



JENNY SCOTT

Teaching an ancient discipline new methods **vegetation mapping**

Paddick Valley looking inland. The lake with island can be seen in the aerial photo and vegetation map.

Over the last two years we have been successfully resurrecting old Heard Island field mapping vegetation data with the aid of new mapping technologies. It has been a great example of collaboration between Henk Broelsma, mapping officer at the Australian Antarctic Data Centre (AADC), a Geographic Information Systems (GIS) consultant, DataVision GIS P/L, and Jenny Scott, the scientist who originally collected the data. The key to the project was the set of ground control points surveyed by Jenny in the summer of 2000–01, which allowed the mapping to proceed with some confidence. We tell the story here in the hope it might inspire other successful collaborations.

During the 1986–87 and 1987–88 Australian National Antarctic Research Expeditions (ANARE) to Heard Island, Jenny mapped most of the island's vegetation in the field using 1980 and 1986–87 colour aerial photography. Vegetation boundaries were traced from aerial photos onto transparent overlays and ground-truthed where possible. A series of 35 mm slides (oblique aerial photos from a helicopter, and also ground-based photos) were taken to aid later interpretation. However, there was a problem afterwards with how best to display and map the information from the aerial photos, as the aerial camera and photography were not designed for mapping. At the time there was no accurate base map of the island, or a Digital Elevation Model (DEM), so the data sat waiting for a solution.

Since this time, satellite imagery of Heard Island and the technology for translating the imagery to map form have become increasingly sophisticated and the AADC has produced a number of increasingly accurate maps of the island. Over the same period, documenting and measuring vegetation change on Heard Island has become a topic of great interest

and relevance to subantarctic terrestrial biologists, as the island presents an unusually sensitive and pristine environment for detecting and measuring the effects of regional climate change. The 1987 vegetation mapping data had the potential to become an invaluable baseline tool for assessing changes in vegetation distribution and the nature of communities on the island.

With this in mind, we were keen to see if we could make the 1987 mapping data come to life. During the 2000–01 summer expedition to Heard Island, Jenny collected a series of ground control points around the east and west coasts using a small hand-held Global Positioning System (GPS) unit. These ground control points, although not ideal due to their spatial inaccuracy (± 10 metres), together with a relatively coarse DEM of the island, enabled the first digital 'ortho-rectification' (correcting for the effects of camera lens tilt and displacement of objects due to ground relief) of the 1980 and 1987 aerial photographs. It also showed that it was possible to use ground control points collected by personnel other than surveyors.

Jenny's old transparent vegetation mapping data overlays were also rectified, although it was decided, after a few tests, that greater accuracy would result if the vegetation boundaries were mapped directly from the rectified aerial images on the screen, while using the overlays for 'ground-checking'. Consequently Jenny spent several months mapping by 'screen-digitising' at DataVision, where she learnt to use ArcView GIS software and benefited from the expertise and advice of the DataVision personnel. Jenny's series of oblique aerial 35mm slides taken in 1987 were invaluable for interpreting the vertical aerial photos during this process.

We have now produced a vegetation map for eastern Heard Island, which can be used as 1987 baseline information

by researchers. Several hundred of Jenny's 35mm oblique aerial and ground-based slides from 1987 and 1988 have been incorporated as part of the final data set ('hot-linked' to the digital vegetation map). Jenny undertook some field checking of the map during the 2003–04 Heard Island expedition and made some minor adjustments to vegetation category descriptions. A report describing the methodology and vegetation mapping categories is available through the AADC's metadata records. The vegetation data can be downloaded from the same record. The final phase of this 1987 baseline project will be to map the remaining vegetated areas of the island (the west and north-west ice-free areas) using similar methods, by July 2005.

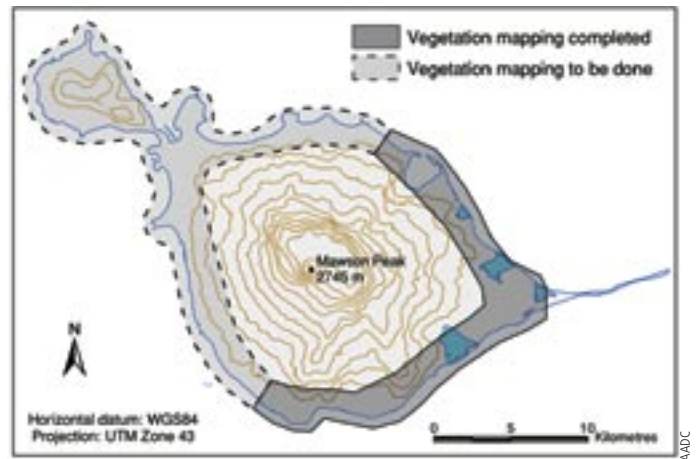
In January 2003 a high resolution satellite image of eastern Heard Island was obtained by the AADC. This was ortho-rectified using a Radarsat DEM and the hand-held GPS control points captured during the summer of 2000–01. On request from the terrestrial biologists participating in the 2003–04 Heard Island expedition, the image was enhanced to highlight vegetation features. The AADC supplied the biologists with several series of prints at 1:5000 and 1:7500 scales for field use. Jenny found these invaluable for assessing the extent and nature of vegetation change on the ground, with similar scale prints of the 1987 aerial imagery and mapping data used for comparison. Together with an extensive series of fixed photo-points of vegetation features on the ground (taken by Jenny in 1987 and 2003–04), the 1987 and 2003 aerial imagery provides an unequalled data set for analysing vegetation change on Heard Island over the 16 year period.

Following the successful collection of usable ground control points in the summer of 2000–01, the AADC equipped the 2003–04 Heard Island expedition with a base station and several differential GPS units. The aim was to collect a series of more accurate ground control points and provide a more efficient and accurate method of data collection for various research programs. In addition to their own programs, three expeditioners (Jenny Scott, Robb Clifton and Justine Shaw) surveyed several hundred new ground control points around eastern Heard Island using the differential GPS system, and re-surveyed the ground control points acquired in the 2000–01 summer to sub-metre accuracy. This will assist the AADC in its endeavours to refine the mapping of Heard Island.

In the island's north, two other expeditioners (Kieran Lawton and Roger Kirkwood) collected a series of hand-held GPS ground control points which, together with the Radarsat DEM, will allow ortho-rectification of the Laurens Peninsula high resolution satellite imagery and aerial photography. Jenny will use these in the next phase of the vegetation mapping project.

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Vegetation mapping completed and to be done.

A 1987 oblique aerial photo after orthorectification and the resulting vegetation map produced by screen-digitising. This vegetation map is a valuable baseline tool for assessing future changes in vegetation distribution and plant communities.

