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Hybridising Orchids – an Australian story: The breeding of the perfect "red" *Dendrobium kingianum*

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"Australian orchids such as *D. kingianum* were gathered from the bush to decorate exotic orchid exhibits at shows and afterwards were often thrown out or left to rot under benches… prevailed until the last two decades"

Adams and Lawson (1995)[1]

Introduction

Hybridisation of native orchids in Australia commenced much later than in other parts of the world. The first Australian native *Dendrobium* hybrid made in Australia is *Dendrobium* Ellen registered in 1928. With an increase of interest in native orchids and the availability of laboratory facilities for orchid seed culture, there have been increasing activities in hybridisation in Australia since the1960s. Many of us are familiar with the work of Ira Butler whose contributions to native orchid hybridisation have been commemorated by the Ira Butler Trophy awarded annually to the best Australian native hybrid judged. However, much less is known in the orchid world about the contributions made in the breeding of the "red" *Dendrobium kingianum* by the late Alwyn Flanagan and his friends of the Hastings Kingianum Growers Group (HKGG) in rural New South Wales, Australia.

The orchid

Dendrobium kingianum (The Pink Rock Orchid) is uniquely Australian, found only in distinct populations along eastern Australia between the Hunter Valley, New South Wales and Central Queensland Highlands.

Figure 1: *Dendrobium kingianum* as a lithophyte in its natural habitat

It is commonly found growing on the east and northfacing cliff faces and rocks in open forests or along forest creeks (Figure 1). Naturally, it is a very variable species, not only in floral form and colour but also in vegetative form such as the height of the pseudobulbs and even leaf colour. The species varies a lot from area to area. Colour of the flowers varies tremendously from white to red, with pink being the most common, and hence the common name of "the Pink Rock Orchid". However, full red is not commonly found in the natural populations. As a matter of fact, what the orchid growers refer to as "red" kingianum has a deep purple violet coloration, very attractive, vibrant and mesmerising.

How did it all start?

The Hastings Kingianum Growers Group, was made up of a small group of native orchid enthusiasts and was active in breeding *Dendrobium kingianum* for over twenty years between the 1970s and the 1990s, was based at the township of Wauchope in mid-north coast of New South Wales, Australia. Geographically it was conveniently situated in relation to the natural habitats of this orchid.

Alwyn Flanagan was a local farmer, born in Comboyne and later on moved to the family property at Tom's Creek, near Wauchope to breed Hereford cattle.[(2)] Growing up in rural Australia, he developed a love for the Australian native orchids at a relatively young age. Alwyn shared his love of native orchids with a few members of the local Hastings River Orchid Society. Like many other orchid societies of that time, members were mainly growing and showing exotic species and hybrids. Native orchids were not popular amongst the members. The first orchid Alwyn owned was a raspy root orchid (*Rhinerrhiza divitiflora*) which initiated his lifelong interest in native orchids. For many years in the1960s and the 1970s, he and his mates spent many hours roaming the bush of the region looking for good specimens of native orchids. Those were the "frontier" days when virtually all the native species on sale in nurseries were collected from the wild. Being close to the natural habitats of many native orchids, Alwyn and his native orchid friends believed the best plants were still in the bush and it was only natural for them to go helping themselves. According to the old timers, it was not unusual for people to go bush in the morning to collect orchids and then to bench them in the evening orchid meetings. However, unlike the professional collectors of the time which were responsible for the vast depletion of many native orchids in Australia, Alwyn and his friends, like many other native orchid hobbyists would only collect a few canes off the side of a plant and would leave the rest of the clump there to carry on as nature intended. Alwyn always had a soft spot for *Dendrobium kingianum* and with time, he had a good collection of this orchid in his orchid house. At the same time, he gradually came to realize that there was another way to get his dream orchids.

Formation of HKGG and the breeding work

As an orchid grower, Alwyn Flanagan frequented the local Wayside Nursery at Port Macquarie and soon became friends with the owners, Bill and Jean Cannons who were pioneers in hybridising Australian orchids. For his twentieth birthday present, he was given a *Dendrobium kingianum* by the Cannons. Encouraged by the Cannons and witnessing the big improvements in floral quality shown in the exotic *Cattleya* and soft cane *Dendrobium* species achieved by breeding, he gradually realised the potential of improving native orchids via breeding. To Alwyn, this could be a better way to obtain his "perfect" kingianum than trying to stumble onto it roaming the bushland.

Alwyn shared his ideas of hybridizing *Dendrobium kingianum* with other native orchid enthusiasts and soon got a group of friends involved; first Harry Klose and subsequently they were joined by Alan Garrett, Rod Graham and others. The Group, often referred to as the Hastings Kingianum Growers Group was never an official organization, but merely a group of local native orchid enthusiasts sharing the same passion of creating the perfect "red" kingianum. They had a set of criteria in terms of their "perfect" kingianum[(3)] :

1. sixteen well- shaped flowers per inflorescence;
2. deep plum or beetroot colour all over (including the labellum);
3. flower size of 40 mm across and
4. raceme capable of holding flowers erect.

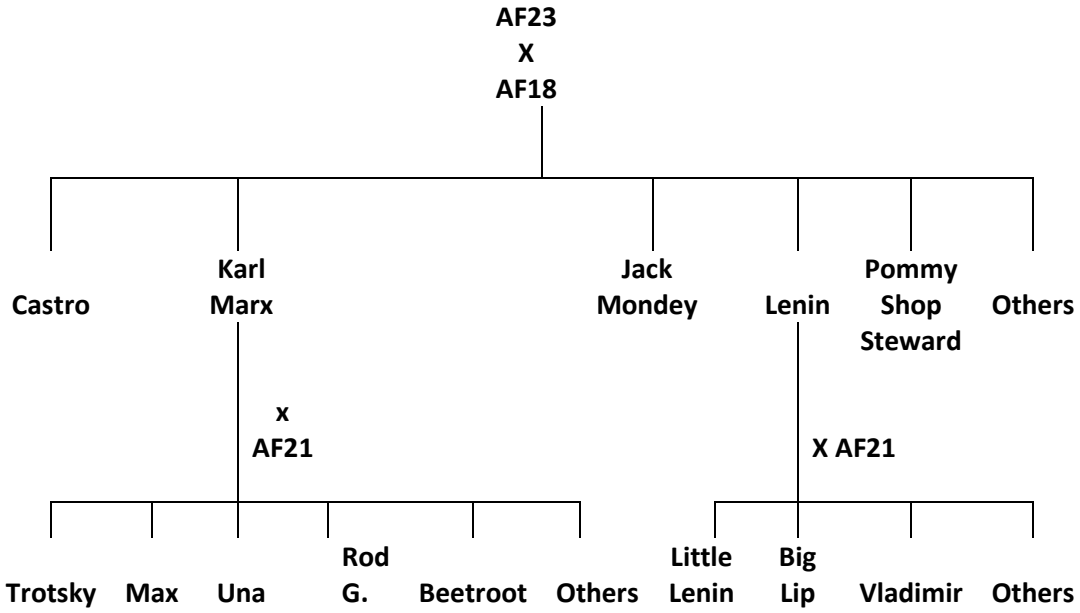
Therefore, they attempted to improve many aspects of the *Dendrobium kingianum* plant, not just the flower colour but also flower size, floriferousness as well as the habit of inflorescence. Throughout their breeding efforts, they used this set of criteria for the selection of parents and the assessment of progenies of the different crosses. Members of the Group used plants selected from their collections for this breeding project, all of which were collected from the natural habitats and met up from time to time to review their successes or setbacks and to plan their next course of actions. They all contributed by sharing and growing up seedlings from the different crosses they made and hence, as a team, were able to evaluate the results of their breeding efforts over a large number of offspring.

Not knowing much about the genetics of the plant *Dendrobium kingianum*, they could only start by trial and error. However, the experience of Alwyn as a cattle breeder and the genetics that Harry learnt from his university days must have proven useful in formulating their approaches. The Group realized the importance of selecting good parents for their breeding project. They started their breeding project using the best bush collected plants in their possession, all from the Gloucester/Bucketts area of New South Wales. As a first attempt, Alwyn and Harry tried to "self" the clone 'Ha Ha', which was at the time regarded as the best "red" kingianum collected from the wild but they had difficulty in obtaining any fertile seed. "Selfing" refers to the method of seed generation in which a flower is pollinated manually using its own pollen or pollen from another flower of the same plant and is a commonly used technique in orchid breeding. However, to their surprise and disappointment, after many attempts they ended up with only one fertile capsule which later on they suspected might have been produced by cross pollination by insects rather than true selfing. The next approach which led to some success was to cross pollinate different plants with desirable

features in their possession.

The first breakthrough cross was made sometime in the mid-1970s between two natural clones 'AF18' and 'AF23'. Both plants were collected by Alwyn from the Gloucester/Bucketts area in 1972. Both plants produced large flowers with 'AF23' being red, but 'AF18' was mauve. The progeny from this historical cross had a range of colours and other characteristics but there were a few outstanding "red". It is interesting that they named these "red" offspring of the cross after prominent communists of that time, namely Karl Marx, Lenin, Castro and even Jack Mundey (Figure 2). Jokingly, they told people that they were also starting their own "red revolution" (in the world of native orchids) in Australia.(4)

Figure 2: The first two crosses carried out by HKGG in the breeding of the perfect "red" *Dendrobium kingianum*



Amongst these offspring, the clone 'Karl Marx' was the best and it has since been used in many "red" kingianum hybridization crosses by the HKGG and other breeding programs. When the siblings from this historic cross were crossed with each other, they were either infertile or gave very poor germination. However, when 'Karl Marx' and 'Lenin' were crossed with natural clones, like 'Ha Ha', 'AF48' and 'AF66', many vigorous offspring with much improved qualities were obtained. One of the most successful cross was a third generation cross, viz. ('Lenin' x 'Ha Ha') x ('AF48' x 'Karl Marx') producing the famous clone 'Blacky No. 2', regarded by some experts as probably the best "red" that came out of the breeding program of HKGG. Alwyn wrote of the occasion on the first flowering of 'Blacky No. 2': "Rodney's chest swelled at least four inches when the buds opened". Reading this, one can vividly visualize the excitement amongst the members on the occasion and the amount of fun they were having. Over the twenty year period they made over a hundred crosses chasing their perfect "red" kingianum.

Successes and achievements

Members of the HKGG were proud of their work and were willing to share their results with the orchid fraternity. A friend still remembers at one stage the Group made up a T-shirt with HKGG lettering and featuring a defecating bull and how they were seen wearing it in orchid shows exhibiting their plants and talking enthusiastically to anyone who was interested in their project. Alwyn was always very keen to pass on his vast knowledge of orchids to any person who was interested and was ready with praise for anyone who succeeded in producing something special. He was also willing to talk to people about the different crosses made by HKGG and was ready to offer a division or keiki of his plants to the new and not so new growers.

As a group, they also welcomed the involvement of other growers and scientists who showed interest in their project. As a result of the chromosome analyses of their plants by Peter Adams of The University of Melbourne, they realized that all the breeding plants collected from the Gloucester/Bucketts area and used in their breeding project were triploid in their chromosomal make up. This information helped to explain the failure of selfing 'Ha Ha' and the infertility problems of some of their crosses. Triploid plants are usually very infertile because of the odd number of chromosome set and selfing of triploid plants are very often unsuccessful. Results of further chromosome analyses from orchid plants collected from other areas by Peter Adams concluded that

"red" coloration of the flowers is not linked to triploidy and "red" kingianum from other areas are often diploid. This information has been useful to HKGG and other breeders in planning future breeding programs of "red" kingianum.

In addition to their own efforts and successes, members of HKGG further contributed by making their plants available to other breeders particularly those from the commercial nurseries, namely Merrellen Orchids, Orchid Glen Nursery, Down Under Orchids and Tinonee Orchids, all of which were able to further improve the "red" kingianum by combining the HKGG plants with other breeding lines. Under these commercial operations, large quantity of "red" kingianum plants were produced to satisfy the growing market and this in turn helped to promote the orchid to the general public.[5] These days, "red" kingianum is readily available in orchid nurseries and is often present in orchid shows in Australia (Figure 3).

(a) (b) (c) (d) (e)

Figure 3. Some outstanding clones of "red" *Dendrobium kingianum* from HKGG and their descendants. (a) 'Black Adder', (b) 'Red Bud', (c) 'Alison', (d) 'Karl Marx', and (e) 'Grand Con'

Many of the modern "red" kingianum clones have parentages which can be traced back to the original HKGG plants, like 'Karl Marx' and 'Alison'. *Dendrobium kingianum* 'Grand Con' was awarded an AM (Award of Merit) by the Australian Orchid Council (AOC) in 2015 and both of its grandparents 'Alison' and 'Gypsy Red' were direct descendants of the HKGG breeding program. The awarded plant had an average of 11 deep purple flowers per spike with very good habit and an average flower width of 37mm. While there is still room for improvement when compared to the HKGG criteria, it definitely has far superior qualities than those found naturally (Table 1).

Table 1: Floral characteristics of different clones of *Dendrobium kingianum* compared to HKGG criteria

Dendrobium kingianum	HKGG criteria§	'Karl Marx'	'Grand Con'	Natural population averages¶
Flowers per spike	16	5	11	3-10
Flower size (mm)	40 mm	30	37	19-30
Colour	Deep purple	Deep purple	Deep purple	Variable, pure white to solid purple

¶ Gloucester- Manning areas[1]; § the criteria set by HKGG for the "perfect" kingianum

The improved qualities of "red" kingianum have helped to promote this unique Australian orchid to the rest of the world. With more than 1,700 species of *Dendrobium* in total globally, it is interesting to note that *Dendrobium kingianum* is currently the third most awarded species orchid, after *Dendrobium cuthbertsonii* and *Dendrobium speciosum*.[6] Examination of the award list revealed that many of the awarded plants in Australia and overseas were "red" with familiar names like 'Karl Marx', 'Black Adder', and 'Alan Garrett', all descendants of HKGG breeding program. *Dendrobium kingianum* 'Karl Marx' was awarded an AM (Award of Merit) by the American Orchid Society (AOS) in 2005. To-day, the orchid nursery that has the largest collection of "red" kingianum is in USA, namely the Santa Barbara Orchid Estate in California which has 27 clones of *Dendrobium kingianum*, with names like 'Karl Marx', 'Red Ink', 'Red Bud' and 'Red King' in its catalogue.[7] Clones with familiar names like 'Karl Marx' and 'Red Ink' were definitely originated from the HKGG breeding program. Therefore, nowadays, *Dendrobium kingianum* is a popular orchid in Australia as well as worldwide. It is a far cry from the bad old days when this orchid was commonly used as embellishment in exotic orchid shows. Many of these achievements have to be attributed to the pioneering breeding work of the HKGG.

Last but not least, today in Australia, one can pick up an advanced "red" kingianum seedling (in fact of any other colour) from nurseries for less than $10 with floral qualities guaranteed to be superior to the

majority growing in the bush. The increased availability and much improved quality of the orchid have helped to reduce its illegal collection from the wild and this has indirectly helped to conserve this unique orchid in its remaining natural habitats.

A Model of worthwhile orchid hybridization

These days, with laboratory culture facilities becoming so readily available and affordable, orchid hybridisation can be carried out by any person so inclined. However, there is really no point to hybridise orchids just for the sake of creating something "new" especially if the progeny is of inferior quality to the parents. The story of breeding for "red" kingianum by the members of the HKGG is a good example of worthwhile orchid hybridisation. They started with a very clear goal: to try to improve on what is available in nature - to create a *Dendrobium kingianum* capable of producing flowers with improved colour, higher flower count, larger flower size and better flowering habit. All the initial plants used in the breeding program came from Gloucester/Bucketts, an area commonly regarded as having the best natural *Dendrobium kingianum* forms. Hence, they started with the best parent plants for their crosses. Their eventual successes were also enhanced by their sharing of resources and wisdom as well as their enthusiasm in promoting their results and generosity in making their plants available to other growers and breeders.

Conclusions

Alwyn Flanagan and his HKGG friends at the end may not have as yet produced the "perfect" red kingianum but they have certainly produced many clones of "red" kingianum of superior quality which have laid a solid foundation for further improvement. As a result of their pioneering work, the much improved *Dendrobium kingianum* and its increased availability have helped to promote this uniquely Australian orchid locally in Australia as well as all over the world. Indirectly they have also made tremendous contributions to the conservation and preservation of the *Dendrobium kingianum* in its natural habitats. While achieving all these, we are sure they have had a lot of fun and enjoyment along this journey of orchid hybridisation.

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Acknowledgements

As keen native orchid growers ourselves, we have long heard about the story of the "red" kingianum and this essay is the outcome of our decision to find out more about this unique piece of Australian orchid history. In doing so, we have contacted surviving members of the HKGG and many other people close to the Group and their breeding work. In particular, we thank Dennis Sinclair, Tony Blewitt, Ted Gregory, Ray Clement, Lloyd Edwards, Michael Harrison, Tony Clarke and Ken Russell for their assistance and the information they have provided.