.
5. A B.spinulosa var collina from the Carnarvan Gorge which has long entire leaves, bright orange spikes and no perianth parts retained on the cone, obviously a case of genetic drift due to isolation.
6. A B.paludosa from Jervis Bay with a large spike.

It probably is important to grow these unusual and in many cases more "spectacular" plants but at the same time if we are "fair dinkum" about "presentation through cultivation" we should also be growing those other variations that we cull from the wild. The question however is which?

NOTE: I have seed of many of these plants and am prepared to provide some to members. I also have seed of B. conferta both var. conferta and variety penicillata.

BANKSIA CONFERTA

I have grown both B.conferta var. conferta and B.conferta var. penicilata at 2 locations, at the R.B.G. annexe at Cranbourne and also in the garden at home in Mt. Waverley.

At Cranbourne growing in very open conditions on sterile sand it forms a low compact shrub a metre by a metre after four years and flowers after 3 years.

Growing at Mt. Waverley in deep clay loam soil with a heavy mulch it has grown up to 2 metres by 1 metre and even after 4 years it doesn't even look like flowering.

I think the moral is that this banksia if not all banksias, do best in open conditions on soils that are low in nutrients.

Seed of these species varieties are available.

Banksias at Monash University

The Botany Department at Monash University who employ Celia Rosser to paint all the Banksia species are at present preparing garden beds and planting out banksias and are hoping to establish all species of the genus. This garden is on the western side of the biology building.

NOTES FROM THE BANKSIA ATLAS REPORTS - Anne Turner

Interesting and Unusual Banksia Reports

A New Banksia from the Nullabor? Lalage and John Falconer (WA) have made a very exciting find near Point Culver. B. media had already been recorded from the area, which was just about its most eastern location. They have sent specimens and photographs of what is either a new species or a new variety of B. media. The new banksia has smaller, more truncate leaves which are also a more blue-green colour than B. media. The pollen presenter is considerably longer than that of B. media and the flowering time appears to be slightly later. On the fruiting cone, the styles curl against the axis, whereas B. media they remain straight. Further studies of the plants are required before their exact status can be ascertained.

Later information indicates a strong similarity of this species to B. praemorsa found around Albany.

B. conferta var. conferta - Response to Fire. In "The Banksia Book", Alex George states that B. conferta var. conferta is "probably fire tolerant and sprouting from the trunk, but not yet verified". We now know that this is not the case at least with the population growing on the summit of Mt. Tibrogargan (Qld). Tony Bean was there a few months after a severe fire in 1980 and found that "B. conferta had been killed in every case. Fortunately regeneration from seed was more than adequate and the first flowering of the new generation occurred in 1984." During my recent visit to Queensland I was lucky enough to visit this site and found that many more seedlings had germinated within the last two years.

A prostrate form of B. ornata - observed by Clive Brownsea in Little Desert National Park, Western Victoria. It is only 0.3m high, and spreads to 2.5m wide.

An inland population of B. aemula. This banksia is usually restricted to coastal sandy areas but Brian Walters has found it growing 60km inland at Agnes Banks Nature Reserve, near Richmond NSW. Unfortunately, sand mining is threatening the area. The NSW National Parks and Wildlife Service is being approached in an effort to extend the boundaries of the existing Reserve.

B. praemorsa giants! Most books describe this species as a shrub to 4m. However, Ed. Smidt has found trees 6-7 m high with single trunks 30-40cm in diam. They occur at Two Peoples Bay Nature Reserve, WA.

B. spinulosa var.? There may be a new variety of B. spinulosa growing in northern NSW. Whilst in New England area recently I noticed an unusual B. spinulosa in New England and Cathedral Rocks National Parks. Most leaves have no serrations at all - only a truncated, mucronate tip. They are up to 6.5cm long, 0.5cm wide, flat but with slightly recurved margin. There are no lateral veins evident on the undersurface of the leaves.

On leaves alone the plants would be identified as var. cunninghamii but there are two things wrong - 1. These banksias have a definite lignotuber (var. cunninghamii identified by its lack of a lignotuber).
2. These banksias grow as shrubs up to 1.5m high. (B.spinulosa var. cunninghamii is known for its tree like habit.)

Others have found similar plants in Gibraltar Range, Boonoo Boonoo and Werrikimbe National Parks.

B.integrifolia forms intermediate between var. integrifolia and var. compar. Alex George states in Nuytsia Vol. 3. No. 3. (1981) that south of Keppel Bay, Queensland, B.integrifolia var. integrifolia is always coastal whereas var. compar occurs further inland and on the hills. He also states that "some populations in northern NSW and south east Queensland are intermediate between the two". Well, it now seems that these forms may occur elsewhere. A recent collection from Wiseman's Ferry area (NSW) by Andrew and Lois Sourry is thought to represent similar intermediate forms.

B.blechnifolia? An interesting prostrate banksia found by Harald Hoffman near Jerramungup, W.A. The very linear leaf lobes with 3 prominent veins on the undersurface resemble Dryandra pteridifolia. Amongst banksias they are more like that of B.chamaephyton than B.blechnifolia, as is the fruiting cone. However, B.chamaephyton is only known from the heathlands north of Perth, a long way from Jerramungup. Flowering season is keenly awaited to check on the flower colour of this Banksia.

THE EFFECTS OF FIRE ON 4 SPECIES OF BANKSIA, by Lois and Andrew Sourry

Bushfires are of frequent occurrence in the part of the east coast where we live and it was inevitable that a fierce fire which swept through Kendall's Glen Reserve, Ourimbah NSW late spring of 1983 would alter the vegetation patterns. We decided then to monitor these in relation to their response to fire. Thus, the information gathered will be useful, considered in the context of the adaptive responses of Banksias to fire in the Reserve.

Of the four species of Banksia present before the fire, nearly all B.ericifolia var. ericifolia were killed outright at the time of the fire. Now, 18 months on and following heavy autumn rain a proportion of seed has germinated and post fire emergence of seedlings is evident under some dead parent trees. Banksias like many other native plants shed their seed after fire and at a faster rate when fire is of high intensity. If they mature, these new plants will produce seed again after 5 to 6 years. We hope a second fire will not occur within 5 years, otherwise this species could be lost in this area.

Two other species B. spinulosa var. collina and B.oblongifolia, which were burnt to ground level, are now flourishing, multi suckering being very evident from lignotubers, that woody swelling at the base of the stem, which contains buds and food reserves.

B.serrata although mostly senescent before the fire are still carrying mostly burnt leaves. Nevertheless, a few are showing new growth from epicormic shoots on their trunks.

This sequence of events is both striking and familiar, a dramatic decline in population of one species B.ericifolia var. ericifolia, reduction in vigour of another namely B.serrata, while the two fire tolerant species, namely B.spinulosa var. collina and B.oblongifolia rise like the phoenix from the ashes.

BANKSIA POLLINATORS - by Ross Goldingay (NSW)

One of the many categories on the Banksia Atlas record sheet concerns the observation of animals visiting the inflorescences of Banksias and in so doing, acting as pollinators. However, to be effective in this task, the animal must come into contact with the tip of the style where the pollen is presented and later received (see illustrations page 24, Banksia Atlas Instruction Booklet and Supplementary Field Guide).

In general, Banksia flowers are adapted for visitation by large animals (i.e. birds and mammals). However, these animals are not easily observed on the inflorescences by big, noisy humans. Patient waiting will often be rewarded with the sight of a honeyeater visiting and probing on Banksia inflorescences but the mammals are mostly nocturnal and difficult to observe.

In Western Australia, it has long been known that Banksias are visited by mammals such as the Honey Possum. Only relatively recently has the importance of mammal pollination to Banksias been recognised. Dr. Rob Whelan and I have been investigating the role of pollinators to several species of Banksia at Barren Grounds Nature Reserve, NSW, during the past two years. Our initial research required placing fibreglass-netting bags around inflorescences hoping to exclude birds and insects. However we did not recognise the small mammals in our study areas as important pollinators or their determination to do their 'job'. This determination (actually to feed upon the abundant nectar) resulted in these mammals ripping holes in our bags. Subsequent trapping in these areas revealed that the Brown Marsupial Mouse (Antechinus tsuartii) was the main culprit but Bush Rats and Eastern Pygmy Possums have also often been captured visiting inflorescences, sometimes at heights of more than 2m.

Our research has shown that these mammals do carry pollen on their snouts and are in fact, pollinating these Banksias. But how can a Banksia Atlas volunteer record such nocturnal visits? Well, often while these mammals are visiting inflorescences they defaecate, leaving a tell-tale sign of their former presence. The inspection of many nectar-secreting inflorescences in a given area will generally reveal the odd faecal pellet adhering to them if mammals are visiting. This can then be recorded as a pollinator observation (A. Taylor pers. comm.). The three species of mammal mentioned above produce faeces similar to but slightly larger than mouse 'droppings'.

Other small marsupials visit Banksias too! Rob Whelan and I have observed Sugar Gliders visiting B.serrata and B.marginata; in Victoria Vivienne Turner has identified B.spinulosa pollen in the diet of the Feathertail Glider and Steven Craig has observed the magnificent Yellow-bellied Glider visiting B.serrata.

AN ENIGMATIC BANKSIA POPULATION - by Greg Keighery (WA)

Analysis of a distinctive group of Banksia shrubs near Lake Indoon, West Australia, suggests that they may be hybrids between B.hookerana and B.prionotes. They are 5 large dome shaped plants to 3m x 3m, quite unlike the normal tree shape of B.prionotes present in the area, because branching occurs from near the base of the trunk. The habit is more like that of a gigantic B.hookerana. However, the smooth, grey, mottled bark is similar to that of B.prionotes. The 5 plants occur at the base of the eastern side of a large stable sand dune. B.hookerana is found on the flats to the east of the dune. Therefore both species are in close proximity to the supposed hybrids.

The leaves, inflorescences and fruits appear intermediate between B.prionotes and B.hookerana. Inflorescence shape is similar to B.prionotes, but longer than B.hookerana. Fruiting cones are similar in size to both B.prionotes and B.hookerana, but have persistent old flowers which is a characteristic of B.hookerana only. Leaves of the two named species and the unknown banksia are illustrated below.

The characteristics already mentioned are highly suggestive of a hybrid origin for the unknown Banksia. A puzzling feature though is the very high pollen fertility levels of all 5 plants (over 95%). This is unusual as most hybrids are characterised by a high incidence of pollen sterility. Also, seedlings germinated from the 5 plants are uniform, showing little sign of the usual hybrid variation due to segregation of parental characteristics.

I attempted to artificially cross the species, but was unsuccessful. Resolving this enigma must await the raising of artificial hybrids.

BANKSIA ATLAS TO BE LAUNCHED IN VICTORIA, by Alf Salkin, Banksia Atlas Co-ordinator, Victoria.

The Banksia Atlas, an exciting new three year project, has been initiated recently. It is the first Australia-wide plant mapping project to be undertaken using volunteer contributors.

Joint funding by the Australian Biological Resources Study (ABRS) and the Western Australian Department of Fisheries and Wildlife has allowed the appointment of a national co-ordinator and a computer programme to run the project. As the co-ordinator, I will be based at the Western Australian Wildlife Research Centre. It is appropriate to base the Banksia Atlas in Western Australia, because 57 of the 72 named species occur in the State. Moreover, staff at the Wildlife Research Centre have four years' experience in running pilot plant atlas projects aimed at developing suitable systems to run successfully a project like the national Banksia Atlas.

The Atlas project aims to involve interested persons throughout Australia in recording information on the distribution, habitat and biology of Banksias. Information will be sorted and analysed by computer enabling rapid retrieval of desired tabulations and maps for any particular species.

The role of volunteers in assisting in the collection of scientific data is particularly relevant in a country the size of Australia which has only a relatively small number of professional botanists located mainly in capital cities. Collaboration of this nature is well established in other countries particularly the U.K., whose Atlas of the British Flora was completed in 1969 largely on the basis of records contributed by amateur botanists throughout the country.

In Australia, the Royal Australasian Ornithologists Union (RAOU) recently enlisted the help of 3,000 volunteers over a five year period (1976-81) to provide records for their Australian Bird Atlas.

Between 1979-83 the Department of Fisheries and Wildlife selected Kangaroo paws and orchids as the subjects for two pilot projects to test the feasibility of computer based flora mapping using amateur volunteers for field recording. Both projects experience to Wildlife Research Centre staff in running a volunteer contributor Atlas Project.

Banksias were considered to be most suitable for a nation-wide flora mapping project for the following reasons:-

They are typically Australian and have distinctive, easy to recognise flowers.

A field guide and recent taxonomic study are readily available.

They are of considerable commercial value - the Banksia cut flower industry is currently worth in excess of \$1m. a year.

They are important as a food source for honey eating birds, mammals and insects which also act as pollinators for the plant.

Hybrid forms (e.g. B.marginata x B.integrifolia) are known to exist but have been scarcely studied).

One of the main outcomes of the project will be up-to-date maps on the abundance and distribution of all Banksia species throughout Australia. Such maps are the first stage in understanding the environmental factors limiting species distribution.

They are also an extremely important tool enabling immediate assessment of the conservation status of a species by observing its distribution both throughout its range and within protected areas such as National Parks/Nature Reserves. Possible threats to a species' existence by, for example new land releases or mining ventures, can be quickly identified and appropriate action taken where necessary.

Information gained on the habitat and biology of Banksias including pollination mechanisms and the response of different species to fire, will be useful in preparing reserve management plans, particularly when the fragile populations of rare or endangered species need to be safeguarded.

Apart from these valuable functions it is also hoped that the Atlas will provide a meaningful and enjoyable reason for contributors to travel in the bush and to learn more about their countryside and native plants first hand.

How the Atlas will Work

1. Each contributor receives a book of recording sheets, instruction manual, field notebook and map.
2. Completed record sheets sent to the Wildlife Research Centre, Wanneroo.
3. All information received entered onto computer.
4. Six monthly progress report and interim distribution maps sent to all contributors.

A number of field trips are planned both to localities where rare or endangered Banksias are thought to occur, and to remote areas which would otherwise probably not be covered. Contributors to the Atlas will have the opportunity to join in many of these trips.

BANKSIAS - John Harris taken from Central Highlands
Group Newsletter

Some non-technical ramblings on my favourite group of plants. Named after Sir Joseph Banks of course, it is probable that Coast Banksia was among the first plants he saw at Botany Bay.

Most of the 60 Banksia species are found in Western Australia and most of these grow on sandy soils, often associated with limestone and in relatively low rainfall areas. Some of the W.A. species are difficult to cultivate in eastern states, but raised beds of sandy soil with the addition of a little ground limestone offers the best chance of success. Banksias are very susceptible to root fungi attack so it is not advisable to add humus, compost, leaf mould or other material which could encourage fungal problems. Mulching the soil surface is O.K. provided the mulch is kept clear of the trunk. All species appreciate full sunlight.

Banksias do not like fertilizers and are particularly susceptible to overdoses of phosphorus. Light applications of blood and bone are reasonably safe. Chlorosis, or yellowing of the foliage, is a common problem; addition of iron chelate is the recommended cure.

Propagation is relatively easy from seeds, but these must first be extracted by heating the cones in an oven (150°C for half an hour). Banksias are one genus which establish much better in the garden situation if growth to a reasonably advanced size (say 2-3 years in pots) before being planted out.

It is claimed that Banksias should be planted out in autumn when roots will develop and the aerial parts of the plant will then grow rapidly in the following spring. This theory may hold true for light soils and warmer climates, but may not apply if you are planting into Ballarat clays.

Six species occur naturally in Victoria. they are:-

- Banksia integrifolia (Coast Banksia) - mainly a coastal species.
- B.serrata (Saw Banksia) - again a coastal species.
- B.ornata (Desert Banksia) - from the drier country of western Vic.
- *B.marginata (Silver Banksia) - widespread, with large habitat range.
- *B.spinulosa (Hairpin Banksia) - coastal and hill country, eastern Vic.
- *B.canei (Mountain Banksia) - high elevations in eastern Vic.
- *B.saxicola (Mt. William Banksia) - high elevations in the Grampians (Ed.)
For areas like Ballarat, and without having to go into large scale building up of sandy garden beds, etc., I'd recommend the above four (*), plus:
B.ericifolia (Heath Banksia) - a N.S.W. species widely planted and suitable for heavier, wetter soils.
- B.robur (swamp Banksia) - a N.S.W. species, grows naturally in swamps and likes a moist position.

I've also got a B.speciosa (Showy Banksia) and B.integrifolia (Coast Banksia) in, and plan to try B.baueri (Possum Banksia), B.occidentalis, B.media, B.prionotes (Orange Banksia), B.lemanniana and B.serrata (Saw Banksia) in the near future.

Why do I like them? Well they've got character - in their habit, in the great variety of foliage and especially in their flowers/cones at whatever stage of development. And birds don't just like them - the nectar feeders are just crazy about them at flowering time.

BANKSIA PROPAGATION

(from the Shepparton and District Newsletter).

Seed Extraction:

Burn the seed cones by placing them over a fire. Either have your fire in the bottom of a large tin with wire mesh over the top to hold your cones, or burn the cones on your barbecue.

Method

1. Place the cones over the fire, make sure the flames touch the cones. When the seed capsules split, turn over to do the other side. Now, place the cones in a bucket of cold water for two minutes then leave to dry. The seeds should then start to come out of the cones, two seeds in each capsule. Some species are difficult to extract; you may have to repeat the process of burning. Do not try to remove the seed forcibly as this may damage it.
2. This alternative method can be used. Place the cones in an oven for 20-60 minutes at 200°F. Then, as above, cold water treatment, etc.
Seed can be kept in the cones for a considerable time, but seems to lose its viability quickly once extracted.

Seed Sowing

1. Sow insitu (final growing position) Autumn or late Winter in free-draining soil, full sun position. Sow 2-3 seeds in each position, then thin out after germination.

OR

2. Sow one seed in a small pot then plant out when large enough or pot on into larger pots.
Banksias do not like their roots being disturbed and most species are affected by a root rot under wet, cold conditions.

PROPAGATION OF AUSTRALIAN PLANTS FROM CUTTINGS

(From the Geelong Group)

Why Cuttings?

- a) Cuttings produce plants "true to type".
- b) Seed of particular plant not available.
- c) Cutting-grown plants flower at earlier times.

Types of Cuttings:

Rules are not easy to make but, in the different seasons, the types of cuttings used are generally as follows:

- Winter - Hardwood cuttings.
- Summer - Soft tips and shoots.
- Spring - Green hardened lateral shoots.
- Autumn - Green hardened shoots

Collection of Cuttings:

Material should be collected from only vigorous, healthy plants. The cuttings must be prevented from drying out - plastic bags and jars are very good. Do not pack the cuttings tightly in the container as sweating will occur and this may lead to rotting of the cuttings. The material can be kept, if necessary, for quite a long period in a plastic bag in the fridge.

GROWING BANKSIA NEAR COFFS HARBOUR - Steve Clemesha

I live on a 5 acre block between Woolgoolga and Coffs Harbour. Most of the block is a hillside facing North East but we have a bit that faces South too. The house is at the top and I am growing Banksia in the higher parts. We are about a mile and a half by air from the sea. We do not have any problem with salt winds as we must be too far away from the sea. We get no frosts in the higher parts of the block. The soil is a light loam. It contains a lot of rocks, is lightly acid and drains very well.

We get a lot of wind - being on a hill and I think this helps break the effect of summer humidity. Some parts of the block near big Eucalypts are very dry. I will now give you the details of the Banksia species I have growing and what stage they are at.

B.ericifolia var. macrantha. Planted about 5 years ago from seed I collected at Byron Bay. Flowering size bushes. They have seed cones on them from last winter's flowering. I was advised by a friend at Coffs Harbour to cut the dead flowers off as this caused more flowers to form. I did not follow the advice as I thought the seed could be useful to someone and am doubtful if what he said is correct anyway.

B.ericifolia var. ericifolia - sent from near Wollongong N.S.W. Young seedlings.

B.integrifolia var. integrifolia - Collected locally - seeds about 6 months old. Planted out and doing well.

B.integrifolia var. compar. Glasshouse Mts. area Qld., Cunningham's Gap Qld., and near Stanthorpe - easy to grow - doing well.

B.integrifolia from near Ebor in the tablelands west of Coffs Harbour. This seems to be the form A George included in var. compar - last paragraph page 281. It has narrow long leaves but the buds are coloured the same as he describes for B.conferta, the flowers are smaller and are crowded as in that species and I cannot distinguish between the seed cones of the two even though I put them side by side. These were collected in September, 1982 and are growing well - still potted.

B.conferta var. conferta - Mt. Tibrogargan, Qld. September 1982. Some still potted and some planted out. So far it seems an easy one.

B.aemula - This is a local species and it is easy for me to get seed of it. My plants of it are planted out. They are going o.k. but some are a bit yellow. I gave them a dose of Iron Chelates and some are improving.

B.oblongifolia - A local common species. It is very easy for me to get seed of it. My plants of it are doing well.

B.robur - Coolum Beach - about East of Nambour, Qld. Sept. 1982 - doing well - seems an easy one. I have some spare seed of it and can get more if I go to Qld. or Sydney. It does not occur locally. The area we live in is in a gap area for it and also ericifolia var. macrantha.

B.spinulosa var. spinulosa. Mt. Coolum East of Nambour Qld. This has entire leaves (except at tip) is shrubby and has all yellow flowers. It seems easy to grow. Sept. 1982.

B.spinulosa var. collina. This is our common coastal form. I have seen it in 5 different areas between Mt. Tibrogargan and Kempsey. It has serrated leaves and all yellow flowers.

B.spinulosa var cunninghamii This has entire leaves, yellow flowers with black pollen presenters and the young growth of my seedlings is much more downy than plants of collina and var. spinulosa the same age. This is the tableland form and I have seen it at Girraween Nat. Park (near Stanthorpe Qld.) Mt. Warning N.S.W. On the tablelands West of Grafton and at Ebor. All within the area Alex George records var. cunninghamii form. All the plants I have seen at the 2 southern most localities are lignotuberous. At Girraween I saw hundreds of plants of it that were lignotuberous - some had been burnt and were growing again and only 2 or 3 in shade near a creek that were single stemmed. At Mt. Warning I only found one plant. It is a big one and it is not lignotuberous but its leaves and flowers showed no difference that I could detect. I have plants of it from seed collected at Mt. Warning and near Stanthorpe. It grows very easily so far.

B.serrata. This occurs in a few localities about 10 miles North of here. I planted some of these out when young at the same time as I did B.aemula, spinulosa var. cunninghamii and var. collina, B.integrifolia and var. compar. I lost all the serrata but all the others went o.k. I had some losses but they were not bad considering the size of the plants. I now have another batch of B.serrata. I am keeping them potted till they get bigger.

B.saxicola - They germinated well after stratification and now are making new leaves. No problems so far.

B.tricuspus I have 2 plants of this. As W.R. Elliott and D.L. Jones book says, this one dislikes summer humidity in the Eastern States, I have been expecting them to die every since they first came up. They are growing steadily and are about 1½ - 2" high.

B.solandri - I have had trouble with these as they started damping off soon after germination. I bought some "Fongerol" to try and save them and found in the instructions that it is injurious to some Banksia species. I decided to take a risk and try it. The rest of the seedlings rotted off anyway except one. It is o.k. so far. I repotted it to get it out of the soil where the damp off was and gave it a second dose of Fongerol. It still looks healthy though still is at the cotyledon stage.

B.sp. prostrate from Albany - Stirling Range Rd. (near Stirling Range.) Seed sent by a friend who went there. 2 seedlings both doing well - still potted.

B.sp. prostrate Ravensthorpe - Esperance Rd. - same source as the above - 1 seedling - going o.k. but slower to germinate than the above, has 3 true leaves. The first of these 2 may be B.gardneri var. gardneri. The second could be the same but it is too early to tell.

B.conferta. The habitat of var. penicillata is cold in winter - frosts and occasionally snow so it should be able to grow in Melbourne. The habitat of var. conferta is frost free so it will need to be tested carefully. As it is a close relative of B.integrifolia it could easily turn out to be frost hardy.

On a trip to Sydney and the Blue Mountains I found the B.conferta var. penicillata easily as it is plentiful where it grows and many plants were beside the road. It is most attractive. I found a few entire leaves on some plants. It definitely is not lignotuberous but apart from that it seems close to paludosa. I have not seen that species so must wait till my newly germinated seeds of it get bigger. I collected quite a few cones but many seeds were grub eaten. I did not find any B.marginata with it and no hybrids.

It grew in some places with B.spinulosa var. cunninghamii. These were true to Alex George's description - non lignotuberous. The underside of the leaves is white - not pale brown. I suspect the latter only is the case in pressed specimens.

Though non-lignotuberous the plants were not slender and small tree as is photo B, page 392 of George's book. They branched fairly close to the ground. Apparently somewhere between the Blue Mountains and here the non lignotuberous habit gives way though the plants otherwise fit var. cunninghamii. I suspect George recorded it from its northern habitats from herbarium specimens on which no plant habit was noted.

I noticed P.397 that he said at Wynnes Rocks Mt. Wilson specimens of var. cunninghamii have dentate leaves. var. collina extends to Mt. Tomah near Mt. Wilson and could very well be at Mt. Wilson too. I would not be surprised if this specimen is var. collina or an intermediate.

In the Blue Mts. I also found B.marginata, - shrub form - seed cones closed and B.spinulosa var. spinulosa.

Near Sydney I noticed var. spinulosa also, another form of B.marginata - small tree - seed cones closed, B.ericifolia var. ericifolia and a huge form of B.oblongifolia - they were about 9 ft. high. Here they are only 2 or 3 ft.

My plants are doing well. We have had a lot of rain recently but it does not seem to have hurt the W.A. ones. (still potted) and the ones planted out love it (all Eastern sp.). I found when planting some out after the last rain tha the soil drains better than my pots even though we had had about 2 inches of rain the day before.

GROWING BANKSIAS IN BENDIGO VIC. - Ian Evans

Bendigo has about 500mm (20 inches) of rain per year, with most of this falling in winter. When the lowest minimum temp. is approx. 3°C with about 30 frosts per year (we had 5 nights below - 8°C and 1 night of 10.5°C (last year 1928). There is about 300 sunny days per year with the highest summer temp. around 41°C.

The "soil" on my land is mostly rough shaley rock with between 6 and 20cm of gravely topsoil, with a 1 in 10 slope. Water drains freely through the soil, I think this is because of blasting of the bedrock in

nearby mines during the Goldrush. When it is ripped and built into mounds with Gypsum added, a wide range of native plants grow very successfully.

BANKSIA BLECHNIFOLIA (originally brought as B. repens).

Position: - Planted in 35cm of red sandy loam over natural soil, semi shaded by the house in winter, full sun in summer.

Size: - At 3 years old - Pros. x 1.0m.

It first flowered in Oct. '81 with five flower spikes. Last year '82 after heavy frosts the flower buds appeared to be damaged but now January '83 after a growth flush new buds all forming.

Banksia caleyii

Position: - Planted next to B. blechnifolia in deeper sandy loam (40cm) in full Sun year round.

Size: - At 3 years old 0.8 x 1.7m.

It has not yet flowered and the foliage was slightly burnt by heavy frosts.

Banksia dryandriodes

Position: - Planted in a similar position and depth of sandy loam as B. blechnifolia. In full sun year round, this plant suffered from iron deficiency when 1 year old, I treated it with Iron Chelates.

Size: - At 3 years old - 0.5 x 0.9m.

This plant flowered in Nov. 1982 with 36 cones, while I was counting them I found a seed cone so it must have flowered when it was 2 years old without me finding them.

Banksia ericifolia

Orange flowered form.

Position: - Planted in the natural soil at original level in the full sun in a very dry spot.

Size: - At 2½ years - 0.8 x 0.6m.

It has not flowered yet. The tips were burnt by heavy frosts.

Banksia ericifolia

Burgundy flowered form.

Position: - Planted in the natural soil mounded up to above 10cm above original level, lightly shaded by mid afternoon.

Size: - At 2 years, 0.7 x 0.4m.

It has not flowered yet even though it was cutting grown and is very slow growing. Tip growth burnt by the heavy frosts.

Banksia "Giant Candles"

Position: - Planted in natural soil mounded up to about 20cm above the original level in the full sun.

Size: - At 2 years, 1.1 x 0.9m.

It has not flowered yet but is growing reasonably well.

Banksia marginata

Position: - Planted in natural soil at original level in the full sun in a dry spot. It is a low growing small flowered form.

Size: - At 3½ years, 1.2 x 1.4m.

This plant was cutting grown and has flowered annually although 1981 many flower buds died because it was very dry.

Banksia nutans

Position: - Planted in about 50cm of red sandy loam over original soil level in full sun.

Size: - At 3½ years, 0.5 x 0.9m.

This plant was in poor condition with a poor root system right from the start it struggled for about a year. I then cut it back hard, after another year it started to grow and in Nov. '82 it had its first flowers 4 in all.

Banksia petiolaris

Position: - Planted in a mixture of natural clay and sand. About 40cm above original soil level in full sun.

Size: - At 2 years, Pros. x 0.5m.

This is a small plant which has been effected by caterpillars and iron deficiency. It is at present growing very well. It formed 1 flower bud in June '82 but it was burnt by frost.

Banksia praemorsa

Position: - Planted in 50cm of red sandy loam over natural soil in the full sun.

Size: - At 2½ years, 1.2 x 1.0m.

It is growing very well and formed flower buds in March '82 but these died off because of a hot dry spell. It was badly burnt (about 15cm of growth) by heavy frost '82.

Banksia serrata

Position: - Planted in natural soil at the original level.

Size: - At 2½ years, 1.2 x 0.7m.

This plant was struggling due to dryness but after mulching in Nov. '82 and increasing the watering it is improving.

Banksia fullfitzii was planted in Autumn '82 and is growing very slowly at present.

B. baxteri and B. speciosa were planted in Autumn '82, both died in the heavy frosts.

B. sphaerocarpa planted Autumn '82 grew through the frosts but has died in the dry summer.

B. gardneri V. brevidentata was planted in Sept. '82 and is growing well.

All plants were mulched in Nov. '82 and have responded by growing even though we are in the middle of a drought.

BANKSIA GROWING IN BRITAIN - D. Price

Banksias have interested me for some years and plants have been bought from nurseries in Britain which occasionally have plants.

My interest was stimulated by the article on 'dwarf' Banksia which appeared in the September 1982 issue of Australian Plants.

The house is located about 400 ft. above sea level and overlooks the sea at front and back. The front looks out at the Bristol Channel and the coast of Somerset/North Devon while the back looks out on Swansea Bay. We are on the fringe of the Gower peninsula which has been classified as an area of outstanding natural beauty because of the small (mainly sandy) bays/coves which make up the coast. The soil in the garden is loamy, acidic and free draining. The climate is mild with little frost in a normal winter and very rarely is there long lasting snow. Even in the cold winter of 1981-82 snow was only on the ground for 7-10 days.

Plant failure in the past has, I think, been due to overfertilization (phosphorus toxicity) combined with overwatering and transplanting at an opportune time.

BANKSIA CONFERTA var. CONFERTA AND BANKSIA "GIANT CANDLES" - Col. Cornford, Brisbane.

B.conferta var. conferta. So far as is known it occurs naturally only on the top of Mt. Tibrogargan (364 m. above sea level) and on the top of Mt. Beerwah (556m A.S.L.). It has been seen growing in both places and it exists in very shallow soils, in some places almost pure rock. The soils that are there are derived from the basic rock of the mountains, are dark grey in colour and probably of reasonable fertility. Plants growing in this situation are exposed to full sun and to strong winds. There are a few old specimens growing in gardens in Toowoomba.

I don't know of any plants of Banksia conf. v. conf. growing in Brisbane but it is quite possible there is some around.

Banksia "Giant Candles" is reputedly a hybrid of B.collina and B.ericifolia. We planted one here just on 4 years ago. It is now 5m high by about 2.5m wide. It suffered badly from iron deficiency in the first year but we got over that problem and it sported a few flowers in the second year. Last year it really flowered. My wife did a bud count at one stage and estimated there was around 150 buds on the plant. It is coming into bud now and appears to be just as good this year. The flower spikes grow to a length of up to 400mm and are a rich deep gold in colour. So far as I can determine it has set no seed but being a hybrid it may not be the same anyway.

GROWING W.A. BANKSIAS IN BRISBANE - Heather Robb

A few years ago I decided I would grow W.A. Banksias, especially the ones people said I could not grow. So I started to propagate by using the following method.

While my sharp sand is baking in the oven, I have my tubes washed and soaking in fongarid, also the name tags. I prefer individual rather than community planting for banksia. The baked sand is then soaked in fongarid for approximately 20 minutes. Seed is sown and then placed in my bush house which gets the morning sun and the early afternoon sun. I have had no problems with germinating, but when I harden them up they topple. One batch I completely forgot about, assumed they had died, and when I finally looked at them, they were as healthy as anything - until I decided to harden them up. They all died within weeks. My next batch are germinating quite rapidly and I think I will forget about them - just leave them in the bushhouse where they are happy. Perhaps my mistake was trying to harden them in the Brisbane summer? Although I did this gradually.

The plants that have been planted are in a garden bed designed especially for W.A. plants. The beds were filled with slightly acid sandy soil to a depth of 1-2 feet. All plants are under established Casuarinas and are 30' - 40' from the sea. They receive shade cloth covers during the heat of the day, usually only for their first summer, and six weekly applications of fongarid during the summer. They are inspected regularly for any sign of disease and of course I talk to them regularly.

I thoroughly recommend *Banksia media* for Brisbane gardens. My plant is about 4' x 5' and has only minimum protection from strong sea breezes. At the moment it is laden with bud about 50 have been counted. It is very hardy having gone under water twice and also a drought. It was also transplanted twice and almost killed with too much iron chelates. *Banksia coccinea* - I killed two with iron chelates and two more died from damp off. *Banksia occidentalis* - one drowned, one died, and one still alive now going on for 6ft. *Banksia grandis* although slow is looking well, and two specimens of *B. repens* are also doing well. New planting of *B. nutans*, *B. victoriae*, and *B. menziesii* are doing well.

The garden is continually being enlarged and more *Banksia* species will be planted. All of the eastern species are doing extremely well and are ideal for coastal planting.

GERMINATION AT MACQUARIE UNIVERSITY - Prof. Keith Cairncross

At the University we have germinated 47 varieties of *Banksia* (our latest successes being *B. saxicola* and *B. canei* - these required storage at 4°C for 3 months before any sign of life appeared!). We now have 200 plants in one of the glasshouses. Overall our germination strike rate is better than 80% and following germination we have lost only 2 seedlings.

We germinate in petri-dishes and vermiculite - plant growth cabinet at 14°C. Following germination we place the seedling in damp river sand in a 12cm (3 cm x 3 cm) plastic pot and water by capillary action, twice weekly. The glasshouse is NOT heated.

When the seedlings have developed 4 true leaves we place a few (3-4) nodules of asucocote (native) into the sand - this to ensure leaching of nutrients (remember no overhead watering).

Intend next to group the various species taxonomically as far as possible. However I am tempted to try genetic speciation using root-tip enzymes and gel electrophoresis. I can see no technical reason why it should not work, and if undertaken will give a clearer infra (inter) species identification. Such information would be useful in deciding both growth compatibility etc. as well as providing a better means of identification rather than anatomical description. We have the equipment and the know-how for animals - so why not Banksias?

AN EXPERIMENT IN NORTH QUEENSLAND - Paul Sutton

I have a small section of my backyard, of black sand and I am interested in trying some Banksias both for their intrinsic value and to attract further species of birds - at present I have 34 species of birds making use of my garden and hope that expanding the variety of plants may induce more birds to visit.

I am quite happy to experiment. Taylors Beach is about 20km East of Ingham and 130km north of Townsville in North Queensland. We are in a wet monsoon area (26 in. so far this week!!) Usually receiving heavy rain from Jan. to April, a little patchy winter rain followed by a long hot dry spell from July to January in which it gets dry enough for the "trees to chase the dogs around". Hence a plant here has to survive some extreme conditions although a plentiful underground water supply helps even things out.

My particular location is on geologically recently reclaimed land supporting a range of Acacia and predominantly Enc.tessillaris close to the shore - mangroves grow in a depression across the road from us. As you can imagine we tend to have excellent drainage and even this weeks' rain has only left a few puddles. I use mulches quite extensively to help retain soil moisture in drier times for those plants which need this help.

BANKSIA GROWING AT KEMPSEY - Inez Armitage

Somewhat belatedly I am beginning to take more than a passing interest in Banksias, largely I think because I have had such success with those planted here (all Eastern species). I have reasonable sort of soil, about 8" to 10" loam over clay. Annual rainfall is about 50". The years since I came here to live, 3½ Years, have been declared to be "droughty" but rainfall has still been in the 40's. We have twice had 10" to 13" in about 3 days which apparently contributed to the definition of "droughty" because of too much runoff.

The following are growing extremely well. All have flowered except the B.serrata . (or in bud now).

- 4 B.serrata
- 2 B.marginata
- 3 B.spinulosa
- 1 B.paludosa
- 4 B.oblongifolia
- 1 B.integrifolia
- 2 B.ericifolia

GERMINATION AT WARNER'S BAY - Allen Foster

In regards to my cuttings of *B. collina* I have had moderate success 40-45% in coarse river sand only, 30% in 70% coarse river sand 30% peat, 40% in 90% coarse river sand, 10% peat, all under 32% shade cloth, and mist and heat.

I believe, I may have had more success if I had have taken my cuttings early morning after rain, rather than mid-morning after no rain.

I have planted several of them out and all are growing well.

BANKSIA GERMINATION TIMES. - James Stuckey.

Further statistics on the germination times of banksia seed under conditions outlined in BANKSIA REPORT NO. 6. Seed was planted in the first week of November 1984.

<u>SPECIES</u>	<u>DAYS</u>	<u>SPECIES</u>	<u>DAYS</u>
<u>ashbyi</u>	17	<u>hookerana</u>	18
<u>attenuata</u>	14	<u>incana</u>	17
<u>baxteri</u>	18	<u>laricina</u>	17
<u>brownii</u>	18	<u>lemanniana</u>	18
<u>burdettii</u>	12,18	<u>leptophylla</u>	15
<u>coccinea</u>	12,18	<u>media</u>	18
<u>dryandroides</u>	18	<u>meisneri</u>	18
<u>goodii</u>	45	<u>menziesii</u>	9,13
<u>grandis</u>	12,16	<u>occidentalis</u>	14,17
		<u>prionotes</u>	12,15
		<u>pulchella</u>	18
		<u>sceptrum</u>	16
		<u>seminuda</u>	12
		<u>victoriae</u>	18

DOUBTS ABOUT LIME - Jeff Irons

References to *Banksia* in Australian Plants suggest that additional lime is the key to success with them in East Australia - perhaps that is incorrect if the geographic area is larger than that receiving the East Australian climate.

Now, *Banksia marginata* grows on Tasmania's Mount Wellington. The lower slopes of the mountain are mudstones, then there is a sandstone community, and finally a dolerite gap. In other terms - all the mountain's soils are acid. Hobart's water is soft and the principal alkaline earth in it is magnesium. Calcium is absent. I believe that *B. marginata* grows on the sandstone.

I cannot see how lime can be important in the plant's growth, so is it a special case or is the calcium quest a wrong turning? Is magnesium the key?

BANKSIA GROWING IN PORT PIRIE - Gary Leske

The garden has only been established for 3 years and consists of various raised beds of a very sandy loam (Bark mulch). PH is 8 to 9. In several areas (where *B. prionotes*, *B. integrifolia* were planted) I added a small amount of sulphur, alum. and yacka bark to the top 18". This top 18" sits on a very clayey subsoil.

Throughout the 3 years I have attempted to grow a wide variety of *Banksias*. The high PH has been the main problem with iron deficiency causing problems.

BANKSIA prionotes

This has been the most successful planting to date with flowering just commencing. The largest buds are presently 3" high and there are 10 flowers present. This plant has made rapid growth from a 6" seedling to its current size. It was tip-pruned after 6 months to promote branching.

It has shown little yellowing other than a few of the bottom leaves.

BANKSIA ericifolia

Flowered with one flower after 2 years. Since that time has made little growth although recently, with warmer weather, it is starting to grow more rapidly. Some yellowing on the plant is of concern.

BANKSIA integrifolia

Rapid growth although it should have been tip-pruned as it is very much like a sapling at present. Several leaves are showing the iron deficiency symptoms but no major problems. There are another two of these in Port Pirie, both around 8-10' and flowering regularly.

- BANKSIA serrata Planted as an advanced plant 18" high. It is now 3' high but shows considerable yellowing and I have treated it with iron chelate 3 times. Still making rapid new growth but iron deficiency is a major problem.
- BANKSIA praemorsa 2 years old. Tip pruned when young. Has grown from 6" to 18" and very bushy. Extremely healthy at present.
- BANKSIA baueri 2 years old. Approx. 12" x 8" slow growing but looks very healthy.
- BANKSIA collina Planted 3 years ago and despite repeated treatments with iron chelate has made very little new growth. Dying from iron deficiency/High pH.
- BANKSIA grandis 3 years old - very little growth and struggling because of High pH.
- BANKSIA spinulosa
B. repens,
B. coccinea. B. speciosa, all dead from high pH. Never grew any more than 4" high.
- BANKSIA media Making slow but steady growth. Recently tip-pruned and looks healthier since that time. One treatment is iron chelate.

Other Banksias planted but only 1 year old and still 5-10" high are Banksia marginata, occidentalis, ornata, caleyi, hookerana, laricina and sphaerocarpa.

Of these occidentalis and ornata are growing rapidly. All of the others have shown high pH effects although chelate treatments have been beneficial with marginata and hookerana.

SUCCESSFUL BANKSIA GRAFTING TRIALS IN SYDNEY - Tony Henderson

Approach grafting techniques have been used using plants of similar diameter to simplify the process. A variety of results have been obtained but successful grafts have been made onto Banksia conferta with B. laevigata var. laevigata and B. speciosa.

Another interesting success is B. meisneri to B. nutans to B. ericifolia (rootstock).

Cotyledon grafting has produced successes as indicated below:

- | | |
|----------------------------------|--|
| <u>B. serrata</u>
(rootstock) | (<u>B. praemorsa</u>
<u>B. lemanniana</u>
<u>B. speciosa</u>
<u>B. menziesi</u>
<u>B. blechnifolia</u>
<u>B. petiolaris</u>
<u>B. baxteri</u>) |
| <u>B. ericifolia</u> | (<u>B. leptophylla</u>) |

EXPERIENCES AT GLENBROOK N.S.W. - Ian Fowler

Initially I spurned pot culture, used introduced and selected soil, even sunk a concrete stormwater pipe into an embankment for the glory of B.coccinea but after two seasons it went to heaven to join other W.A. banksias from my garden. I have learn't little more than someone could (or did) told me. e.g.

- but
1. Experience is misleading
 2. Experience is misleading
 3. Banksias like water (if not the likely consequences of plenty).
 4. Banksias like sun.
 5. Banksias like air - room to grow roots and shoots.
 6. The Western species reputedly the easiest to grow - are!
 7. I'm addicted!

What's new?!

Unfortunately there is little prospect of me being more than a dabbler so all I intend to try now - is a lot! - i.e. to grow several W.A. species in large pots; "cutting clone" some eastern species and try grafting onto these in a small scale but systematic long term programme. Dreams!

I don't know if the "limestone effect" is still controversial but I wondered if some subtle influence may be related to limestone contaminants - say Strontium which often accompanies calcium in minerals.

I used Fongarid when in great Phytophthera fear - its use was followed by wholesale death (my poor Victoriae!) Later I noticed that the insert had an inconspicuous warning that Fongarid was toxic to "some species of Banksia". However Alex George seems to give fongarid an unqualified ON in "The Banksias".

My most established B.praemorsa is in an embankment of clay (potters clay - but tinged with Fe) with a southerly aspect -which stays moist in winter and also receives, see page from a south-easterly slope. However the embankment has a base and core of sandstone and concrete slabs and boulders! So perhaps it's "made-earth" environment is pathogy free, and airy down below - I don't know, but it's in bud at the moment.

BANKSIA SPINULOSA VAR. SPINULOSA - Rosalie Eustace - Brisbane

Grows just outside the Redland Shire on the hillside above the Leslie Harrison dam. It has both golden yellow style and dark red style forms intermingled with the occasional light red style plant. There is considerable variation in the leaf however which does not seem related to the form of the shrub or flower colour. The flower spikes in general are well presented on long stems and they bear large numbers of blooms. The height of the shrubs varies between 1 metre and 1.5 metres but the area is usually burnt about every two years, which is probably why the shrubs also tend to be spreading rather than upright. It regrows from a lignotuber.

SEED SOURCES

Bushland Flora, P.O. Box 435, Subiaco, W.A. 6008
 Kandelka Native Seeds, Ridgeway Cres. Valley Heights, N.S.W. 2777
 Nindethana Native Plant Seeds, Narrikup, W.A. 6326
 K.G. Seeds, Box 182 Albany W.A. 6330
 H.G. Kershaw, P.O. Box 88, Mona Vale, N.S.W. 2103
 Goodwin and Sons, Bagdad, Tas. 7407
 Tasmanian Forests and Seeds, (T. Walduck) Summerle as Farm, Kingston Tas. 7150
 J. Gotham and Partners, P.O. Box 29, Kingston A.C.T. 2604.
 Watkins Seeds, 21 Glover Street, P.O. Box 468, New Plymouth, N. Zealand.
 Grantville Native Nursery, Grantville, Vic. 3984.
 Harper Seed Co., P.O. Box 111, South Perth, W.A. 6151.
 Vaughans Wildflower Seeds, P.O. Box 66, Greenwood, W.A. 6024
 Seeds for Preservation (T. Hall), Lot 6, Badgerup Road, Wanneroo, W.A. 6065
 Aust. Tropical Plant Supplies, Pinnacle Rd. Julattan, Q. 4880
 L.J. Langley Aust. Seed Co., Robertson, NSW, 2577.
 W. McReaddie, Western Wildlife Supply 'Terrara', P.O. Box 90,
 Gilgandra, 2827.
 Northern Aust. Native Seed Supplies, L.Brigden, Box 4003, Casuarina, NT,
 5792.

S.G.A.P. REGIONAL SEED BANKS

NSW	Mrs. S. Heins, 111 Woodland Village, Kitchener Rd, Cherrybrook, 2120.
Q	Mr. B. Arthur, Lot 122 Steel Rd. Logan Village, 4206
VIC	Mr. A. Salkin, 38 Pinewood Dve, Mt. Waverley, 3149
SA	Mr. J. Porter, 3 Barcroft St. Pasadena, 5042.
WA	W.A. Wildflower Society, P.O. Box 64, Nedlands, 6009
TAS	Mrs. M. Walker, P.O. Box 468, Sandy Bay, 7005
ACT	Ms. L. Thornburn, P.O. Box 207, Civic Square, ACT 2608.