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# THE VEGETATION PATTERN OF RANGITOTO

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A thesis submitted for  
the degree of

Doctor of Philosophy

in the  
Department of Botany,  
University of Auckland

1992

## ABSTRACT

The vegetation of the island of Rangitoto was examined in order to determine the current vegetation pattern and to identify the factors which have influenced the development of this pattern.

Information about the order and dates of eruptive events was reviewed to gauge the length of time that the various surfaces of the island have been available as a substrate for the development of a vegetation covering. Available geological information, dating evidence, historical accounts, tree ages, and Maori evidence all point to a single period of eruptive activity, probably only several years in duration, around the mid- to late-1300's (A.D.). The order of eruption was probably production of the ash that covers neighbouring islands, followed by cinder cone building, followed by eruption of the lava flows.

The lava flows were found to consist of clinkery aa flows, blocky aa flows, and a flow type referred to as Rangitoto slab flows. These flow types could be partially distinguished from one another, using discriminant analysis, on the basis of the length of the longest fragment on a 5x5m plot and the number of fragments on a 1x1m subplot. A new transition sequence of flow types from pahoehoe to aa lavas is proposed for viscous lavas undergoing low rates of shear strain.

The vegetation pattern of the lava fields was examined using TWINSPLAN and CANOCO analysis of foliage cover percentage information gathered from 125 5x5m plots. It was found to consist of a successional sequence of vegetation arranged in a mosaic. The mosaic was found to relate strictly to the underlying lava flow surface. Large *Metrosideros* grow in crevices on slab flows and next to large boulders on aa flows. Smaller *Metrosideros* grow on small slabs on slab flows. Mixed species scrub is found growing on unbroken slab surfaces. The relative rate of colonisation of different types of flows under different climatic conditions was considered.

The *Metrosideros* hybrid swarm was studied using morphometric information. The putative parent species of the swarm were found, using Principal Components Analysis, to be *Metrosideros excelsa* and *Metrosideros robusta*. The Rangitoto *Metrosideros* population was found, using Canonical Variates Analysis, to be the result of hybridisation, followed by introgression towards *M. excelsa*. The probable F<sub>1</sub> hybrids grow in early successional stage vegetation. The major geographical trend is the tendency for backcrossed hybrids to grow on the eastern side of the island, suggesting eastern origins of *M. robusta* seeds.

The impact of browsing animals on the vegetation was studied over five years in exclosures and corresponding control sites. *Metrosideros* foliage recovered slightly. *Griselinia lucida* and *Cyathodes juniperina* seedlings were recruited into the shrub layers in exclosures, but not in control sites. *Astelia* seedlings also benefitted from the absence of browsing pressure, as did *Thelymitra longifolia*.

The distribution of browsing animal populations in relation to the vegetation pattern was studied using faecal pellet recruitment data gathered by the New Zealand Forest Service in 1984. Both wallabies (*Petrogale penicillata penicillata*) and possums (*Trichosurus vulpecula*) were found to be distributed principally according to the amount of palatable foliage available to each species in each vegetation type.

## ACKNOWLEDGEMENTS

I would like to thank the many people who have made it possible for me to produce this thesis.

First, I would like to say thanks to my father, Rex Julian, who has been my trusty field assistant, my technical photographer, and my thesis production assistant in turn, leaving my long-suffering mother, Chris Julian, alone at home for weeks on end, bringing home the bacon.

Next, I would like to thank Jenny Fuller who has contributed far more to my thesis than I ever did to hers. She has mapped, letrated, and proof read, in addition to assembling reference lists and appendices. Only a true friend would stay up to 3am to help get things finished.

I would also like to thank my supervisor Neil Mitchell, who encouraged me to learn by allowing me to plan and execute my own study. He has taught me much about the application of classification, ordination, and other multivariate statistics techniques of which I was previously totally ignorant. He has also helped me tidy up my writing style; I have used almost all of his suggestions made during editing of the text. His forbearance and support during my long illness was also much appreciated. Thank you Neil.

I would like to say special 'thank yous' to several people who have acted in an advisory capacity. Bob Brockie of the DSIR ripped apart the chapter on the browsing animals and offered very helpful editorial advice which I did not always take. However, my grammar has improved and I promise I will (almost) never use the word 'occur' again. Russell Fulton of the University Computer Centre has helped me solve many problems and has displayed great patience. Les Kermode of the DSIR and Ian Smith in the Geology Department of the University both helped me with the geological side of this study. I would particularly like to thank Ian for his interest in my lava transition theory which led him to help me with further research in this area, expanding my horizons considerably.

I would also like to thank the Motutapu staff of the Department of Conservation who very efficiently provided accommodation at short notice and who kept an eye on me when I was working alone on the lava fields. I wish them all the best in the future for the challenging task of reforesting Motutapu.

To everyone who was in at the kill, helping me to photocopy and collate the thesis, thank you very much. Tim Hammett has coped with incessant demands on his time and has helped me with the technical side to producing and printing out the thesis. Sally Unsworth, Natalie Julian, David Broadbent, and Alison Broadbent all gave up time to get me organised when I was most tired and fuzzy-headed.

Finally, I would like to thank David who has supported and encouraged me, particularly over the last six months, and has provided transport, hot meals, and clean clothes on demand at all hours of the day and night.

To everyone else that has helped or contributed. I am sure that my blood will run cold when this has all been sent to the binders, as I am sure to remember someone that I have forgotten to thank properly. You know who you are and I hope you will forgive the shortcomings of my memory at this time and understand how truly grateful I am to you for your help.

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