Range extension, habitat and conservation status of three rare mallees, *Eucalyptus castrensis*, *Eucalyptus fracta* and *Eucalyptus pumila* from the Hunter Valley, NSW

Lachlan M. Copeland[1] *and John T. Hunter*[2]

[1]Botany, Centre for Ecology, Evolution & Systematics, University of New England, Armidale, NSW 2351, AUSTRALIA. Email: 1copela2@une.edu.au [2]School of Human & Environmental Studies, University of New England, Armidale, NSW 2351, AUSTRALIA. Email: flora@austarnet.com.au

Abstract: New populations of three threatened mallee species, *Eucalyptus castrensis* K.D.Hill, *Eucalyptus fracta* K.D.Hill and *Eucalyptus pumila* Cambage (all Myrtaceae), have recently been found in the Singleton Military Area in the Hunter Valley of New South Wales (32°45′S, 151°15′E). Each population is significant as they increase the known distribution and total numbers of three highly restricted species. Details of the habitat and size of each additional population are given and conservation notes provided.

***Cunninghamia* (2005) 9(2): 307–309**

Introduction

The Singleton Military Area (SMA) covers about 14 375 ha in the central Hunter Valley of New South Wales, 20 km south of Singleton (32°45′S, 151°15′E; Fig. 1). It is bisected west to east by the Broke-Cessnock road. North of this road the SMA has been largely cleared and is gently undulating while to the south the terrain is relatively steep and corresponds to the northern fall of the Broken Back Range. The geology is fine-grained sandstones of the Early Permian and Triassic periods which are part of the Hunter Valley Dome Belt (Herbert & Helby 1980). Altitudes range from 40 m ASL in the far north of the SMA to over 500 m on top of the Broken Back Range.

During 2004 field surveys targeting rare or threatened vascular plant species and endangered ecological communities were conducted in the SMA to provide the Department of Defence with management guidelines to minimise impacts on these taxa and communities, and to secure their future. Considerable effort was made to determine the distribution of each rare species, their population sizes and their potential threatening processes over two survey periods (June and December 2004). Nine rare or threatened plant species and one endangered community were found within the SMA (Hunter 2004). Of particular interest were the discoveries of several new populations of three rare mallees: *Eucalyptus castrensis* K.D.Hill, *Eucalyptus fracta* K.D.Hill and *Eucalyptus pumila* Cambage (all in family Myrtaceae). These mallee species, although not closely related, are all endemic to the same limited area and are of high conservation significance. Prior to this study each species was known from just a single population. This paper describes the size, habitat, fire response and potential threats for these recently discovered populations.

Species profiles

Eucalyptus castrensis

This species has a typical mallee habit and grows to a height of 8 m (Hill & Stanberg 2002). It appears to be most similar to *Eucalyptus aenea* K.D.Hill to which it differs by its larger buds, fruit and adult leaves, and by retaining a small amount of rough bark at the base of larger adults (Hill & Stanberg 2002). *Eucalyptus aenea* itself is a narrow endemic found 100 km to the north-west in Goulburn River National Park and Manobalai Nature Reserve (Hill 1997, 2002; Bell 2001; Peake 2005).

When described by Hill & Stanberg, *Eucalyptus castrensis* was only known from a single stand approximately 3 hectares in size, and was considered endemic to the SMA (*castra* meaning camp in reference to the SMA). Our survey of this population estimated it to contain between 27–37 000 individuals and cover an area of approximately 10 hectares. This population estimate was made by counting the number of individuals within two 100 x 10 m belt transects and then extrapolating across the occupancy area (Hunter 2004). The high number of individuals is not surprising considering the species was uniformly mono-dominant throughout the stand.

In addition to the type location, a number of additional populations of *Eucalyptus castrensis* were found within the SMA during the recent surveys. The five new populations ranged from a single plant to approximately 150 individuals. The western most stand was approximately 2 km west of the type population and the southern most stand was just 150 m north of the boundary with Pokolbin State Forest.

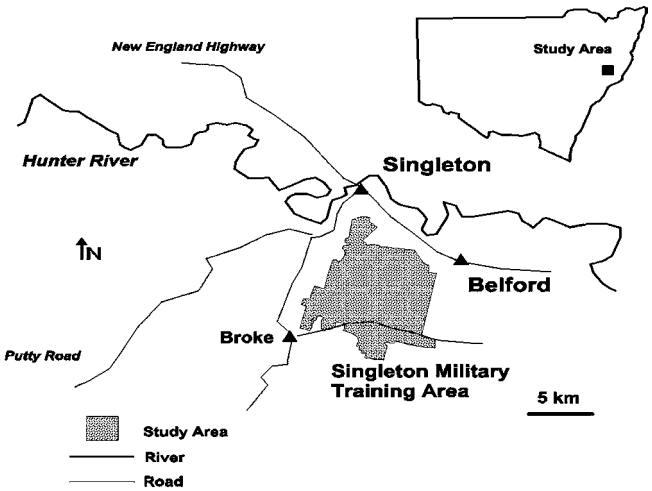

Fig. 1. The location of the Singleton Military Area on the lower North Coast of New South Wales.

The newly discovered stands occurred on relatively flat benches on top of northerly running spurs. The soil on these sandstone benches was particularly shallow with small patches of exposed rock often outcropping at the surface. The dominant tree species in the surrounding area were usually *Eucalyptus fibrosa*, *Corymbia maculata* and (less commonly) *Callitris endlicheri*. Each population of *Eucalyptus castrensis* however, formed a tightly packed stand rarely with space for other tree species within them. Shrub species such as *Bursaria spinosa*, *Dodonaea viscosa* subsp. *angustifolia*, *Olearia elliptica* s.l., *Phyllanthus virgatus* and *Pultenaea spinosa* were often growing within the stands along with a sparse ground layer of *Cheilanthes sieberi* subsp. *sieberi*, *Eragrostis brownii*, *Themeda australis*, *Desmodium varians* and *Paspalidium gracile*. All populations of *Eucalyptus castrensis* had been recently burnt in a wildfire event approximately 18 months prior to the first survey (i.e. burnt early 2003). Despite the severity of the fire, however, only the periphery of the type population was burned leaving the centre unburnt. All other smaller stands were severely affected although a few unburnt individuals were observed in the rockier, open areas. All burnt individuals were resprouting from their lignotubers with the thick regrowth attaining a height of 1–2 metres in 2004.

Hill & Stanberg (2002) suggested a ROTAP code of 2V for *Eucalyptus castrensis* following the criteria of Briggs & Leigh (1996). The species has also recently been listed on Schedule 1 (Endangered) of the *NSW Threatened Species Conservation Act 1995*. Despite the discovery of several additional satellite populations, and the total number of plants likely to exceed 30 000 individuals, we still consider that the species may be under some threat. The highly restricted distribution of *Eucalyptus castrensis* (confined to 4 km^2), and the likely occurrence of frequent fires, suggest that the status of vulnerable is the most appropriate.

Eucalyptus fracta

This spreading mallee or small tree can reach a height of 10 m (Hill 1997). It is thought to be most closely related to *Eucalyptus siderophloia* Benth. but differs by its smaller habit, more rounded juvenile leaves, broader fruits and smaller buds (Hill 1997). *Eucalyptus siderophloia* also tends to be a forest species growing in deeper, more fertile soils in protected sites.

When described by Hill (1997), *Eucalyptus fracta* was known from just a single population at the far northern extremity of the Broken Back Range. Our recent survey of this locality revealed that the population extends for approximately 1.5 km east-west along the northern side of a narrow ridge (Hunter 2004). Soils were particularly shallow (occasionally skeletal) and a dry, exposed northerly aspect was favoured. The population was estimated to be at least 1000 individuals and occupied both Pokolbin State Forest and a small area of the SMA. The fire in early 2003 was particularly severe at this site and virtually all individuals of *Eucalyptus fracta* were burnt. In December 2004 most individuals were vigorously resprouting however, and a few of the resprouting plants were beginning to flower.

A second population of about 300 individuals of *Eucalyptus fracta* was also discovered on the ridge immediately south of the type population. These plants occupied the same habitat as the type location and were associated with the same tree species (*Corymbia maculata*, *Eucalyptus punctata* and *Angophora euryphylla*). This population appeared to have been less severely burnt and at least 30 mature individuals escaped damage. These plants were up to 10 m tall and were typically single-stemmed trees rather than mallees. The majority of the population was within the SMA with a few individuals in the adjacent Pokolbin State Forest.

All currently known individuals of *Eucalyptus fracta* occur in a State Forest or a Commonwealth owned military training area, neither of which meet the criteria of a conservation reserve (Briggs & Leigh 1996). In addition, the small size of the total population (currently thought to be less than 1500), and the continuing threat from frequent wildfires, suggest that a ROTAP code of 2V may be more appropriate than the 2R proposed by Hill (1997). The species is currently listed on Schedule 2 (Vulnerable) of the *NSW Threatened Species Conservation Act 1995* and we support this listing.

Eucalyptus pumila

This small mallee reaches a height of about 6 m (Brooker & Kleinig 1999) and is the sole representative of *Eucalyptus* section *Pumilio* (Brooker 2000). As such it is a distinctive species with no close relatives and is of particular phylogenetic conservation significance. Since its description nearly 100 years ago (Cambage 1919), it has only been known from the type population in Pokolbin Flora Reserve and an adjacent private property.

During the 2004 rare plant surveys two additional populations were discovered in the SMA (Hunter 2004), approximately 4 km north-west of the type locality and separated from each other by just 300 m. Despite their close proximity these populations are quite distinct, occuping very similar habitats (flat benches on a steep-sided spur) but separated by a deep valley. Soils were shallow and rocky with the benches exposed to the north. Vegetation of the surrounding area was woodland dominated by *Eucalyptus fibrosa* and *Corymbia maculata* although these species never entered the dense mallee stands. Associated shrubs included *Persoonia linearis*, *Exocarpos cupressiformis*, *Leptospermum parvifolium* and *Olearia elliptica* s.l. while a sparse ground layer of *Paspalidium gracile*, *Platysace ericoides* and *Pomax umbellata* was present in both populations. At one of the *Eucalyptus pumila* stands, *Eucalyptus castrensis* occurred sympatrically, an association not known to occur elsewhere. Both populations of *Eucalyptus pumila* were severely burned in early 2003 although a few mature individuals escaped the fire and were flowering profusely during the June 2004 survey. Previously, the species has only been reported as flowering in April-May (Brooker & Kleinig 1999). All burnt plants were resprouting and the new growth was typically up to 1.5 m tall. Approximately 150 plants were present in each population, although these estimates were difficult to make due to the tightly-packed nature of the individuals and the dense regrowth.

Despite the additional populations, the conservation code of 2VCi (Briggs & Leigh 1996) and the current listing of the species as Vulnerable on the *NSW Threatened Species Conservation Act 1995* is still considered appropriate. All known plants of *Eucalyptus pumila* occur within 5–6 km of each other and this highly restricted distribution leaves them vulnerable to threats such as an inappropriate fire regime.

Discussion

The recently discovered populations of *Eucalyptus castrensis*, *Eucalyptus fracta* and *Eucalyptus pumila* are all of significance given the highly restricted distributions and relatively low population numbers of each species. Only the type population of *Eucalyptus pumila* in Pokolbin Flora Reserve is currently reserved. The Department of Defence, which controls the SMA, has made a commitment to protect all rare or threatened plants and endangered ecological communities within the SMA. The Department is aware of each of the new *Eucalyptus* populations and is willing to manage all populations effectively to ensure their continued survival. Potentially destructive activities within the vicinity of known populations will be excluded. This is an important step as the SMA is of considerable environmental significance (Peake 2005), particularly when one considers the three quite unrelated eucalypts that share the habitat within the same small geographic area. The northern fall of the Broken Back Range should be considered a significant region of endemism for *Eucalyptus* following the criteria of Platnick (1991). As all recently discovered populations occupied similar habitats (shallow, rocky ridges with a northerly aspect), it is possible that further stands may be found in nearby areas of similar habitat that still remain botanically unexplored.

Acknowledgements

The Department of Defence instigated the project, funded the fieldwork and allowed full access to all of the SMA. We would especially like to thank Louise Cairns of this department for logistical support, assistance in the field and for comments on the manuscript. Stephen Bell and Vanessa Hunter also gave valuable assistance in the field with Stephen also providing useful feedback on the manuscript. Travis Peake and an anonymous referee are thanked for further improvements to the paper.

References

Bell, S.A.J. (2001) Notes on the distribution and conservation status of some restricted plant species from sandstone environments of the upper Hunter Valley, New South Wales. *Cunninghamia* 7(1): 77–88.

Briggs, J.D. & Leigh, J.H. (1996) *Rare or threatened Australian plants*, revised edition. (CSIRO: Collingwood).

Brooker, M.I.H. (2000) A new classification of the genus *Eucalyptus* L'Her. (Myrtaceae). *Australian Systematic Botany* 13: 79–148.

Brooker, M.I.H. & Kleinig, D.A. (1999) *Field guide to eucalypts, Vol.1. South-eastern Australia*. 2nd Edition. (Blooming Books: Hawthorn).

Cambage, R.H. (1919) Two new species of *Eucalyptus*. *Journal and Proceedings of the Royal Society of New South Wales* 52: 453.

Herbert, C. & Helby, R. (1980) A guide to the Sydney Basin. *Geological survey of New South Wales Bulletin 26*. (Department of Mineral Resources: Sydney).

Hill, K.D. (1997) New species in *Angophora* and *Eucalyptus* (Myrtaceae) from New South Wales. *Telopea* 7: 97–109.

Hill, K.D. (2002): *Eucalyptus*. Pp. 96–164 in G.J. Harden (ed.), *Flora of New South Wales Volume 2*. 2nd Edition (UNSW Press: Sydney).

Hill, K.D. & Stanberg, L.C. (2002) *Eucalyptus castrensis* (Myrtaceae), a new species from New South Wales. *Telopea* 9: 773–776.

Hunter, J.T. (2004) Rare and threatened plants of the Singleton Training Area. Part A and B. (Unpublished report prepared for Department of Defence).

Peake, T.C. (2005) The vegetation of the Central Hunter Valley, New South Wales. A report on the findings of the Hunter Remnant Vegetation Project. Final draft Version 1. (Unpublished report available from the Hunter — Central Rivers Catchment Management Authority, Paterson).

Platnick, N.I. (1991) On areas of endemism. *Australian Systematic Botany* 4: 1–11.

Manuscript accepted 20 October 2005