PODOCARPUS NIVALIS CIRCUM-CENTRAL NORTH ISLAND

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Podocarpus nivalis Hook. (snow totara) a dioecious, procumbent, gymnosperm shrub "is widely distributed in the South Island mountains but is confined to the central region of the North Island" (Webby *et al.* 1987). "The fertile hybrid *Podocarpus hallii* □ *P. nivalis* is very common where the parents overlap, but is also found in localities where only *P. hallii* is known." (Wardle *et al.*1988). The presence of the hybrid plant where one parent is apparently absent is an intriguing problem that requires explanation.

Various authors including Connor (1985), Webby *et al.* (1987), and Wardle *et al.* (1988) have advanced wholly or in part possible explanations or hypotheses for the presence of the hybrid in the absence of one parent:

1. The missing parent (*P. nivalis*) may have been present on the site in the recent past.

2. The presence of the hybrid results from long distance dispersal (> 100 km) of its succulent fruit by birds.

3. The presence of the hybrid results from long distance dispersal (> 100 km) of *P. nivalis* pollen to female *P. hallii* trees and subsequent fertilisation and fruit production near the site.

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Several circum-central North Island sites seem particularly relevant in seeking an explanation for this problem of the presence of the hybrid where one parent is apparently absent: Pouakai Range, Egmont National Park, Herangi Range, Mount Pirongia, and Mount Te Moehau. These outlier sites, arrayed from southwest to north, are all more than 100 km away from the central North Island stronghold and type locality of *P. nivalis* at Mount Tongariro.

The recent article by de Lange (1998) regarding *P. nivalis* on Mount Pirongia has raised the problem again. This has prompted me to provide some additional comments and outline the nature of the research that will be required to fully elucidate the problem.

On the 13th of November 1982 I discovered and collected a procumbent *Podocarpus* growing on a rock outcrop near the Cone on Mount Pirongia (NZFRI 12517)[4]. At first I thought it might be *Podocarpus nivalis*, but brought a plant(s) into cultivation by striking three cuttings taken from the rather large patch > 1m diameter growing on the outcrop. After several years of cultivation and as a result of comparison with central North Island plants (also cultivated), and wider circum-central North Island observations, e.g., Pouakai Range and Herangi Range, I began to doubt that the plant was good *P. nivalis*. Some variation was also apparent between the cuttings I had taken from Mt Pirongia; one plant looked closer to *P. nivalis* than the other two. In brief, the trend which emerged, and which was discussed several times with A. P. Druce, was that in the circum-central North Island sites the majority if not all plants seen were (on morphological evidence) problematic and were probably putative hybrids of *P.*

[4] Note that this is not the specimen discussed by de Lange (1998) which is one collected by A. P. Druce (CHR 469592)

hallii and *P. nivalis*. By this stage, I was referring to the Mount Pirongia plant as *Podocarpus* cf. *P. nivalis* and *P. hallii* □ *P. nivalis* (Clarkson 1984). On receiving Brian Molloy's comment, I redetermined the specimen as *P. hallii* □ *P. nivalis*. However, the identification is still problematic. Chris Ecroyd the Herbarium Curator at NZFRI has commented (1999): "Your specimen does stand out in the folder of four *P. hallii* □ *P. nivalis*? specimens as being closer to *P. nivalis* than the others. I compared it with the *P. nivalis* specimens and could not see any significant differences. I would suggest that if it is a hybrid then it is probably a backcross to *P. nivalis.*"

The same difficulties appear to be true for various plants seen and/or collected on the Herangi Range, Pouakai Range, and Mount Te Moehau. In the case of Mount Te Moehau, cytological evidence (Hair & Beuzenberg 1958) has been used to demonstrate conclusively that the plant there is a hybrid; *P. hallii* has a chromosome number 2n = 34 while for *P. nivalis* it is 2n = 38 and for the hybrid 2n = 36. Webby *et al.* (1997) have used flavonoid markers to show hybridisation of not only putative *P. hallii* □ *P. nivalis* and other *Podocarpus* hybrid combinations, but also several unexpected and previously undetected hybrids, such as *P. totara* □ *P.nivalis* in the Northland and Wellington regions in the absence of *P. nivalis*. These latter anomalous examples, in particular, provide strong support for the possibility of long distance pollen dispersal.

At present, I am left with the impression that the general trend outlined by Webby *et al.* (1987) and Wardle *et al.* (1988) still holds, that is, in circum-central North Island sites, *P. nivalis* is rarely present, *P. hallii* is abundant and the majority of procumbent *Podocarpus* plants are hybrids.

Perhaps further possible explanations or refined hypotheses could now be added to the three above:

4. *P. nivalis* is naturally rare in these sites because of the scarcity of suitable non-forest rock outcrop habitat; the populations show a delicate balance between loss by introgression with *P. hallii* and gain through segregation of forms more suited to the rock outcrop habitat.

5. We are witnessing the last phase of a postglacial readjustment in the vegetation and *P. nivalis* is being lost through introgression with *P. hallii*.

The possible explanations then await full consideration and critical comparison. On the Herangi Range *Lepidothamnus* and *Chionochloa* parallel the situation with *Podocarpus*. I hope within the next few years to shed more light on this interesting research problem when I have adequate data (morphological, cytological and molecular) to comment on which is the most plausible explanation.

With regard to the northern limit of *P. nivalis* in New Zealand, it appears that this is on the East Coast mountains - Mount Hikurangi and Whanokao (Druce 1973; Clarkson *et al.* 1986)[5] and Mount Raukumara (Creswell 1961) - which are some 10-25 km north of Mount Pirongia. However, there is considerable high ground nearer the East Cape; the high altitude outcrops and cliffs of Pukeamaru could potentially harbour as yet undiscovered more northerly individuals of *P. nivalis*.

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REFERENCES

Clarkson, B. D. 1984: Mt Pirongia field trip: 11th November 1984.*Rotorua Botanical Society newsletter 3:* 15.

Clarkson, B. D.; Daniel, L. J.; Overmars, F. B.; Courtney, S.P. 1986: Motu Ecological District: survey report for the Protected Natural Areas Programme. New Zealand Protected Natural Areas Programme No. 6. Department of Lands and Survey, Wellington.

Connor, H. E. 1985: Biosystematics of higher plants in New Zealand 1965-1984. *New Zealand journal of botany 23:* 613-644.

Creswell, R. D. 1961: An ascent of Mt Raukumara. *Wellington Botanical Society bulletin 32:* 8-9.

de Lange, P. J. 1998: Two interesting plant records from Mt Pirongia, western Waikato. *Auckland Botanical Society newsletter 53:* 66-69.

Druce, A. P. 1983: Indigenous vascular plants of Mts Hikurangi, Whanokao (Honokawa), Aorangi, Wharekia and Taitai, Tapuaeroa Catchment, Raukumara Range, 300-5733 ft. Unpublished checklist No. 75, held Landcare Research Library, Lincoln.

Hair, J. B.; Beuzenberg, E.J. 1958: Contributions to the chromosome atlas of the New Zealand flora - 1. *New Zealand journal of science 1:* 617-628.

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[5] Voucher specimens for Mount Hikurangi or Whanokao include: NZFRI 13157 and

Wardle, P.; Harris, W.; Buxton, R.P. 1988: Effects of glacial climates on floristic distribution in New Zealand - 2. The role of long-distance hybridisation in disjunct distributions. *New Zealand journal of botany 26:* 557-564.

Webby, R. F.; Markham, K. R.; Molloy, B. P. J. 1987: The characterisation of New Zealand *Podocarpus* hybrids using flavonoid markers. *New Zealand journal of botany 25:* 355-366.

CHR 165703. No voucher was located for the Mount Raukumara record.