Caladenia bartlettii

Drawing by J Bruce Irwin.

From the 2001 edition
of the Group's Field guide.
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From the editor
Atypical orchids

Acknowledgement: this paper is based on a chapter by Pierre Delforge in his *Orchids of Britain and Europe* (Collins Photo Guide 1995).

Colour
The violet-purple pigment found in many orchids is anthocyanin. Its presence is inherited, but its intensity can also be affected by the brightness of light and the acidity of soil. In a large population (of *Caladenia lylitii* or *C. minor* for instance) there may be a gradient from some plants with heavily pigmented flower parts, leaves and hairs, to others that have pale green leaves and pure white flowers. Some European orchids are paler at higher altitudes -- is our white version of *Corybas* aff. *trilobus* a separate taxon, or is the colour lack simply a reflection of the high altitude where it is usually found?

Hypochromy is said to be present when anthocyanins are completely absent as the result of a genetic anomaly. The plant almost entirely lacks red or blue pigment, the leaves are unspotted, and the flowers are pure white, yellowish or greenish. The yellow anthocyanthan green chlorophyll pigments show through. All orchids that have anthocyanins sometimes show hypochromy, and indeed it has been reported among many NZ orchids; the green version of *Orthoceras novaezeelandiae* is hypochromic in relation to the purple from; the brownspotted and green-leaved versions of *Aporostylis bifolia* may just represent pigment differences. The genetic anomaly is said to be less frequent in self-pollinators -- indeed the "white" forms of *Corybas cheesemani* and *C. oblongus* appear to be rare. Hypochromy can be confined to a small pan of the flower.

Albinos are plants entirely lacking in any pigment, including chlorophyll; they cannot derive their nutrition from photosynthesis so are obliged to depend on an association with soil fungi for nutrition. I have seen almost pure white forms of *Gastrodia cunninghamii*, and some very pale *Pterostylis* (typically, of course, *P. paludosa*).

Hyperchromy is an excess of anthocyanin pigment, and is said to be very rare.

Abnormal shapes
Any organism can suffer a genetic abnormality and produce an abnormal form: in orchids, that means oddly-shaped flowers, and sometimes the shape is so odd, orchidologists think it is a new taxon -- NZ's *Petalochilus* is a prime example, a *Caladenia* with a petaloid labellum and abnormal column. In some orchids the flower may occasionally be entirely made up of bracts, or any perianth segment can be missing, deformed, fused to another, or doubled up.

All three petals may resemble the labellum, or conversely, the labellum may lose its differentiation and take the form of the other two petals; again, *Petalochilus* is an example: in Australia *Calochilus robertsonii* may have a clean-shaven petaloid labellum; in the Catlins a decade ago Jean Jenks found a colony of *Aporostylis bifolia* with labella no different from the other two petals.

Flowers of *Thelymitra aff. longifolia* with a column consisting of three staminodia have been reported in this Journal; *T. formosa* is well known for its frequent third column lobe; double columns are common among thelymitra.

Thelymitra with fused tepals are common. I have reported a colony of *Pterostylis aff. montana* with its petals "unzipped" from the dorsal sepal, the whole flower having an "exploded" look.

Abnormalities can be acquired, rather than genetic, and in such cases the abnormality would not be expected the following year. Orchids close to roads and tracks suffer the effects of herbicides and fertilisers (a spotted *T. hutchii* near havercargill; spirally coiled leaves on trackside Thelymitra in the Rimutakas, for examples). Parasites and late frosts
can cause anomalies in the buds as tissues form. Odd “siamese twins” occur, with incomplete separation of two flowers; I have seen this in *Pterostylis patens*.

Strange-shaped orchids should not stimulate the description of new taxa unless there is compelling supporting evidence: consistency of the differences, and wide geographical distribution of the form for instance. Is Max Gibbs’s *Gastrodia “city”* (see Original papers in J78) one or the other?

**Hybrids**

Hybridisation among plant species is much more common than among animal species. Interspecific hybrids are common in the wild orchid flora of most countries; some European orchids produce natural intergeneric hybrids, and M. Bradhurst recently reported *Caladenia caerulea x Glossodia minor* from New South Wales, but I know of none in NZ.

Occasional hybrids are generally rare, and flower among large numbers of both parents. When the number of hybrids exceeds the numbers of the parents, it is called a hybrid swarm or hybrid population.

A hybrid should be different from all the usual variations of colour and shape of its parents: one aberrant character is not enough, but many characters must be considered – habit, leaf shape, flower shape, colour, floral parts, column parts, flowering time, etc; most of these must be intermediate between the parents, though new characters can appear.

When a hybrid is sterile, it is genetically isolated, but if it is fertile it can interbreed with one or both of its parents. When they share the same pollinator, the hybrids can cross with themselves and their parents and set up hybrid swarms or populations. This of course does not apply to self-pollinating species, so in NZ, where only 40% of the species are insect-pollinated, few such instances have been reported. Nonetheless Mark Moorhouse observed recently, “I found an interesting conglomerate at Kikiwa with *Pterostylis patens, banksii, australis* and *areolata* features in varying degrees….“ I have seen colonies with similar characteristics in the Eglinton Valley, and in Aorangi SFP. These pterostylises are all insect-pollinated and appear to form hybrid swarms.

And Peter de Lange wrote after a visit to Great Barrier Island, “I now have some serious doubts about the validity of splitting of *T. pulchella*, unless we have a massive hybrid swarm on GBI – I found fimbriate (yellow/orange), kelp-like, and unbranched, simple column arms in the same population(s) of orchids in numerous sites on GBI. I could see no differences beyond these slight variations in the column arm adornments. I think Lucy Moore’s cautious approach is still warranted. I would like to see consistent morphological/ecological distinctions before I went further reinstating the various names available.” *T. pulchella* is itself regarded as a stable amphidiploid hybrid between *T. cyanea* and *T. longifolia*, so is this variation within the Great Barrier colonies simply the range of normal *T. pulchella*? or a hybrid swarm among *T. pulchella* and its parents? or a hybrid swarm among the various taxa Lucy Moore included in *T. pulchella* (*T. fimbriata, T. caesia, T. pachyphylla*)?

Occasional apparently sterile interspecific hybrids do occur in the NZ insect-pollinated taxa: *T. xdentata* (*T. longifolia x T. pulchella*) is well known; *T. “comet”* appears to be sterile and is probably another, of questionable parentage: *Corybas macranthus* crosses with *C. “Trotters”* on the Pinnacles track in southern Wairarapa.

**An insect-pollinated form of *Corybas aff. trilobus***?

I referred [J77 p7] to a new round-leaved *Corybas aff. trilobus* growing with *C. “Trotters”* by a muddy streamlet at Craigie Lea in the Eastern Wairarapa. I have now had time to do sketches of the dead insect in a decaying flower.
A degenerating flower of *Corybas* aff. *trilobus* showing the decaying abdomen of a dead insect jammed in the V of the labellum.

Field guide to the New Zealand orchids

2001 edition by Ian St George, Bruce Irwin, Dan Hatch and Eric Scanlen

The extensively updated 2001 edition is $20 to members: order your copies now from Ian St George, 22 Orchard St, Wadestown, Wellington. istge@rnzcgp.org.nz
The Irwin Orchid Symposium

This is an announcement and first call for papers for a symposium on New Zealand Native Orchids to be held at Iwitahi 7-9 December 2001 to mark the 80th birthday of Bruce Irwin and to acknowledge his work on New Zealand native orchids, and his efforts for the NZ Native Orchid Group and its aims.

Programme

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<tr>
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<th>Time</th>
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<tr>
<td>Friday 7 December</td>
<td>7.30pm</td>
<td>Scientific session 1</td>
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<td>Saturday 8 December</td>
<td>9am</td>
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<td></td>
<td>1pm</td>
<td>Field foray 1</td>
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<tr>
<td></td>
<td>7.30pm</td>
<td>Scientific session 3</td>
</tr>
<tr>
<td>Sunday 9 December</td>
<td>9am</td>
<td>Field foray 2</td>
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A detailed programme will appear in the September Journal.

If you wish to contribute to the programme, please contact Ian St George, 22 Orchard St, Wadestown, Wellington (istge@rnzcgp.org.nz).

For information on accommodation and other arrangements, please contact Trevor Nicholls, 33 Hinekura St, Taupo (nicholls@reap.org.nz).
This flower was pale cream, some areas greenish but the tepals just cream. Very little red streaking inside the labellum and on the column, the entire midlobe including the calli cream, the calli on the lamina cream with midstems red/purple — the same colour as the labellar streaks. Flowering 21 January ‘01 (very late), though an apparently identical colony nearby (about 10 plants) were still in bud. The dorsal sepal appeared dark.

This appeared to match the dark-stemmed form common at Iwitahi, though the stem and ovary were devoid of purple pigment. The disposition of sessile glandular dots on the backs of the tepals was identical — quite unlike the pattern on *C. chlorostyla*.
LABELLUM: laminar calli almost straight, cream-tipped, reddish midsection, barely swollen at apices.

COLUMN: rostellum not seen

Midline of slightly raised dots over a thin reddish brown stripe; dots decrease towards base, virtually none in lower third. Back of column nude.

Glandular dots less dense than on dorsal and confined to margins of the 3 nerves—most dense along central nerve

Nearside petal removed.

Short pale hairs, some dark gland-tipped.
Making identifications more difficult
by J.Bruce Irwin, Tauranga

In 1907, Dr R.S. Rogers, reviewing Prasophyllum in South Australia, said - "The genus Prasophyllum is admittedly the most difficult and perplexing one in the whole of the Orchideae. Not only are the flowers frequently of very small size, but there are so many intermediate forms that almost every species may be said to blend insensibly into another" [1].

Others have echoed Rogers's views; so when on 28 January 1998, unusually tall and elegant flowered Prasophyllums were found at Middle Road, Horopito, and several NOG members said they must be a species other than P. colensoi. I was loathe to agree, despite having seen very similar plants in a wetland on Kapoors Road, west of Mt Tongariro in late January 1992. These plants were regarded by some Botanical Society members as Prasophyllum aff patens because they were growing virtually in water, however the flowers were much smaller and lacked the conspicuous white labellum of that species. I had seen it again on 4 February 1996, again in water in the large wetland NW of National Park Village. This time I dissected and drew a flower yet continued to wear mental blinkers until I read that David Jones had stated that Prasophyllum colensoi could be distinguished from the Australian species P. alpinum, by its column appendages being as long as or longer than the anther [2].

That statement contradicted all my drawings of P. colensoi including that shown on p149 of Flora II. Furthermore it seemed to contradict Hooker's original description in which he said "Column very short with very low two-lobed lateral pieces" [3]. How could Jones have made such an erroneous statement? One possible explanation was that the subject for Jones's illustration of P. colensoi, collected at Lake Lyndon, Canterbury, may have been a P. colensoi look-alike with column appendages as long as the anther. From that time I began to examine apparent P. colensoi, always finding that the appendages were only half anther length - until Anne Fraser drew my attention to a plant roughly half way up the road to the Turoa Skifield [J75 p15]. That plant structurally resembled P. colensoi very closely indeed, except that the appendages were very nearly as long as the anther.

The tall elegant semi-aquatic Prasophyllum mentioned above also has appendages almost as long as the anther, but should not be confused with P. colensoi nor the P. colensoi look-alike because it shows several consistent differences in structure. Clearly it is a species not previously found in New Zealand. Anne and I now refer to it as Prasophyllum "B".

As for the P. colensoi look-alike which we now regard as Prasophyllum "A", we did notice that the flower stem was a strange blackish-purple. The colour showed also on ovary ribs and on the outer surface of tepals. I could not remember seeing similar colour on any undoubted P. colensoi. Maybe this could be an aid to identification? Unfortunately the season was too advanced to let us make comparisons.

Anne and I confidently expected to sort out all the problems this present flowering season. On 11 January 2001 the search was resumed in earnest above Mangawhero Falls, where we found that plants of Prasophyllum "A" had adopted fashionable new colours, ranging from clear yellow/green, through reddish to almost black. The blackish flowers were no problem, but the yellow/green ones looked more like P. colensoi than ever. Wherever we searched, and we searched for four days, the plants appeared to vary much more in colour than those found last season.

It became more urgent to locate true P. colensoi, but they lived up to the reputation
**Prasophyllum colensoi**

- Column appendage much shorter than anther
- Late sepals 1 1/2 times labellum length
- Column appendage almost equals anther
- Labellum half late sepal length

**Prasophyllum "A"**

- Dorsal sepal ovate
- Labellum half late sepal length
- Dorsal sepal acuminate

**Prasophyllum "B"**

- Column appendage nearly as long as anther
- Dorsal sepal acuminate

- Bract ovate
Rogers had bestowed on them. They were deliberately difficult. There is no other way to explain why, when we searched for \(P.\) colensoi in known localities, they either transformed into \(Prasophyllum\) “A”, or were absent without leave. Towards the end of January 2001 I was almost convinced that true \(P.\) colensoi was absent from Ruapehu. But what about the plants found during previous seasons with very short appendages? Were they mere figments of my imagination? Had I lost my marbles?

Anne rang on 28 January to say she had spent the day on Ruapehu checking a colony of very late-flowering white Caladenias which we had observed previously in bud. Also she had found magnificent flowers of a form of \(Pterostylis\) aff \(montana\) on which leaf and flower were an unusual, almost blackish-green, and finally, high on the track to Waitonga Falls, two Prasophyllums, one reddish which Anne presumed was \(Prasophyllum\) “A” and the other yellow/green which looked like \(P.\) colensoi. Did I think it was worth coming down again? I certainly did.

2 February was a great day. The Caladenias were at the peak of flowering and more common than we expected. The tall, elegant, dark-leaved \(Pterostylis\) was magnificent as always, and as a bonus \(Thelymitra\) “Whakapapa” was wide open in warm sunlight.

The trip had proved well worthwhile already, but would that yellow/green \(Prasophyllum\) disappoint me? No. It really was the elusive \(P.\) colensoi, its appendages barely half anther height. What a relief to find it at last and to realise I hadn’t lost my marbles. Well, not all of them anyway.

After our tussles with \(Prasophyllum\) this season, we make the following tentative comments -

1. Rogers’s statement can’t be faulted.
2. Two unidentified taxa have been found on

<table>
<thead>
<tr>
<th>(Prasophyllum) colensoi</th>
<th>(Prasophyllum) “A”</th>
<th>(Prasophyllum) “B”</th>
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<tbody>
<tr>
<td><strong>General appearance</strong></td>
<td>usually &lt;15cm. flower segments rather short.</td>
<td>very like (P.) colensoi; colours probably more Variable.</td>
</tr>
<tr>
<td><strong>Habitat</strong></td>
<td>prefers moist soils.</td>
<td>as for (P.) colensoi.</td>
</tr>
<tr>
<td><strong>Flowering time</strong></td>
<td>peak - Dec-Jan.</td>
<td>probably as for (P.) colensoi.</td>
</tr>
<tr>
<td><strong>Floral bract</strong></td>
<td>very short, truncate.</td>
<td>as for (P.) colensoi.</td>
</tr>
<tr>
<td><strong>Dorsal sepal</strong></td>
<td>ovate, apex often rather blunt.</td>
<td>as for (P.) colensoi.</td>
</tr>
<tr>
<td><strong>Labellum</strong></td>
<td>about (\frac{1}{2}) lateral sepal length.</td>
<td>as for (P.) colensoi.</td>
</tr>
<tr>
<td><strong>Column appendages</strong></td>
<td>(\frac{1}{2}) length of anther.</td>
<td>almost equal to anther.</td>
</tr>
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Ruapehu, one of them, Prasophyllum “A”, is so like P. colensoi in general appearance that it can only be distinguished with certainty by the length of the column appendage being about twice that of P. colensoi. On Ruapehu that difference is constant, but if intermediates are found in other areas, sub-species rank may be more appropriate. Prasophyllum “A” appears to be much more common on Ruapehu than P. colensoi s.s.
3. The other new taxon, Prasophyllum “B”, looks like a taller, more elegant form of Prasophyllum “A”, but is clearly distinct from that form and from P. colensoi. It probably does not occur at such high altitudes and flowers later than Prasophyllum “A” and P. colensoi at comparable altitudes.
4. David Jones’s statements suggest that Prasophyllum “A” or a form very like it, is probably widespread in New Zealand.
5. Until now, if a Prasophyllum did not have a prominent white labellum, and provided that the flowers were not so minute as to be mistaken for Genoplesium, then it had to be P. colensoi. But if our musings are correct, it will now be necessary to prostrate yourself before the plant, probably on wet ground, hold it steady with one hand and with another hand push the small petal aside, then peering through a 10x lens held in your third hand, if you are lucky enough to have one, decide whether the column appendage is much shorter than, or almost as long as, the anther. Well! Rogers did warn us that Prasophyllums were difficult.

Stop Press - Gary Penniall has sent me slides taken at Pureora 7 February 2001, which are clearly Prasophyllum “B”.

References
1. Rogers R.S. A critical review of South Australian Prasophylla. Transactions Royal Society South Australia 197 - 222 (1909)
3. Hooker J.D. Flora Novae Zelandiae 241 (1853)

Orchid hunting in the Southern Ocean
by Angela Abernethy, Christchurch

Locating and identifying terrestrial orchids is all about timing. I applied for a scholarship from the Enderby Trust so I could observe the distribution of terrestrial orchid species on the subantarctic islands. Orchid emergence times are reasonably well known on the mainland of New Zealand, but not well documented for the offshore islands. For this reason, I was uncertain how many orchids would be identifiable or even present during my visits to the various islands. I was therefore pleasantly surprised by the number of orchids I found and was able to identify on my voyage. The highlight from an orchid point of view was Tuku reserve on the Chathams.

Enderby Island - Auckland Archipelago
While on Enderby Island, I encountered two species. The first was Thelymitra longifolia, located amongst Dracophyllum scrub. The handful of specimens I found all showed sign of foliage damage, either through frost or intense sunlight. Such damage affects the plants’ ability to accumulate carbohydrate reserves, thus limiting their ability to reproduce. Only a single flowering specimen was discovered, displaying a spike containing four (closed) florets. My PhD research at the University of Canterbury has shown that T. longifolia tends to reproduce every second
year on the mainland. An exception to this is when the plant has been acclimatised to a high light environment, allowing greater accumulation of carbohydrate reserves, thus allowing the plant to reproduce annually. The second species observed was a Microtis sp. found in and around Bulbinella rossii. Accurate identification in this genus is not possible without flowers. Unfortunately, my visit preceded the flowering time at this latitude. Other orchids reported (but not observed) in the Auckland Islands are: Acianthus viridis, Aporostylis bifolia, Chiloglottis cornuta and Waireia stenopetala.

**Macquarie Island**

The only orchid known to occur on Macquarie Island is the endemic species Corybas diemenus. This orchid is rarely seen by the ANARE staff, although discussions with the sole botanist on the island revealed a small population has been identified approximately 8 km from the ANARE base. It would appear that very little is known about the phenology or ecological requirements of this orchid. No formal mapping studies have been performed. New Zealand has a very similar orchid, Corybas orbiculatus which occurs on Stewart Island as well as selected ecological regions throughout the South and North Islands. Further research into Corybas, especially genetic analysis, would establish if these species are separate or whether they are a subspecies or the same with the variations in appearance a result of environmental conditions. Time constraints precluded visiting the population on Macquarie Island, but probably the endemic species follows a similar life cycle to other Corybas which predominantly flower in winter through early spring.

**Col Lyll Ridge - Campbell Island**

Walking up the track to Col Lyll Ridge, I identified two terrestrial orchid species; Aporostylis bifolia and Chiloglottis cornuta. In both cases they were significantly smaller than plants I have studied throughout South and Stewart Islands. Chiloglottis cornuta specimens displayed foliage damage much like T. longifolia found on Enderby, though most of the plants were flowering. Other terrestrial orchid species known to occur, but not encountered on Campbell Island include; Corybas oblongus, Corybas trilobus and Waireia stenopetala. Prior to embarking on this voyage I had talked to others who had visited the island, and been shown spectacular photographs of the Campbell island megarherb species. Sadly, my time on the island was early in the flowering season, and only Bulbinella rossii and Stilboearpa polaris were flowering. The intriguing Hebe benhamii was also in flower, but I would have dearly liked to see the Pleurophyllum and Anisotome species in bloom.

**Tuku Reserve - Chatham Islands**

What a find, this reserve is - an orchid hunter's dream come true! I found sixteen species all within this reserve. There is more diversity in this reserve than in any of the dominant forest types on the mainland. Orchids identified were: Adenochilus gracilis, Aporostylis bifolia, Caladenia aff. carnea, Caladenia lyallii, Chiloglottis cornuta, Corybas macranthus, Corybas trilobus, Earina mucronata, Microtis unifolia, Pterostylis australis (a new find for me), Pterostylis banksii, Pterostylis aff. montana, Pterostylis venosa (a new find for me), Thelymitra cyanea, Thelymitra longifolia and Thelymitra pulchella. I would recommend this reserve as a 'must see' for any orchid hunter. How-ever, the amount of 'pig rooting' evident in this reserve is cause for concern, both for regenerating vegetation, and the endangered Taiko, which is believed to nest in burrows in this reserve.

**Acknowledgements** I would like to thank Enderby Trust for awarding me this scholarship as well as the staff, crew and passengers on board who made this voyage 'simply the best'. I thank you all.
Dan hatchia
by 'Tricia Aspin

After being approached by Eric Scanlen to do a day-by-day study, I can give you the following facts, figures, feelings and frustrations gleaned from a study of the recent season of Dan hatchia australis at Mata kawau. I hoped to be able to note such things as the length of time one could observe this orchid, when one could expect to find the flowers open, if there was any evidence of insect pollination or if there was a perfume present and to observe the growth patterns.

I began observing on 8 December 2000 and concluded on 12 February 2001. Because time is precious to me and the area is only 4 km from my home, most times I would bike there and back and so complete my training for the day at the same time. I visited doggedly every 2 or occasionally 3 days mostly in the late morning. Some visits were made in the afternoon, one was at the crazy hour of 5 am and another in the early hours of darkness.

The original discovery (January 1999) site has had colonies emerging in the two subsequent years but in widely varying numbers. Sites are levelish on a gradual west-facing slope receiving dappled sunlight. All have young nikau, mature taraire, puriri, ponga and kauri nearby. There seems always to be more than one colony per site. This year yielded 3-5 colonies per site. Measurements between colonies range from 1.3m-1.8m so if one is found then a hunt within a two metre range will most likely produce more.

Year one yielded two sites — one of three colonies, one of one colony.

Year two yielded three sites with a total of 44 colonies as noted by Peter de Lange.

Year three yielded five sites with a total of 61 stems in only 18 colonies — quite frustrating after the prolific previous year. The total area of colonies so far discovered, encompasses about 7500 square metres.

One of the original colonies (Stella Christoffersen’s) from year one did not emerge this time. The habitat has changed. There is now greater under-storey growth and a very thick germination of taraire seedlings. There is less light and it is cooler than previously.

Because D. australis is an epiparasite lacking chlorophyll, sunlight shouldn’t need to be a factor but my observations have lead me to believe it is. A certain level of warmth and airiness, an ideal amount of shade and a lack of competition from under-storey growth, all give clues as to an ideal habitat for this orchid.

Studies were conducted over two sites, one of three colonies totalling 17 stems and one of one colony with 4 stems. Other sites were noted but not studied in detail.

Eric had given me a few pointers as to what I could look for. He had told me how some pollinating bugs get hungry through the night so the crack of dawn is a good time to catch them in action if they exist. I had not observed any insect activity inside the flowers during the day so I thought I’d better check this out.

It was a beautiful morning on 3 January at 5:10am — the first light in the east, the last bright stars still quite clear, the skylarks, the tuis, Nancy’s rooster, Brian’s dog rounding up his cows (hey, it’s eleven years since I had to get up to cows. The things one does for orchids). My footsteps are so loud in the bush — why does broad daylight muffle them so? My light shows many flying moths. Maybe...

The two sites with open flowers were visited. Light and lens reveal nothing new — no bugs, no perfume. Mosquitoes have a feed of me! Five thirty a.m. and I’m back in bed wondering at the sanity of the orchid enthusiast. By the way, I did cheat a bit — I went by car! Then I got to thinking about whether those insects did their visiting in the
early part of the night and wondered if the flowers reacted to sundown and closed up at all? Another torch-light visit eventuated, this time at 8:30pm 13 January. It was dark within the bush but again the flowers were still wide open and again there were no bugs and no perfume. I'm getting strange looks from the locals too.

Lack of space restricts full details of 67 days of observations but the following is a summary of flower development as observed. All buds lie against the stem during all or part of the time. The top bud forms the apex of the stem. Tired looking buds with the ovary swelling, I have called spent, a swelling ovary with shrivelled flower is called a capsule, the matured capsule with seeds dispersed is referred to as being cast and a dried, unfertilised bud is called shrivelled. New stems are visible in pale mushroom pink at 3cm height. Bud development begins at this stage and the final number of buds on each stem develop there from the 3-7cm growth stage over 10 days.

There are four “behavioural forms” of flowers. Three are quite distinct:

1. those which remain closed and lie against the stem.
2. those which remain closed but turn at right angles to the stem from 2-13 days and then return to lie flat against it again.
3. those which open fully and are observed as a true flower and
4. those which open partially, just a slight lifting of the sepals and a slight opening of the petals but not enough to see inside to the column. These usually turn out from the stem also.

Of the 73 buds studied, only four opened fully. Subsequently, 3 others opened fully on colonies outside the study area. No insects were ever observed in the flowers (NB none through the same hours and none at dawn or in the dark on the two special visits). No perfume was detected at any time. The ovaries start swelling after 18-22 days. The flower parts remain fresh looking for a further 10-14 days before shrivelling when the full seed capsule is formed. The capsule ripens quickly and the seed is cast 33-41 days after emergence.

The flowers that did open remained so for 11, 18, 20 and 22 days respectively. The part opened ones, remained so for 6-8 days and all were pollinated.

Of the 73 buds studied, 39 matured to cast seed. Of these, 19 buds did the “right angled” thing, 15 of them matured but four shrivelled up, unfertilised. Four became fully open flowers none of which were pollinated nor were the other 3 open flowers outside the study area. All 7 shrivelled giving a total of 11 shrivelling without pollination. Eighteen were eaten by bugs or slugs and so were lost to the study. The remaining stems still had 6 buds present at the end of the study.

Conclusions. Danhatchia australis was found from early December 2000 to late February 2001.

Stem growth was rapid during the first week after emergence but then slowed down until the full height of around 12cm was reached after about 3 weeks. During this stage the flower buds developed and displayed one of the 4 behavioural forms.

The average reproductive cycle lasted 38 days. Part open flowers were found over a period of 47 days (18 Dec to 3 Feb). Fully open flowers were not common but were observed for an average of 18 days, not briefly as previously implied. From first open to last closed for these was 39 days (26 Dec to 3 Feb). The number of open flowers was usually one or two at the most this season, compared with four open simultaneously on one stem last season when flowering was comparatively prolific.

My observations confirm that this is a self-pollinating orchid. Wide open flowers not pollinating could indicate that the species is still striving for cross pollination by some fluke of nature. Dan Hatch pointed out [1 pp42-44] that “... incoherent pollinia merge with the top edge of the stigma at a very early stage of development and the barely visible rostellum seems redundant.” But this process
seems not to occur in flowers which open wide. Of course the significance of this behaviour did not become apparent until the study was nearly completed! Something for someone more expert in these matters to study up next season.

And so to the future. Obviously more studies are needed on the open flower phase. I can only pose questions on some of the flower behaviour patterns. Why the right-angled thing? Why did part-open flowers pollinate but not fully opened ones? Is this always so or was it just this season? No doubt other questions will spring to mind as you read this.

Illustration: Fig. 10, p19.
Reference

The column: Eric Scanlen -
1. Pterostylis puberula quest

Pterostylis puberula once fairly widespread is now “critically endangered” [1] as its sunny, wet habitat diminishes. Peter de Lange, DoC’s Endangered Plant Officer, had chided the Column for not disclosing a celebrated colony’s site on the Billy Goat Track, Kauaeranga. A maintenance gang, it seems, had dug through it but the Column wasn’t about to be the Billy Goat scapegoat. In a field party [J59, p19] of 2 Dec 95 he was shown a colony by Bruce Irwin and Ian St George with only one late mutant still open but had no idea that DoC were unaware of the presence of the colony.

Allan Ducker also lacked a photo-record of this gem, so they hiked the Webbs, Billy Goat Track loop on a calm, clear 10 November. Both tracks had somehow got steeper in the intervening 5 years even at orchid hunters’ pace. A lone P. banksii diverted a camera lower down. Two patches of flowering Corybas “Kaimai” diverted both higher up but legions of C. oblongus var. “aestivalis”, stole the show with their beds of disc papillae in darkest purple. No double headers were seen but one group of 4, sported well figured leaves up to 60mm long (Figs. 1 & 2). In the 3-D view, the orchids and their wavy edged leaves stand clear of the moss camouflage. Allan stopped at the exact spot described by Catherine Beard, 5 years before, and spotted a spent P. puberula on the track edge. Some juvenile rosettes there were examined for ID purposes. One other Webbs colony of juveniles was located. Allan paused to video some bugs running in and out of Earina mucronata, lost his footing on the slippery slope and wrenched his shoulder whilst shielding his videocam. What this doughy orchid hunter goes through only for your reading and viewing pleasure?

Lunch was taken luxuriating in the view of our target colony of P. puberula. A trampler, flushed from an ascent of the Pinnacles, paused to chat so the Column unwisely showed him the prizes. The unimpressed trampler — normal for his ilk — took one fell step to indicate some “bigger ones further back” and flattened 3 prime flowers! He retired confused but unrepentant leaving a muttering pair to film the remains. (Fig. 3)

The labellum, usually the showiest petal in an orchid, has not been triggered, it is just too short to be seen, making it unique among NZ Pterostylis.

Allan remembered seeing another colony down the Billy Goat before its rarity was appreciated, so the hunt continued. Three more colonies were found in damp locations, and code-flagged for Peter. One healthy plant in full sun, had its portrait made (Fig. 4) on a bank of wet, black, mould, blobbed with algal
5. Column, colony, colony

4. sepals

1. References

5. References

2. Corybas “whiskers” agg.

17 October '00. During an intriguing side issue to “Tracking down Caladenia bartletti” [J78], Jean Smith nee Bartlett, showed Allan Ducker, Gloria Scanlen and the Column, her Corybas (Fig. 5) in a sizeable colony on Mahoeurnui* Stream bank, near her home at Coatesville. Gloria was non-committal, the Column guessed it was C. “whiskers”, Allan wasn’t convinced and Jean called it C. orbiculatus, as universally accepted in the 1950s for all the C. rivularis aggregate.

What constitutes C. “whiskers”? It is the last of Bruce Irwin’s 7 or 8 babies born from the round leafed C. rivularis aggregate [J55, p24] and it is widespread, occurring from Eastern Northland to Nelson. It has its labellum covered with papilae or “whiskers” so dense as to obscure the veins and has its purple flecked, green peduncle visible above the leaf. Taxonomists doubt specific status for it because herbarium specimens are difficult to separate from Bruce’s C. “Kaimai” and C. “rest area”.

The Column’s old C. “whiskers” slides show specimens with invisible (turned under) apiculi [J74 p15, Fig. 4, not 6] on convex labellum bibs and a straight dorsal sepal on fresh flowers, from Waitakeres (Fig. 6), Te Mata Bridal Veil Falls, Ongarue and Browning Tk, Nelson. But all Mahoeurnui specimens had prominent apiculi on narrower Veed labella and that eagle’s-bill dorsal sepal. Bruce said that Jean’s Corybas was a taxon of C. “whiskers” similar to one of his first from inland Wanganui. His elegant drawing [J55, p24] shows the eagle’s bill but a flattish labellum bib. Further ratting through the slides came up with Dr. Brian Molloy’s C. “whiskers” (Fig. 7) from the Tinline River, with a prominent apicus also on a flattish bib, straight but speckled dorsal sepal and a purple peduncle, (observed by leaf cup) as in most C. rivularis s.s. Graeme Jane’s from Cobb River [J69, p13] is a close ally of Brian’s. All 4 key out as Corybas “whiskers”: but all differ! Jean’s, with that Veed labellum is as different as they come. Should we tag all 4 separately?

Jean kindly sent the Column photocopies of a bundle of priceless letters from orchid experts of the day to her father, the late Frank Bartlett. They were intriguing voices from the past, Monty Rüpp, Dan Hatch (see Historical reprint in this issue—Ed.), Ella

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*Not the Mahoeurnui of giant-wetas-in-the-gorse fame.
the past, Monty Rüpp, Dan Hatch (see Historical reprint in this issue—Ed.), Ella Campbell, Lucy Moore and others from 50+ years ago. With the letters came an envelope of pressed Pterostylis specimens for identifying, from the Silverdale area. Jean had found them loose in various books of Frank’s. Most, including P. puberula, were recognisable but three from Alf Poynter’s, at Silverdale, had a jug spout sinus to the lateral sepals like P. brumalis and the straight dorsal sepal of P. alobula. Two specimens had normal P. alobula leaves (one was in seed) but on the other two, the upper two bracts were short and broad. The three lower bracts were elliptic/spathulate similar to juvenile leaves on P. puberula, the centre one being 9mm wide and 20mm long plus a 10mm petiole. Back lit

Fig. 9. Pterostylis "Poynter"

Figs. 8 & 9 show the labellum and column silhouetted right through the galea. Hybrid P. alobula/brumalis springs to mind but P. brumalis wasn’t on Dan Hatch’s/Frank’s 23 April ’49 exhaustive list of 30 Silverdale orchid species. P. alobula/puberula hybrid is the Column’s shot-in-the-dark. Both species were present and their flowering periods overlap. What do you think?

Back-lighting of a specimen sheet taped to a sun-lit

Figures: Page 18: from top, anticlockwise
Fig. 1 & 2. Corybas oblongus. When the L & R eyes focus on L & R pics, one 3-D picture springs out. A viewer with two magnifying glasses makes it easy but with a little practice free viewing becomes second nature.

Fig. 3. Pterostylis puberula. Note; labellum too short to see; inward turning sinus to lateral sepals.

Fig. 4. Pterostylis puberula in a sunny spot with ground water oozing all year round.

Fig. 5. Corybas “whiskers” Mahoenui, Coatesville 17 Oct 00 with level to upheld lateral petals, Eagles bill dorsal sepal and out-thrust Veed labellum.

Page 19: from top left, clockwise:
Fig. 6. Corybas “whiskers”, Waitakere Stream 19 Sept 98. Note down thrust lateral petals, unusually up-turned dorsal sepal tip with recurved labellum edges and apiculus.

Fig. 7. Corybas “whiskers” from the Tinline River, Ecological region 40. Note cupped leaf and speckled dorsal sepal.

Fig. 8 (& 9 ←). Pterostylis “Poynter” from Silverdale c. 1950. Can you identify it?

Fig. 10. Danhatchia australis at Matakawau. This colony of 18 stems on 24 January 00
Historical reprints
Correspondence: Hatch to Bartlett

Dan Hatch and Frank Bartlett of “Bankside”, Silverdale (see biographical notes by EJ Godley in NZ Bot.Soc. Newsletter June 1995) became acquainted in the midforties. Hatch suggested naming a new Caladenia for Bartlett in his letter of 21 October 1946; he apparently rejected Matthews’s manuscript name “Caladenia nitido-rosea” because he regarded the plant as no more than a

4. Caladenia carnea var ? (this the pink flowered form. Matthews wanted to call it something-rosea but I feel it is only another variety of the already crowded carnea species (6 or 7 varieties so far). It is quite new and so far not described. Do you know if it mixes with the greenish-flowered form ? When I do Caladenia I shall describe and name it. What about var. bartletii ? I feel I owe you something. I should be glad of all the information you can get about it and one or two dried specimens in sund due season. The green stuff is excellent for dissection but the segments lose their shape for pressing.)

Hatch’s contemporary understanding of Caladenia is interesting: the most recent work on Caladenia had been Cheeseman’s 1925 edition of his Manual, where Caladenia minor, C. exigua (now identified with C. alata) and C. lyallii were the only three species recognised in NZ: Hatch was breaking new ground. He read his paper “Petalochilus Rog. and the New Zealand forms of Caladenia R.Br.” before the Auckland Institute on 22 October 1949. He had married in that year and he and his wife had visited the Bartletts one Saturday in the spring. The photograph was one of several taken during the visit—four of them intended to illustrate a planned joint paper on the botany of Bankside.

Dan Hatch and Frank Bartlett at Silverdale, spring 1949
The photograph of the scientists is referred to in a letter dated 15 October 1949. Importantly for us, Hatch also drew the labellar midlobes of all three Caladenias.

Dear Frank,

I hardly know where to begin - I attach one more name for the list (Ginger), also photos taken the other Saturday. I think the calves are perhaps the prettiest? I don’t think much of the scientists do you? I have numbered the others 1-4.

1 is no good I must have moved the camera or a cloud got in the way or something. Nevertheless its a good view and I must take it again another time. (note the dog.)

2 is quite good - shows well the original trees, their offspring and their relationship to the teatree.

3 is also good, shows the creek bank and the proportions of Eucalypt and teatree.

4 is a bit too close, but still may be useful. shows the poplars and loquat and bits of the ginger.

They are at any rate a beginning and I will know where to improve on them for next time I come up. Also they will refresh my memory for the writing up.

So to the specimens and enclosed note. Thelymitra ixioides, Corybas macranthus typicus AND ALL THREE Caladenias, C.minor Jord I, ditto Jord. ii, and bartlettii. The three are similar in general form and liable to be confused. In minor J.i, the labellum is whitish with pink bands, the midlobe of the labellum has several calli on either side and all the calli are tipped with yellow which usually fades to white.

In minor J.ii. the morphology is the same but the whole labellum, including the midlobe and the calli - tips are dark reddish brown.

In bartletti the labellum is dark mauve with 2 rows of yellow tipped calli. The midlobe is yellow and has no calli.

Hatch’s 2 “jordanons” of C. minor are what we would now call C. minor (C. chlorostyla) and C. atradenia: his C. carnea var. bartlettii is now C. bartlettii. Of less happy interest is their discovery of ginger.
Notes, letters, questions, comments

Peter de Lange wrote “I was most impressed with Max Gibbs excellent account of variation within urban and Iwitahi *Gastrodia aff. sesamoides* populations. There is one minor quibble I wish to make. I was not responsible for the *Gastrodia aff. sesamoides* illustration used in the NZNOGJ reproduction of my original AK.Bot.Soc.Jour. article. As Eric Scanlen full well knows I am a hopeless plant photographer and as such I have tried not to ruin good film on orchids - my partner usually takes my plant photographs, and - as some might agree - one photographer in the family is more than enough! In so saying it happens I did try to photograph *Gastrodia aff. sesamoides* at the Symonds Street site some years after my original Ak. Bot.Soc.Jour article was published. The photograph is hideous, serving as further confirmation that I won't even try to photograph any orchids in the future. But it does show that this urban population at least had (the population has since been destroyed) WHITE not DARK sepal tips - as my herbarium specimens show (AK!). As to how the *Gastrodia aff. sesamoides* picture appeared in the NZNOGJ reproduction I can only presume that the editor, Ian St George, having first sought my permission to reproduce my originally faceless text in the NZNOGJ felt that a picture of the orchid discussed might liven the page (if not the story) up, and used one that he had taken from Iwitahi”. Indeed, they were, as they were labelled, Iwitahi specimens, and my photographs – Ed.

Pat Enright wrote (in NZ Bot.Soc. Newsletter 63 [March 2001]: 10) of a visit to the Clifden Limestone in Southland on 3 January, “Some of the group then made their way down to the beech forest beside the river where a number of *Gastrodia cunninghamii* plants were in full flower. These were heavily scented and the perfume permeated the air. Funnily enough some people could not detect the perfume and other comments ranged from it being delightful to rather cloying and unpleasant.”

Bob Bates wrote on *necrophylly and drought resistance* in South Australian orchids (NOSSA Journal), “South Australia is the driest state in the driest continent. Many of its native orchids have evolved strategies for beating or avoiding drought, e.g. growing only in damper microclimates, having a short
these reserves in the new tuber (or fleshy flowering scape). The leaves are then effectively dead or necrotic - hence the term necrophyll.

“At least 20% of South Australian orchids use the technique. The best known ones are the so called ‘Rufa group’ Pterostylis. South Australia probably has about 30 species of these, most of them undescribed.

“Each September when the temperature rises and daylight lengths, the leaves simply shrivel up. This often happens even if the soil is kept damp. For some species it can be quite a rapid process, the leaves looking fresh and green in the morning but “gone” by nightfall but for most species it happens gradually over a week or so.

“Flowering may already have begun before the leaves die but the late flowering species may not even have developed scapes before leaf senescence. The most noticeable of these is Pterostylis aff. despectans from Eyre Peninsula. The leaves of this species shrivel in September but flowering does not start until November - up to 8 weeks later and flowers may continue to develop up to 3 months after necrophyll. I have actually dug up some of these species in bud, pulled off the new tuber and watched as the plant, simply sitting on a bench with no soil or water provided, goes through with its flowering, produces a new tuber and even develops seed to maturity.

Many other genera have some species which flower after the leaves are gone, Caladenia for example has the aptly named C. necrophylla but most of the dryland species will flower after the leaf has shriveled - e.g. C. cardiophylla, C. roxochila and C. clavula.

I have seen Prasophyllum odoratum complex species in the desert pushing out a juicy flower spike from a totally desiccated leaf. Even Microtis arenaria will flower after most of the leaf is dried out. Some of the late flowered Thelymitra like T. aff. nuda “November” and T. benthamiana can be seen in good flower after leaf senescence. Of course not only does flowering proceed after leaf loss but seed capsule development must continue for weeks after that!

Then there are our autumn flowered species - Eriocharis and Leporella - these must initiate all growth from the tuber without a leaf at all, but they do quickly form a leaf to help out as soon as flowering begins.

Let’s hope South Australians themselves learn to manage our water resources as effectively.

Oops! As Eric Scanlen kindly pointed out, in J78 “Plate 9” bottom of p34 should read “Plate 13”. Ten lines on, on p35, “Plate 11” should read “Plate 9”.
Some orchid keys
By Graeme Jane, Tauranga

They say that pictures speak a thousand words and so the Field guide, with its sketches of all the species, is an essential companion on field trips. But sometimes it takes a quite bit of puzzling or debate to sort out which species you have. Often the debate hinges around one or two key features distinguishing the species. This means getting to grips with the terms used to describe orchids or even using new words to describe what is meant. Keys can highlight these differences and help sort out the distinctions.

A key then, focuses on and highlights the distinctive features of species. Traditionally keys are used by starting at the beginning (step 1) and making a series of choices until an answer is arrived at. Others use them to find out information about a species not covered in a description. They can also be used to find the key difference between two species by working upwards from the end point of two species until they appear on opposite sides of a couplet. Thus the key difference between Corybas papa and C. iridescens in the key below is at step 8 or in the lower key at step 2 - C. papa leaf is sessile.

1. Key to Corybas

The following key is almost a synoptic key to the genus because related species (and some of the more widespread related tag named forms) are kept close together. Tag named forms are grouped under or near closely similar species.

1 Plants leafless, colourless, flowers in litter, plant seen only at seeding
   Plants with at least a leafy bract
   cryptanthus
   2

2 Lateral sepals almost absent
   Lateral sepals well developed
   cheesesmanii
   4

3 Dorsal sepal much larger than labellum
   Dorsal sepal equal to tubular labellum
   carsei
   rotundifolius
   6

4 Dorsal sepal cleft, plants of Empodisma bogs
   Dorsal sepal rounded at tip, plants of scrub and light forest
   oblongus
   7

5 Labellum tubular with a frilled front margin
   Labellum broadly flared, usually frilled only on the lower margin
   trilobus
   15

6 Dorsal sepal blunt or notched, capping labellum
   Dorsal sepal acute or acuminate
   orbiculatus
   8

7 Lateral sepals scarcely reaching the top of the labellum
   Lateral sepals greatly exceeding labellum
   9

8 Leaf distinctly, often long-petiolate
   Leaf sessile or very shortly petiolate
   11

9 Dorsal sepal narrow, acuminate
   Dorsal sepal broadening considerably over the labellum top and then narrowing sharply to an acuminate tip
   macranthus
   10
10 Outer surface of labellum distinctly rough throat with a bead-like callus
   Outer surface of labellum smooth, callus absent from the throat
11 Leaf strictly sessile, labellum flared with a ragged lower edge
   Leaf very shortly petiolate, labellum more or less boat-shaped
12 Flowers almost totally green
   Flowers with a red labellum tube, striped white with pale yellow face
13 Auricle down-pointing, mostly green
   Auricle forward pointing, red flecks on dorsal sepal and elsewhere
14 Dorsal sepal curved upwards, leaf tip rounded
   Dorsal sepal curved downwards
15 Flower lacking red
   Flower with at least some red
16 Flower deeply coloured with outer edged of the labellum strongly incurved
   Flower with much yellow or green, outer edges of labellum flared outwards
17 Dorsal sepal beak-like, pointed
   Dorsal sepal rounded or notched
18 Flower oval, dorsal sepal scarcely longer than labellum
   Flower round, dorsal sepal much exceeding the labellum
19 Flowers usually above the leaf, early flowering, before main leaf flush
   Flowers usually below the leaf, late flowering, with main leaf flush

This key attempts to use the leaf or longer lasting features of the flower so that flower buds or dead flowers can be used to get close to identifying the species after the flower is over.

1 Plant leafless, flowers in litter, plant seen only at seeding
   Plant with at least a small green leafy bract at seeding
2 Leaf sessile with petiole entirely clasping the stem if present, flower pedunculate
   Leaf distinctly petiolate and free from the stem
3 Leaf small, often hidden in the litter at maturity
   Leaf well developed
4 Lateral sepals much shorter than the labellum
   Lateral sepals much longer than the labellum
5 Dorsal sepal cleft, plants of Empodisma bogs
   Dorsal sepal rounded at tip, plants of scrub and light forest
6 Leaf thin, wavy, often brownish green
   Leaf thick, flat, bright green
7 Leaf triangular with a long acuminate tip, flower trumpet-shaped
   Leaf ovoid, acute but not acuminate, flower tubular
8 Leaves about as wide as they are long, usually more or less kidney shaped
   Leaves oval or oblong
9 Dorsal sepal narrow, acuminate
   Dorsal sepal broadening considerably over the labellum top and then narrowing sharply to an acuminate tip
10 Leaf distinctly long-petiolate
   Leaf shortly petiolate
11 Lateral sepals not much taller than labellum
   Lateral sepals greatly exceeding the dorsal sepal
Close relations: orchids like ours

*Corysanthes unguiculata* (*Corybas unguiculatus*)
This is the species which was for many years regarded as identical with New Zealand’s *Corybas carsei* and *Corybas rotundifolius*.
Profile of a threatened NZ orchid: 7

*Pterostylis irwinii* D.L.Jones, Molloy et M.A.Clem.

**Family:** Orchidaceae  
**Endemic to:** Central North Island [and northern South Island].  
**Common name:** Greenhood  
**Ranking:** Unranked.  
**Descriptor:** A tall, slender, grass-leaved, greenhood orchid with large, red-tinted, minutely hairy flowers.  
**Conservancy:** TT, NM. Earlier known only from a single site at Erua, but recently confirmed at Takaka Hill (B.P.J. Molloy pers. comm. 1999).  
**Habitat:** Amongst *Polystichum* and in a seasonal wetland with small trees and shrubs, e.g. *Coprosma wallii* and *Olearia virgata*.  
**Threats:** Uncertain. Extremely uncommon (possibly naturally so). However, in recent years plants have become harder to find amongst the dense *Polystichum* fern. It is possible that plants are being shaded out through the aggressive growth of this fern. Flooding from the river may impact on the plants; flooding occurred in 1997 but the impacts have yet to be assessed.  
**Work undertaken to date**  
Species taxonomically described in 1997. Searches have been made for the species in the vicinity of the known site, and regular counts of plants have occurred in each of the last three years; *Polystichum* was trimmed back in October 1997.  
**Priority sites for survey**  
Uncertain. Virtually nothing is known about the ecology and habitat requirements of this orchid, which was only discovered in the mid 1990s.  
**Monitoring: objectives and priority sites**  
-  
**Research questions** What are the habitat requirements, autecology and population dynamics of *P. irwinii*? How does *P. irwinii* respond to the opening up of its habitat? What are the threats to *P. irwinii*?  
**Management needs**  
Research; threat mitigation once threats are established.  
**Selected references**  
Using genetics to answer taxonomic questions or “to split or not to split” by Doug Bickerton (Abridged from a two-part article from the Journal of the Native Orchid Society of South Australia Dec. 2000/ Feb. 2001)

Part I
The Lofty Block Threatened Orchid Project is a partnership between Threatened Plant Action Group and Dept. Environment & Heritage. The focus is the conservation of a number of nationally endangered or vulnerable orchid taxa found in South Australia. In some circumstances it has been difficult to distinguish whether plants in a population are sufficiently different from other populations to be labelled a distinct species. Sometimes there are minor morphological differences such as labellum shape or veins on the leaf, and perhaps the population is found in a different type of habitat, or many kilometres from a similar population. But perhaps there is some other difference that cannot be distinguished by sight, feel, smell or intuition.

Exactly what is meant by a species varies according to which taxonomist you talk to. When I was at high school I was told that different species had different numbers of chromosomes, and therefore a cross between species (i.e. a hybrid) would not produce viable offspring. Nobody told me about the Orchidaceae, which seem to produce more viable hybrids than non-viable ones! Therefore the best way to determine the relationship between two populations is to examine their genetic material.

Earlier in the year it was decided to use a process called Allozyme Electrophoresis to answer some questions about three taxa.

Pterostylis aff. nana
Bob Bates and some other NOSSA members have known of a patch of “P. nana” at Hale CP for over a decade. The population covers a mere 0.25m² and in recent years has 70 – 170 plants. They are smaller than the typical P. nana, with a brown-orange hood and a “dolichochila”-type pointy lip. The population is found in micaceous soil with long-leaf box/native pine woodland (Eucalyptus goniocalyx/Callitris rhomboidea). In 1999, NOSSA members on a field trip 80 km away in Ferries McDonald Conservation Park, discovered a similar patch of orchids in sandy soil with mallee woodland. Since the two populations are apparently rare, but growing in different habitats, there was some doubt that they were of the same taxa.

In August 2000, with the assistance of David Pettifor, the Bridles, the Houston, and other NOSSA members, I located the two Pterostylis aff. nana populations and collected a leaf from 20 plants at each site. I also took 14 or 15 leaf samples from the Adelaide Hills form and mallee form of P. nana. These were immediately stored cryogenically (in liquid nitrogen) to prevent deterioration, and taken to Mark Adams at the Adelaide Museum within a few days.

The material was then brought out of storage, crushed and subjected to a number of electrophoretic gels that highlight certain loci (or the positions of genes on the chromosomes). The reading from each gel indicates whether the highlighted gene is identical to other samples or similar. It also shows if a gene is heterozygous (a mix of dominant and recessive characteristics) or homozygous. This process indicates whether there are genetic differences between samples without showing what the differences are. That is, if a gel gives an identical reading for both samples of material then we know that the gene is identical in both plants, but we don’t know the purpose or importance of the gene.

The tests indicated that the Hale CP and Ferries McDonald CP population are of the same taxon, distinct from the Adelaide Hills and mallee forms. Also the samples within each population were identical, although the populations are not identical to each other.
This means that both populations are clonal, i.e. only reproducing vegetatively (by tuber). The tests on the Adelaide Hills form and mallee form indicated that these latter forms are of one species. Furthermore, there was little variation within samples of the latter forms, indicating that most reproduction is by tuber division, but some spread also happens from seed.

These results answer some questions for us, but in the process other questions are raised. Perhaps it should not be surprising that the Hale/ Ferries-McDonald form is spreading vegetatively because there are numerous plants in a very small area, but why are they clonal when Bob Bates has been hand-pollinating the Hale population for more than a decade? And why are they found in such different habitats? One suggestion put to me is that each population began from a hybrid from two common species (e.g. P. nana with P. robusta or P. dolichochila), which produces sterile seed. Another is that the seed is not sterile, but simply no reproduction has resulted from the seed at these two populations. Bob Bates believes that a P. aff. nana common to Eyre Peninsula is the same taxon, and these populations near Adelaide may be outliers.

Needless to say, further research needs to be conducted to answer these questions.

Part 2

In this article I detail the work done on another taxon, and mention another not-quite-so successful story.

**Caladenia gladiolata**

This small but distinctive plant could once be seen in woodlands in at least 10 places between Dutchman's Stern CP in the Flinders Ranges and Scott Ck CP south of Adelaide. Now it is apparently limited to Mt. Remarkable NP and Scott Ck CP. The two latter parks are separated by 300 km, and some NOSSA members had noted that photographs of *Caladenia gladiolata* individuals taken at both Parks showed differences in appearances. The Scott Ck plants are smaller, with lighter-coloured sepal tips. So the question was raised: Are they the same taxon?

In September last year tissue samples were taken from plants at three populations: 10 each from two populations in Mt. Remarkable NP and 20 from Scott Ck. The Allozyme Electrophoresis analysis indicate that the Scott Ck plants are the same species as the Mt. Remarkable ones.

What does this signify? It means the species was probably much more widespread before European settlement. The nearest population of *C. gladiolata*, now presumed extinct, is at Tothill Range, 150 km away. If these populations had been separated for say 10,000 years one could expect allopatric speciation to occur (i.e. when two populations of a species become separated geographically and evolve into two species), but it hasn’t happened. It is likely there were many more *C. gladiolata* around until 200 years ago, and there may still be populations out there waiting to be discovered.

**Pterostylis aff. biseta** (Mt.Brown)

Unfortunately not all forays into the brave new world of gene technology meet with resounding success.... In 1994 when Bob Bates was helping the Nature Conservation Society with a botanical survey of the newly formed Mt. Brown CP, he discovered nearby a small group of greenhoods that appeared to be closely related to, but distinct from, *Pterostylis biseta*.... I decided to find out how closely related they were. Last year, armed with a liquid nitrogen canister, I set off to collect some tissue samples of *P. biseta* from five sites including Sandy Creek, Mt. Remarkable NP, Mt. Brown CP and the nearby population of particular interest.

Following my return, we discovered to our dismay that the samples had not frozen properly apparently due to insufficient liquid nitrogen in the canister. Mark Adams was able to run some tests, and find that the apparently different plants probably aren’t so different, but the material gave very poor readings and the results are far from conclusive. So the best laid plans of mice and men, or geneticists and orchidologists, have been laid waste. Better luck next time.
A correspondent asked, "How long can an orchid live sub-surface?"

"A case is described by Hanne N. Rasmussen (of the) mass occurrence of flowering Cypripedium calceolus 2 years after a forest clearance in a locality where the species had not been recorded in recent times.

"In her table 8.2 Rasmussen gives some data, and an extract is as follows

- Cypripedium acaule: 1-12 years underground
- Epipactis helleborine: 3 years
- Listera ovata: 1-2 years
- Spiranthes spiralis: 1 year
- Dactylorhiza sambucina: 1 year
- Orchis mascula: 1 year
- O. simia: 1-2 years
- Ophrys apifera: 1-3 years
- O. sphaegodes: 1-2 years

"To this list I can add my own observation: After at least two consecutive years of flowering, a plant of Dactylorhiza fuchsii stayed underground for 2 (maybe 3) seasons after which another fertile stem was created during each of the following four springs.

"On p304 Rasmussen summarizes research which seems to show that it takes at least 4 years for young plants of Coeloglossum viride to develop the first aboveground parts, but that the rate of development depends on the habitat, the plants developing more rapidly in warm, open places."

A contributor wrote, "This season, in the area I watch, the first shoots of Corallorhiza trifida were registered on May 9, raising to a maximum number of 28 at the end of the month. At the beginning of June, however, more than half (15) the shoots had disappeared prior to flowering.

The question I ask is why?

"Literature gives the following facts: in early fall, the next season's shoots (4 mm in diameter and 1.5 - 2.5 cm tall), are formed from nodes of the coralloid rhizome about 4 cm down in the substrate - whether moss or forest soil. [1: p50]. In the following spring, aboveground shoots are created and the time of flowering is accelerated by dryness [2: pp49,125] and perhaps the amount of light present [3: p135]. In this phase, plants of C. trifida contains sufficient amounts of photosynthetic pigments for diffuse daylight to bring the aerial shoot above compensation point, i.e. the point where the production of oxygen by photosynthesis exceeds the consumption of oxygen in the respiratory process [4: pp352-353]. Although the flowers are visited by small insects, no one has been able to conclude that the insect visitors were actually affecting pollination and autogamy (self-pollination) via movement of pollinia to the stigmatic surface seems to be the rule [5: p31]. Seeds produced presumably germinate in the autumn of the same season [4: p353].

"My observations indicate that the disappearance of the stems prior to flowering happens only when this period is very wet due to heavy rainfall. Of course, during such periods, the number of insects visiting the flowers is smaller, but given the lack of involvement in pollination (cf. above), this should make little difference. On the other hand, could it be that rain reduces the probability of autogamy? Some indirect support for this may be found in the fact that dryness accelerates flowering.

References
When needles of *Pinus sylvestris* and *Pinus nigra* were put (separately) in closed glass jars and kept moist, the needles of *P. sylvestris* became rather slowly infested with sparse growing mycelium of mainly *Ceratobasidium cornigerum* (a very widespread, cosmopolitan fungus which can be found in different kinds of soil) while needles of *Pinus nigra* developed a more abundant fungal garden of mainly so-called sugar-fungi, such as *Penicillium* and *Mucor*. When seeds of the orchid *Goodyera repens* were introduced, they germinated on needles of *P. sylvestris* (an interesting method to propagate this species), but were rapidly parasitized by the *P. nigra* flora. Inoculation of *P. nigra* needles with *C. cornigerum* was never successful.

A Dane wrote, "I am looking for the definition of the terms of Taxonomy as there are Species; Subspecies; Varietas; Forma; Lusus. Are there defined requirements or stipulated conditions to be complied with a plant to put it to one of the categories?"

"In his paper ‘Species concept and guidelines for infraspecific taxonomic ranking in Dactylorhiza (Orchidaceae),’ (Nord. J. Bot. 18(3) 1998), Henrik Årenlund Pedersen states that recent classifications of Dactylorhiza recognize from 6 to 49 species in Europe alone. I believe this shows that no such agreed terms exist.

"Further, Pedersen uses a study of Dactylorhiza populations to set up the following rules (here quoted from the paper's Conclusions):

**For species:** As "species" are designated taxa complying with the biological species concept in a modern, botanically focused sense. In addition to mutual reproductive isolation they are distinguished by basically different genome compositions - a fact that can be utilized when assessing the rank of allopatric taxa. It is tentatively suggested that autotetraploid taxa should be treated as conspecific with their diploid progenitors.

**For subspecies:** As "subspecies" are designed taxa complying with the ecological, but not with the biological species concept. All subspecies of the same species have basically similar genome compositions, but their ploidy levels may differ.

**For varieties:** As "varieties" are designated taxa complying with the phenetic, but neither with the biological nor the ecological species concept. All varieties of the same subspecies have identical ploidy levels and basically similar genome compositions.

"Based on these definitions, Pedersen concludes that the tetraploid *D. maculata* s.str. (genome FFF) and *D. majalis* s.str. (FFII) should be treated as different species. On the other hand, *D. majalis* and *D. purpurella* s.str. have the same genome composition (FFII), but should be given subspecies rank based on the existence of pre-pollination barriers: Geographic separation and time of flowering (*D. purpurella* s.str. is northern, late-flowering whilst *D. majalis* is southern and early-flowering). Thus, according to Pedersen, the correct taxonomy here should be *D. majalis* ssp. *majalis* and *D. majalis* ssp. *purpurella.*"

Apply this logic to *Pterostylis* and what do you get? - Ed
The NZ Native Orchid Group 2001

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