THE NEW ZEALAND NATIVE ORCHID JOURNAL

#102


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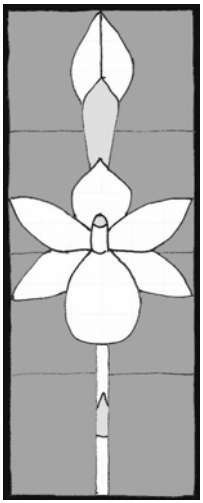

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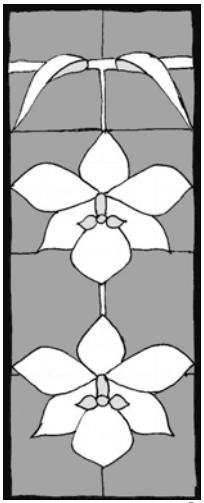


EDITORIAL: IAN ST GEORGE

1. Resupination

Why is Cryptostylis called Cryptostylis?
Well, crypto means hidden, and style is the column.
"Hidden column". Why?

The nonresupinate flower of *Prasophyllum hectorii*; it is insect pollinated.

The nonresupinate flowers of *Cryptostylis subulata;* its column is hidden by the uppermost labellum, but it is insect pollinated.

Well, because the labellum is uppermost, hiding the column, and that state is called nonresupination.
Why? Well, you lie "prone" when you are face down, and "supine" when you are face up. The orchid flower develops with its labellum uppermost, and during development most twist so the labellum is lowermost: the act of "resupination" (OK, it should be simply "supination" to describe the act of lying supine, but it isn't). Some orchid flowers, *Cryptostylis* included, never resupinate, keep their labellum uppermost, so hiding their column. Other nonresupinate flowers actually resupinate then twist a further 180 degrees, a total of 360 degrees from their original position. These include *Prasophyllum* and are also therefore nonresupinate.
Why resupination and nonresupination? goodness knows, but nonresupination is said to be a sign of self pollination—the labellum presumably not a platform for insects. But there are an awful lot of exceptions to that rule—insect pollinated *Cryptostylis subulata* and *Prasophyllum hectorii* for instance.

2. Pollination mechanisms for *Nematoceras*?

GM Thomson on *Nematoceras macranthum* in 1878

In 1878 the Otago schoolteacher GM Thomson read his now famous paper "On the means of fertilisation among some New Zealand orchids" to the members of the Otago Institute [1]. I will quote in full what he said of *Corysanthes macrantha:*

"Both this species and *C. rivularis* (he would be referring to the *N.* aff. *iridescens* found around Dunedin) were examined by me, but the flowers are almost identical in structure, the difference not affecting the relations of the parts. They are very striking in appearance, owing to their lurid purple colour, and the long twisted sepals and petals, which give them an extraordinary resemblance to a large spider sitting on a leaf. The upper sepal is large, prominent, and helmet-shaped, and projects forward over the flower. The labellum is large and involute, almost semi-cylindrical, with its external margin fimbriated and expanded downwards into a longish tip. It is not attached continuously at its base. On each side of the flower, when in bud, a small slit is seen, which widens by an expansion of the margin (which is thus caused to arch slightly outwards) into a small circular aperture. By the contact of the in-turned edges of the labellum, and the overlapping of the upper sepal, a horizontal aperture is left in the mouth of the flower, which bends at right-angles a little way in, and opens into a tolerably large cavity, Placed quite at the bottom of this is the short, thick column, lying almost horizontally in *C. rivularis*, and somewhat more erect in *C. macrantha*. The stigmatic cavity is deep, and on its posterior margin is the rostellum. This is formed of large cells, covered with a very delicate membrane. If this be touched with a bristle, it is almost instantly ruptured, and a small, very viscid drop of matter exudes. In withdrawing the bristle the pollinia are brought away with it. The anther is terminal (posterior), and has broad lateral projections. The pollinia are four in number, in two pairs, and in the form of plates. The flowers do not appear to secrete any nectar, but when the surface of the labellum is slightly punctured, a considerable amount of sweetish purple juice exudes, which is probably grateful to insects. From the shape of the flowers, it is necessary to cut them longitudinally to see the parts. Looking at the position of the anther and stigma, it appears to me almost impossible that self-fertilisation can take place; at the same time it is somewhat difficult to suggest any satisfactory way in which an insect could accomplish either this or cross-fertilisation. I presume that any insect entering the flower would have to back out again by the same way as it entered, and in doing so it would come in contact with the rostellum, and would remove the pollinia on its head. It is also probable that, in endeavouring to obtain from a second flower any of the sweet juices from the tissue at the base of the labellum, it would slightly advance its head, so as to bring the pollinia attached to it on to the stigma. Again, it is possible that self-fertilisation might be secured by an insect thus getting the pollinia on its head, and then endeavouring to push its way down through the small lateral apertures. In doing so, it would almost certainly smear the stigma with pollen from the same flower, and I have sometimes been inclined to think that such did take place. At the same time, this would seem like putting an unnecessary difficulty in the way of what is usually a very simple process, and therefore no great value is to be attached to this idea.

"For a time I could not understand why spiders frequented these flowers so much, but I soon found a sufficient cause. The only insects capable of removing pollen which were found about the flowers were small Diptera—probably a species of *Culex*. In several cases these small flies had penetrated into the tube of the flower, and, in their eagerness after the sweet juices found there, brought their heads in contact with both rostellum and stigma, and partly owing to the viscidity of those parts, and partly to the narrowness and bending of

the tube, were unable to withdraw backwards. In some flowers insects were thus found still alive, in others they were dead, while in many others only portions of them, such as legs, wings, etc., were left, the spiders having devoured the rest. In every case in which a captured insect was withdrawn from its trap, the pollinia wore removed also, securely attached to the front of the head.

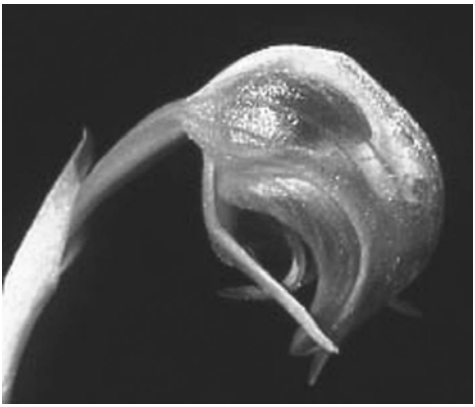
"I closely examined 148 flowers, and found that in 47 the pollinia were still in the anther cells; from 90 they had been removed, while in 6, dead or living insects were found glued to the stigma. Of the whole number examined, only a small proportion ultimately produced capsules.

"The flowers of this genus will well repay examination."

Pterostylis, Nematoceras and fungus gnats

I wrote [J100 p7, in the context of a discussion of nectaries], "What about *Nematoceras?* There is a protruberance at the base of the column of *Nematoceras* species. The pollinators are fungus gnats; some adult fungus gnats drink nectar. The position of dead bodies of fungus gnats found in *N.* 'Craigielea' and *N. iridescens* suggest that the protruberance is what they seek".

In the same issue was a report of Carlos Lehnebach's work [2], including observations of fungus gnats probably pollinating *Pterostylis alobula.* He wrote "… these orchids (*Pterostylis*) may be 'window flowers' with the clear crystalline panels in the hoods concentrating the light on the inside of the flower thus attracting the fungus gnats (Jones, 1981 [3]). The presence of colourless translucent areas in the perianth such as those of *P. alobula* and *P. patens* has been reported in other trap flowers (Dafni 1984 [4]; Vogel & Martens 2000 [5]). These authors explained that since flies are positively phototropic (attracted to light) once inside the floral trap, they will try to escape through the trap's entrance before reaching the reproductive organs. The light that comes through these 'window-panes', usually located at the bottom of the trap and close to the reproductive organs, will lure the insects deep into the trap assuring insect visitation to the reproductive structures."



Pterostylis nutans—dubbed "crystal dome" by George Fuller, who grew it from an Australian plant. An insect-pollinated window flower.

Only male fungus gnats visited the flowers of *P. alobula*, and Carlos Lehnebach postulated sexual attraction by fragrance mimicking pheromones, then trapping by the irritable labellum, movement towards the base of the "window-flower", then escape via stigma, rostellum and pollinia, depositing and carrying pollen.

Can we understand insect pollination in *Nematoceras* similarly? Perhaps so, but we need some important knowledge gaps to be filled.

I suggest this: some *Nematoceras* flowers exude fragrance attractive to fungus gnats (can we determine the sex of gnats found inside *Nematoceras* flowers? George Fuller [6] *(see p.10)* found female gnats from at least three different species visiting *Nematoceras iridescens*, and Eric Scanlen photographed gnats' eggs in *N. trilobum* [J98: 34].but is this more generally true? And do the gnats approach from downwind?

The long filiform tepals act as "pollen guides" as the gnat draws closer.

The light (or ultraviolet) reflected from the

galea [7] provides a ring target for the gnat, which enters the narrow flower cavity. Once there it may be rewarded by nectar from the protruberance in front of the stigma, or it may simply be attracted to the light entering via the auricles. It may (if it is very small indeed) exit through those auricles, or it may exit by backing out the way it came in. In doing so it dislodges and carries pollen on its thorax, ready for the next flower it visits. Fungus gnats *are* attracted to nectar and to light, and *Nematoceras* appears also to be a "window flower" with its auricles.

New Zealand orchids appear not to have formed the specialised orchid-pollinator partnerships common among Australian orchid species. What seems likely here is that a number of fungus gnats are capable of pollinating a number of orchids – *Pterostylis* as well as *Nematoceras.*

Bruce Irwin's longitudinal sections seemed at first a strangely complex, even contrived, way of distinguishing among different members of the *N. rivularis* group, but they clearly differentiated a range of new taxa, and possibly define the entry route of the gnat, and thus the pollination system of the different species.

Is *N. papa* a self pollinated species?

George Fuller wrote that no pollinators visited *N. papa* during his observations: *N. papa* may be self pollinated—or it may spread only vegetatively (has anyone seen fruit on it?). In the Fernery at Pukekura gardens in New Plymouth it grows alongside *N. iridescens,* they flower together, and they do not hybridise.

What advantages might self pollination confer on *N. papa*? A guaranteed fertility so that it flourishes in its little ecological niche, and doesn't need to await the arrival of an appropriate gnat. Noncompetitiveness with neighbouring *Nematoceras.* But if its ecological requirements are too narrowly circumscribed – and it does have a very restricted geographical range – it may be in trouble in an extreme season, or with climate change.

Mind you, a degree of rarity and a nice neat stable structure that humans can easily recognise may, in this new conservation age, confer a special human-mediated advantage to enhance its chances of survival too.

Is there any structural clue to self pollination in *Nematoceras*? *N. papa* is a shy, small-flowered, largely green and odourless orchid, its proximity to the big, purple, fragrant, flagrant *N. iridescens* at Pukekura emphasising the contrast between the two. There are others in both the *N. rivulare* and the *N. trilobum* alliances that would appear on a superficial assessment to be self pollinators too.

Do the insect pollinated taxa have a selfing fallback position? To do that the flower would have to tip forward, making the column vertical, allowing pollen to fall onto the stigma; I don't think I have observed that.

Hybrids *(see p.12)*

We are aware of a number of likely naturally-occurring hybrids between pairs of *Nematoceras* species [8], and that would be expected if the insect pollinator were not specialised to a single *Nematoceras* species. The same is probably true of gnat-pollinated *Pterostylis* species, and indeed some colonies of *Pterostylis* have all the appearances of hybrid swarms.

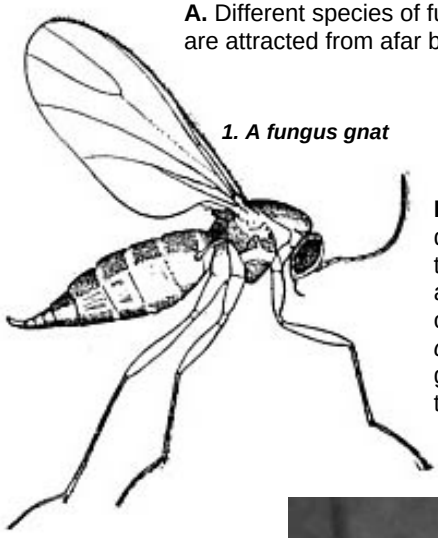
Perhaps a single species of fungus gnat may visit several species of *Nematoceras,* and perhaps different fungus gnats may pollinate the same *Nematoceras.* In other words perhaps neither the gnats nor the orchids are selective, so hybridization is possible when habitat, flying and flowering times all allow the gnats and the orchids to be there at the same time.

Could that be the situation with (for example) the *Nematoceras trilobum* complex? Of the *Nematoceras* species that have chromosome counts, all are diploid (2n = 36), except for the *N. trilobum* complex that has diploid (2n = 36) and tetraploid (4n = 72) representatives (M.I. Dawson & B.P.J. Molloy, pers. comm.). Or is that 72 an allopolyploid whose number has doubled? *Nematoceras* hybrids therefore cannot be detected as easily by chromosome studies, as they can in *Thelymitra.*

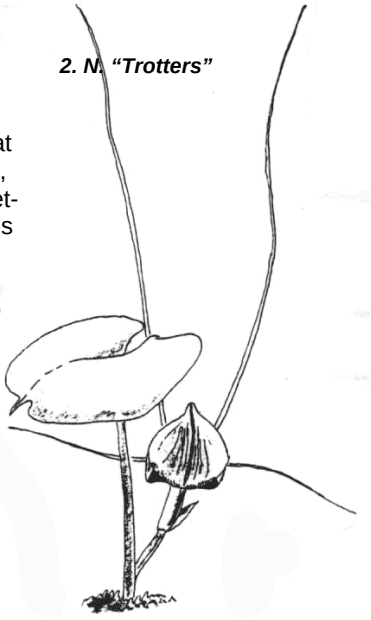
Today's *Nematoceras* taxa may be hybrids

Is this how *Nematoceras* species are pollinated?

A. Different species of fungus gnats (**1**) are attracted from afar by floral fragrance.



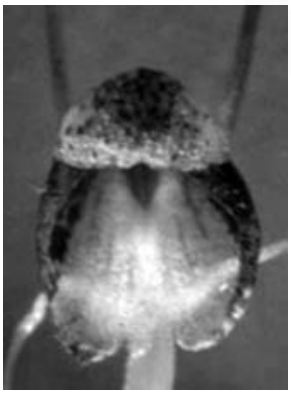
1. A fungus gnat



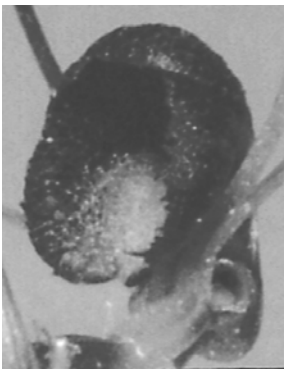
2. N. "Trotters"

B. As the gnat draws nearer, the filiform petals and sepals of *Nematoceras* act as guide lines to the galea (**2**)

C. Nearer still, the pale reflected light (**3**) or ultraviolet (**4**) of the central labellum forms a target, and the gnat flies to the centre, entering the V-shaped opening to the narrow rear cavity, folding its long legs to enter.



3. N. aff. trilobum

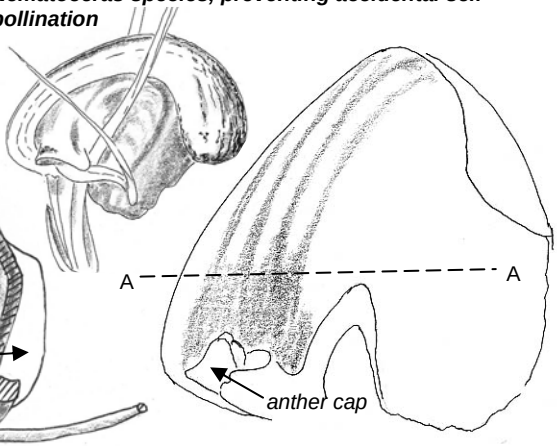


4. N. "Trotters".

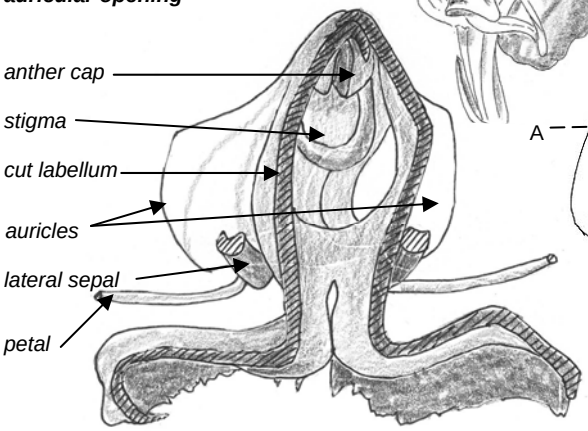
D. As the gnat crawls over the labellum flexure, and into the tight cavity darkened by the purple labellum (**5**), it is attracted to light entering via the auricles (**7**), and moves further down the cavity.

5. A dead gnat in N. iridescens: Photo Brian Tyler

6. N. "Trotters", with its horizontal column typical of Nematoceras species, preventing accidental self-pollination



7. N. "Trotters" sectioned A-A : a gnat's view of the column and daylight through the auricular opening

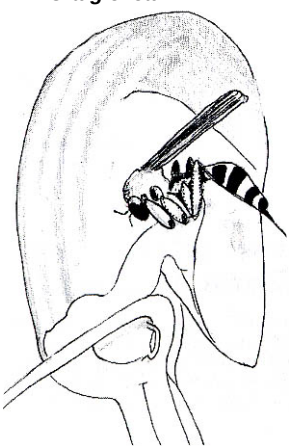


E. As it moves down, the gnat's back is to the anther cap, and pollinia stick to its hunched thorax (**8**).

8. A gnat carrying the pollinia of N. iridescens. Photo George Fuller

F. A small gnat may exit via the auricles; larger ones must try to back out—some become stuck and die there (**5, 9**).

9. A dead gnat in N. "Craigie lea"



G. The gnat visits other nearby species of *Nemato-ceras,* depositing pollen, making hybrids (**10**).

10. Postulated hybrid N. aff. trilobum* X *N. "whiskers".

that are successful and stable in today's environmental conditions—but will they be the same ones that dominate in new conditions? or will other hybrids find those conditions more to their liking?

Hybridisation, especially the wide range of hybrids possible in a hybrid swarm, is an evolutionary means of improving the survival of at least *some* taxa, and thus of the gene pool.

Fungus gnats

The fungus gnats seem to be important insects for New Zealand orchidophiles. What do we know of them?

These are *Mycetophilidae* – NZ has about 600 species but there are approximately 3000 described species in 150 genera worldwide, although the true number of species is undoubtedly much higher. Some, like the NZ glow-worm, are bioluminescent. Adult fungus gnats are about 2.5 mm long, grayish to black, slender, mosquito-like, and delicate with long legs, antennae and one pair of wings. Identification can be made by the vein patterns in the wings. Eggs are hardly visible, oval, smooth, shiny white and semitransparent (do you recollect Eric Scanlen's photographs of flies' eggs on *Nematoceras* [J98 p34]? They must be the eggs of fungus gnats). Larvae or maggots are legless, thread-like, white, shiny blackheaded, up to 5.5 mm long and transparent so food in the gut can be seen through the body wall. Pupae occur in silk-like cocoons in the soil.

Fungus gnats reproduce in moist, shaded areas in decaying organic matter such as leaf litter. A great starting point for *Nematoceras.* The life cycle is about four weeks, with continuous reproduction in homes or greenhouses where warm temperatures are maintained. Broods overlap, with all life stages present during the breeding season. Larvae not only feed on fungi and decaying organic matter, but on living plant tissue, particularly root hairs and small feeder roots. Brown scars may appear on the chewed roots. The underground parts of the stem may be injured and root hairs eaten off. Damage occurs most often in greenhouses or plant beds.

Adults live about 7 to 10 days and deposit eggs on the moist soil surface or in soil cracks. Females lay up to 100 to 300 eggs in batches of 2 to 30 each in decaying organic matter. Eggs hatch in 4 to 6 days; larvae feed for 12 to 14 days. The pupal stage is about 5 to 6 days.

How much more do we know now?

So, where have we got to since George Thomson in 1878? Not much further, truth to tell. What he deduced from a study of structure alone, we are now beginning to confirm from observations in the field, most notably those of George Fuller (see below).

But "the flowers of this genus will repay (a lot more) examination (yet)."

3. The pollination of *Nematoceras iridescens*

George Fuller, then Director of Pukekura Park, New Plymouth, observed fungus gnats pollinating N. iridescens. His contemporary diaries are transcribed here, and his photographs ***Figs. 6-8****—Ed.*

1979

16 Aug Pukekura Park Fernery House No 1. Dense colony of *Nematoceras iridescens** in full bloom, several hundred in a m^2 on an almost vertical bank. Several mosquito-like flies noted, three of them bearing on the head pollen masses of the orchid. Photographs taken & the violent efforts observed of this rather long-legged insect trying to extricate itself from a bloom

28 Aug Specimen noticed with pollen & after a great stroke of luck in that it landed on the end of a nearby pointed leaf, it was caught for preservation. (*Mycetophylla diffusa* Tonnoir 1927). *N. papa* is now in full bloom amongst the *N. iridescens* but no insects noted paying attention to it.

3 Sep Insect with pollen noticed on later form of *N. iridescens* in No 2 House. R Bickerstaff of Napier on hand to photograph it.

9 Sep Several specimens noticed in vicinity of later form of *N. iridescens* in House No 2 but none with pollen. Extremely active and strongly attracted to blooms. Two caught and preserved, one having entered a bloom but probably not far enough to remove pollen (*Mycetophylla colorata* Tonnoir 1927). The other, with striped abdomen, had not been seen to alight on any blooms (*M. subspinigera* Tonnoir 1927). In House No 1 most blooms of both spp. are almost over yet no flies have been observed near the slightly later *N. papa.* The later form of *N. iridescens* in House No 2 is attracting flies but the *N. papa* now in full bloom there has not been seen to attract any.

11 Sep Another specimen with pollen on head observed on bloom of *N. iridescens* in House No 2. It eluded capture by flying away. Several other specimens in flight were seen in the area of these late blooms but they moved very rapidly when disturbed. Weather was sunny & warm.

26 Sep The plant of *N. iridescens* on which a fly was seen bearing a pollen mass (House No 2, 3 Sep) now has a very well formed seed pod. Several other plants in the same vicinity have likewise, but none occur on the *N. papa* nearby. Could this fly be pollinating *N. iridescens* only?

1980

6 July Gnat noted on very early bloom of *Nematoceras iridescens.*

8 July Male and female, apparently copulating noted on same bloom. No pollen. Several photos taken. Female larger on filamentous petal.

11 July One gnat observed.

22 July *N. papa* commencing to open. Gnats very prevalent.

31 July *N. papa* now open in quantity but little apparent attraction for gnats. Had great success in catching specimens. Over half appear to be bearing pollen.

4 Aug Further efforts at catching all gnats observed in order to obtain an average sample of insect species, sex and number bearing pollen. Observation suggests that possibly a little over half are bearing pollen. Insect movements somewhat clumsy, some seen landing on leaves, & in one case on a bloom of *N. papa* but perhaps by accident, since they appear to almost "dance" on the labellum of *N. iridescens.* Specimens caught added to those of 31 July.

26 Aug Few specimens of *N. iridescens* in the mixed colony in No 1 House now in flower but *N. papa* at its peak. Some gnats still present but in much less numbers than when *N. iridescens* was at its peak. None observed bearing pollen. A paler and more broad-winged gnat has been observed in small numbers over the past week.

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* Fuller identified the plants as *Corybas macranthus* and *Corybas orbiculatus* in his diaries, later changing the names to *Corybas* "A" and *Corybas rivularis* as nomenclature changed. They are now known as *Nematoceras iridescens* and *N. papa*, and those names have been substituted throughout for the sake of clarity. Fuller sent a large second batch of specimens for identification, but apparently they never arrived. That is a great shame, for only one of his first three gnat species was actually bearing pollinia, so the best we can conclude is that the female of *Mycetophylla diffusa* is a probable pollinator of *Nematoceras iridescens.* Is this is a specific orchid/insect pollination syndrome? The answer will depend on the identification of further pollinia-bearing gnats. And what of *N. papa*? Does it form fruit at all? Or does it rely entirely on vegetative spread? (which might explain its rather restricted distribution—though as Eric Scanlen reminds me, it is 130km from Mt Pirongia to Makatote). This is a remarkably vivid account by a careful observer – Ed.

4. Hybridisation

… is the interbreeding of individuals from genetically distinct populations, regardless of the taxonomic status of the populations.

Hybridisation & conservation
Natural hybridisation can create genetic diversity, e.g. plant species of hybrid origin. But hybridisation resulting from human disturbances (particularly introduced species, but also habitat modification) can compromise the genetic integrity of existing species to the point of causing extinctions. For example, the New Zealand grey duck (*Anas superciliosa*) hybridises with introduced mallards *(Anas platyrynchos).*

- Mallards are common but greys are rare;
- So NZ greys tend to mate with mallards, simply because more readily available;
- So pure NZ greys are disappearing.

The domestic cat (*Felis catus*) is swamping the European wild cat (*F sylvestris*) and African wild cat (*F libyca*).

Three general outcomes of hybridisation
1. Hybrid zone: an area of contact between genetically distinct populations where hybridisation occurs. Geographically localised, does not affect the genetic integrity of two parent populations.
2. Hybrid swarm: a population of individuals that are all hybrids by varying numbers of generations of backcrossing with parental types, and by mating among hybrids. Less localised, blurs genetic integrity of parental populations. This blurring of genetic integrity is called *genetic introgression* - gene flow between populations that hybridise. Introgression is not necessarily symmetrical - so one of the parent taxa might be genetically swamped by the hybrid swarm, while the other is not.
3. Hybrid taxon: an independently evolving stable population or group of populations with a unique set of heritable traits, distinct from the two or more parent taxa from which it arose. New genetic boundaries are established when the hybrid species forms.

Hybrid index
This is used to assess how far a population has progressed from early hybridisation (F1 only) stages to well established hybrid swarms. It is important to determine if hybridisation is natural or influenced by man's activities (anthropogenic). If we can't distinguish, then we must either fail to protect natural hybrids, or protect anthropogenic hybrids, perhaps to the detriment of parental taxa (which may become genetically swamped) [9].

Orchid hybrid swarms?
Orchid hybrid swarms have been observed in Britain where common spotted orchids and early marsh orchids grow together, so individual plants can be impossible to identify with certainty in the field. This situation can be made even more confusing if one of the parents dies out, perhaps as a consequence of environmental change, leaving the hybrid swarm with the other parent [10].

Tony Clarke reported a study of the hybrid swarm *Dockrillia pugioniformis* x *Dockrillia striolata* in the Watagan Mountains [11].

Bob Bates wrote on the observation of pollen vectors on a putative hybrid swarm of *Microtis* in South Australia, noting *Mm. parviflora, unifolia* and *rara,* with great numbers of apparent intermediate forms among the three species [12]. Two species of wasp each visited each of the three species of *Microtis.*

Phillip Cribb of RBG, Kew, has reported a well intentioned but misguided attempt at conservation of a rare orchid in Britain, in which the rare and a common species were

Figures p.13

Fig.5 *Nematoceras* "whiskers" growing alongside *N.* aff. *orbiculatum* near Nelson (photograph Mark Moorhouse—see J101).

Pukekura Park fernery: the pollination of *Nematoceras iridescens*
(All photographs by George Fuller)
Fig.6. A fungus gnat on the labellum.
Fig.7. *N. papa* growing alongside *N. iridescens.*
Fig.8. Two gnats bearing pollinia on their thoraces, emerging from the labellum.


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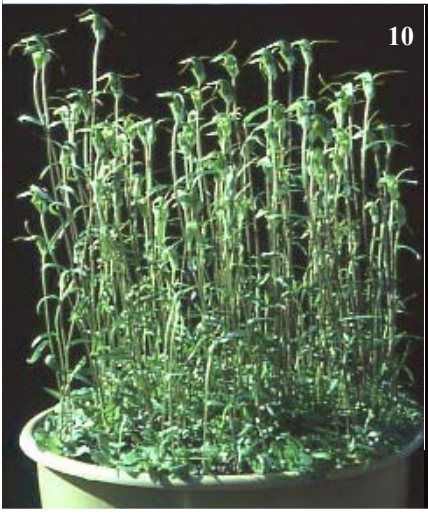
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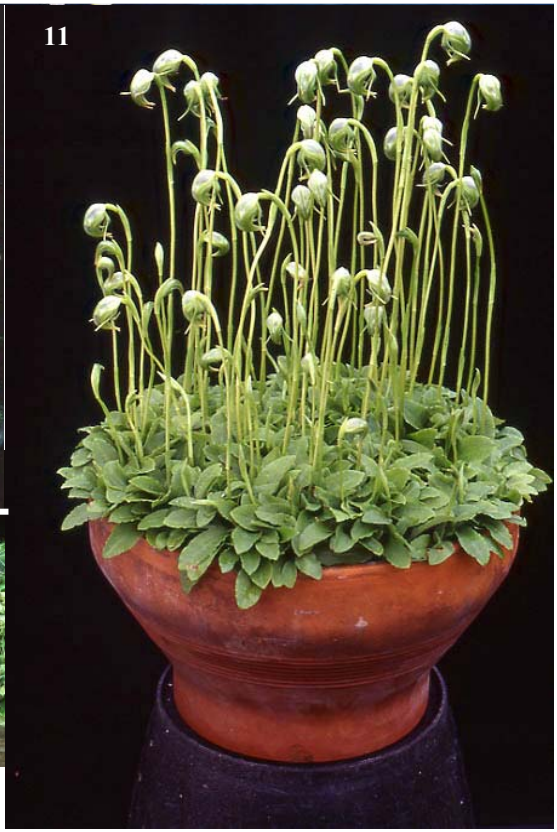
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accidentally cross-pollinated, resulting in a hybrid swarm which replaced the rare species in the wild.

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Figures p.14

Cultivated New Zealand native orchids

(all photographs George Fuller)

Fig.9 *Winika cunninghamii.*

Fig.10. *Pterostylis trullifolia.*

Fig.11. *Pterostylis nutans* (Australian specimen).

Fig.12. *Nematoceras papa.*

5. Conservation by cultivation

For most of its existence the New Zealand Native Orchid Group has rather disparaged the notion of cultivation, preferring to observe and record the natural history, ecology, structures and taxonomy of plants in the wild.

We have too often observed the sites of rare orchids after they have been ravaged by wouldbe growers, and we have tended to lump all growers as thieves. Or at best, fools, who do not realise that many native orchids are difficult, if not impossible to grow in cultivation. Or hybridisers who risk the escape of vigorous hybrids into the wild at the expense of native species.

We have to rethink that attitude.

Clearly there is a deep and serious interest in horticulture and hybridization, and in fact it is the major driving force for many of the Australian native orchid groups affiliated to the Australasian Native Orchid Society (ANOS).

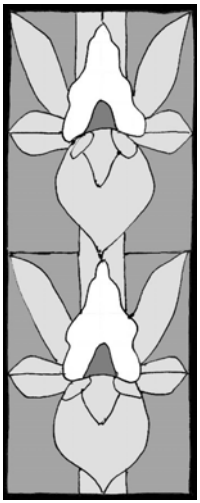
More importantly, perhaps, this originally horticultural interest, with the skills in growing native orchids developed for that purpose, can now be a powerful tool for conservation.

Species thought impossible to grow just a few years ago can be grown successfully using specialised techniques. Transplantation from threatened sites to safe sites has become far more successful in Australia, by following a few simple rules. Seed propagation of many species, including the rare and endangered, is not just a possibility, but a reality. Seedlings thus propagated have been re-established in the wild.

Imagine a seedpod of *Anzybas carsei*, its thousands of seeds not wasted in the wild, but sown out into hundreds of culture flasks; months later the protocorms pricked out onto new media, and later still the little seedlings planted into pots for transfer later still to restored wetlands.

We need to celebrate the people using these techniques and start putting their expertise to use in the conservation cause.

Thanks to those who have contributed their experience and wisdom in the series of papers on page 20 *et seq.* See **Figs. 9-12**.



EPONYMOUS ORCHIDS: VAL SMITH

Owen Edward Gibson (1928-1978)
Pterostylis irsoniana

Owen Gibson, the son of carpenter Cedric (Sid) Gibson and his wife Gertrude May Gibson, née Parkin, was born in New Plymouth and grew up in the suburb of Westown. At the age of 15 or 16 he left New Plymouth Boys' High School, where his father had earlier been Dux, and took employment as a trainee with nurserymen Duncan and Davies, working up to the position of block manager. Founded at Westown in 1899, Duncan and Davies was to become the largest grower of ornamental trees and shrubs in the Southern Hemisphere.

Owen imbibed a love of the outdoors and its wildlife from his father, and as a lad accompanied him to nearby Barrett Lagoon, or further afield to Mt Taranaki and the ranges, sometimes with friend and orchid enthusiast Bruce Irwin. Later Owen Gibson replaced his father on native orchid expeditions with Irwin, and in 1947 discovered a new species of *Pterostylis* on the mountain. He drew it, and in 1950 ED Hatch described *Pterostylis irsoniana*, "Ir-son", a combination of the names of the two men "who between them have done much to elucidate the orchid flora of Mt Egmont". The investigations of Irwin and Gibson led to Hatch's paper *Orchids of the Egmont Ranges*, published in 1953. On an expedition to Northland in 1949 they found an unusual *Thelymitra* that Irwin nicknamed "sanscilia". On their return south, near Wellsford, Gibson found *Corybas cryptanthus* (now *Molloybas cryptanthus)*, a little-known, almost subterranean spider orchid. Their last trip together was to Arthur's Pass in January 1957 – looking for orchids, of course!

Owen Gibson married Phyllis Swan; they were to have two sons and a daughter. In 1962 the family moved to Waitara, leased a block of land, and started their nursery Seaview Plants. Gibson was a good plantsman, and did considerable work with hybrids. In the 1970s he grew the award-winning native flax "Yellow Wave" for horiculturalist and plant breeder Felix Jury, and recognised the qualities of a *Leucadendron* hybrid bred by Mr Bell, Wanganui, raising and introducing "Safari Sunset" to New Zealand gardeners and cut flower growers.

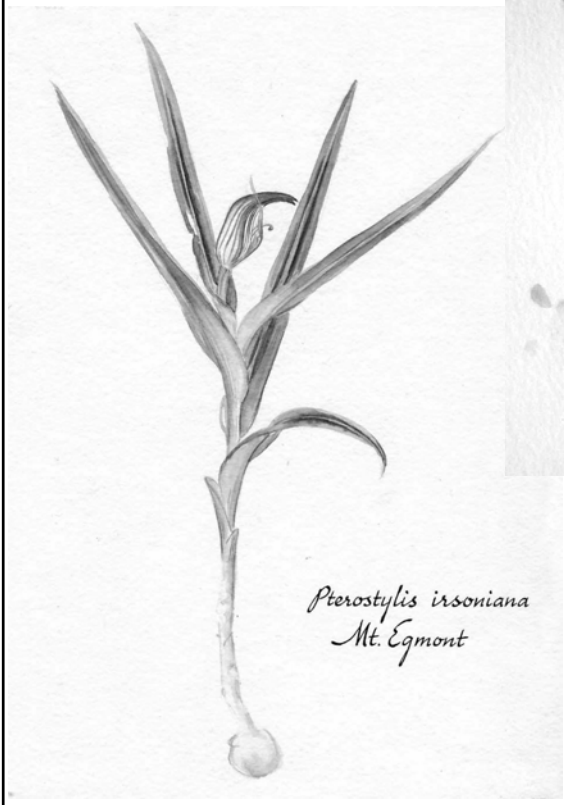
Owen and Phyllis Gibson both enjoyed drawing, painting and, in the early days, going on art group excursions. Owen had studied watercolour painting at night school, and his native orchid watercolours were accurate as well as artistic. He was a keen sportsman, and when at Duncan and Davies, played cricket for Westown. Taking after his father, he was also a competent handyman, and built a bach at Onaero, in North Taranaki. Unfortunately, ongoing health problems led to Owen Gibson's untimely death at Waitara in 1978, at the age of 49.

His colleague Bruce Irwin will be the subject of a future article in this series.

Pterostylis irsoniana Hatch. Trans. & Proc. Roy. Soc. New Zealand 78: 104 t.18 (1950).

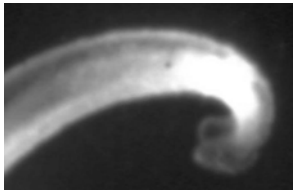
Pterostylis irsoniana (named for Bruce Irwin and Owen Gibson who first found it) is a strongly coloured plant up to 35 cm high, but often much smaller, with the uppermost leaf usually overtopping the flower. It is distinguished from the other species in the genus by its characteristic labellum, which is very narrow, arched and protrudes from the flower, its dark, ∩-shaped tip curling back to form a ∪-shaped scoop (see Eric Scanlen's photograph below). The labellum is unique in having a large dark prominent callus at the base, and sometimes smaller calli along the midline. Flowering December-February, *Pterostylis irsoniana* grows in subalpine scrub and forest margins from Mt Egmont/Taranaki and East Cape southwards (but not Mt Ruapehu) and in the South Island, Nelson and Westland.

***Pterostylis irsoniana* →**
from a watercolour
by Owen Gibson, 1947-8.

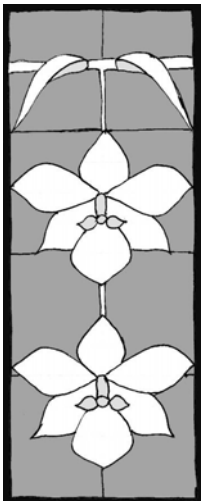


← *Pterostylis irsoniana,*

from a watercolour by Bruce Irwin dated 25 November 1949 (published in "Bruce Irwin's orchid paintings"; *NZ Native Orchid Group's Historical Series*



The tip of the labellum, photograph by Eric Scanlen →



CONSERVATION BY CULTIVATION

1. *Ex situ* cultivation of NZ terrestrial orchids – should we be doing more?

By Ken Davey, New Plymouth

NZ orchid growers and enthusiasts have a very good reputation both nationally and internationally for growing exotic orchids of all types to perfection. Many of the orchids they grow occur in the wild as epiphytes, lithophytes, or terrestriphytes, i.e. they grow on or attached to other surfaces but only the terrestriphytes are more likely to be found growing in the ground (soil) or in the litter layer on top of the soil.

For many years we have been very successfully growing exotic terrestrial genera. *Bletilla, Orchis, Pleione* are some of the older genera, and in the last 10 years or so *Disa uniflora* hybrids as a commercial cut flower crop. Many of us grow Australian terrestrials quite successfully, mainly amongst *Pterostylis, Thelymitra, Diuris* and *Chiloglottis*.

Many of the NZ native orchid species grow as terrestrials in the ground or in the litter / organic layer above the soil.

Why don't we do the same for our often locally and nationally endangered NZ genera? one seed capsule's worth of seed put into culture would be enough to start with for any species to get it into cultivation. With large seeded genera such as *Thelymitra* flask culture is not always needed.

There are some people, often members of Orchid societies, growing NZ terrestrials very successfully usually in the genera *Pterostylis, Thelymitra* and *Corybas* (or any of its new names), but they are often reluctant to take credit for their achievements, or to talk about their cultivation methods, ie potting mixes and fertilisers they might use.

Apart from *Microtis* sp. (usually *M. unifolia*) that grow in a wide range of potting mixes and soil types, are subject to all sorts of fertiliser regimens, become weeds in long term pot plants and get a white rust like disease, most of the other NZ terrestrial orchid species don't appear to have been looked at very much for pot culture.

I've seen photos of NZ terrestrial orchids being grown very successfully in both the UK and North America.

I'm sure that in NZ there are keen gardeners, collectors and professional horticulturalists growing a number, if not most, of our terrestrial orchids quite successfully in containers.

I think it is time we encouraged those people in NZ already successfully growing NZ terrestrials in cultivation to share their knowledge so that others can learn to grow them. This would reduce the pressure on wild populations and cultivated plants would in time become more readily available.

Australian growers

Several years ago my wife and I were in Adelaide at the time an ANOS show was on; we were fortunate enough to get onto a couple of the day trips that were organised to visit orchid growers in and around Adelaide. Amongst them

were several that grew Australian native terrestrials very successfully (they also had permits to grow orchids rescued from development sites). One grew plants from seed in culture without too much effort and another sowed his seed on the surface of the *Casuarina* (Sheoak) needle duff that he topped up all his pots with, to help reduce the growth of moss etc, and provide a seedbed. The seed was broadcast on the surface of the pot, then simply watered in and left to do its thing.

The mycorrhiza in the duff appeared to help the seed germinate well and grow strongly. (This would be much the same as the effect on orchids that are seen growing under pines in NZ. The success of the Iwitahi site at Taupo is in no small way due to the fact that the transplanted orchids suffer very little soil modification, and pine duff is everywhere). The resultant seedlings were pricked after two years or when the tubers were big enough to handle.

Growing NZ natives

Before I retired I was employed as Technical Officer in The Fernery in Pukekura Park in New Plymouth. Part of my job was to look after the very diverse orchid collection that the Fernery is known for. The collection had been assembled over many years by George Fuller and included terrestrials from other parts of the world, but only a few from NZ.

There is a growing public interest from NZers and especially overseas visitors and tourists to see properly identified NZ orchids on display in such places as the Fernery and at shows.

In the collection there are some Australian *Pterostylis* spp including *P. coccinea* and *P. nutans* and *Chiloglottis formicifera* all growing and multiplying readily (very little water from the first sign of leaf drop to resprouting, regular seaweed based fertiliser when in growth and an open mix including pine duff). There are a few NZ *Pterostylis* and *Corybas* that did not do very well until they were put into the duff supplemented mix.

Epiphytic spp. such as *Winika* and *Earina* are very easy to grow and display, and attract a lot of attention, even when not in flower.

Although some work has been done growing NZ terrestrials from seed in sterile culture, I understand that exflasking has not always been very successful.

I'm told that standing the flasks of terrestrial orchid seedlings on the cooler floor of the growing room for a period of time prior to exflasking hardens them off so that they will survive better.

Growth conditions

It is very easy to kill plants of exotic terrestrial orchid genera by being too kind; by that I mean

1. Too much shelter, shade and high temperatures (especially within the pots) along with increased humidity and restricted air movement.
2. Fancy potting mixes that are too water retentive and often break down too easily.
3. Too much fertiliser that is often very soluble and in forms that are not encountered by orchids growing in the wild.
4. Overwatering so that the root hairs on the tubers etc suffocate and drown.
5. Under watering by only applying enough water to keep the top layer of the potting mix damp and the bottom of the pot dry.

If we stop and take a look at the range of sites and soil types where most NZ terrestrial orchids are found in the wild, we will find that in general the soils are usually shallow, have a low nutrient status, are generally acidic and in many cases subject to dry spells, drought and sometimes seasonal flooding,

Some of my observations of growing sites in NZ are

1. *Corybas* etc grow *in* the litter/organic or moss layer *on top* of wet ground or seeps and not in the wet ground etc. and usually under good shade.
2. *Thelymitra* often occur on dry banks especially on the top side of road cuttings and farm tracks, with the tubers developing where the topsoil and subsoil horizons meet, or where the topsoil is very thin, in cracks in the subsoil or between rocks. As these or-

chids appear to require good light levels to open their flowers, more open sites seem to favour them.

3. *Pterostylis* often grow under good shade in the litter layer above the bush floor soil with some of the roots but not the tubers growing down into the soil.
4. *Orthoceras* seem to like open unimproved grassland that has a light scrub cover at higher altitudes and open bush at lower levels, with the tubers growing in the soil.

Within each genus there will be exceptions to these observations. In Australia in areas where the soils are sandy or gravelly *Thelymitra* and *Pterostylis* can be found with the tubers well down into these types of soils.

In *most* cases the tubers develop below the roots, are *annual* and occur on the end of "droppers" that descend from the main root mass or from the previous year's tuber.

Droppers develop from the tips of horizontal vegetative shoots or rhizomes that arise from the previous year's tubers; these shoots or rhizomes can vary considerably in length and often have scale leaves spaced out along them. In the case of a dropper being damaged at the tip of a shoot it is possible to get a very dormant axillary bud hiding under a leaf scale to break and develop into another shoot or dropper.

This type of tuber reproduction and multiplication can be seen with ease if you are fortunate enough to grow or know somebody who grows *Disa uniflora*, a South African terrestrial orchid and its many hybrids. Here the shoots and droppers arise from the vegetative collar at the top of the previous year's tubers.

Growing media

The potting mixes that I used for the Australian and NZ terrestrial genera at the Fernery and with the small collection I have at home are

Mix 1 – below the tubers
Two parts composted fine pine bark up to 10mm grade, screened to remove the dust and small fragments up to about 1mm.
One part coarse sand/pea gravel 3-8 mm, washed to get rid of weed seeds, silt etc.
Half a part of milled sphagnum moss.
Mixed well and slightly dampened to the stage of not sticking together when squeezed into a ball.

Mix 2 – around and above the tubers to within about 1.5 cm of the rim of the pot.
Equal parts of: screened composted pine bark and sand/pea gravel prepared as above, and screened pine duff that is prepared by collecting the duff (the layer of pine needles that is starting to rot and is just below the top layer of unrotted needles) preferably from under old pines. Remove most of the top layer of unrotted needles and collect the next layer that will have a fair bit of fungal mycelium growing in it; don't collect the lowest layers as they will have broken down too much. Rub the duff through a 10-15mm sieve to break the needles up. Mix all 3 ingredients well and keep very slightly damp as if it is allowed to dry out too much it can be very difficult to re-wet after potting

The idea of leaving the 1.5cm gap at the top of the pot is so that the top of the pot can be topped up with some of the duff on its own as it helps to reduce the rate at which moss and liverwort develop.

As mentioned earlier the use of broken up *Casuarina* needles in Australia to top up pots is worth following up here if a clean supply of these needles can be found.

Mix 1 is free draining but moisture retentive below the tubers, and Mix 2 has much more air available around and above the tubers.

Most of these orchids have tubers that are in themselves quite robust, but the roots and especially the shoots and droppers and their attachment points are very fragile and easily damaged, so the plants need to be as near to fully dormant as possible to avoid damage, this timing of repotting is quite important especially if you want to separate seedlings. If the plants are already in growth the tubers are easily broken off the shoots.

Many people when potting up these types of orchids use too much force "firming" the

plants in the pot; this leads to damaged, even broken roots and crushed tubers, and will allow disease in and is often the sole cause of failure. (You don't see plants of any type growing in concrete, instead they grow in the cracks and cavities in the concrete or on it, where they adapt to the constraints of the site).

If you have a slightly damp potting mix that will "flow" around the tubers and any roots that are present, then the chance of damaging the tubers and roots by gently tapping the pot on the bench as you fill the pot with mix is greatly reduced, and the mix will be finally firmed down at the first watering.

Fertilisers

Another way to kill these orchids is to apply highly soluble fertiliser too soon after growth commences and too often. Or have it already in the mix.

If you are repotting these plants when they are already in growth then the fertiliser should not be applied for at least one week after repotting. This will allow any damaged or broken roots to heal or start regrowing and reduce the possibility of fungal root infections becoming established.

The liquid fertilisers I used were seaweed based and used in the cut flower and pot plant industries, so have added potash to stimulate flower initiation and help the plants with disease resistance. This was applied once a week at about a quarter the rate for pot plants, at growth initiation and three times a week when in full growth until after flowering when it would go back to twice a week until the first signs of dormancy appear.

The potassium source should be Potassium sulphate, not Potassium chloride as orchids don't generally like chloride ions.

Those pots that were left too late to repot or were not to be repotted were given a light dusting of Dolomite as growth commenced.

Having seen the seedling growth and development in Australia, in pots with a surface layer of duff, I think it is well worth trying here, with the most important thing being to gently water the seeds into the surface of the duff and not try to cover them with the application of a further thin layer of duff.

Large seeded spp. such as *Thelymitra* lend themselves well to this technique, but I think it could be applied to many other genera.

Corybas and *Pterostylis* are kept under shade and the *Thelymitra* are grown in full sun.

Conclusion

I strongly support the concept of "conservation by propagation and distribution" and not locking rare plants up behind barbed wire etc, as this encourages greed and elitism, even leading to great losses of wild plants because of their artificially inflated "value".

2. Back from the brink: voluntary orchid conservation in Victoria, Australia

By Andrew Dilley, President, ANOS Victorian Group

In recent years the Australasian Native Orchid Society, Victorian Group (ANOS Victoria), has taken a proactive hands on approach to orchid conservation. To try and reverse the plight of our native orchids, which are suffering from loss of natural habitat through development, land use changes and climate change, the Threatened Orchid Recovery Team (TORT) was established. TORT is made up of representatives from the Department of Sustainability and Environment (DSE), Parks Victoria, Royal Melbourne Botanic Gardens, Melbourne Zoo, Victorian Universities and the Australasian Native Orchid Society, Victorian Group. It was established to bring all the various bodies together that had responsibility or involvement in orchid conservation across the state so that a coordinated approach to maxi-

mising our efforts could be achieved.

ANOS Victoria has been involved in many ways with orchid conservation. Our activities have included monitoring, searching, environmental management, weeding, associated species identification, translocation, growing orchids from seed, establishment of ex-situ populations, reintroduction into the wild and the promotion of awareness of our natural orchid heritage.

When we started getting more involved in conservation, the group decided to "adopt" some orchid species that were endangered. The orchids chosen were colonies that we were already aware of that were receiving little in the way of resources or attention. All work carried out was undertaken under the guidance of the responsible authority and in accordance with recovery plans that had been drawn up.

Our first "adopted" orchid was *Prasophyllum suaveolens* (Fragrant Leek Orchid) that was growing in a small country cemetery (**Fig.1**, inside front cover). Only a few people were aware of the existence of this isolated colony, believing that the best way of protecting the orchid was to keep its existence a secret, under the impression that its greatest threat was from unscrupulous collectors who would dig it up given the opportunity. The Cemetery Trust had been made aware of the presence of these orchids many years previously, but was not really aware of their significance. Over the years the management of the Cemetery Trust changed and gradually the orchids in the cemetery were forgotten about. Consequently they were under threat from invading weeds, principally Watsonia and English Broom. Also the area was being mown regularly, particularly when the orchids were coming into flower. When we visited the site to see what needed to be done the population stood at only 39 plants.

This site had several layers of management. The Cemetery Trust managed the site and burial allotments. The local council were responsible for mowing which was undertaken by a private contractor. The site was also classified by the DSE as a native grassland remnant so they also had to be consulted regarding any works that were to be undertaken.

Prasophyllum suaveolens: Marker in the *Watsonia.*

Because the weeds were particularly bad in the orchid area, our first plan of attack was to organise a controlled burn as these orchids are stimulated by fire. We then followed up with hand weeding and the application of herbicide on individual weeds. A mowing regime was implemented and plans drawn up showing when and where mowing could take place, which allowed the orchids to set flowers and disperse seed. Each year since 2000, we have regularly monitored the orchids. Total numbers of individual plants recorded has risen to 277, with 174 flowering plants being observed in a single year. This is a site that needs to be regularly maintained. The site has now been burnt 3 times and we follow up each year with hand weeding.

Our second "adopted" orchid was *Pterostylis despectans* (Lowly Greenhood) (**Fig. 2, IFC**). This orchid grows in the state forests of the central Victorian gold fields. We knew that the orchid was highly endangered and was under attack from White-Winged Choughs, a native bird that eats the tubers, as well as gold prospectors that work over the areas. At the time we took on this project there were only four known sites and the estimate of the total number of orchids remaining was believed to be around 500 plants. There was no sound basis for this number as no research had been undertaken due to a lack of resources.

Pterostylis despectans:
Broad acre counting.

Pterostylis despectans: monitoring.

We began by establishing 3 monitoring sites, recording emerging, flowering and seed setting plants. We also embarked on a searching program to see if we could find new sites. Associated species surveys were undertaken at the known sites and this information was entered into the state's Flora Information System (F.I.S.). The F.I.S. was then used to search for other potential sites where similar plants grew. Over the years we have conducted extensive searches and have now discovered over 30 individual colonies over a range of about 70 km. We count the plants at each of the known sites annually and have established that the numbers of known plants are around 4500. Although the numbers of known plants are growing each year, mostly due to finding new locations, our monitoring sites have not been fairing so well. The extended drought in the region over the past 6 years and the Chough attacks have seen the orchids at our monitoring sites decrease by an average of 12% per annum. As a backup we have a permit to collect orchid seed and material and are working on establishing an ex-situ population. We have discovered that the damaged orchid material left by the Choughs, which would normally dry out and die in the field, can be placed in a terrestrial orchid propagating mix and if kept moist will often grow a root and establish a new tuber.

Since establishing these two orchid projects our involvement with other projects has since snowballed. We assist the Melbourne Zoo which has established a large ex-situ population of *Diuris fragrantissima* (Sunshine Diuris) (**Fig. 3**), an orchid virtually extinct in the wild. We help the zoo deflask orchid seedlings, grow plants in our own collections so that the entire remaining population is not held at a single location and we assist with re-establishing new colonies in the wild by monitoring their progress and watering if needed.

Deflasking *Diuris fragrantissima*

The Victorian Road Authority calls us in when orchids are in the path of new roads and freeways. We assist with the translocation of the orchids and have cared for the plants off site while new translocation sites have been established. Our members have been called in by local councils and the Ports and Harbours Authority to consult and assist with various site management issues where orchids grow. We also assist friends' groups and involve

Field Naturalist groups in our activities, as locals can often keep a regular eye on sites that we cannot visit regularly. The DSE often calls upon us to assist with their conservation work and as a result of the success we have had with *Pterostylis despectans*, we now conduct similar monitoring and searching activities for several other endangered species.

Another essential part of being able to undertake orchid conservation is funding. Through grant applications and donations we have received around $45,000. This has been used for equipment, herbicide, fencing and caging materials, paying for controlled burns and to assist members with transport costs.

In trying to raise the profile of orchid conservation and the work that has been achieved, Gary Backhouse from DSE was instrumental in preparing a submission for the 2006 Prime Minister's Environmental Banksia Awards. This submission presented the work that had been done on behalf of the organisations represented in TORT.

The close coordination between the groups and the results achieved culminated in winning the Prime Minister's Environmental Banksia Award in the category of Land and Biodiversity. The Banksia Awards are Australia's most prestigious national awards for the environment and are keenly competed for by private, government and voluntary organisations. Winning this award showed that our collaborative efforts have been successful, even though there is still a great deal of work to be done. Although we do not undertake this work for the accolades, it has certainly been rewarding to receive recognition for our efforts. We are also hopeful that it will attract more public interest and funding from government and private organisations enabling us to continue this important work.

For further information about the activities of ANOS Victoria, or to download the Banksia Award submission titled "Back from the Brink – Saving Victoria's Threatened Orchids" visit our web site at www.anosvic.org.au.

Jane Goodall presents the Banksia Award to Andrew Pritchard of ANOS Victoria Group.

Installing a bollard to discourage poachers at Baluk Willam Reserve

Diuris fragrantissima shadehouse at Melbourne Zoo

Deflasking seedlings

Plating seed in laminar flow cabinet

Seed propagation lab.

Weeding *Watsonia* at Mornington Railway site.

Weeding *Watsonia* at *Prasophyllum suaveolens* cemetery 2001.

3. An interview with John Dodunski

John Dodunski is a descendent of Polish settlers in New Plymouth, and he is a pioneer in his own way. Local enthusiasts remark on his genius for growing NZ natives when others fail. His garden is a rich tapestry of orchids. There are *Thelymitra, Chiloglottis, Nematoceras, Pterostylis, Microtis* (as well as South African and Australian species) growing and multiplying in the soil of his front garden, the trees are festooned with a polyglot mix of epiphytes, the garage is a mess of light box, flasked protocorms, orchids in all stages of growth, the shade houses are bursting with pots of terrestrials and slabs of epiphytes.

… trees festooned with epiphytes….

Most of it is grown from seed. He has been fascinated by *Pterostylis* since he was a kid, and it shows in his collection.

He is the complete natural gardener – he can tell you the fundamentals of what he does, but the rest is instinctive. "How much of that do you put in?" I ask. "Well, it's just like cooking," he replies, "You really have to use your own judgement. Every pot is different, and you give it water or fertiliser when it needs some: you cant work to a routine."

He modifies the basic mix for different species…

- 2 parts coarse sand, 2-4mm grains;
- 1 part black bush loam;
- 1 part leaf mould – kamahi is best – from underneath the surface layer, with some fungus, but not fully rotted down;
- 1 part plane shavings, hardwood like gum, weathered or kept in a bag in the shed a month to get the sap out (a planed dead branch is best); this gives an aerated layer, similar to the surface litter in the bush;
- a pinch of blood & bone and a pinch of dolomite to a 5 inch pot.

More moisture (loam) for *Corybas* – it depends on the orchid and its natural habitat. *Thelymitra* grows well in Taranaki red clay alone. *Pterostylis trullifolia* is thriving in straight river sand.

Growing from seed

John prefers a mature pod – the best time is as soon as it splits, soon after it starts to yellow.

What follows was first printed in *Orchids 2004*, the Orchid Council of NZ publication, and is reprinted with the permission of the author and editor.

"It is not as simple as shaking the seed at the base of the pot and hoping they will grow… but it's still quite easy if you follow some simple rules. The following has worked for me.

"Flasks (old jam jars are ideal, preferably with a metal lid and a rubber seal). A pressure cooker, scales, food processor, a distiller for water. A sterile cabinet - an old aquarium lying on its side is ideal – so you can see through the top while your hands are through the sides. A spray can with 10% Janola in distilled water, a bottle of distilled water, rubber gloves, a test tube, a pipette with a rubber hat (or eyedropper) and a scalpel.

"And finally an incubator, a simple polystyrene lined cabinet with a cool grow fluorescent lamp in the top. Two 40-watt lamps plugged into a thermostat will act as a heater (the temperature inside the box should be about 20 deg C).

"First assemble the flasks by drilling a hole

in the lid, cover the hole with a wad of cotton-wool, cover the wad with masking tape, leaving a crinkle to let the air in.

John uses the late Malcolm Campbell's mix for the flask medium (this is enough for 20 jars)…

- 1 litre distilled water with 20Gm sugar dissolved in it;
- 2ml each of Bio Plus orchid food spring mix A and autumn mix B (or any garden shop formula);
- 3 drops Maxicrop (pH adjuster);
- 1 firm banana mashed with a little distilled water in the food processor;
- 8Gm agar (available from the "health food" shop).

"Heat all these until dissolved, and just before boiling pour 10mm into the base of the jars. Screw lids on loosely, place in pressure cooker and boil for 20 minutes. Tighten caps and store till needed.

"Now for the action.

"You will now embark on the most important action in the whole process of seed sowing, and that is providing a sterile environment in which to sow the seed. Mix up a 10% solution of Janola and fill the spray can. Put all your flasks and other gear in the cabinet. To sterilise the cabinet, hang a towel over the opening, put on your gloves, and spray everything in the cabinet, including your gloves; leave half an hour; this is the most critical phase of the whole process: do not breathe inside the cabinet!

"For dry seed, work with rubber gloves inside the sterile cabinet and place the seed in a test tube, cover with the Janola solution, shake for 5-10 minutes, let the seed settle, and pipette off the Janola. Wash the Janola off the seed with 3 distilled water washes. Sterilise the flasks with a spray of the Janola solution around the lids before opening, drop in 2-3 drops of seed, reseal lids, label and place in the incubator.

"For green seed, work again with sterile gloves inside the cabinet, wipe the pod thoroughly with the Janola solution, sterilise the scalpel with Janola, cut the pod lengthwise and scrape seed directly into the sterile flask.

"Seeds should germinate in a couple of months. Don't be in a hurry to throw out a flask if there appears to be no activity, as some seed may take a year. Actually…

"They just grow."

Deflasking

John doesn't "reflask" as the Melburnians recommend. In June to September (just before the growing season) he plants seedlings unwashed, agar still clinging to the seedling, out into 50/50 chopped sphagnum and pumice ("Spongey, not too wet, not too dry"), and leaves them a couple of months. When they look stable he puts the whole lot, medium and all, into the basic mix above (there's enough fungus in the leaf mould). Chopped *Casuarina* needles on top. Sickly ones he will put in with a mature *Pterostylis* or other (eg, South African) terrestrial pot, with its ready source of fungus.

Repotting

"Simple: when they die back they are dormant, tip them out, put a few tubers in the new mix and give the rest away."

"Water? When they need it. Feel around the pot. Every pot is different."

"Fertiliser? Rarely – the annual change of mix is usually enough."

If you would like to learn more about this, contact John: jrdski@infogen.net.nz.

A selection of cultivated natives on John's dining table.

4. The terrestrial orchid

From ANOS Geelong Group June 2002

What is a terrestrial orchid? It grows in the ground, usually has a growing period and a dormant period, usually has a tuber although sometimes a thickened root. The plant usually replaces itself each year, has one flower spike with from 1 to 50 flowers, in most instances does not have a root as we know it and is reliant on a mycorrhizal fungus.

Let us look at the structure of the terrestrial orchid. It has a leaf or leaves, flower stem, tuber, tuber droppers, and a very reduced root structure. Therefore a terrestrial orchid is dependent on mycorrhizal fungi to grow successfully and needs a growing medium in which the fungi can grow. The orchid may have up to four different fungi and four or more different bacteria involved in feeding it. In some orchids there is a three way relationship e.g. *Dipodium*, orchid-fungus-gum tree.

As mentioned earlier the mycorrhizal fungus lives in certain underground parts of the plant. When the plant is dormant the fungus seems to live in the old tissue. Thus when repotting use half of the old mix including plant parts to maintain the fungus in the pot.

What do we grow terrestrial orchids in? A mix that

- holds moisture but is not wet
- dries out and encloses the tuber when the plants are dormant
- is open enough to include sufficient air
- has food for the fungi
- will support the flower spike.

The most common potting mix is

- 2 parts gravel
- 1 part leaf mould — still with texture –
- 1 part wood shavings or Eucla Mix. Check that the particle size is not too large or contains chemicals that may harm the orchid
- 1 part good soil; check that it does not have fertiliser or other things added
- a little blood and bone.

Variations of the mix components are made to meet the specific requirements of more difficult to cultivate orchids.

The pots need extra drainage holes in the bottom and a piece of shade cloth or fly wire in the bottom to stop the mix falling out. 12 to 15 cm diameter pots are most commonly used.

The mix should be damp when used. The tubers are placed about 3cm below the top of the mix, with the top centimetre of the pot free of mix to assist with watering. Up to 20 tubers may be placed in a pot. When only a few tubers are placed in a pot they should be placed near each other. This seems to assist fungal activity and hence give stronger orchid growth.

A layer of mulch is needed on the top of the pot to stop the water disturbing the medium (and hence the fungi) and to keep the leaves off the ground to reduce rotting. Chopped *casuarina* needles or larger gravel are commonly used. At the completion of potting the orchids are watered.

How do we grow terrestrial orchids? Most of the available terrestrial orchids grow in a cycle of

Rain in late autumn
Rain through winter and early spring
Little rain through a dry summer and early autumn.

This is different to most epiphytes. Thus if we are trying to grow them with epiphytes it is very difficult as they get too much water in winter and much too much water in summer resulting in tuber rot.

Most of the readily available orchids grow under trees which provide shade and heat protection. Thus we need to protect them from the heat, sun and from excessive rain using a solid roof that is partly transparent. We need to give them plenty of ventilation using shade cloth walls. And we need to lift the pots off the ground to protect our back, make them easier to view, give better air circulation and keep them away from snails and slugs.

Watering, or incorrect watering is the cause of most plant deaths. Most commonly grown terrestrial orchids need a good soaking at the beginning of February. When watering, check that the mix has wetted, as water can run around the side of the pot instead of through the mix. Keep the pot just damp until leaves

emerge and then water every one to two weeks, depending on the weather. A warm wind can dry a pot in a day. By checking the bottom of the plant name tag you can see how moist the pot is. For newer growers it can be helpful to make up a couple of extra pots of mix. You can then dig down into the media and check its moisture level.

In late spring the leaves will start to go yellow. This is the time to reduce watering and let the pot almost dry out. Keep the pot almost dry over summer. Just damp enough to stop the tubers dehydrating.

Summer and autumn flowering orchids are usually watered earlier and require a different watering cycle.

Pests and diseases

Pest and disease control is similar to that required for epiphytic orchids with snails, slugs, caterpillars, spider mites and aphids being the most common pests. Rust and virus are controlled by removing infected plants.

How do you increase your orchid numbers?

Collect seed pods from your plants and store the seeds in paper envelopes in the refrigerator. In autumn sprinkle the seed around the parent plant and gently water the pot. The pot would not be repotted the first summer after sowing seed. Some species can be induced to produce an extra while others increase their numbers naturally.

An excellent resource

The reference book *Cultivation of Australian Native Orchids* by Richards, Wootton and Datodi (*$A10 from www.orchidaceousbooks.com.au - Ed*) is excellent. I find it to be an essential reference book when growing terrestrial orchids. Page 52 gives the basic potting mix with the following pages giving variations to the mix needed for specific orchids and the times to commence watering and the particular needs of each species.

Owen Gibson's orchid paintings

watercolours and line drawings of New Zealand native orchids

compiled by Ian St George
with
Bruce Irwin and Val Smith

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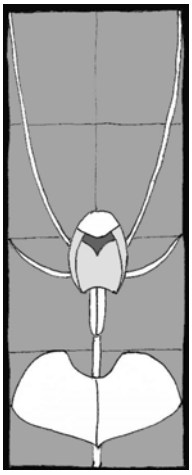


HISTORICAL REPRINT — from TF Cheeseman's

llustrations of the New Zealand Flora, Vol.II, Government Printer, 1914.
Drawings by Miss Matilda Smith, engraved by John Nugent Fitch.

PTEROSTYLIS BANKSII.
FAMILY ORCHIDACEÆ.] [GENUS PTEROSTYLIS, R.BR.

Pterostylis Banksii, *B. Br. ex A. Cunn. in Bot. Mag.* t. 3172; *Hook. f. Fl. Nov. Zel.* i, 248; *Cheesem. Man. N.Z. Fl. 679.*

Pterostylis Banksii, which is by far the finest species of the genus found in New Zealand, was first discovered by Banks and Solander at Mercury Bay in November, 1769, during Cook's first voyage. Solander, in his manuscript Flora of New Zealand, referred it to the genus *Arethusa,* but gave no detailed account of it, for he supposed that it was identical with an Australian plant described in another part of his manuscripts. It was not again seen until 1826, when the talented and enthusiastic Allan Cunningham gathered it on the banks of the Kawakawa River, Bay of Islands. Since then it has been found to range through almost the whole length of the Dominion, from the North Cape to Stewart Island, and from sea-level to nearly 4,000 ft.

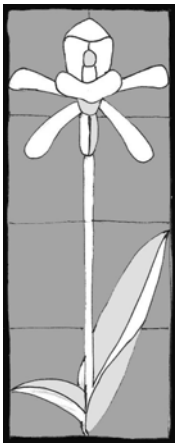
P. Banksii is usually found along the sides of lightly wooded gullies, or on the margin of forest lands, and sometimes occurs in considerable quantities. It is variable in size, sometimes attaining a height of quite 18 in. or even more, at other times barely reaching 6 in. Specimens of the sizes quoted above have been collected by myself in a single locality growing under uniform conditions; but, speaking generally, the taller specimens are found in sheltered places along the sides of ravines, and the smaller in more open situations. The large green flowers, often streaked with red or reddish-brown, and with the three sepals all furnished with long filiform tails, have a most curious and bizarre appearance, and always attract the notice of strangers when seen for the first time.

The remarkable fertilization of *Pterostylis* was first described by myself in the "Transactions of the New Zealand Institute" (vol. v, p. 352 *et seq.).* The upper sepal and petals are connate into a hood, at the back of which the column is placed. The tip of the lip, which is extremely sensitive, hangs out of the entrance to the flower, thus forming a convenient landing-place for insects. When touched by an insect it springs up, carrying the insect with it, and thus enclosing it within the flower. The position then occupied by the lip is that shown in fig. 2 of the accompanying plate, and the insect is enclosed in the space between the lip and the column. The hood-like flower prevents any escape to the right or left of the lip, and as the lip remains closely appressed to the projecting wings of the upper part of the column as long as the insect is present, the only mode of escape is by crawling up the front of the column and passing between the wings (see fig. 4). In doing this, it is first smeared with viscid matter from the rostellum, which projects at the back of the passage between the wings, and then drags away the pollinia, which can hardly fail to adhere to its sticky body. When visiting another flower it must pass over the stigma before escaping, and can hardly fail to leave some of the pollinia on its viscid surface. From the above, it is clear that the fertilization of the flower depends entirely on the irritability of the lip. With the view of proving this, on one occasion I removed the lip

PTEROSTYLIS BANKSII, *R.Br.*

from twelve flowers while young, so that insect visitors would not be compelled to crawl out of the flower by the passage between the wings of the column. When these flowers commenced to wither they were examined, when it was found that they were not fertilized, and that not a single pollen-mass had been removed from the anther. I have also repeatedly placed minute insects on the lip, thus causing them to become entrapped, and in several instances I have seen these escape from the flower in the manner described above, bearing pollinia on their backs. The whole of the New Zealand species of *Pterostylis* are fertilized in the manner described above; and according to the researches of the late Mr. Fitzgerald, it is also the manner employed in the Australian species.

PLATE: *Pterostylis Banksii*, drawn from specimens collected in the vicinity of Auckland. Fig.1, petal; 2, lip and column; 3, lip alone; 4, front view of column, the wings spread open.



FIELD TRIP REPORTS

Northland Odyssey (October 2006)

By Ian Townsend

The Party: Ernie Corbett, John Dodunski, Claire Francis, Margaret Menzies, Kristy and Ian St George, Ian Townsend, Brian and Judith Tyler, Glyn Wren.

The gathering point was to be Te Paki but we all took different routes to get there and return.

This is how the trip went for Brian, Judith and Ian.

I was picked up in Levin at 7.45a.m. (18 Oct 06) by the Tylers and we headed north. A brief stop at Taihape and then on and across the Desert Road. We noticed a column of steam coming from the northern shoulder of Tongariro as we approached, but by the time we got closer it had all dissipated. At the "orchid bend" we stopped to check on the *Nematoceras* and found plants in seed, but the fruit was sitting right down on the leaf – no extended stalk. We went on past Lake Taupo with the kowhais all brilliant yellow. Called in to see Bruce Irwin in Tauranga and at his suggestion visited the Te Puna Quarry where the planted exotic Dendrobiums and Cymbidiums were at their peak of flowering. We carried on north and stayed the night at Ngatea and on the road again by 7.30 the next morning.

We dropped in to Papakura to see Eric and Gloria and our next orchid stop was Dome Forest. The path up the hill was quite productive with swards of *Pterostylis graminea* each side of the first steps and good clumps of *P. banksii* in flower higher up. *Acianthus sinclarii* was in late seed, mostly with split capsules. We got to Whangarei in good time so continued north, detouring briefly to Kawakawa to see their lurid loos. This road took us through Moerewa and then north again to Kerikeri and on to Mangonui for the night.

Next morning the weather gave us a very murky start to the day. The only bright thing about it was the pink and blue paint on the houses. At Taipa we turned inland on Oruru Road to Peria – a road which soon turned Brian's car into a mobile ball of mud. We were looking for Dangen Road – a place where Brian Molloy used to go orchiding. It would have been easy if someone had told us "you turn at the saleyards", but with all the hubbub of a sale in progress we sailed past until we got on to tar seal again. It was tempting to carry on on this carpet but we knew we had over-shot – so back through the mud and slush to the saleyards, and there was the elusive sign! (At least we saw some nice epiphytic orchids in the Puriri and Taraire trees). About 5 kms along Dangen Road we saw orchid-like areas in the scrub and caught up with flowering *Microtis* (probably *parviflora*, and *Thelymitra sp.* in seed. (Apparently, at the very end of the road there is a DoC reserve, but we didn't know that at the time).

Our next stop was Lake Ohia where there are stumps of 30,000 year old kauri trees. Around these stumps were plants of

Thelymitra malvina, but I did not see good flowers for a photo. Bright pink *T. carnea* was in bloom and *Microtis parviflora* quite plentiful. (On a later visit, following John's advice we found *Cryptostylis subulata* (**Fig.19**) flowering amongst the rushes. We also saw the very tiny *Petalochilus alata* – the seed capsules looking more like moss spore-capsules, being only a few inches high).

We headed on to Kaitaia, crammed more supplies into the car and made a bee-line for Te Paki. We did manage to stop on the way at Te Kao for huge ice creams decorated with pink alligators on top! Local people were water blasting the war memorial in honour of the new Maori King who was due to arrive tomorrow. Brian tried to get them to clean the car as well – *it needed it*! At Te Paki we had barely got food etc loaded into kitchen cupboards when John and Ernie arrived. Then Margaret, Glyn and Claire appeared and we all headed down to Waitiki Landing for the evening meal. Ian St.G and Kristy turned up then, completing the team.

Saturday, 21 Oct 06: Ian and Kristy "did their own thing" for the day. The rest of us jumped at the opportunity to visit the North Cape Scientific Reserve. We were all aboard Ed Smith's DoC 4WD and John's Suzuki. It's a long way out there and had there been a shower of rain the track could become "very interesting". As it was we had no trouble driving right to the old serpentine quarry – a big hole left in the landscape.

We began finding orchids straight away – tantalising *Thelymitra* of the *longifolia* complex. One of the *longifolia* group that may be *T. colensoi* (*T. intermedia* in NOJ) had a tall stalk of twenty-three flowers, twelve of which were fully open – a marvellous sight, even if they were plain white. When it comes to names for this *longifolia* complex, I think it depends on what school you came from as to whether you call them "pink", "stunted" or just "don't know"! We also found "Darkie" unopened.

John had amazing eye sight that could penetrate the dense ground-hugging scrub to see underneath it, *Plumatichilos tasmanicum* flowering and *Cyrtostylis oblongus* with tall seed stalks. We also saw *Acianthus sinclarii* with spent seed capsules, and a bright mauve *Thelymitra colensoi*.

There were lots of plants of special botanical interest in the "scrub", many restricted to this isolated ultramafic environment. Also of high conservation value were the unique land snails, *Placostylus ambagiosus michiei*, which were literally being hammered by birds using the many stones as anvils to smash the smaller ones. Ed assured me they are going to build some "exclusion areas".

We had lunch at the top of the Surville Cliffs watching gannets flying west in vee's far below. Then we browsed our way back down the track until Ed returned to pick us up, having gone off to inspect a stranded Orca. Back at the Spirits Bay turnoff we found a bright blue *Thelymitra aemula*, our last find for the day.

However, the tale would not be complete without a mention of Ian and Kristy's activities, as told; truthfully I'm sure; by Kristy. Ian took off at the rate of knots through the Hakea, his long legs well protected by tuff long trousers. Kristy had shorts and in no time had blood trickling down her legs. "I wish I had put my track-pants in", she wailed. Further bush bashing and Kristy's boots were fast filling with blood. Then Ian made a discovery – "Oh, I've got your track pants in my pack"! She did not relate the rest of the conversation! I'm sure Ian will follow on with their orchid finds….

Sunday, 22 Oct 06: Next morning, was an early start for us all to get along the northern section of Ninety Mile Beach before the tide cut us off. We got to Te Paki stream and found some youths with their car firmly bogged. This caused an unexpected delay as John drove to the rescue and got them mobile. We just managed to sneak along the beach to the parking area at Scott Point before salt water covered the sand. Then there was a huff and puff as we climbed 150-odd steps up to the plateau. Ian and Kristy left us in the dust

as they seemed to be racing each other to the top. We had a light misty shower and then the sun shone opening the *Thelymitra* for us. There were all the forms of *longifolia* (**Figs. 15, 20, 21, OBC**) and a lovely blue "rough leaf" – and yes, the leaf is rough, almost like grass to the touch. There was *Acianthus*, *Corybas cheesemanii* in seed, also *Microtis arenaria, parviflora* and *unifolia*. The main flush of *Caladenia* flowers was over, but there were still plenty of *C. bartlettii* and *C. minor*. The tide retreated and so did we by mid afternoon, leaving time for a visit to Rubbish Dump Hill. There we found many plants of tall-growing *Thelymitra* aff. *longifolia* in full flower. At first we thought they might be *T. tholiformis* but later the column showed they were quite unlike anything in the *Guide*.

Monday, 23 Oct 06: We awoke on Monday morning to drenching rain. Ernie and John were the first to get restless feet and puddled off out to see what could be found in the Shenstone. By mid morning there were definite signs of improvement in the water so we were all tempted out. Down by the stream at the start of the track we found a *Singularybas* (Matthews's "aestivalis") in seed. Further along the track, also in seed were *Corybas cheesemanii*, *Molloybas cryptanthus* and *Cyrtostylis reniformis*. We saw flowering clumps of *Simpliglottis cornuta* and one nice flower on *Calochilus* aff. *herbaceus*. Brian, Judith and I went on the side track north to see Anne Fraser's *Thelymitra matthewsii* area, but no plants visible now, just her markers. John photographed a beautiful green gecko with yellow stripes and a red mouth. Back to base for a late lunch. Then Brian, Judith and I went to Spirits Bay. We saw flowering plants of *Thelymitra sanscilia* that Margaret and Ernie told us about – or we thought we did, but they must have been different ones, because when we checked the column, our ones were not *sanscilia*. On our return we found John, Ernie and "the girls" hove to by some manuka scrub. We investigated and were shown a nice patch of flowering *Calochilus* aff. *herbaceus*.

Tuesday, 24 Oct 06: Clean up, pack up and on the road by 8.30am with a final farewell deluge as we loaded the car. Nothing new to report until we stopped on the south side of the Mangamuka Saddle to look for *Nematoceras rivulare*. The usual bush-bash down to the stream and there they were, dense as ever, almost in the splash zone of the water. Plenty of nice flowers.

Our next stop was Ruapekepeka redoubt. *Ichthyostomum pygmaeum* still clinging to the Puriri near the gate, and the same confusing *Thelymitra* in the open grass area, but no flowers open. We stayed at Wellsford for the night.

Next morning, Wednesday we looked for orchids at Wilks Road, Dairy Flat and found *Microtis parviflora* and *Thelymitra carnea* flowering, plus other *Thelymitra sp.* in tight bud. We called to see Eric and gave him a run-down on the trip.

Next orchid stop was Rainbow Mountain, south of Rotorua. On the track up to the summit we found a huge clump of *Earina mucronata* with literally thousands of flowers open, and a delicate sweet scent (not as over-powering as *E. autumnalis*). Then we caught up with the little *Petalochilus alata* in flower, and a very large flowering plant of *Chiloglottis cornuta* growing through the carpets of moss. There were also unusual ferns like *Schizaea dichotoma* and our native *Nephrolepis.*

The following day, Thursday, we spent some time around Ruapehu. On the Chateau Road we walked to the Tawhai Falls. Under the bank below the falls there were patches of *Singularybas oblongus*, their tiny compressed flowers just visible in the leaf. Along the track there were several *Thelymitra* with tight flower buds. On the Whakapapanui Track *Pterostylis patens* had not yet showed itself and the only *Caladenia* we saw were last year's stalks. Now round to the west via National Park. At Makatote there were lots of typical *Nematoceras iridescens* in flower and in amongst them just one *Nematoceras papa* or at least that was all we could identify, there may have been more leaves. At "Archway

Culvert" we photographed *Nematoceras* "whiskers" – fairly similar to *N. rivulare* at Mangamuka, differences may be due to habitat? We also saw two species of *Pterostylis*, one upright growing and one more like *P. humilis* but flower-bud only just developing.

Our final orchid stop was Ohakune. Near the DoC headquarters *Pterostylis* was up but no flowers. We walked up the track and spent some time searching the carpets of *Nematoceras trilobum* leaves before Brian found two small dark flowers. Unfortunately they were past their best. Then further up the track we noticed the leaf shaped changed – from small, deeply cut leaves to larger more rounded leaves, and these plants had reasonably plentiful flowers with a green dorsal lobe. We also came across a round leafed species flowering below the leaf – maybe *Nematoceras macranthum*, but the whiskers were only short and it seemed a bit early in the season for this species. Then we came across what we were really looking for – a large patch of *Nematoceras acuminatum* in full flower.

A great sight and a wonderful way to end our orchid odyssey.

I would like to thank Andrew Townsend for providing orchid names as recognised by DoC. and Judith Tyler for typing and e-mailing the manuscript.

Ruahines: Sixtus Lodge

(November 2006)
By Judith Tyler

Bruce Irwin, Wilma Fitzgibbon, Don Isles, Claire Francis, Glyn Wren, Margaret Menzies, Val Smith, Gary Pennial, Bob and Mary Watson, and Brian & Judith Tyler arrived at **Sixtus Lodge** for an orchid weekend. The lodge is 77km north of Palmerston North in the **Ruahine Ranges.** The weather conditions were typical of an orchid weekend with constant and heavy rain. Bob and Mary arrived already drenched after spending the day at Karori Sanctuary in heavy rain feeding the birds.

The Maestro at 85
(photo by Judith Tyler, cake by Wilma Fitzgibbons)

This was also Bruce's 85th Birthday, celebrated with a cake supplied by Wilma. Bob found a suitable macrocarpa candle.

Saturday morning everyone was up bright and early rearing to go. We were off to Heritage Lodge, which unfortunately had been burnt to the ground sometime during 2005. On the way we stopped by the bridge to check the side of the road for orchids.

Ian St George and Vic Vercoe arrived shortly before 9am to find us still looking and photographing the finds. We found *Nematoceras macranthum* all over the bank, *Pterostylis patens*, and several undeveloped *Thelymitra*. The walk to where the Heritage Lodge once stood was through a nice bushy area. The only evidence of the Lodge was the damaged water tank and broken china pieces of what was possibly the toilet bowl.

We had a lunch stop here and as we were ready to continue on the track a light shower of rain had us scrambling into rain gear. It was time to head back to Sixtus Lodge for a late lunch and to dry out. We had found *Pterostylis patens*, *Pterostylis* aff. *montana*, *Pterostylis irsoniana*, *Chiloglottis cornuta*, *Nematoceras trilobum*, *Nematoceras macranthum* (small and normal size), *Adenochilus gracilis*.

By late afternoon the rain cleared and the 12 went off for a walk to the creek. Of course the best display of *Nematoceras* was on the far bank. Brian who avoids getting his feet wet of

Bruce Irwin and Judith Tyler... in the rain... in the Ruahines…. (photo Val Smith).

course had to get his photo shots standing knee deep in the water. It didn't take Claire long to roll up her trousers and cross to the other side and scramble up the bank to look for the elusive flower. She found one which Bruce declared was a form of *Nematoceras* "whiskers"). Most of us took the short cut back to the lodge through long wet grass and were able to admire the recent planting of native trees. Finally after sloshing along the muddy track we reached the creek which was to take us back up to the lodge. Here we were faced with a plank of wood sitting on large rocks, with a rope to hold onto. Of course the scribe was first in line to cross and was keen to show everyone the way. No one mentioned the rope was slack. Carefully stepping across the plank and gripping hold of the rope, it gave way and the scribe overbalanced way over the water. Hanging midstream for a few seconds then in slow motion the scribe dropped into the water with it flowing fast over person and gear. From the side of the banks came the cry "Watch out for your camera." Too bad about the person!!!!!! A dripping wet scribe sloshed back to the lodge with plenty of comments coming from behind.

A shared meal at night was a feast fit for a king…. One thing about orchid people: they enjoy their food. After dinner we were entertained with an orchid slide show by Brian.

Sunday looked to be fine so everyone was out and about early to get the most of it. We drove to Coal Creek track and walked over paddocks and found a fascinating bank with plenty of moss, ferns and *Nematoceros trilobum*. Of course, once again a flowing creek to cross, with Don and Brian assisting people over the slippery rocks. This was

followed by a wet muddy climb upwards and along the track looking for orchids. Not many were found although there were *Chiloglottis cornuta*, *Singularybas oblongus*, *Caladenia* not yet open, *Pterostylis* not yet in flower, *Pterostylis* aff. *montana* and *Earina autumnalis*, and *Nematoceras trilobum* – leaves only.

We were deciding which direction to take when it was noticed we were missing Don. Margaret was busy on her whistle blowing loud and clear but no reply. On returning and meeting up with Don again it was found our intrepid leader had gone off in a different direction. All's well so we continued back for another water crossing. Of course we had more rain along the way. Back at the lodge we met up with Geraldine Wood and everyone took off to see the red mistletoe (*Peraxilla tetrapetala*) in full flower on the red beech tree.

After lunch and when the rain stopped we headed off to visit the glow worm caves.

Of course the rain came with us and surprise-surprise, more water to cross. But this time not just once but time and again. We came to the limestone caves and what a magnificent sight to behold! We paddled all the way through the cave with water overhead as well. Not far in we thought Margaret was going for her swim as she slipped and got more water than she expected. Further along we could see *Nematoceras trilobum* and many fine samples of filmy ferns and mosses on the dripping wet banks. Up and over many fallen logs we climbed along the creek, amazed at such a wonderful sight before us. Bruce was up in front and took off like a teenager scrambling over rocks and logs. It was not dark enough for the glow worms but the atmosphere was enough for us to enjoy. On the way out Claire found *Adenochilus gracilis* that most of us had missed. Geraldine and Don found *Orthoceras* on the roadside where we had been looking the day before and all missed seeing.

Thank you Don for organising such a great weekend. Sixtus is a comfortable and pleasant lodge to stay.

Matthews & Son on orchids

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Figures p.39

Fig. 13 & 14: pink and white forms of *Caladenia alata,* flowering on his farm, and photographed by Kevin Matthews, Kaitaia.
Fig.15. A *Thelymitra* aff. *longifolia* from Te Paki.
Fig.16. A *Thelymitra* aff. *pauciflora* found by Pat Enright in the southern Wairarapa, 19 Nov 06.
Fig.17. *Thelymitra* aff. *pulchella* near Kaitaia; photo Kevin Matthews.
Fig.18. *Caladenia nothofageti* above Wainuiomata.

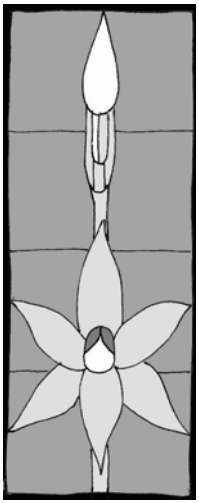
Figures p.40

Northland Odyssey (p.32) – photographs by Brian Tyler

Fig.19: *Cryptostylis subulata* at Lake Ohia.

Fig.20: a small grasshopper on *Thelymitra* aff. *longifolia* at Rubbish Dump Hill.

Fig.21: a typically fine display of the *T.* aff. *longifolia* of the Far North.



THE VARIOUS CONTRIVANCES

The New Zealand terrestrial orchid flora is unique because most can self pollinate: the various contrivances by which the New Zealand orchids are fertilised by themselves are recounted here.

3. Thelymitra

Some of the best wild orchid floral displays are the spikes of *Thelymitra* aff. *longifolia* in the far north: fragrant, pink, all open at once, mimicking the manuka, deceiving the native bees (see **Figs 20,21,OBC**).

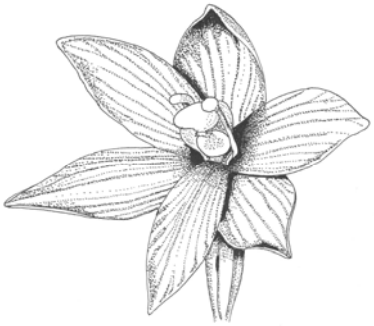
But many *Thelymitra* are self pollinating: scentless, barely opening if at all, and then only one at a time.

Cheeseman described the process for *T. longifolia.* As the flower matures, the column lengthens, the top edge of the stigma rolls back leaving the sensitive surface facing up and back; the anther cap is drawn upward leaving the pollinia adherent to the rolled-back top of the stigma; fertilization follows.

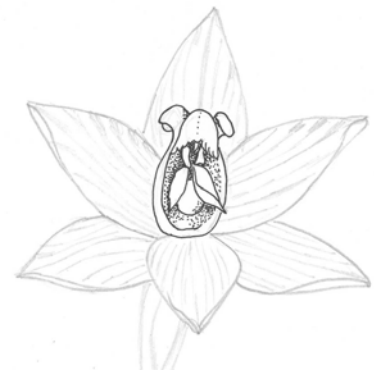
Certainly *T. longifolia* is capable of insect pollination, and I have reported elsewhere the frantic apparently pseudo-copulatory movements of a native bee engaged with the dark column. But self pollination by the method described above is at least a secondary capability.

In *T. matthewsii* the pollinia are so easily dislodged from the anther cap that the slightest movement sends them falling down onto the stigma.

RD Fitzgerald wrote [*Australian Orchids.* Sydney, Charles Potter, 1876-1894] "Mr. Darwin's proposition regarding 'the contrivances by which Orchids are fertilized' (*sic*) is, that they `have for their main objects the fertilization of each flower by the pollen of another flower.' As far as I could investigate the subject in Australia, I have not been able altogether to verify this proposition; for though the great majority appear to be frequently impregnated by pollen brought from other flowers, I believe they are also frequently fertilized by their own…. Certain parts of plants and animals being wonderfully designed (or adapted) for certain ends to the palpable benefit of such plant or animal, it is argued that



Thelymitra matthewsii
Above: pollinia intact
Below: pollinia fallen onto stigma.

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KEY p.37

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KEY p.37

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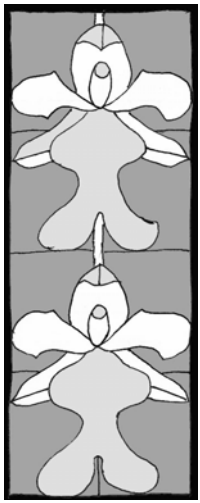
their life or existence being dependant on such design, they must have been so created. But what, except inheritance, can account for the extension of similar parts to others where they are evidently useless? The flowers of *Thelymitra ixioides* are of a beautiful blue colour, and are borne in attractive spikes. In the centre of each flower is placed the stigma or female part of the flower; it resembles a shield, covered with viscid matter. At the top of it is inserted, in a notch, a little boss or button called the rostellum, connected with which, and behind the stigma, are the pollen masses, and on either side arms stretch out, supposed to attract and guide to the rostellum. Touch this rostellum, which is covered, as it were, with glue, with the point of a pin, and then withdraw it, and the pollen masses are at once withdrawn from behind the stigma. Return the pollen masses, now firmly attached to the point of the pin, again into the flower, and the greater part of them adhere to the viscid surface of the stigma, and the flower is fertilised. Such is the process, and the only one, by which it can be impregnated; but in nature the proboscis, or some part of an insect, acts as the pin has done in the experiment. Left to themselves, in a bell-glass, not one flower of *Thelymitra ixioides* will produce seed.

"Can there be a more perfect example of predetermined design? The bright colour to attract the insect - the arms to guide it - the projecting rostellum for it to touch - the viscid matter on the rostellum to adhere to the visitor - and the expanded shield-like stigma, covered in its turn with gum to lay hold of the pollen, when the insect either returns its head in search of honey or visits another flower, perhaps on the same spike. What trace is there of development? It is a well-adapted whole: a whole adapted to one end.

"Now examine another species of the same genus, *Thelymitra carnea*. The flowers are of a bright pink. Here are the extended arms - the shield-like stigma - the sticky rostellum and the pollen masses behind the glutinous stigma; but there is a slight modification; the pollen masses are not only behind but over the stigma, and crumble upon it whilst yet in bud, thereby fertilizing the flower, which seldom opens, and never until after fertilization. What has become of the picture of design? For what is the colour in the flowers, seeing that they so rarely open, and then to no purpose? For what are the arms? What use is the rostellum? Without their aid, *Thelymitra carnea* is far more fertile than *T. ixioides*; in fact, every flower produces seed. Why are all those parts, so necessary in *T. ixioides*, present in *T. carnea*? Can they be accounted for by any other explanation than relationship through inheritance?"

The immature (above, left) and mature (right) column of *Thelymitra longifolia.* As the column lengthens, the pollinia are left adhering to the top of the stigma.

Thelymitra malvina (below) has friable pollen and as the flower opens its parts are liberally covered with fragments.



ELEMENTARY: ED HATCH

11. The epiphytes 2.

Drawings by Eric Scanlen and Ian St George

Earina

– an endemic genus (spring flowering)
Epiphytes with, creeping, branching rhizomes and long ± pendulous branches. The racemes often persist into the following season and flower again.

5: *Earina mucronata*

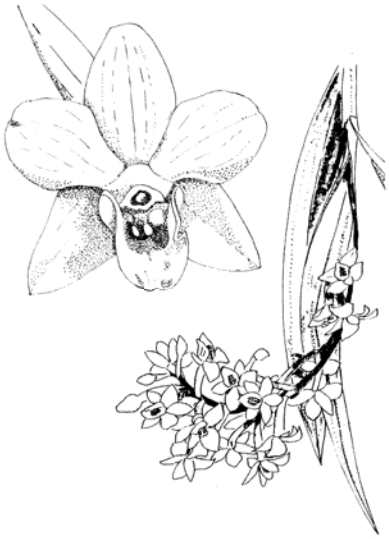
(the mucronate tips to the leaves)
The stems are compressed and marked with black spots. The labellum is sessile, without calli, and bifid at the tip.
Distribution – endemic – North, South, Stewart and Chatham Is.
Flowers – September-November, with some plants flowering later – insect pollinated.

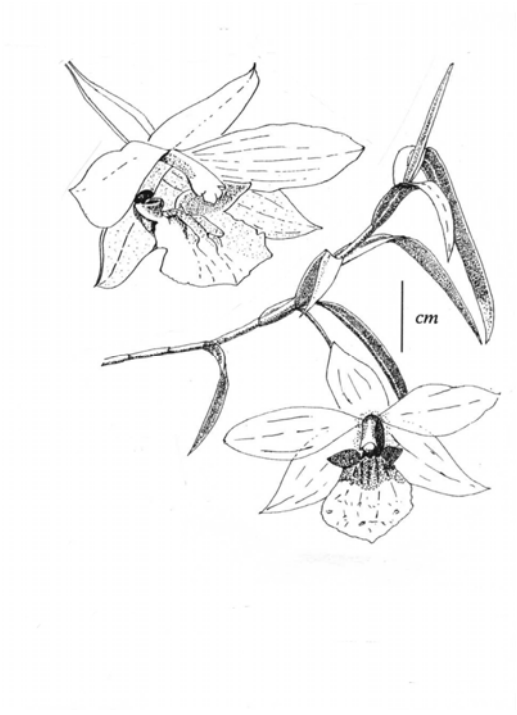
6: *Earina aestivalis*

(summer flowering)
A coastal version of *mucronata*, the leaves shorter and broader.
Distribution – endemic – coastal in the North, South and Chatham Is.
Flowers – December-January – insect pollinated.

7: Earina autumnalis

(autumn flowering)
The flowers are strongly scented. The tips of the branches are often turned upwards so that the raceme of flowers is erect. Labellum clawed and entire, with basal calli.
Distribution – endemic – North, South, Stewart and Chatham Is.
Flowers – March-May – insect pollinated.



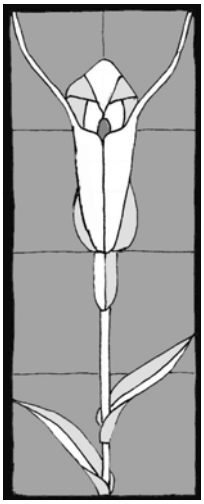


Winika

(the Maori name for the plant).
Was originally included in *Dendrobium*, but now recognised as endemic.

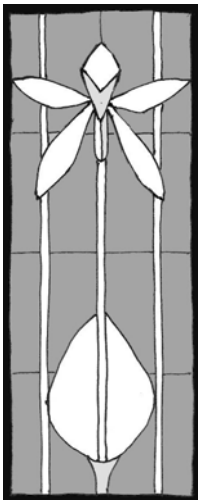
8: *Winika cunninghamii*

(Allan Cunningham, Australian botanist who made 2 trips to the Bay of Islands – in 1826 and 1838).
Stems numerous, woody, jointed, branched, erect or pendulous. Flowers white or pink, in lax racemes.
Distribution – endemic – North, South, Stewart and Chatham Is.
Flowers – December-March – insect pollinated.



CLOSE RELATIONS: ORCHIDS LIKE OURS

Microtis parviflora painted by Ferdinand Bauer, engraved by A Gebhardt, and published in 1838 in S Endlicher's *Iconographia Generum Plantarum* (1838).



NOTES ETC

Ron Coleman wrote to the Orchid Specialist Group, "Each year, as I have for the past 13 years, I go out about this time to visit ***Dicromanthus michuacanus*** **in SE Arizona.** This and the Big Bend area of Texas are the only places it grows in the United States. It comes up after the summer rains begin in July and starts blooming in mid-October. This year after many years of drought we had the best summer rains in our time in Arizona. The plants responded. This year has the most blooms I have witnessed and some of the largest plants. I measured one at 65 cm which is a record for Arizona. These are the last of our orchids to bloom. They will last for another week or two and then it is wait for spring." *Midoctober: that's autumn over there—Ed.*

Anne Fraser wrote (November), "During the continued monitoring of the *Thelymitra matthewsii* populations in the Te Paki area in early October, my two companions and I were able to visit the North Cape Scientific Reserve to confirm the species' continued presence there. That we able to do so was due to the much appreciated assistance given to the project by the Department of Conservation staff at Kaitaia and Te Paki. The visit successfully recorded three adults in seed and a small group of juveniles, in two localities, on the plateau and near the cliffs.

"While scanning the serpentine mine workings for *T. matthewsii* we recorded several ***Pterostylis tasmanica*** The first group seen, in the upper worked area, were associated with a tussock grass and the roots of *Cassinia leptophylla.* The second sighting was in the lower level of the workings where they were growing in the serpentine rubble, seven to eight plants being seen, some still in flower and others spent. These recordings add to this species' occurrence in the Scientific Reserve.

"*Thelymitra* aff *longifolia* was beautiful, in flower in all parts of the plateau and along the access road. In one instance a honey bee was observed on a *T.* aff *longifolia* flower apparently foraging on the perianth which glistened in the sun. It did not approach the column as we watched. Typically, as usually happens, I had used up the film in the camera recording *Thelymitra matthewsii*, so was unable to record this interesting event."

Kevin Matthews wrote (from Kaitaia 21 Nov 06), "I have been following a particular ***T pulchella*** **stripe-less variation** with highly variable column arm structure which is all without cilia. This one from a new site some 4 km distant from the one here at home. I have described the full burst of scent as freesia, but I have had a second opinion on this particular one and they are describing it as resembling violet." **Fig.17.**

Pat Enright brought the *Thelymitra* flowers pictured in **Fig.16**, having found them between Martinborough and the Wairarapa east coast. The green sepals and pink petals might just represent the form of *T.* aff.

pauciflora that Colenso described as ***T. concinna****:* "Perianth, petals clear pink, sub-rhomboidal, 4 lines long, obtuse with a slight mucro, obsoletely 5-nerved; sepals a little larger than petals, oblong-ovate, concave, dull pink with a green centre; column 2—2½ lines long, rather slender, pink, hooded; the hood smooth on the back, the base dark-red; tip bright yellow, emarginated, margins entire or very slightly erose, involute; the lower lateral margins between apex and staminodia produced into 2 little curved pointed horns, one on each side; the two lateral lobes (staminodia) sub-linear-spathulate, erect, bearing a globose bushy tuft of pinkish-white hairs, which rise above the column…."

The ***Microtis unifolia*** at right has all its flowers facing inwards—ie, is nonresupinate—the effect, I suspect, of roadside weed spraying.

Ian Townsend sent some **thoughts on name changes! "**Yes, they are necessary, but don't worry about them.

"My son Andrew and I had a discussion about the continuing name changes that are going on with native orchids and almost every other biological group you can think of.

"'Not surprising', I said, 'because these things have evolved and are still evolving. It's the scientists that want to take a snap-shot of the biological picture as of now and neatly classify everything into named categories…'

"'Don't worry about the names,' said Andrew, who is a scientist, working for the Department of Conservation; 'the name is only the tag that scientists of the moment are using to identify the thing so they can talk about it. It's the biological entity underneath that counts – that special biological bundle that replicates itself and makes up a unit, be it plant, animal or whatever. Names are fashionable and names change like fashions. It's like a person underneath the clothes that they wear. These clothes may identify a man, by a military uniform, for example, but one day he may be given a different rank, or even shed the uniform altogether to become "John Citizen"; but it's the same man underneath. So, that little scrap of "biological entity" remains the same, whether its name has changed by studies of DNA or whatever.

"'If we wait for everything to be given a scientific label some of the precious little biological bundles could become extinct before we know them. It's important to understand their uniqueness and not worry too much about whether they are "good" species, different genera, varieties, or forms.'

"Does that make you feel better when you find the experts can't agree?"

Speaking of name changes, readers wishing to keep up with the incursions into NZ orchid taxonomy by the **Polish orchidologist Dariusz Szlachetko** should look at *Richardiana* (www.richardiana.com). I was awestruck by the 2003 paper [1] for which his English abstract reads, "Some more notes on the subfamily Thelymitroideae (Orchidaceae). Nomenclatural changes in Diuridae *sensu latissimo* (=Thelymitroideae, Orchidaceae,) proposed by Jones & al. (2002) are briefly discussed. New combinations on various taxonomic levels are validated. Several taxa are reduced to the synonymy of formerly described ones. There are recently conducted researches - especially with the applying of

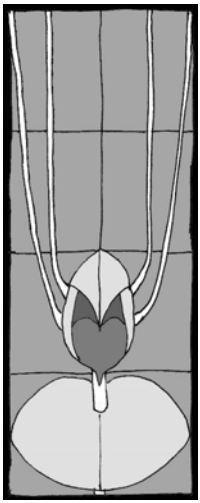
Here is a photograph by Olaf John of a ***Pterostylis banksii*** he and Pat Enright found at Matawhero Station, southern Wairarapa. The tips of its lateral sepals have not (as they normally do) rolled into a tube, allowing them to curl forward like ribbons.

molecular methods - on miscellaneous groups of orchids, the representatives of the Thelymitroideae (Lindl.) Szlach. included. The molecular researches results are - most often indiscriminately - rendering into the nomenclatural changes, what causes confusion in the taxonomy of both that and another groups of orchids. Below we would like to assume an attitude towards the results of the studies on Thelymitroideae being published recently." The authors appear to have erected new subgenera in Arthrochilus, Caladenia, Corysanthes, Genoplesium, Microtidium, and a new section in Corybas, Corysanthes. Thus Corunastylis (Fitzgerald) Szlachetko (subgen. Genoplesium), Molloybas (D.L.Jones & M.A.Clements) Szlachetko (subgen. Corysanthes), Nematoceras (J.D.Hooker) Szlachetko (sect. Corysanthes), Singularybas (Molloy, D.L.Jones & M.A.Clements) Szlachetko (sect. Corysanthes), Stegostyla (D.L.Jones & M.A.Clements) Szlachetko (subgen. Caladenia). New species names would be Corysanthes acuminata (M.A.Clements & Hatch) Szlachetko, Corysanthes cryptantha (Hatch) Szlachetko, Corysanthes dienema (D.L.Jones) Szlachetko, Corysanthes iridescens (Irwin & Molloy) Szlachetko, Corysanthes longipetala (Hatch) Szlachetko, Corysanthes pandurata (Cheeseman) Szlachetko, Corysanthes papa (Molloy & Irwin) Szlachetko. *Scary really – Ed.*

1. Szlachetko DL, Rutkowski P. Quelques notes additionelles sur la sous-famille Thelymitroideae. *Richardiana* 2003; .3 (2): 90 – 100.

There's an old story that might be applied to those of us who get immersed in Australasian orchid taxonomy. (Sensitive readers should not read on: content may offend). This chap, after a life of mildly pleasant sin, goes to Hell. The Devil tells him he can choose one of three pits in which to suffer for eternity. "Well, let's have a look at them" says the chap anxiously. The Devil opens the door to the first pit; the heat hits our chap in the face: naked people are being consumed by fire, their skin blistered, their hair in flames…. They progress to the second pit; all is white: people are freezing, their fingers, toes and other bits going black and snapping off…. They progress to the third pit; all is sunny, but naked people are wading about in a waist-deep, noisome mess of excrement, pus and rotting internal organs. The chap decides this seems the best of a bad lot and joins those in the third pit. A minute later a whistle blows, and the Devil shouts, "OK! smoko's over! everybody back on their heads now!"

Caladenia nothofageti is usually a solitary plant in my experience, but on 27 November, just off the Wainuiomata Ridge Track, under beech, I saw is a colony of perhaps 30 flowering plants in a few square metres (**Fig.18**).



THE COLUMN: ERIC SCANLEN

1. *Nematoceras* "tribaldy"

Down in the Longwood Range, near Riverton and not far from the top of Bald Hill, the highest point there, (affectionately known as Baldy), one can find the local form of *Nematoceras* "Trotters". It grows under *Nothofagus* species in a tight mat which cannot be negotiated without standing on plants; it flowers in mid January, not October to December and the flower is reddish maroon not dark brown to very dark green as any self-respecting *N.* "Trotters" should be.

Sid Smithies and Kelly Rennell felt sure it was a distinct species when they showed it to the Column on 18 Jan 04 at an elevation of about 740m. [J91:12 Fig. 12 & J91:18] and Sid was happy to tag it *N.* "tribaldy". The Column has dithered for two and a half years on this one feeling that it might be different enough but well aware of the scepticism which can greet new announcements. However Mark Clements' recent presentation re *N. sulcatum* and *Nematoceras* in general, showed some notable DNA differences among similar looking *N.* "viridis" alias "whiskers" taxa which had all previously been conservatively lumped under *N.* "whiskers"; that is until H. B. Matthews' 1928 *Corysanthes* "viridis" came to light as another of the same aggregate. Mark's most revealing phylogenetic trees showed *N.* "whiskers" Taranaki, as quite distinct from Brian Molloy's *N.* "Tinline" from Tinline Stream, Nelson whereas Bruce Irwin and the Column had both taken the slight differences involved as variations within the species. This DNA surprise persuaded the Column to take his own advice; "if it seems different, say so", then others in the field can check their own finds for consistency or dissimilarity. What do you think of **Figs.22, 23**, compared with Ian St George's J89:20, the Column's of the Waharau taxon in J82:16 Fig. 2 and of course the *Field Guide*? Anyone with their own variation on *N.* "Trotters", in flower shape, flowering time and/or habitat, please also let the Editor in on the differences.

Acknowledgements
Many thanks to Sid Smithies and Kelly Rennell for leading the Column to the huge colonies of *Nematoceras* "tribaldy".

2. *Thelymitra formosa* "Opuatia"

Remember Ian Reid's remarkable pix of *Thelymitra formosa* with dazzlingly bright red cilia in Journal 100, p. 27? This is a taxon from the Opuatia Wetland at about 20m altitude and Ian had these modest words to say about it.

"A recent thumb through of archived prints and negatives of *Thelymitra* orchids, raised questions about the taxonomic identity of certain plants discovered flowering on the dome of the Opuatia wetland, back in the sum-

mers of the 1980s and '90s.

"Plant photography was my bent; it developed my interest in native orchids. With the Hamilton Junior Naturalists, I discovered Te Kauri Park in the Kawhia district — a rich source of orchid species. Peter de Lange was a vigorous Junat. Later, while he was studying at Waikato University, he led me to Opuatia wetland. He spotted the taxon in question here and expressed his opinion that it might be *Thelymitra formosa.*

"I accepted without question, Peter de Lange's botanical tutelage. He led me and others into the wetland and inspired efforts to discover and identify specimens in the jungle-like sedge swamp. Early December, in sunny or even cloudy weather, we found open flowers.

"*T. formosa* among the wild grass and ferns on the dome of the swamp, is only one of the exciting orchid taxa we studied. Bev Woolley from Hamilton, usually wallowed and brushed through the thick profusion with me to the drier dome, often sighting unknown orchid specimens beyond our energy and reach, and always wet.

"I am grateful now, in 2006, to the real author and investigator, namely 'The Column', who has minutely observed the old negative material proffered from my archive set and presented evidence gleaned on this taxon's identity."

This *T. formosa* taxon will still be there in 2006 along with other remarkable orchid taxa also deserving far more attention such as that hypochromic *Prasophyllum hectorii* [J93:9] which impressed Ian with its metres long roots, an alba form of *Thelymitra cyanea* [J100:27] also Peter de Lange's *Pterostylis* "Sphagnum" and white *Spiranthes novae-zelandiae* [J70:17]. However, the Column has been in no fit state to pursue these treasures for the last two years much as he is champing at the bit to get amongst them. Next year!

On his prints, Ian pointed out the undeniable evidence of the column, on his *T. formosa* "Opuatia", being different from those of the regular forms of this normally subalpine species. Not only are the column tops and cilia that bright red but they sprout similar cilia on the post anther margins as one can see in **Figs.24, 25**. Bob Talbot had a similar flower from 260m altitude at Ngaere Swamp, East Egmont, as one can see on the cover of Ian St George's *Nature Guide* but whether Bob's one had cilia on the side lobules is not clear from the photo. Ngaere Swamp has been drained so the very existence of that colony is now in grave doubt.

The Column's pix, from four sites around the Central Plateau, all show the usual pale yellow cilia on the column arms with naked post anther margins of red, yellow or apricot hue although minor differences among them are still apparent. Note **Fig.26** with prominent red side lobules, from 1,100m at Waipakihi Hut on 5 Feb. 1975, **Fig.27** with forked yellow side lobules from the Silica Rapids at 1,280m on Ruapehu on 19 Feb. 1995 and **Fig.28** with wavy edged apricot side lobules from Erua Rd. at 740m, on 16 Jan. 2001. The last is much the same as a solitary Iwitahi flower, albeit with unusually narrow tepals, on 22 Jan. 1995, overexposed so not here illustrated.

Quite possibly, Ian's rare Opuatia taxon is distinct so could do with some serious investigation and measures of conservation?

Firstly, *T.* "Opuatia"'s cilia on the side lobules are structurally different from the norm; not that cilia or lack thereof made any difference to the controversial definition of *T. pulchella* for instance.

Secondly, there is the altitude difference from the usual subalpine habitat and;

The cilia on the side lobules of *T.* "Opuatia" are structurally different from the norm; not that cilia or lack thereof made any difference to the controversial definition of *T. pulchella* for instance. The Column's only contact with, normal, yellow ciliated forms, has been subalpine, flowering in Jan/Feb suggesting that cross pollination with the lowland red ciliated form flowering in Nov/Dec. would be unlikely but Peter de Lange assures us that the common form is still present in lowland wetlands from Great Barrier to Stewart and the Chatham Islands.

However, the Opuatia and subalpine taxa are indubitably *following different evolutionary paths* so the Column has to agree with Ian that there are "questions about the taxonomic identity" of *T. formosa* "Opuatia".

What more evidence is needed to separate taxa for specific status? Some DNA comparisons and chromosome counts would be of value to verify or negate Ian's question.

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Inside back cover

Fig. 22. A sectioned *Nematoceras* "tribaldy" flower showing the often definitive shape of the labellum midrib. Note the typical trilobum pocket mid keel, this time however, devoid of fly's eggs (see p.42).

Fig. 23. A whole plant from Bald Hill, 18 Jan. 2004 showing leaf shape from underneath and the reddish hue to the flower.

Fig. 24. *Thelymitra formosa* "Opuatia" column from above and behind, scanned from a tiny portion of Ian's 35mm negative, showing the bright red, ciliated post anther portions of the column. Photo from late November, Opuatia Wetland say 20m above sea level.

Fig. 25. *Thelymitra formosa* "Opuatia" columns scanned and adjusted from a contrasty negative, clearly showing cilia on the side lobules. None of the subalpine plants demonstrate this trait.

Fig. 26. *T. formosa* for comparison from 1,100m altitude near Waipakihi Hut, 5 Feb 1975. Note yellow cilia on column arms only. Red to yellow post anther lobe with undulating margin.

Fig. 27. *T. formosa* from Silica Rapids, Ruapehu at 1,280m altitude, 19 Feb. 1995. Forked yellow side lobules otherwise similar to the Waipakihi taxon.

Fig. 28. *T. formosa* from Erua Road at 740m, 16 Jan. 2001. Unforked, less prominent side lobules than for Silica Rapids but standard yellow cilia and non-ciliated post anther portions.

Outside back cover

Thelymitra aff. *longifolia*, Te Paki, October 06.


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A *Thelymitra* having affinities with *Thelymitra longifolia*
Te Paki, October 2006