AUSTRALIAN NATIVE FERNS: SELECTION AND DEVELOPMENT OF COMMERCIALLY ACCEPTABLE FORMS

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The New Environment. The progress of modern civilisation has little feeling or sentiment for plants that lack compatibility with the new environment it creates. Among the most severe casualties are the indiginous or "native" ferns. In Australia, without positive action, many exquisitely beautiful and uniquely different native fern forms are virtually doomed to extinction.

Not only is their natural habitat being physically eliminated by man's machines, drowned under feet of water by his dams, buried under the concrete tanks of his sewage treatment works, swamped by the excessive floods that follow his urban and rural development, and poisoned by his polluted creeks and rivers, but the natural habitats themselves are being invaded by foreign and devastating forms of life.

Lantanas and privets are ravaging our secluded gullies and gorges; imported snails and slugs are chumping their way through millions of fern prothalli every night; imported strains of grasses and weeds are penetrating our remote wildernesses and, as more nutrients seep into our waterways, liverworts, algae and mosses are smothering the minute fern prothalli. More insidious and more potent are the plant diseases. Anthracnose, the black spot disease, attacks but seldom destroys mature plants but is most effective in the elimination of entire colonies of young ferns. Very few species of our native ferns escape the attacks of anthracnose and even the sky epiphytic climber, *Arthropteris tenella*, is rapidly disappearing and not being re-established.

Tricothecium roseum, a common disease that normally does not attack green plants has developed a healthy appetite for fern prothalli, and is prolific on the rainforest floor. *Rhizoctonia* is simply wiping out extensive areas of ferns in locations where its activities have not previously been observed. The occurrence of *Pythium and Rhizoctonia* in domestic water reticulation around the perimeter of many rain forest areas could be a contributing factor. Rust is taking its toll of our majestic "King" fern, — (*Leptoteris barbara*) (*Todea barbara*), and the dainty little blanket fern of the dry inland is disappearing — the cause unidentified.

Selection and Development for the New Environment. We believe that the most significant method of saving and perpetuating the many rare and beautiful forms of our native ferns is through the selection and development of plant forms. Plant forms that

conform to the requirements of urban and domestic usage and can satisfactorily compete in the market place of tomorrow.

In the northern Hemisphere, selection and development has been a continuing process for centuries. In Australia, we are only just beginning, and time is already running out. Australians, in general, and the world at large have little or no knowledge of our native ferns and cannot recognise them by sight or name. Consequently every native fern produced for the market must have sufficient appeal in its own right to attract ready and appreciative admirers.

It has been our observation and experience that within a species, native ferns can be selected, bred, and development to certain characteristics that are genetically inherent although not generally obvious, in much the same way that a terrier dog can be bred to have black or white ears. For example: *Sticherus flabellatus*, as it is generally obvious, has a long running rhizome, seldom branching, with fronds arising sparsely up to 18" apart, tall and rangy. On the side of a mountain, "The Castle" on the N.S.W. south coast, is a patch of *Sticherus flabellatus* hanging grimly to the windswept face of a vertical cliff, exposed to sun, heat, cold and persistent winds. These plants have probably existed there for many thousands of years, and have developed their own latent characteristics to cope with this particular environment. Rhizomes are short, branching every two to three inches. The fronds, stiff and erect, short, dense, and compact arise as frequently as every inch along the rhizome. From this plant has been bred the *Sticherus flabellatus* we are producing today. Stiff and erect fronds, reasonably dense and compact, arise at intervals of 1" to 1½" from short frequently branching rhizomes — in brief — a good commercial type of plant with an inbuilt hardiness.

Natives that can be Developed Commercially. The range and types of ferns that we believe can be successfully developed are quite extensive and include approximately two-thirds of our total fern population. In broad scope the range includes miniature filmy ferns of the family *Hemenophyllaceae*, fully grown at one to three inches in height and ideal for terrariums, brandy balloons, bottles and jars. Others with commercial potential are:

The giant *Angiopteris evecta* tree fern with a spread of 30 ft. in its native jungle.

The bird's nest fern, *Asplenium nidus*.

Staghorns and Elkhorns, *Platycerium grande* and *P. bifurcatum*.

Weeping ferns, *Lycopodium phlegmaria* — the Queensland Tassel Fern, and Australia's most beautiful basket fern, the weeping *Polypodium subauriculatum* 'Knightii'.

Climbers such as *Microsorium spp.* and *Arthropteris.*

Trailing ferns like *Asplenium flabellifolium*, the necklace fern, and a fascinating assortment of shape, size, texture and colour.

Search Development and Results. For more than thirty years we have been searching, breeding and developing, and have canoed endless miles of rivers, lakes and swamps, climbed mountain after mountain, descended into innumerable gullies and gorges and collected and raised literally millions of Australian native ferns from spores.

The specific characteristics sought vary from species to species and include —

Compact Growth, as previously discussed with *Sticherus flabellatus* is one of the most successful areas of development, as so many natives are rather lanky, spindly, and sparse with their fronds. These are wonderful attributes for a rain forest floor, but a calamity as a pot plant.

Hardiness. *Pellaea falcata* is a beautiful fish-bone fern, deep green, glossy, coriaceous. Its main problem is that at the slightest provocation of wind, dryness, heat or cold, it defoliates leaving naked frond midribs.

Search and development has produced a compact *Pellaea falcata* which does not defoliate except under the most extreme of adverse situations. From the Comboyne Plateau in N.S.W. we have collected spores of the most hardy *Asplenium flaccidum* in an epiphytic situation. The resultant plants are magnificent basket ferns, their five foot trailing fronds having a unique fascination, and yet tougher and hardier than any *Nephrolepsis.*

From the Atherton Tableland of Queensland we have collected spores of *Cyathea bayleyarna* and *C. rebecia* tree ferns that have withstood thirteen frosts in a row in our search for cold tolerant plants for the temperate cities.

Balance and Form. *Pteris tripartita* is considered by many as a weed among ferns, soft, fleshy, tall and lanky. Taken from the rain forest it is generally badly shaped and unable to hold its heavy fronds erect. Our search has produced a specimen of perfect balance and form, its fronds robust and erect. At six to eight feet in height with no trunk it has the appearance of an exotic fan leafed palm but infinitely more interesting.

Disease Resistance. In our production we are constantly selecting plants with apparent disease resistance. Disease is the greatest single problem in a native fern nursery.

Adaptability to Commercial Production. The main problems in the commercial production of native ferns are economic; the slow rates of growth, and factors adversely affecting the germina-

tion and growth of spores. Many native ferns offer plantlets on their fronds, and others may be divided by rhizome divisions. However spore production is the most economically efficient method.

Because of the problems involved in production, a number of species currently being produced are not at this stage economical propositions, but we believe they will become so as their particular requirements are better understood.

Some Problems Involved in Spore Production.

1. Many spores collected from their natural environment have such a high surface tension that they float as dust on water and cannot readily be wet. This condition appears to vary with the age of the spores and is far less a problem in spores from commercially produced plants. The use of commercial wetting agents has produced no successful results.
2. Some spores have a built-in time dormancy factor. Only 5% to 10% of *Cyathea cooperi* spores germinate in the first year. Others will struggle through for up to seven years.
3. Some spores have a temperature dormancy factor. *Cyathea bayleyana* spores (these tree ferns generally grow above 2,000 ft. altitude) germinate much more successfully if exposed to temperature variations from 10°C to 30°C.
4. Spores may carry algae, and a range of diseases including *Tricothecium roseum, Pythium, Botrytis* and *Rhizoctonia*, all of which will attack and destroy the young ferns at a very early age.
5. Young prothalli are readily destroyed by fungicidal sprays, and these cannot be used with any degree of safety till at least forty-seven days after germination.
6. Some spore prothalli, particularly *Cyathea cooperi* and *Lastreopsis shepherdii* have a peculiar attraction for nutrient salts in the soil and these form crystals on the prothallus, subsequently burning and destroying the tissue.
7. Some spores have specific requirements of temperature, pH., aeration, and growing media. For instance, the giant hare's foot fern, *Davallia solida* is best germinated on the bark of *Casuarina cunninghamii*, the river she oak.
8. It is suspected that some spores have a symbiotic relationship with certain fungi and some of our lycopodiums have a mycorrhizal symbiotic relationship. As the spores germinate, the prothalli colourless, instead of green, grow underground instead of on the surface.
9. Many spores have their own peculiar problems *Davallia pyxidata*, a native hare's foot fern, is deciduous. The rate of

germination generally deteriorates very rapidly, and spores must be sown as soon as collected which is in December or January. Spores will germinate at a temperature of 17°-23°C. The young sporophyte only just commences to send up its juvenile leaves when the plant defoliates and is ultimately lost. To prevent defoliation, temperatures must be raised to a range of 25°-30°C from mid-May and maintained till the end of September, with daylength maintained at a constant 14 hours.

10. Some natives, such as the giant tree fern, *Angiopteris evecta*, which progressively drop their lower leaves with age, do so before the spores they carry have matured and they remain tightly enclosed in the sori. The collection of clean mature spores in these cases is very difficult.

As an operation we are very small. The task that we tackle is enormous. In implementing the final stage of our programme, the commercial production, we have had to cope with the establishment of a wholesale nursery in a specialised field where there are no precedents plus the added involvement of moving the entire set up. We are perfectly frank and honest when we state that under these circunstances, we are in no position to invite inspection of our developmental programme. Any such inspection would be an embarrassment both to our visitors and to ourselves. We have no facilities for handling mail orders and enquiries.

However, we are working to this end and anticipate that within two or three years we will have adequate facilities to display our results and endeavours to all interested parties. At the same time we hope to develop facilities for despatching clean disease-free spores overseas. All plants that we produce are of necessity being fed into the local Sydney wholesale market. It is no longer a forlorn hope but rather a sure knowledge that the unique beauty of many of our native ferns will be perpetuated while ever there is a market.