It is interesting to note that there is a marked bias towards large individuals occuring in the drier habitats and that earlier collecting in wet habitats (Green, 1972, 1973) had failed to produce any of a weight greater than 59 grams.

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NOTES ON *EUCALYPTUS PAUCIFLORA* IN TASMANIA

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INTRODUCTION

The biogeography and population ecology of *Eucalyptus pauciflora* Sieb. ex Spreng., or Snow Gum (for those of us on mainland Australia) or Cabbage/Weeping Gum (in Tasmania), is interesting and instructive. Its geographic distribution exhibits the broadest altitudinal range, and one of the largest latitudinal ranges, of any of the 600 odd extant species of eucalypt. Thus the species spans a multitude of environmental gradients.

On continental, south-east Australia *E. pauciflora* is found throughout the mountains and sub-alpine regions of eastern Victoria, New South Wales and the most southerly part of Queensland. It is the dominant tree at high altitudes and, as pure stands, forms the tree-line. At the same time, populations occur down to close to sea level. In southern Victoria and south-east South Australia, for example, many disjunct populations occur below about 700 metres in elevation (Williams & Ladiges, 1985).

In Tasmania *E. pauciflora* is displaced from its typical position as 'Snow Gum' by endemic *Eucalyptus coccifera* Hook f.. Here *E. coccifera* is typically the tree-line species and *E. pauciflora* is restricted in distribution to the eastern and central regions of the State within the altitudinal range of about 0-730 metres although some extension occurs up to about 1,275 metres (Hall, Johnston & Chippendale 1970).

On a relatively coarse spatial scale, *E. pauciflora* in Tasmania is typically found on more fertile soils as a component of grassy woodland or forest (Kirkpatrick & Backhouse,undated). However in the north-east, for example around Ringarooma Bay, it does occur on sand in situations apparently comparable to those occupied by lowland populations at Wilsons Promontory and Powlett River in coastal, southern Victoria. More widely in mainland Australia *E. pauciflora* is commonly found on shallow rocky soils and well-drained alluvia of relatively moderate quality (Boland *et al.*, 1984).

RESEARCH ON MAINLAND POPULATIONS

Most of the earlier work *E. pauciflora* has concerned those populations on mainland Australia, particularly in relation to their distribution, morphological variation with altitude (Pryor,1957) and their ecophysiology (as e.g.,Slatyer, 1978, Slatyer and Ferrar, 1977, and Slatyer and Morrow, 1977). More recently, the patterns of morphological variation in isolated lowland populations were investigated by Williams and Ladiges (1985). They sampled 20 populations of *E. pauciflora* ranging from that in Caroline State Forest in South Australia, the most westerly occurrence, to those at Wilsons Promontory and Eildon in Victoria. Highland populations (e.g. Mt Cole & Mt Buffalo, Victoria) were also examined to provide a basis for comparison. Williams and Ladiges (1985) found that the morphology of adults varied relatively little between lowland populations and suggested that this may be due to the general uniformity of the habitat these populations occupied. In other words, these populations were probably less subject to intense selection pressures compared to the highland populations. Of interest, also, was the fact that seedlings showed two distinct morphological forms, a 'lowland' and 'highland' (samples from 1000m or above) form, within the range of *E. pauciflora* sampled. The seed sample from Tasmania, although from a forest site of only 470 metres in elevation, produced seedlings which were classified as highland. Presumably this result was related to climatic differences arising from the much more southerly location of this site. In conjunction with cladistical data derived from a separate study, Williams and Ladiges (1985) proposed that the lowland form of the seedlings perhaps represents the ancestral condition. Their conclusion added a new dimension to the earlier suggestion of Slatyer and Morrow (1977) of a single gene pool for *E. pauciflora* and the contention of Dodson (1975) and, more recently, Hope and Kirkpatrick (in press) that this species had a widespread lowland population during the most recent glaciation. In summarising, Williams and Ladiges (1985) speculated that during the relatively warmer climatic conditions of the Holocene, several of the lowland populations of *E. pauciflora* extended their geographic range upslope. In turn it was suggested that the extant, lowland population-isolates of *E. pauciflora* may represent the remainder of a more widespread distribution which has been significantly reduced by competitively-superior species of eucalypts adapted to the current, warmer interglacial phase.

Recent experiments conducted as part of a doctoral study have, albeit somewhat indirectly, shed more light on some of the areas discussed above. This work has concentrated on identifying the ecological factors effecting the lower distributional boundary of the higher altitude populations of *E. pauciflora*. For example, at study sites in the sub-alpine forests of the Brindabella Range in the Australian Capital Territory, *E. pauciflora* is typically replaced downslope, at around 1240m above sea level, by the Broad-leaved Peppermint, *E. dives* Schau. Further, the transition zone or ecotone between these forests is relatively narrow, commonly less than about 30 metres in elevation. Using seedling

transplants, I have shown that *E. pauciflora* can grow successfully below its current limit given that it has the opportunity to become established. Several additional experiments have indicated some of the major interactions operating within the ecotone. Put simply, it appears that the peppermint cannot extend its range further upslope to any significant degree because it is intolerant of a variety of environmental extremes, but probably in particular climatic extremes, it would then encounter. Individuals in the ecotone appear less healthy and more susceptible to disease. In contrast, *E. pauciflora* is unable to extend its range downslope because, *inter alia*, its intrinsic rate-of-growth is somewhat less than that of the peppermint. In other words, *E. pauciflora* is excluded from growing in areas downslope, where the peppermint can grow.

Eucalyptus pauciflora IN TASMANIA

In a general sense it seems that the highland populations of *E. pauciflora* on continental Australia, at least, have 'traded-off' the ability to cope with environmental extremes and shorter periods of summer growth often experienced at higher altitudes with, again generally, a relatively high intrinsic rate-of-growth. For example, proportionally much more carbon may be allocated to protecting tissues from damage from extremes than to height increment *per se*. In this sense, *E. pauciflora* is a highly specialised species being able to occupy a high altitude 'niche' (outside of Tasmania) in the absence of all other eucalypts. At the same time it probably has the ability to occupy a far greater range of habitats than it does currently in the absence of faster-growing eucalypts. Hence the interesting question then becomes 'why is the pattern of distribution of *E. pauciflora* in Tasmania different from that observed on continental Australia?'

It is clear that without further work any explanation to the above question is speculative. However, several testable hypotheses could be formulated which might increase our understanding not only of this phenomenon but also of some of the processes influencing the biogeography of associated taxa in southern Australia during the early Holocene. One idea is that the high altitude 'niche' in Tasmania may have already been occupied before *E. paucliflora* was able to exploit it. Alternatively, the niche that *E. pauciflora* occupies in Tasmania may be comparable to that in highland areas elsewhere, the apparent anomaly in its observed distribution being related simply to a different spatial arrangements of, say, certain climatic and/or edaphic factors. Moreover, matters are undoubtedly complicated by the genetic architecture of the species, particularly the degree of genetic variation between major highland, population isolates. These areas are (or are proposed to be) currently being investigated.

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BOOK REVIEW

The Wombat : Common Wombats in Australia

By Barbara Triggs, illustrated by Ross Goldingay.

Published by NSW University Press
R.R.P. $14.95 paperback only
Reviewed by D.G. Hird

In south-eastern Australia wombats are well known to many people who regularly traverse bushland areas. Unfortunately this may often be due to road casualties, although fleeting glimpses at night or around campsites are also not