Notes On Native Orchids In Hanmer Forest

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Introduction

My introduction to the orchids of Hanmer Forest occurred in 1974 when I assisted the New Zealand Forest Service to describe the native plants at selected points along the newly-constructed Mt Isobel Walk (Molloy 1974). This information was included in a booklet on the Hanmer Forest Walks, published a year later (McCaskill & Johns 1975). Although most of this work concerned native vegetation, several visits were made to the various walks in the exotic forests. About that time the presence of native orchids in these forests was beginning to arouse attention, especially among members of the Canterbury Botanical Society who have visited the area on several occasions (e.g., Elder & Moore 1973).

The importance of Hanmer Forest as an orchid habitat was brought into sharper focus by the discovery there of an Australian orchid, believed to be *Chiloglottis gunnii*, in November 1981 by Grant Bawden of the New Zealand Forest Service (Johns & Molloy 1983, Molloy & Johns 1983). This was the first record of this Australian orchid in New Zealand and it stimulated the search for this migrant elsewhere. Subsequently the same orchid was found under beech forest in the Richmond Range Forest Park in 1981 by Helen Rainforth of the Wellington Botanical Society (A.P. Druce pers. comm.), and under *Pinus nigra* at Iwatahi, Kaingaroa Forest in 1985 by Lorna Grey, Tauranga Orchid Society (M. Gibbs pers. comm.). Until now this orchid was thought to be *Chiloglottis gunnii* Lindley, known in Australia as the common bird orchid. Extensive studies of *Chiloglottis* in Australia by David Jones have shown that there are several distinct taxa included under the name *Chiloglottis gunnii*. One of these, *Chiloglottis valida* D. Jones is described as new (Jones, 1991) and specimens from Hanmer, Richmond Range Forest Park and Iwatahi have been confirmed as the same species (D.L. Jones, pers. comm., 1991). *Chiloglottis gunnii* is now considered to be a Tasmanian endemic of restricted distribution (Jones 1991). From information passed on to me by Grant Bawden, and from my own experience at Hanmer, it became clear that stands of several exotic conifers, particularly those planted in the early 1900s supported unusually large numbers of native orchids. These notes summarise information gathered on orchids at Hanmer from 1982 onwards. Not all the exotic stands have been examined and to that extent the notes are incomplete. Rather, I have concentrated on those areas where orchids have been (and in some cases still are) abundant.

General distribution of orchids

The distribution of native orchids within old stands of conifers at Hanmer is summarised in Table 1.

Table 1: Distribution of native orchid species in different conifer plantation stands. Frequency of occurrence is indicated by symbols: ab = abundant, f = frequent, o = occasional, and r = rare.

Orchid species	***Larix decidua***	***Pinus nigra****	***Pinus ponderosa***
Gastrodia minor	f	f	-
Gastrodia cunninghamii	f	f	-
Chiloglottis cornuta	o	o	ab
Chiloglottis valida	r	-	-
Pterostylis banksii	-	r	-
Corybas trilobus	-	ab	-
Microtis unifolia	-	o	-
Caladenia lyallii	-	r	-
Aporostylis bifolia	-	o	o
Thelymitra longifolia	-	f	f
Adenochilus gracilis	-	-	ab
Pterostylis areolata	-	-	r

* No distinction is made between Austrian pine (*Pinus nigra* ssp. *austriaca*) and Corsican pine (*Pinus nigra* ssp. *laricio*) as little if any difference was noted in their orchid populations.

The main conifers associated with native orchids at Hanmer are European larch (*Larix decidua*), Corsican and Austrian pines (*Pinus nigra*) and western yellow pine (*Pinus ponderosa*). The old larch stands (1904, 1905) in the Recreation Area, which includes the well known Forest Walk, seem most suitable for the small potato orchid, *Gastrodia minor*, and the recent Australian migrant, *Chiloglottis valida*. Old stands of Corsican and Austrian pines (1907-1914) are also favoured by gastrodias, but especially the spider orchid, *Corybas trilobus*, as well as several others. The former stands of western yellow pine (1914) in compartments 20 and 13 in the eastern part of Hanmer Forest were the prime habitat of the bird orchid, *Chiloglottis cornuta*, and the sole habitat of the slender forest orchid, *Adenochilus gracilis*, which grew in abundance. These and the adjoining stands of Corsican pine in these compartments were easily the best orchid habitats at Hanmer and supported the widest range of orchids until the stands were cleared in 1990-1991.

Explanation

As a habitat for forest orchids, some of the old stands of exotic conifers at Hanmer are ideal. With tree densities from 800-1100 stems/ha, these stands provide the shade, shelter and long-term stability needed for orchid establishment and reproduction. Aside from larch which is summer-green, the evergreen canopies of Corsican and Austrian pines and western yellow pine provide sufficient shade to inhibit the establishment of most potential competitors of orchids, while allowing enough diffuse light for orchid

growth and reproduction. The regular lines and spacing of trees also provide a large uniform area of open spaces for orchids to colonise.

An even more important factor for orchids is the build-up of fungi in the litter layers associated with the continuous decomposition of fallen leaves and cones, prunings, and fallen trees. Most orchids depend on fungi for seed germination, retaining this dependence throughout their lives to a greater or lesser degree. The gastrodias for example, lack chlorophyll and are entirely dependent on specific fungi. Other genera and species of terrestrial orchids with normal green leaves also have specific fungal partners, but are capable of photosynthesis. These fungi infect the roots and rhizomes of orchids as well as the swollen basal part of their stems. The fungi are digested by the orchid cells and provide a rich source of nutrients.

From her extensive studies of our non-green, strongly mycorrhizal orchids, Ella Campbell has suggested that *Gastrodia cunninghamii* and *Gastrodia minor* possibly obtain nutrients from fungi ectotrophic on the roots of associated trees and are therefore epiparasites (Campbell 1962, 1963). At Hanmer however, both these species seem confined to root-free decomposing litter layers, especially rotting stumps and logs.

At Hanmer, different conifers produce different amounts and kinds of litter which are reflected by corresponding differences in litter and soil pH. This in turn determines the kinds of fungi present and their specific orchid partners. As far as I know, the fungi at Hanmer have not been identified systematically, but the influence of the various conifers is apparent even to the untrained eye by the regular appearance of different 'mushrooms' and 'toadstools' (mature fruiting bodies) following autumn and spring rains, with the larch bolete and agarics being especially plentiful.

Orchids are not the only plants affected. Other native and introduced flowering plants such as *Lagenifera pumila* and *Mycelis muralis* are associated with specific conifers. This suggests that they too may have close mycorrhizal relationships with particular fungi, or are responding to other factors such as the degree of shading or soil pH.

The climatic conditions throughout Hanmer Forest are fairly uniform, and the soils of the prevailing terraces and rolling lands are mapped as Ashwick soils, which are silt loams, and stony loams with low natural fertility. These conditions, while conducive to orchid development, are unlikely to play a major role in determining the local distributions of orchids present at Hanmer. The conifers on the other hand are considered the major factor in this respect.

Table 2 summarises information on the litter, fungi, soil and pH at the various sites examined. As can be seen, the deepest and most acid litter occurs under *Pinus ponderosa*, and there is a difference of almost two units of pH between the litter of this conifer and Norway spruce (*Picea abies*) where

Table 2: Litter, fungi, soil and pH at the various sites examined.

Conifer Species	Brief Description of Litter, Fungi, and Soil	Litter pH*	Soil pH*
Pinus ponderosa			
Compartment 20	2-4 cm fresh needles; 6 cm decomp. needles, cones etc., much white and yellow fungal hyphae; over brown stony silt loam	4.8	4.9
Compartment 13	3-4 cm fresh needles; 4 cm decomp. needles, cones etc., much white fungal hyphae; over greyish brown gritty silt loam	4.9	5.1
Pinus nigra ssp. *austriaca* Compartment 3	3 cm fresh needles; 5 cm decomp. needles, cones etc., much white fungal hyphae; over greyish brown stony silt loam	4.8	5.0
Larix decidua			
Compartment 3	1-2 cm fresh needles; 1-2 cm decomp. needles, cones etc., very little white fungal hyphae; over greyish brown stony silt loam	5.1	5.1
Compartment 4 (*Chiloglottis valida* site)	1 cm fresh needles; 2-3 cm decomp. needles, cones etc., very little white fungal hyphae; over greyish brown stony silt loam.	5.4	5.3
Pinus nigra spp. *laricio* Compartment 20	2 cm fresh needles; 2-3 cm decomp. needles, cones etc., much white fungal hyphae; over brown stony silt loam	5.8	5.4
Picea abies Compartment 3	1 cm fresh needles; 1-2 cm decomp. needles, wood etc., very little yellow fungal hyphae; over greyish brown stony silt loam	6.5	5.4

* pH was determined with a Cambridge pH meter on the decomposed and partly decomposed litter layers and the uppermost mineral soils immediately beneath.

no orchids were found. Fungi were most prevalent under *Pinus ponderosa* and the two subspecies of *Pinus nigra,* and least of all under European larch and Norway spruce. Not surprisingly, there was less than a unit of pH

difference among the soils immediately beneath these different litters and fungi extended into the topmost soil layers under *Pinus ponderosa* and *P. nigra* in particular. Most of the orchids' rhizomes, roots and tubers are confined to the fungal-rich litter, with a few like *Corybas trilobus* penetrating the fungal-infected soil.

Conclusion

Old stands of exotic conifers at Hanmer have proved to be some of the best habitats in the country for certain native orchids though perhaps not as rich as those at Iwatahi, Kaingaroa Forest (Gibbs 1988). Important features of these stands which have attracted orchids are; stand density (800-1000 stems/ha) inhibiting competitors on the one hand and yet permitting sufficient light for orchid establishment on the other, stand age (77-87 years) allowing an uninterrupted development of deep litter layers and a consequent build-up of the all-important mycorrhizal fungi, and the species of conifer planted which in turn determines the kind and quantity of litter, fungi and orchids present.

In terms of orchid species diversity, the conifers at Hanmer can be rated in the order *Pinus nigra* (both subspecies), *Pinus ponderosa* and *Larix decidua*. However, the last two are the only known habitats in Hanmer Forest of certain orchids, including the rare (for New Zealand) migrant from Australia, *Chiloglottis valida*.

Prior to felling in 1990 and 1991 the stands of *Pinus ponderosa* and *Pinus nigra* in Compartments 20 and 30 were considered the best orchid habitats at Hanmer for the number and diversity of orchids present. On the other hand, the stands of *Pinus nigra* and *Larix decidua* in Compartments 3 and 4 of the Recreation Area are little inferior and should be maintained for as long as possible. The colony of *Chiloglottis valida* remains vigorous and healthy and continues to expand beyond its boundaries mapped in 1982.

It seems clear to me that some of the old conifers in the Recreation Area have reached the stage where individual stands are thinning out for one reason or another creating openings for other plants to enter, thus making these new habitats less suitable for orchids. Other parts have been windthrown or felled in the past and replanted with conifer species and/or at densities less suitable for orchids. I understand that it is now planned to harvest small groups of old conifers from this area and to replant in these gaps in order to maintain this unique species planting as an amenity the public have come to enjoy.

Provided the appropriate species are replanted, and at the appropriate densities, the orchids should continue to cycle through this area. The main problems could be the susceptibility of residual stands to wind damage, and the continual ingress of undesirable plants, both native and introduced. Given the right habitats, I am confident the orchids at Hanmer can look after themselves. The majority of species present are self-pollinating and self-

fertilised and produce abundant seed. Some, like *Corybas trilobus*, rely less on seed production but extend vegetatively with great success.

Over the last ten years native orchids have become one of the more unusual attractions of Hanmer forest exceeding in numbers their counterparts in the surrounding beech forests and shrublands. With appropriate management it should be possible to maintain if not enhance this feature.

References

Campbell, E.O. 1991. The mycorrhiza of *Gastrodia cunninghamii* Hook.f. **Transactions Royal Society of New Zealand, Botany 1,** 289-296

Campbell, E.O. 1963. *Gastrodia minor* Petrie, an epiparasite of manuka. **Transactions Royal Society of New Zealand, Botany, 2,** 73-81

Elder, Y. & Moore, L.B. 1973. What grows under the forest at Hanmer. ***Canterbury Botanical Society Journal 6,*** 13

Gibbs, M. 1988. Iwatahi: a native orchid reserve in exotic pine forest, New Zealand. **The Orchadian 9(3),** 49-51

Johns, J. & Molloy, B. 1983 **Native Orchids of New Zealand**. Reed, Wellington.

Jones, D.L. 1991. New taxa of Australian Orchidaceae. **Australian Orchid Research 2,** 43-44, Fig 54.

McCaskill, L.W. & Johns, J.H. 1975. **The Hanmer Forest Walks.** New Zealand Forest Service, Wellington.

Molloy, B.P.J. 1974. **Forest Walk - Mt Isobel: The Vegetation and Flora.** Botany Division DSIR Vegetation Report Number 61.

Molloy, B. & Johns, J. 1983. *Chiloglottis gunnii* Lindley, a new orchid record for New Zealand. **The Orchadian 7 (9),** 210-214.