

John Woolf:

John started growing orchids at the age of 12 when as a Boy Scout he collected and photographed Native Orchids. He completed a course at Queensland University on plant tissue culture and in later years has imparted much of that knowledge to interested groups at TAFE, Skillshare etc. John has been on committees for the Native Orchid Society of Toowoomba, Queensland Orchid Society and South West Queensland Orchid Council and is a Judge of the Australian Orchid Council/ Queensland Orchid Society and A.N.O.S. Since 1982 John has been manager/partner of Florafest Nursery. Australian Native Orchids and their hybrids form a major portion of the business.

Heinrich Beyrle:

Heinrich was awarded the Alexander von Humboldt Fellowship in Germany prior to coming to Australia with his family in 1989, in time for the Third Asia Pacific Orchid conference. Whilst in Adelaide he worked at the Waite Institute on the reaction between mycorrhizal fungi and orchids under Professor Sally Smith. He is now residing back in Friedberg, Germany, where he is propagating European orchids, along with a few Australian natives in his recently established laboratory. Heinrich is a very enthusiastic grower of Australasian native terrestrial orchids.

Ron Heberle:

Ron has been researching the genus *Caladenia*, including the pollination and pollinators, for the past 40 odd years and has given numerous slide talks on this fascinating phenomenon. In 1982 he published a preliminary paper on the subject. He is a Life member of the Western Australian Orchid Study and Conservation Group. Ron has been called upon to supply research material to the professional taxonomists including Mark Clements and David Jones. The interest in orchids commenced when Ron's mum used to take him, as a small child, collecting wild flowers in the Perth metropolitan area, of course, amongst the collection were orchids.

Andrew Perkins:

Andrew has been attending Orchid meetings since the age of two and is now a member of A.N.O.S. Hawkesbury group. His main interest is Australian native terrestrial species. Andrew's paper is based on his Master's research project (under the supervision of Dr. Murray Henwood). This project is Andrew's third research project involving native orchid species. The previous two were involved with orchid/mycorrhizal fungi associations and published in the Australian Journal of Botany.

Geoff Stocker:

In scientific circles Geoff has a reputation as a leading researcher into the ecology of tropical vegetation. Although he has a nursery in Queensland Geoff has travelled widely in tropical countries particularly New Guinea, hence his considerable collection of New Guinea orchids I guess. He has established his own laboratory and concentrates on raising rare species from seed.

Phillip Spence:

Phil was another childhood convert. He began collecting orchids at the age of 11 after he was given a plant of *Dendrobium speciosum* and two cymbidiums. In 1966 his work in the printing industry took him to Papua New Guinea and the orchids there won him over. He has since returned many times to various parts of the country. Phil began raising seed 25 years ago and has produced many crosses of native species. He is now working with Australasian species, particularly the *Latouria dendrobiums* of New Guinea.

CALADENIA IN WESTERN AUSTRALIA AND NATURAL HYBRIDISATION

R. L. Heberle

The genus *Caladenia* in Western Australia has been widely and lavishly distributed over about 34,000 hectares within a rough triangle bounded by Shark Bay in the north, Augusta in the south-west corner and Israelite Bay in the south-east. Within this vast area grow the 40 species and 10 varieties that have been named and described.

The genus reflects a tremendous diversification and a high degree of specialisation and flourishes over a wide variation of geographic, climatic and ever-changing habitats. *Caladenia* plants seem equally at home in the high rainfall areas in the south-west corner and in the drier north and east and in the arid inland goldfields up to 600km from the coast.

My personal interest in terrestrial orchids comes from many years of exhibition and display to the public, visiting the same colonies at the same time each year and being constantly confronted with problems of identification. It seems to me that many of the problem forms of *Caladenia* are more likely to be hybrids than un-named species.

Five years ago I decided to make a project of attempting to isolate these "presumed" hybrids and match them to parent combinations, to record relevant information to press and photograph the specimens in the hope that this work might assist in the future naming of new species. Although I had previously seen "presumed" hybrids as far north as the Murchison River, eastward to the east of Esperance and inland to Coolgardie, I decided to concentrate this work in the extreme south-west corner with the expectation that hybridisation would be more abundant in the integrated colonies there than elsewhere. As I live in Albany I could visit these colonies throughout the flowering periods.

So far, the most productive colonies have been those that grow adjacent to rivers, streams, lakes and swamps - and so on, and around granite rocks where the insects are very active. I hope to study the specific fertilising insects in the future and possibly other species isolating mechanisms which may have broken down to produce hybrid swarms.

The project was undertaken with the expectation that hybrid progeny would generally exhibit prominent structural features of one parent rather than the other and that possibly the pod-parent or the pollen-parent would be dominant, but this is not always the case. Apparent indications that the cross between pod-parent and pollen-parent (A x B) and the reverse (B x A) produce two distinct and different hybrids may well be evident merely that one parent is more dominant than the other, or that some back-crossing has occurred, or that the hybrid has "selfed" and thrown to one parent or the other. These are distinct possibilities in hybrid "swarms". However, in the cross between *Calda. multiclavia* and *Calda. filamentosa* var. *filifera* (fig. 1) each flower has dominant structural features from each of the parents!

Other pointers noted are that uneven and irregular calli rows, wavy and angular lateral sepals can assist in identifying hybrids. I also note that if either of the parents is a fire-stimulated flowerer the hybrids will be likewise.

The presence of a number of un-named species together with the so-called "complexes" such as that of *patersonii* - *huegelii* - *filamentosa* and *doutchae* (which contains numerous variations, races and possible hybrids) further complicates a complex issue. Nevertheless I have enjoyed some success as preliminary findings suggest that apart from the isolation of early and late flowering species, most *caladenias* hybridise naturally. Some are capable of crossing with a number of others, this being demonstrated by *Caladenia flava* - *latifolia* - *reptans* - *marginata* - *filamentosa* - *doutchae* - *patersonii* - *huegelii* - *radiata* - *lobata* and *cairnsiana*.

At this early stage I note that certain hybrids have established colonies in the areas east of Esperance, Jerramongup and Manjimup, these being the crosses between *Calda. flava* and *Calda. latifolia* and between *Calda. patersonii* and *Calda. dilatata* var. *falcata* (fig. 2). The project suggests that *Calda. ericksonae* (fig. 3) and *Calda. triangularis* (fig. 4) are in fact hybrids.

This report is tentative and preliminary and is made in the hope that enthusiasts may be influenced to do similar work in other areas. A combined effort should eventually bring into clearer focus hybridisation of *Caladenia* in Western Australia. Meanwhile the author invites constructive criticism of this paper. A beginning must be made - especially as the W.A. Government plans to release a further 3,000,000 hectares of virgin land for agricultural development during the next ten years.

The following table is offered as a basis:

Natural Hybridisation in *Caladenia* in South Western Australia

Parent Species.		Locations of Collections	Flowering Months
<i>Calda. aphylla</i>	(no hybrids recorded)		Mar. - April
<i>barbarossa</i>	<i>x patersonii</i>	Buyup Brook, Kamballup, Boxwood Hills Ongerup, Jerramungup, Gairdner River	Sept. - Oct.
<i>bryceana</i>	(no hybrids recorded)		Aug. - Sept.
<i>caerulea</i>	<i>x saccharata</i>	Boxwood Hills	Aug. - Sept.
<i>cairnsiana</i>	<i>x filamentosa</i>	Albany, Kamballup, Green Range	Aug. - Sept.
	var. <i>denticulata</i>	Boxwood Hills, Pallinup, Cranbrook	
<i>cairnsiana</i>	<i>x doutchae</i>	Lake Grace, Jerramungup, Green Range Pallinup River, Boxwood Hills	Sept. - Oct.
<i>corynephora</i>	(no hybrids recorded)		Dec. - Jan.
<i>crebra</i>	<i>x patersonii</i>	Arrowsmith, Dongara	Aug. - Sept.
<i>cristata</i>	<i>x filamentosa</i>		
	var. <i>tentaculata</i>	Kumari	Aug. - Sept.
<i>cristata</i>	<i>x doutchae</i>	Lake King	Aug. - Sept.
<i>deformis</i>	<i>x saccharata</i>	Lake King	Aug. - Sept.
<i>dilatata</i>			
var. <i>falcata</i>	<i>x lobata</i>	Rocky Gully	Sept. - Oct.
" "	<i>x patersonii</i>	Pallinup River, Gairdner River, Jerramungup Ongerup, Cranbrook, Frankland, Gordon River	Sept. - Oct.
<i>discoidea</i>	(no hybrids recorded)		Sept. - Oct.
<i>doutche</i>	<i>x filamentosa</i>	Boxwood Hills, Green Range	Aug. - Sept.
	var. <i>denticulata</i>		
<i>doutche</i>	<i>x radialis</i>	Lake Grace	Aug. - Sept.
"	<i>x cairnsiana</i>	Lake Grace, Jerramungup, Green Range Pallinup River, Boxwood Hills	Aug. - Sept.
"	<i>x roei</i>	Tincurrin	Aug. - Sept.
<i>drummondii</i>	(no hybrids recorded)		June - July
<i>*ericksonae</i>	(*possible hybrids between <i>doutche</i> , <i>radialis</i> , <i>cairnsiana</i> , <i>filamentosa</i>)		Aug. - Sept.
<i>filamentosa</i>			
var. <i>denticulata</i>	<i>x radialis</i>	Lake Grace	Aug. - Sept.
" "	<i>x cristata</i>	Lake King	Aug. - Sept.
var. <i>tentaculata</i>	<i>x sigmoidea</i>	Lake King	Aug. - Sept.
var. <i>filifera</i>	<i>x multiclavia</i>	Jerramungup	Aug. - Sept.
var. <i>dorrinii</i>	(no hybrids recorded)		Sept. - Oct.
var. <i>caesarea</i>	<i>x var. filifera</i>	Frankland	Sept. - Oct.
<i>flava</i>	<i>x reptans</i>	Highbury, Broom Hills, Manjimup, Mt. Barker Murchison River, Albany	Sept. - Oct.
"	<i>x marginata</i>	Denbarker, Rocky Gully, Lake Muir, Mayanup	Sept. - Oct.

Species.		Locations of Collections	Flowering Months
"	<i>x latifolia</i>	Rocky Gully, Manjimup, Broom Hills, Albany	
"	<i>x nana</i>	Condingup, Duke of Orleans Bay, Lake Muir	Aug./Sept/Oct.
<i>gemmata</i>	<i>x ?</i>	Lake Muir, Rocky Gully, Parry's Inlet	Sept. - Oct.
<i>gemmata</i>		Goomalling, Quairading	Sept. - Oct.
var. <i>lutea</i>	(no hybrids recorded)		Sept. - Oct.
<i>graminifolia</i>	(no hybrids recorded)		Aug. - Sept.
<i>hirta</i>	<i>x patersonii</i>	Green Range, Jerramungup, Cranbrook, Wongan Hills	Sept. - Oct.
<i>hirta</i>	<i>x filamentosa</i>		
	var. <i>denticulata</i>	Cranbrook, Amelup, Ongerup	Sept. - Oct.
<i>huegelii</i>	<i>x lobata</i>	Frankland, Mayanup, Rocky Gully	Oct. - Nov.
<i>huegelii</i>	<i>x patersonii</i>	Numerous variations both parents variable	
	var. <i>longicauda</i>	20+ locations from Albany to Buyup Brook	Oct. - Nov.
"	<i>x radiata</i>	Lake Muir, Rocky Gully, Manjimup	Oct. - Nov.
"	<i>x un-named (3)</i>	Buyup Brook, Rocky Gully, Frankland	Oct. - Nov.
<i>integra</i>	(no hybrids recorded)		Oct. - Nov.
<i>latifolia</i>	<i>x reptans</i>	Rocky Gully, Lake Muir, Manjimup, Mayanup	Oct. - Nov.
<i>lavandulacea</i>	(no hybrids recorded) (possibly a <i>roei</i> hybrid)		Sept.
<i>lobata</i>	<i>x patersonii</i>		
	var. <i>longicauda</i>	Frankland	Oct. - Nov.
"	<i>x radiata</i>	Rocky Gully	Oct. - Nov.
"	<i>x un-named (2)</i>	Rocky Gully, Frankland	Oct. - Nov.
"	<i>x barbarossa</i>	Rocky Gully	Oct. - Nov.
<i>longiclavata</i>	<i>x longiclavata</i>		
	var. <i>longiclavata</i>	var. <i>rhomboideiformis</i> 'Karridale'	Sept. - Oct.
<i>longiclavata</i>	var. <i>magniclavata</i>	(no hybrids recorded)	
<i>marginata</i>	<i>x nana</i>	Rocky Gully, Parry's Inlet	Sept. - Oct.
"	<i>x reptans</i>	Mayanup	Sept. - Oct.
<i>macrostylis</i>	(no hybrids recorded)		Sept. - Oct.
<i>menziesii</i>	(no hybrids recorded)		Sept. - Oct.
<i>patersonii</i>	<i>x flava</i> (= <i>Calda triangularis</i> possible hybrid)		Sept. - Oct.
	var. <i>longicuada</i>	<i>x un-named (2)</i> Rocky Gully, Frankland	Oct. - Nov.
<i>plicata</i>	(no hybrid recorded)		Sept. - Oct.
<i>radialis</i>	<i>x roei</i>	Lake Grace	Aug. - Sept
<i>radiata</i>	<i>x un-named (2)</i>	Buyup Brook, Mayanup	Oct. - Nov.
<i>reptans</i>	(see above - <i>flava</i> , <i>latifolia</i> and <i>marginata</i>)		Oct. - Nov.
<i>roei</i>	<i>x filamantosa</i>		
	var. <i>denticulata</i>	Tincurruin	Aug. - Sept
<i>saccharata</i>	(see <i>deformis</i> above)		Aug. - Sept
<i>sericea</i>	(no hybrids recorded)		Aug. - Sept
<i>sigmoidea</i>	(see above <i>filamentosa</i> var. <i>tentaculata</i>)		Aug. - Sept
* <i>triangularis</i>	*Possible hybrid <i>flava x patersonii</i> .		Aug. - Sept

Summary of Table

Interim and preliminary figures suggest that out of the 40 *Caladenia* species named at least 26 hybridise and out of the ten varieties seven do likewise. There remain at least 19 collections of possible hybrids where further research is required to determine parentage. The collections have

been made from approximately 180 locations. The bulk of collections fall within the 200km radius from Albany as shown on the map.

The decision to re-publish *Caladenia* in Western Australia and Natural Hybridisation HEBERLE R. L. (1992) is to give background information from the original research and introductory information supporting this. Whilst the original thrust of that paper is still relevant to this follow up paper, subsequent taxonomic treatment and revision will drastically alter names used in the "TABLE", drawings and photos.

CLEMENTS M. A. (1989) listed 5 new species, 7 reinstatements and 9 elevated from varieties to specific rank.

HOPPER S. D. and BROWN A. P. (1996) currently have in Manuscript proposals to increase the numbers of formerly described and published caladenias from 46 to approximately 126 with a break down of *Calda. filamentosa* (32) *Calda. huegelii* (20) *Calda. longicauda* (25) with minor additions to other species. There are also proposals to formally name and describe 14 hybrids, (we wait their publication with more than passing interest). They propose to erect a new genus to cover all the "BLUE" caladenias and include a white and yellow form under *Cyanicula* and similarly with the *Calda. barbarossa* and its variants under *Drakonorchis*. *Calda. menziesii* will become *Leptoceras* and *Calda. aphylla* to *Praecoxanthus*.

The names of all of the above have been prematurely released and widely published in books, papers, journals and lectures and are currently in common use, however until validated under the Convention of the International Code of Botanical Nomenclature they are illegitimate (refer to GEORGE A. S. (1995) and HEBERLE R. L. (1995)).

From the above it will be apparent to amend the TABLE etc. in HEBERLE R. L. (1992) will be futile until such time as HOPPER & BROWN'S manuscript is validated, however CLEMENTS M. A. (1989) will be used at the Conference lecture and the display of coloured prints in the Exhibition supporting these papers.

Since 1982 the field research has been ongoing with numerous new areas and a more thorough search in areas previously visited, also the research area has been marginally increased to a 300km arc from Albany. The list of presumed hybrids continues to grow. An impetus to the research has been the study of species variants and recording these on colour slides. This has given a fascinating insight and a field of conjecture where hybrids that appear to have the same parentage demonstrate a remarkable variation, as most registrants would know hybrid vigour often gives the best of both worlds. This adds a new dimension to the paragraph in the first paper on this subject, and suggests for every variation of form and colour from either parent can produce an distinctly different hybrid.

There is a school of thought that natural hybridisation springs from a disturbed environment, such as road and railway reserves and degraded areas around towns and industrial sites, our research suggests otherwise. Referring to this section in the previous paper, the major factor to natural hybridisation seems to be the abundance of different species integrating and the prevalence of non specific pollinators and the climatic seasonal conditions that encourage pollination activity namely warm, calm slightly overcast days. These factors trigger orchid pollination strategies such as fragrance and pheromones with glands and calli in addition to colour and mimicry.

The previous statement that most caladenias hybridise appears to be confirmed as many not listed in the first paper have been proved to hybridise. Specificity of "one to one" pollination is seriously questioned here, this may occur with a minority of species, however, our research suggests that non-specific pollinators prevail.

Positive identification of presumed hybrids is still a "Grey" area, with most hybrid progeny showing a dominant influence from one parent. It is a rare occurrence to split down the middle. Identification could be improved when taxonomists apply the new technologies of enzymes, electrophoresis and DNA fingerprinting with further research on pollinating specificity. This seems a long way off as most professionals in our experience show little interest in natural hybridisation

It is unfortunate that the name TABLE in the first paper could not be amended and subsequently research included at this stage for reasons previously stated.

If and when taxonomy etc. stabilizes, a further paper will be published. To conclude, although names appear to be of paramount importance to we humans in nature there are no genera, species etc. only populations not withstanding our approach is based on subjective and empirical values embracing the adage that a "PICTURE" is worth a thousand words.

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Figure 1. *Calda multiclavia* and *Calda filamentosa* var. *filijera*. This hybrid is rare even though both parents are plentiful. Colouring is a beautiful shade of pink diffused through orange to red - from both parents.

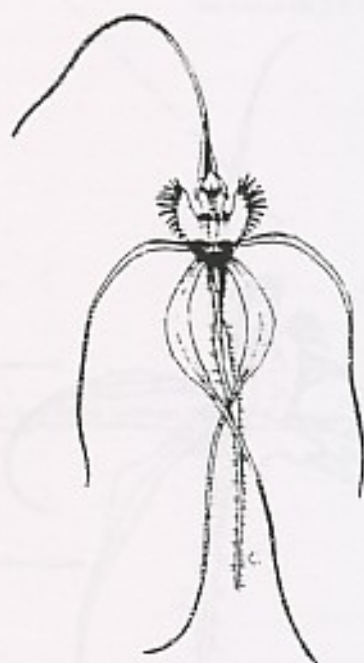


Figure 2. *Calda patersonii* x *Calda dilatata* var. *falcata*. A common and widely distributed hybrid - stabilised into colonies in some areas. Var. *falcata* shows little variation over a wide range but *Calda patersonii* is very viable: hence the hybrid varies considerably. Colour is whitish to cream (rarely pale green). Tepals follow the structure of *Calda patersonii*. The dilated labellum fringe and purple tip favour the other parent. This hybrid occurs also in most eastern states.

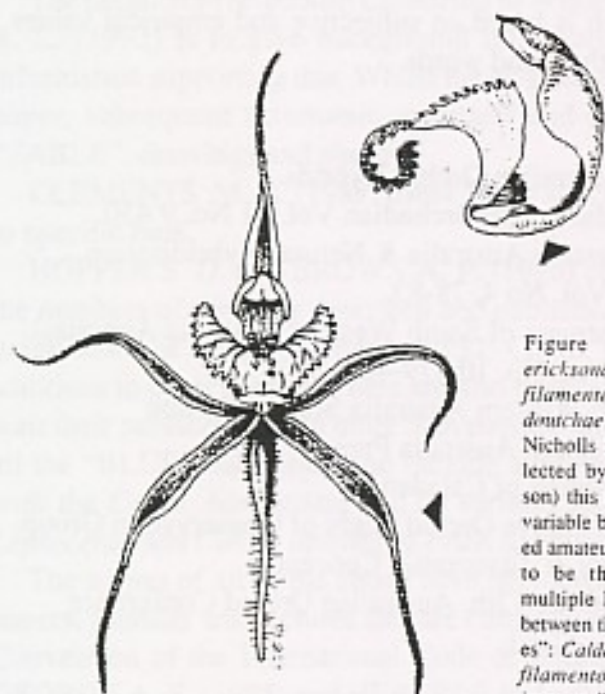


Figure 3. *Calda ericksonae* (= *Calda filamentosa* x *Calda douchia*?) Named by Nicholls in 1950 (collected by Rica Erickson) this taxon is very variable but experienced amateurs consider it to be the result of multiple hybridisation between the "complexes": *Calda douchia* - *filamentosa* - *cairniana* - *radiata*. All these have striped labellums. The hybrids are widely distributed and plentiful - especially inland. They reproduce vegetatively as do most of the parents.

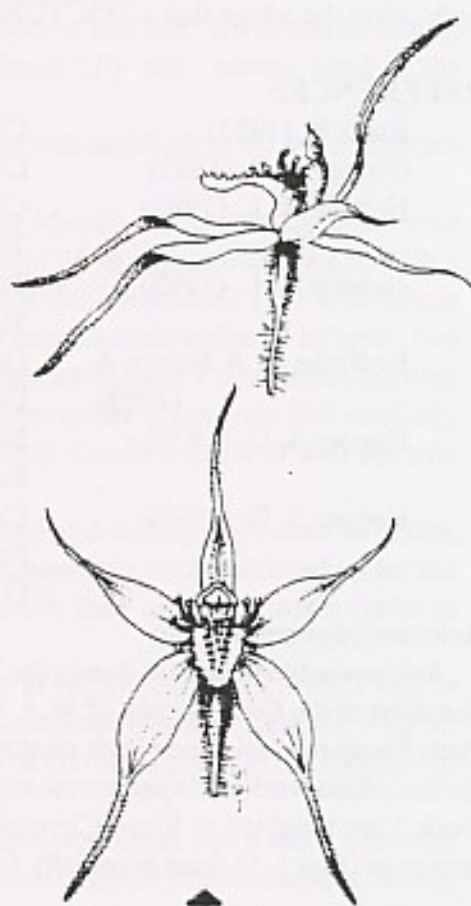


Figure 4. *Calda triangularis* (= *Calda patersonii* x *flava*). Named by R. S. Rogers (1927). Collected by Colonel Goodby from Highbury near Narrogin (1924). Structural features of both parents can be seen. The triangular labellum comes from *Calda flava*. Colour is pale yellow to cream with the red markings of *Calda flava*. The hybrid is widely distributed but never abundant. It reproduces vegetatively.

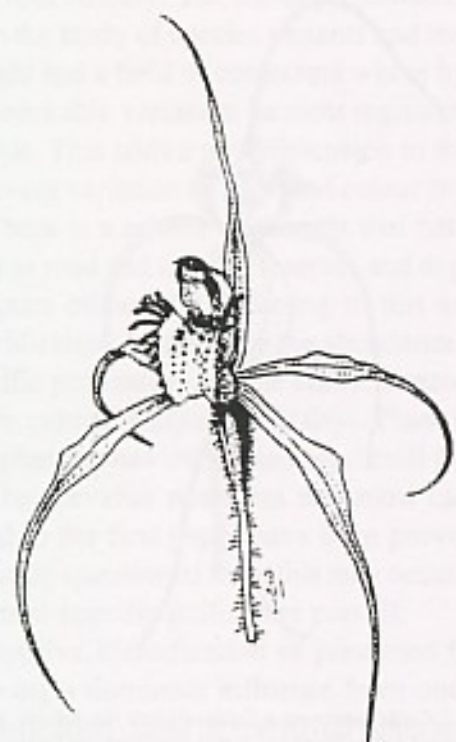
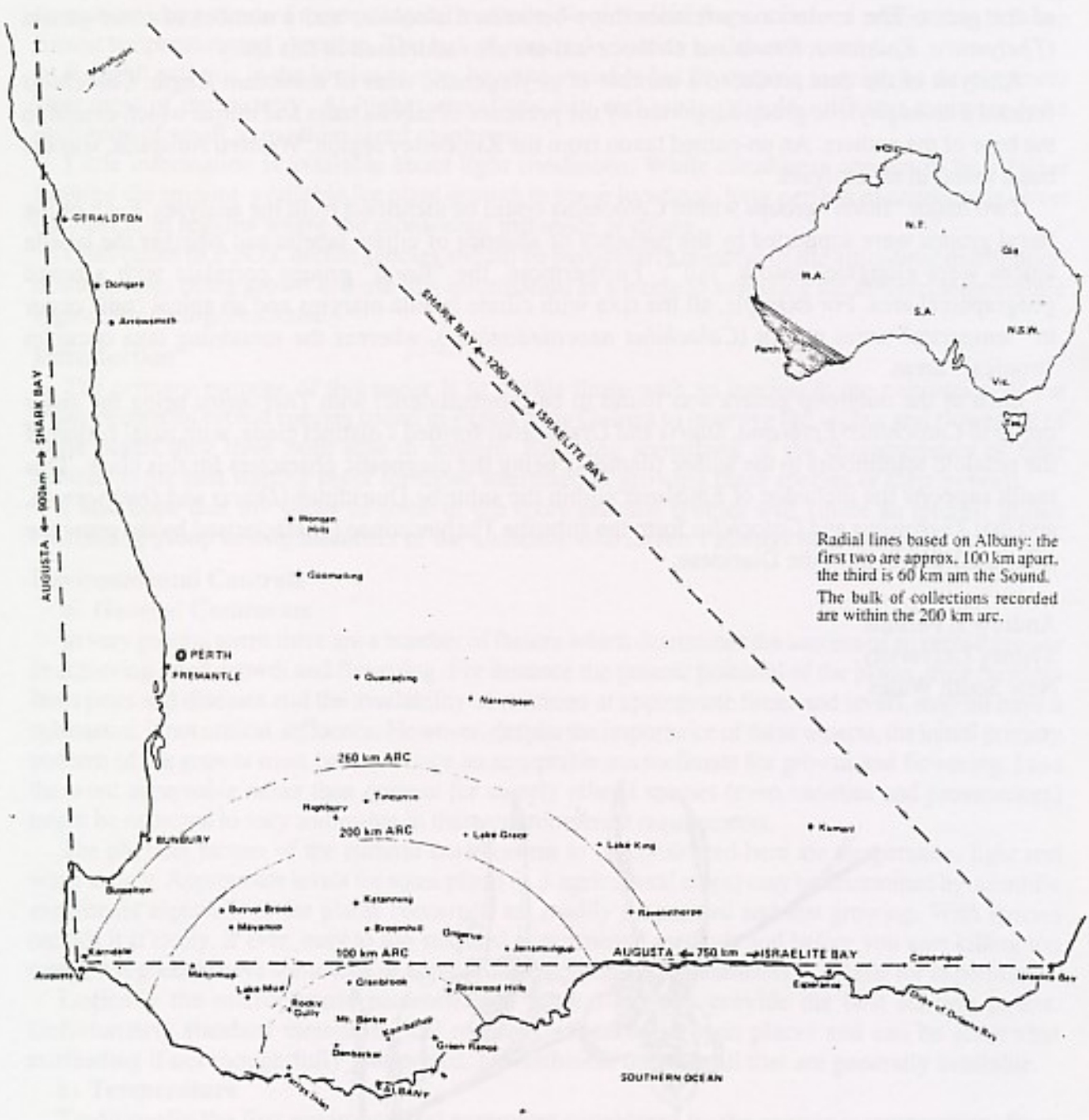


Figure 5. *Calda patersonii* x *Calda barbarossa*. Both parents are widely distributed and abundant throughout the "South-west Corner". The hybrids show great variation - as does *Calda patersonii* - but this is not so with *Calda barbarossa* (= "red-beard") refers to the dense mat of red hairs on the labellum. Its colour is pale green to yellowish, the purple stalked calli rising from the base of the labellum and at an angle on each side with reddish hairs on the tip. Tepals are short and angular. This is reflected in the (quite common) hybrids.

All drawings by C. Woolcock

WESTERN AUSTRALIA (South-West Corner)



Radial lines based on Albany: the first two are approx. 100 km apart, the third is 60 km from the Sound. The bulk of collections recorded are within the 200 km arc.

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