Genetic variation in *Banksia saxicola* (Proteaceae), a rare Australian plant with a markedly disjunct distribution

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**Abstract.** *Banksia saxicola* A.S. George (Proteaceae) is a rare Australian endemic, found in only two locations in Victoria that are separated by approximately 500 kms: the Grampians and Wilson’s Promontory National Parks. The organisation of genetic variation between and within populations at the two locations was assessed using the Amplified Fragment Length Polymorphism (AFLP) technique. Two populations were sampled in the Grampians National Park and one population was sampled at Wilson’s Promontory. The three populations were genetically divergent from each other, in particular the Grampians and Wilson’s Promontory populations, and this relates to the ancient geographic isolation of these two regions. The Wilson’s Promontory population had lower genetic diversity than either Grampians populations, consistent with its smaller population size. The findings are important for strategies to conserve *B. saxicola*.

**Key words:** *Banksia saxicola* A.S. George, rock banksia, AFLP, genetic variation, population differentiation, genetic diversity, biogeography, conservation.

*Banksia saxicola* A.S. George (Proteaceae), the rock banksia, is a rare endemic found in only two locations in Victoria, Australia that are separated by approximately 500 km: the Grampians (a) and Wilson’s Promontory (b) National Parks (Fig. 1). At the Grampians, *B. saxicola* is relatively widespread and locally common (Taylor and Hopper 1988), and grows predominantly on rocky mountain summits as a shrub or small tree up to six metres in height (Middleton et al. 1996). At Wilson’s Promontory, it is less abundant and occurs as an understory tree, of up to 15 metres in open *Eucalyptus* forest (Middleton et al. 1996). *Banksia saxicola* is distinguished from *B. integrifolia* L. f. and *B. canei* J.H. Willis, to which it is closely related, by the absence of a lignotuber, grey-yellow coloured inflorescences, flowering time (January to March) and whorls of relatively large (40–100 × 10–35 mm) leaves (George 1981).

Wilson’s Promontory National Park, situated approximately 230 km south-east of Melbourne, is the most southerly part of the Australian mainland and includes Devonian granitic mountains in the south and Quaternary sands on the Yanakie Isthmus in the north. During the last glacial maximum, 18–20,000 years ago, sea level was approximately 150 m lower than at present and Wilson’s Promontory formed part of a land bridge to Tasmania; sea-level probably reached its present height about 7,000 years ago (Costermans 1998). There is a wide range
of vegetation types at Wilson’s Promontory and at least 668 native plant species have been recorded (Wescott 1998). Floristic links between Wilson’s Promontory and Tasmania are evident (Costermans 1998).

The Grampians Ranges in western Victoria, 260 km north-west of Melbourne, are a group of isolated mountains consisting of quartzose sandstone of late Silurian-early Devonian age (Calder 1987). Today, the closest sea coast to the Grampians is more than 150 km to the south. However, about 14 million years ago, the Grampians were probably part of the coastline (Calder 1987). The Grampians are one of Australia’s most botanically rich regions, containing over 1,000 plant species. They include at least 20 species that are endemic (Elliot 1984, Newnham et al. 1986, Whiffin and Ladiges 1992, Ladiges and Whiffin 1993) and several that are limited to a single range, for example *Eucalyptus victoriana* (Ladiges and Whiffin 1993). A number of species, in addition to *B. saxicola*, have unexpectedly disjunct distributions, including links with Tasmania (e.g. *Leptospermum turbinatum* J.H. Willis) and the Blue Mountains, New South Wales (e.g. *Hibbertia cistiflora* N.A. Wakef.; Calder 1987).

Middleton et al. (1996) studied the population ecology of *B. saxicola* at the Grampians and Wilson’s Promontory and concluded from morphological measurements that there was some degree of differentiation between Grampians and Wilson’s Promontory populations. However, because these population differences could have been at least partly due to differences in the environments from which the samples were collected, and also because the differences were not clear-cut, recognition of distinct taxonomic units was not warranted.

This paper describes research that aimed to resolve more fully the degree of genetic differentiation between disjunct populations of *B. saxicola*, and to investigate differences in the genetic diversity of populations. The data collected are used to assess the conservation status of *B. saxicola*.

**Materials and methods**

**Plant material.** Young leaf tissue was collected from 59 plants from three populations of *B. saxicola*: 20 plants were from each of two populations at the Grampians National Park (Mt William and Victoria Range), and 19 plants were from a population at Wilson’s Promontory National Park. Mt William is the highest point in the Grampians (1,167 m) and lies on the eastern side of the Park (37°18’S, 142°36’E; 950–1,167 m a.s.l.). The Victoria Range lies approximately 25 km west