

## **Revision of Antarctic Specially Protected Areas (ASPAs) Nos. 118a and 118b**

### **Cryptogam Ridge, Mt Melbourne, North Victoria Land (SPA 22) and Summit of Mt Melbourne, North Victoria Land (SSSI 24),**

#### **Working Paper New Zealand**

#### **Introduction**

An area of 6 km<sup>2</sup> on the summit of Mount Melbourne was originally designated in Recommendations XVI-5 (1987, SSSI No. 24, Summit of Mount Melbourne) and XVI-8 (1991 SPA No.22, Cryptogam Ridge, Mount Melbourne) after proposals by New Zealand and Italy on the grounds that these areas contain geothermal soils that support a unique and diverse botanical community. The warmest areas of ground created by fumaroles support patches of moss, liverwort and algae along with one species of invertebrate protozoan.

Following entry into force of Annex V, SPA 22 and SSSI 24 have been renamed and renumbered as Antarctic Specially Protected Area (ASPAs) No. 118a and 118b respectively. (Note: Under Resolution 5 (1996) both sites on Mt Melbourne were given the same ASPA number. However, these sites do remain as separate areas until such time as a new management plan(s) is agreed and consequently they are referred to here as ASPA 118a and 118b).

In accordance with the provisions Annex V of the Protocol on Environmental Protection to the Antarctic Treaty and Resolution 1 (1998), New Zealand has undertaken a review of the management plans for these related areas.

#### **Review of Activities**

Since designation, one New Zealand scientific party has visited ASPA 118b (SSSI 24), in the 1988/89 season. This party sampled vegetation. A surveying and inspection visit to support the management plan revision was made by New Zealand to both Areas in January 2002. The United States has not issued any permits for entry to either area. Personnel from the Italian Antarctic Programme have entered ASPA 118b annually over at least the last five seasons. Activities have included: one visit per year involving thermal gradient measurements, soil, snow or vegetation sampling; up to 20 visits per year to take Global Positioning System (GPS) measurements at three survey markers within the Area which form part of a deformation survey network; and up to five visits per year to maintain telecommunications equipment within the Area. One visit was made to Cryptogam Ridge (ASPAs 118a) for soil and vegetation sampling.

A review of relevant literature suggests that the biological communities within the both areas remain unusual and of scientific interest, particularly for comparative study with Mt Erebus (Tramway Ridge ASPA 130) and Mt Rittman as knowledge of these high altitude warm ground Antarctic habitats increases.

Some species within the areas have been found at further locations in the Antarctic since designation of the areas. However, *Campylopus pyriformis* remains the only known leafy example on the Antarctic continent and the algae *Stigonema ocellatum* and *Chlorella cf. reniformis* remain the only Antarctic records. An entirely new species of thermophilic bacteria, *Bacillus thermoantarcticus*, has also been discovered

### **Issues Addressed in the Revision**

There is no doubt that the outstanding scientific values of the area remain. The relatively little research conducted in the areas (especially at Cryptogam Ridge) since the management plans were written has, if anything, increased the value of the area. Inspection of Cryptogam Ridge in January 2002 detected no visible damage to vegetation or soil.

Two practical issues were given particular consideration in the review:

- The area designated as ASPA 118a (SPA 22) falls within the area designated as ASPA 118b (SSSI 24).
- The location of survey markers forming part of a deformation survey and a radio repeater site for Italian Antarctic Programme communications within ASPA 118b means regular access to these points within this Area is required.

### **Proposed Revision**

The proposed revised management plan for ASPA 118 merges ASPA 118a (SPA No. 22) and ASPA 118b (SSSI No. 24). Restricted and Prohibited zones provide for more stringent access conditions within the former SPA, Cryptogam Ridge.

Most of Cryptogam Ridge is proposed as a Restricted Zone in order to protect the most rich and diverse of stand of vegetation. The western tip of the ridge is proposed as a Prohibited Zone (similar to the approach taken at Tramway Ridge ASPA 130) to preserve part of the Area as a reference site for future comparative study. The remainder of the Area, similar in biology, features, and character, is available for research programmes and controlled sample collection.

Two Managed Zones are also proposed. The aim of these zones is to allow the issuing of permits to access survey marks and the radio repeater site without permitting access to the rest of the Area.

The outer boundaries of the Area remain the same as the original ASPA 118b (SSSI No. 24) designation, along the 2200m altitude contour. This boundary is most practical since all access to the Area is by helicopter and altitude can be readily assessed by visiting parties.

## Relevant Literature

- Nicolaus, B. Lama, L. Esposito, E. Manca, M.C. Di Prisco, G. Gambacorta, A. 1996. *Bacillus thermoantarcticus* sp. nov., from Mount Melbourne, Antarctica: a novel thermophilic species. *Polar Biology*. 16(2). pp.101-104.
- Seppelt R.D., Green T.G.A. 1998. A bryophyte flora from southern Victoria Land. *New Zealand Journal of Botany*. Vol 36. pp 53-59.
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**DRAFT Management Plan for  
Antarctic Specially Protected Area (ASPA) No. 118**

**SUMMIT OF MOUNT MELBOURNE, VICTORIA LAND**

**1. Description of values to be protected**

An area of 6 km<sup>2</sup> on the summit of Mount Melbourne was originally designated in Recommendations XVI-5 (1987, SSSI No. 24, Summit of Mount Melbourne) and XVI-8 (1991 SPA No.22, Cryptogam Ridge, Mount Melbourne) after proposals by New Zealand and Italy on the grounds that these areas contain geothermal soils that support a unique and diverse biological community. The warmest areas of ground created by fumaroles support patches of moss, liverwort and algae along with one species of invertebrate protozoan. ASPA No. 118a (SPA No. 22) was originally enclosed within ASPA No. 118b (SSSI No. 24) in order to provide more stringent access conditions to this part of the Mt Melbourne summit area. ASPA 118a and 118b have now been merged in the current plan, and Prohibited and Restricted zones provide for more stringent access conditions within the former SPA. The outer boundaries of the Area follow the original SSSI No. 24 designation.

The biotic communities of the closest documented fumarolic ground, 400 km to the south on Tramway Ridge, Mt Erebus and on Mt Rittman, in the Mountaineer Range over 180 km to the north, are considered significantly different to that on Mt Melbourne. Mount Melbourne has the only known leafy example of the moss *Campylopus pyriformis* on the Antarctic continent (the moss is present on Mt Erebus only in the protonema stage). The liverwort *Cephaloziella exiliflora* is uncommon in Antarctica, found only at Granite Harbour, southern Victoria Land and the Windmill Islands, Wilkes Land, both below 500 m in altitude. The algae *Stigonema ocellatum* and *Chlorella* cf. *reniformis* are the only Antarctic records. Several other algal species are not recorded elsewhere in Antarctica, apart from Mt Erebus. An entirely new species of thermophilic bacteria, *Bacillus thermoantarcticus*, has also been discovered on the summit.

The total cover of vegetation within the Area is hard to assess due to largely permanent snow cover, but is estimated at 100-200 m<sup>2</sup>. Despite this relatively small area of cover, the uniqueness and fragility of the biological communities and their physical environment are such that the Area is of high scientific and conservation value and vulnerable to human disturbance. The dangers of introducing new organisms and disturbance by trampling and sampling are great and justify this site being given long-term special protection. Extensive ice-free geothermal areas at high altitude, supporting a unique community of flora and microbiota and accumulations of organic matter, make this Area of exceptional scientific interest.

## **2. Aims and objectives**

Management at Mount Melbourne aims to:

- avoid degradation of, or substantial risk to, the values of the Area by preventing unnecessary human disturbance;
- allow scientific research on the ecosystem in the Area, in particular on the plants, liverworts, algae and invertebrates, while ensuring protection from oversampling;
- allow other scientific research provided it is for compelling scientific reasons which cannot be served elsewhere;
- minimise the possibility of introduction of alien soils, plants, animals and microbes into the Area;
- preserve a part of the natural ecosystem of the Area, which is declared a Prohibited Zone, as a reference site for the purpose of future comparative studies;
- allow visits for the purposes of installation of essential communications equipment that does not compromise the values of the Area;
- allow visits for management purposes in support of the aims of the management plan.

## **3. Management activities**

The following management activities are to be undertaken to protect the values of the Area:

- Information showing the location of the Area (stating the special restrictions that apply) shall be displayed prominently, and a copy of this Management Plan shall be kept available, in all of the research hut facilities located within 25 km of the Area.
- Markers, signs or structures erected within the area for scientific or management purposes shall be secured and maintained in a good condition.
- Visits shall be made as necessary to assess whether the Area continues to serve the purposes for which it was designated and to ensure management and maintenance measures are adequate.
- National Antarctic Programmes operating in the region are encouraged to consult together with a view to ensuring these steps are carried out.

## **4. Period of designation**

Designated for an indefinite period.

## **5. Maps and photographs**

Map A: Mount Melbourne, location map. Map specifications: Projection: Lambert conformal conic; Standard parallels: 1st 72°40'0.000"S; 2nd 75°20'0.000"S; Central Meridain: 165°0'0.000"E; Latitude of Origin 74°0'49.2"S; Scale approx. 1:350,000. Spheroid: WGS84

Map B: Mount Melbourne, site map. Map specifications: Projection: Lambert conformal conic; Standard parallels: 1st 72°40'0.000"S; 2nd 75°20'0.000"S; Central Meridain: 165°0'0.000"E; Latitude of Origin 74°0'49.2"S; Scale approx. 1:16,000. Spheroid: WGS84. Photography USGS/DoSLI (SN7851) 22 November 1993.

## 6. Description of the Area

### 6 (i) Geographical coordinates, boundary markers and natural features.

Mount Melbourne (2733 m, 74°21'S 164°42'E) in northern Victoria Land, is situated between Wood Bay and Terra Nova Bay, on the western side of the Ross Sea, and Campbell Glacier, about 10 km to the west (see Map A). The Area encompasses all terrain above the 2200 m contour surrounding the main crater of Mt Melbourne. Boundary markers are not installed at points on the 2200 m contour, due to access being predominantly via helicopter to the summit of the mountain, making assessment of altitude straightforward.

Mount Melbourne is part of the McMurdo volcanics, which are a line of dormant and extinct volcanoes running along the coast of Victoria Land. The Mt Melbourne area is thought to be late Quaternary in age and the most recent eruption may have been as little as 150 years ago. The volcanic rocks have been detailed as trachyte to trachyandesite on the mountain itself, with basalt at its base.

Mount Melbourne is an almost perfect low-angle volcanic cone with extensive areas of hot ground, fumaroles, and ice towers prominent around the summit crater and on some upper parts of the mountain. The summit caldera is about 1 km in diameter and forms the névé for a westward flowing glacier. Several smaller basaltic cones and mounds occur near the base and on the flanks of the mountain. The summit also contains the most extensive areas of warm ground, marked by snow-free warm or steaming ground, fumaroles and ice towers or pinnacles. Surface soil (0-2 cm depth) temperatures of up to 42°C, areas of cooler ground where activity is discontinuous, and zones of geothermal activity are marked by ice and snow hummocks up to a metre in height.

There are three main areas exhibiting thermal activity (see Map B); two situated on the edge of the caldera, and a third about 250 m lower on the northern slopes. However, areas of surface activity extend at least as low as 2400 m on the north-west side of the mountain. These geothermal areas support a unique biological assemblage of species otherwise restricted to low altitudes. The species are not of a local provenance and must have been dispersed over long distances to reach the Area. The total cover of vegetation at the site is small, perhaps only 100-200 m<sup>2</sup> with plant life only possible through the occurrence of small water droplets formed by the condensation of steam keeping the soils moist. Known sites of vegetation are marked as A-E on Map B. Site D is known to have been disturbed and possibly contaminated by human activity.

Mount Melbourne exhibits high biodiversity relative to other geothermal sites in the Antarctic, both maritime and high altitude. Biota includes algal crusts and felts (11 species) that coat small stones, gravel and finer substrata, bryophytes (one species of moss and one of liverwort), a protozoan, and a range of microflora. A lichen association has been observed as a component of black crusts over small areas of warm soil. The warmest areas of ground support yellowish-green patches of the moss *Campylopus pyriformis*, along with the liverwort *Cephaloziella*

*exiliflora* and brownish crusts of algae. The unusual occurrence of shallow peat is evidence of bryophyte growth over at least several decades. The amoeboid protozoan *Corythion dubium* was observed only as empty shells in both mineral substrates and amongst bryophytes. The species is not common in continental Antarctica, and only found at one other site in Victoria Land.

*6(ii) Prohibited, restricted and managed zones within the Area*

Prohibited and Restricted Zones - Cryptogam Ridge

An area on the southern rim of the main summit crater (known as Cryptogam Ridge) is designated as a Prohibited Zone and a Restricted Zone (see Map B) in order to protect the most extensive stand of vegetation and preserve part of the Area as a reference site for future comparative study. The remainder of the Area, similar in biology, features, and character, is available for research programmes and controlled sample collection.

The zones consist of areas of snow-covered cool ground, warm snow-free ground, and ice-hummocks covering steam emissions and extend 40 m in all directions from the ridge line. Most of Cryptogam Ridge is incorporated within the Restricted Zone, which may be accessed by permit for essential scientific reasons which cannot be met elsewhere in the Area. The western most 100 m of the Cryptogam Ridge is a Prohibited Zone, to which access is strictly prohibited until such time it is agreed by management plan review that access should be allowed.

Managed Zones

Two Managed zones (see Map B) have been established within the Area where survey marks used in deformation studies need to be regularly accessed, and a radio repeater is installed and maintained each season. The zones extend 15 m around the survey marks and are located as follows:

1. Summit of Mt Melbourne, containing survey mark no. 600 and radio repeater site; and
2. South-east of Cryptogam Ridge, containing survey mark no. 601.

*6(iii) Structures within and near the Area*

A total of six survey marks, consisting of a metal tube set into a concrete base, are located around the summit area (see Map B) and are used in an ongoing Italian scientific programme examining the deformation study on the mountain. A radio repeater to support communications for the Italian Antarctic programme, consisting of an equipment box and aerial, is also installed annually on cool, ice-free ground near the summit.

*6(iv) Location of other protected areas within close proximity of the Area*

The nearest protected areas are: Cape Hallett, Victoria Land ASPA No. 106 (SPA No. 7), approximately 300 km to the north and Botany Bay, Cape Geology, Victoria Land ASPA No. ?? (SSSI No. 37) approximately 300 km to the south.

## 7. Permit conditions

Entry into the Area is prohibited except in accordance with a Permit issued by appropriate national authorities. Permits may be issued for the following purposes:

- For activities outside the Restricted and Managed zones, permits may be issued only for scientific study of the ecosystem, for a compelling scientific or management purpose that cannot be served elsewhere, or for essential management purposes consistent with the plan objectives such as inspection, monitoring or review.
- Permits to access to the Restricted Zone may only be issued for essential scientific or management purposes that cannot be met elsewhere in the Area.
- Permits to enter ONLY the Managed Zones may be issued for essential operational or scientific purposes consistent with the objectives of the Management Plan, such as to access survey marks and radio repeater sites.

Conditions for issuing a Permit to enter the Area are that:

- the actions permitted are not likely to jeopardise the natural ecological system or scientific values of the Area;
- any management activities are in support of the objectives of the Management Plan;
- the actions permitted are in accordance with all requirements of the Management Plan;
- a Permit, or a copy, shall be carried within the Area, including a copy of all relevant maps from the Management Plan;
- a visit report shall be supplied to the authority named on the permit; and
- any Permit shall be issued for a stated period.

### *7(i) Access to and movement within the Area*

The following restrictions apply within the Area:

- land vehicles are prohibited within the Area;
- helicopters may only land at the established survey marks within the two Managed Zones (see Map B);
- use of helicopter smoke grenades within the Area is prohibited;
- any overflight of the Prohibited or Restricted Zone must be more than 50 m above the ground level; and
- hovering over any part of the Area is not permitted lower than 50 m, and ice-free areas should be avoided unless absolutely necessary for access to the Area.

Visitors should avoid walking on areas of visible vegetation or moist soil, including both areas of ice-free ground and among ice hummocks, and should not interfere with any ice structures unless specified in the permit. Pedestrian traffic should be kept to the absolute minimum necessary consistent with the objectives of any permitted activities and every reasonable effort should be made to minimise effects.

*7(ii) Activities that are or may be conducted in the Area, including restrictions on time or place*

As outlined above, permitted activities within the Area may include:

- scientific research that will not jeopardise the ecosystem of the Area and cannot be conducted elsewhere;
- essential management activities, including monitoring and inspection; and
- essential operational activities, such as access to survey marks and radio repeater sites.

*7(iii) Installation, modification or removal of structures*

No structures are to be erected within the Area except as specified in a Permit. All scientific equipment installed in the Area must be approved by Permit and clearly identified by country, name of the principal investigator, and year of installation. All such items should be made of materials that pose minimal risk of contamination of the Area. Removal of specific equipment for which the Permit has expired shall be a condition of the Permit.

*7(iv) Location of field camps*

Camping is permitted only in the ice-filled summit of the caldera or outside the Area (i.e. below the 2200 m contour).

*7(v) Restrictions on materials and organisms which can be brought into the Area.*

To avoid compromising the values of the ecosystem for which the Area is protected, the following restrictions apply to all activities in the Area:

- no living animals, plant material or microorganisms shall be deliberately introduced into the Area and precautions shall be taken against accidental introductions;
- chemicals, including radio-nuclides or stable isotopes, which may be introduced for scientific or management purposes specified in the Permit, shall be removed from the Area at or before the conclusion of the activity for which the Permit was granted;
- fuel is not to be stored in the Area, unless required for essential purposes connected with the activity for which the Permit has been granted and shall not be stored on ice free areas; and
- all materials introduced shall be for a stated period only, shall be removed at or before the conclusion of that stated period, and shall be stored and handled so that risk of their introduction into the environment is minimised.

*7(vi) Taking or harmful interference with native flora or fauna*

Any removal or disturbance of the vegetation or invertebrates is prohibited, except in accordance with a Permit. Any sampling is to be kept to the absolute minimum required for scientific or management purposes, and carried out using techniques which minimise disturbance to the surrounding soil, ice structures and biota. Any sampling or experimental sites should be photographed and the location recorded in detail and reported to the Permitting authority.

*7 (vii) Collection or removal of anything not brought into the Area by the Permit holder*

Material may be collected or removed from the Area only in accordance with a Permit and should be limited to the minimum necessary to meet scientific or management needs. Sampling

is to be carried out using techniques which minimise disturbance to the surrounding soil and biota. Material of human origin likely to compromise the values of the Area, which was not brought into the Area by the Permit holder or otherwise authorised, may be removed from any part of the Area, including the Restricted Zone, unless the impact of removal is likely to be greater than leaving the material *in situ*: if this is the case the appropriate authority should be notified.

*7(viii) Disposal of waste*

All wastes, including all human wastes, shall be removed from the Area.

*7(ix) Measures that are necessary to ensure that the aims and objectives of the Management Plan can continue to be met*

1. Permits may be granted to enter the Area to carry out biological monitoring and site inspection activities, which may involve the collection of small samples for analysis, or for protective measures and other essential management activities.
2. Any specific sites of long-term monitoring shall be appropriately marked (as in *7(iii)* above).
3. To help maintain the ecological and scientific values derived from the isolation and relatively low level of human impact at the Area, visitors shall take special precautions against introductions, especially when visiting several thermal regions in a season. Of particular concern are microbial or vegetation introductions sourced from:
  - thermal areas, both Antarctic and non-Antarctic;
  - soils at any other Antarctic sites, including those near stations;
  - soils from regions outside Antarctica.

To this end, visitors shall take the following measures to minimise the risk of introductions:

- a) Any sampling equipment or markers brought into the Area shall be sterilised and maintained in a sterile condition before being used within the Area. To the maximum extent practicable, footwear and other equipment used or brought into the Area (including backpacks or carry-bags) shall be thoroughly cleaned or sterilised and maintained in this condition before entering the Area;
- b) Sterilisation should be by an acceptable method, such as by UV light, autoclave, or by washing surfaces in 70 percent ethanol solution in water.
- c) Sterile protective overclothing shall be worn. The overclothing shall be suitable for working at temperatures of -20°C or below and comprise at a minimum sterile overalls to cover arms, legs and body and sterile gloves suitable for placing over the top of cold-weather gloves. Disposable sterile/protective foot coverings are not suitable for the scoria surface and should not be used. Instead, all footwear should be thoroughly brushed to remove soil particles and wipes with 70 percent ethanol.

*7(x) Requirements for reports*

Parties shall ensure that the principal holder for each Permit issued submits to the appropriate authority a report describing the activities undertaken. Such reports should include, as appropriate, the information identified in the Visit Report Form suggested by SCAR. Parties

shall maintain a record of such activities and, in the Annual Exchange of Information, shall provide summary descriptions of activities conducted by persons subject to their jurisdiction, in sufficient detail to allow evaluation of the effectiveness of the Management Plan. Parties should, wherever possible, deposit originals or copies of such reports in a publicly accessible archive to maintain a record of usage, to be used both for review of the Management Plan and in organising the scientific use of the site.

## **8. Bibliography**

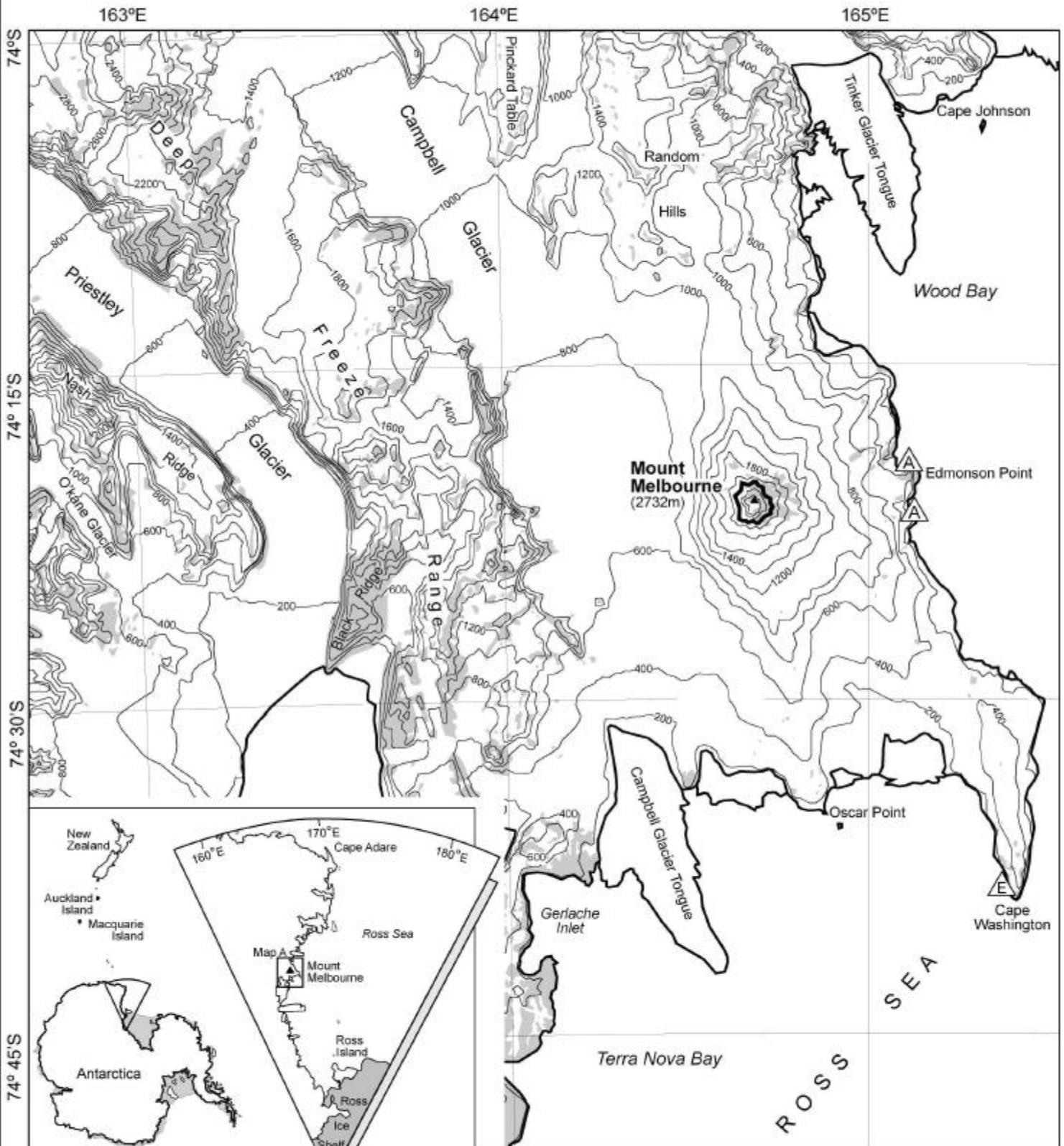
Nicolaus, B. Lama, L. Esposito, E. Manca, M.C. Di Prisco, G. Gambacorta, A. 1996. *Bacillus thermoantarcticus* sp. nov., from Mount Melbourne, Antarctica: a novel thermophilic species. *Polar Biology*. 16(2). pp.101-104.

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Smith, G.H. 1992. Distribution and ecology of the testate rhizopod fauna of the continental Antarctic zone. *Polar Biology*. Vol 12. pp 629-634.

Map A - Mount Melbourne, Antarctic Specially Protected Area 118  
 Location, contours, ice-free areas.



Inset: Mount Melbourne location map.

— Contour interval = 200m

— Coastline

— Protected Area Boundary  
 (all terrain above 2200m contour line)

■ Ice-free areas

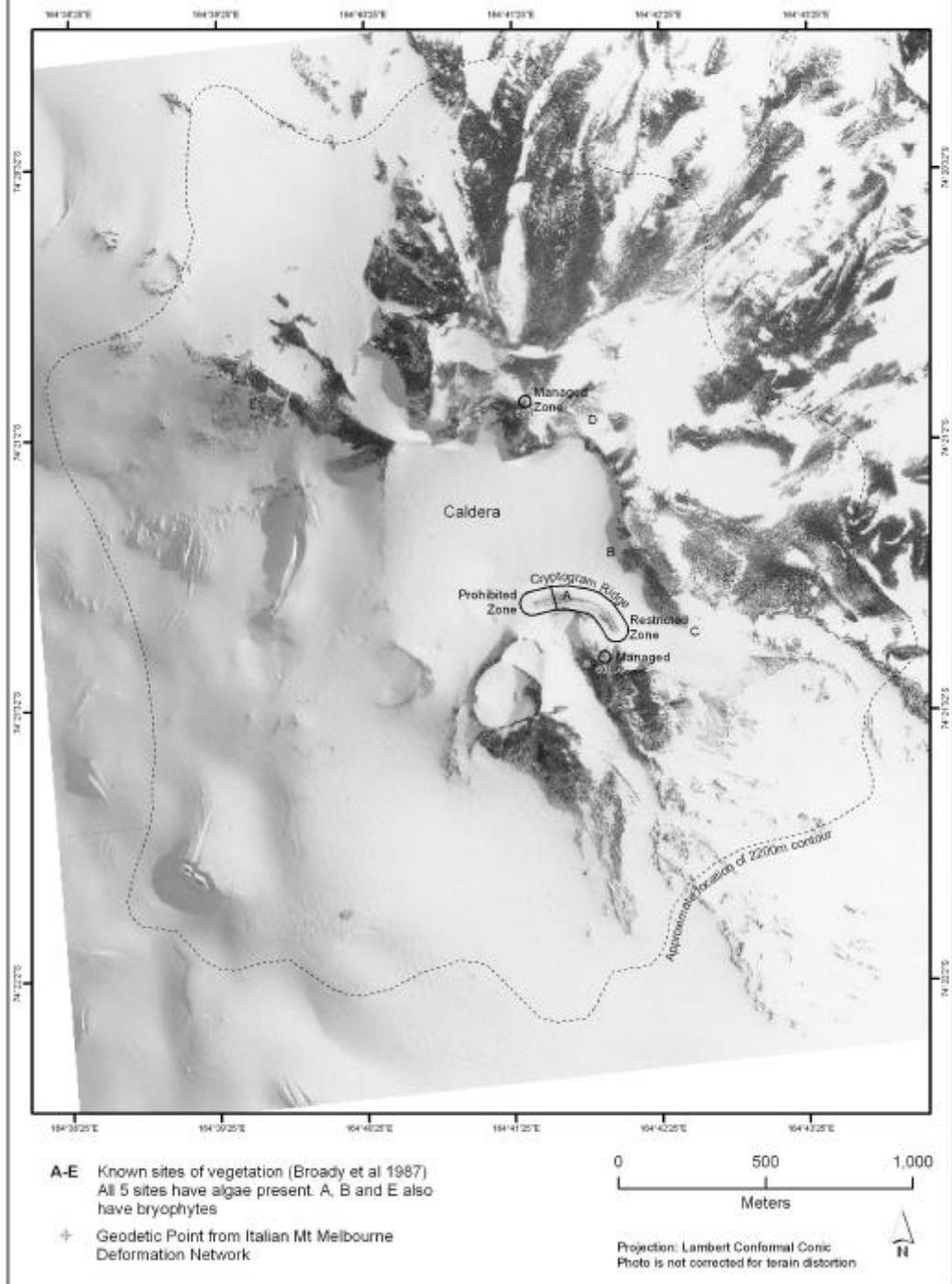
▲ Adelie penguin rookery  
 USGS 1:250 000

▲ Emperor penguin rookery  
 USGS 1:250 000

Projection: Lambert Conic Conformal



Map B - Summit of Mount Melbourne, Antarctic Specially Protected Area 118



**A-E** Known sites of vegetation (Broady et al 1987)  
 All 5 sites have algae present. A, B and E also have bryophytes

+ Geodetic Point from Italian Mt Melbourne Deformation Network

0 500 1,000  
 Meters

Projection: Lambert Conformal Conic  
 Photo is not corrected for terrain distortion

