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## IPY Aliens in Antarctica



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## Information paper submitted by Australia and SCAR

### Summary

The impact of non-native (alien) species on ecosystems is one of the big issues of the 21st Century. Antarctica is not immune to this problem with some alien species having established on the Antarctic continent and on most sub-Antarctic islands. *IPY Aliens in Antarctica* is an international project sponsored by SCAR that will help inform the Antarctic Treaty parties of the size and nature of the threat and possible mitigation methods.

### Background

The impact of non-native (alien) species on ecosystems is one of the major threats facing biodiversity and the global economy in the 21<sup>st</sup> Century. Human travel is occurring at an unprecedented level across the globe, and such travel is a major vector for transfer of propagules from areas where their parent species are indigenous to areas where they are not.

Although surrounded by the vast Southern Ocean, Antarctica's protective isolation is also being chipped away by the movement of people and cargo to the region by national programs and the now booming tourist industry. Over 40,000 people travel to the Antarctic each year.

Currently, alien microbes, fungi, plants and animals occur on some parts of the Antarctic continent and most of the sub-Antarctic islands. Introduction routes are largely associated with movement of people and cargo in association with national programs and tourist operations.

The impacts of current alien species range from minor transient introductions to substantial loss of local biodiversity and changes to ecosystem processes and evolution, through the impact of transformer species. These impacts will be exacerbated with rapid climate change now being experienced in parts of Antarctica.

### The Project

*IPY Aliens in Antarctica* is an international project sponsored by SCAR that will assess the pathways for transfer of propagules (seeds, spores, eggs), and the extent to which people from many nations unintentionally carry propagules of alien species into the Antarctic region.

The project is based on an invasion model in which there are 4 barriers in the process of invasive species colonisation: 1) transport barrier; 2) establishment barrier; 3) invasion barrier, 4) transformer barrier (*sensu* Richardson et al. 2000).

We know that once the initial transport barrier has been breached then the remaining barriers can be breached to some degree in the sub-Antarctic islands by an extensive range of taxa (see Frenot et al. 2005; Convey et al. in press; Frenot et al. in press), and that in the Antarctic region the establishment barrier has been breached by a handful of taxa (Frenot et al. in press).

As the transport barrier is the major hurdle for alien species colonisation, this project is focused only on this barrier and, specifically, on the size of, and variation in the propagule load breaching this barrier.

### Project Aims

- To assess the size and species range to which the annual migratory human population carry propagules (seeds, spores, eggs) of alien species into the Antarctic region during the first IPY summer (2007/08), and to attribute this load to the various transport routes.
- To ascertain the general source of the propagule load.

## Project Questions

### *Primary Questions*

These seek to quantify the risk of introductions for various groups of travellers and pathways.

- 1) What is the propagule load being carried by the various transport components? Are some pathways carrying more propagules than others?
- 2) What is the propagule composition (number of species) being carried by the various transport components?
- 3) Are some categories of traveller more likely to be carrying propagules than others?
- 4) Are some pieces of gear more likely to be carrying propagules than others?
- 5) How viable are the propagules in Antarctic conditions?

### *Secondary questions*

- 1) How significant is the risk of alien propagule transport to the Antarctic?
- 2) How can scientists working on biological invasion research best interact with managers and operators to reduce the propagule threat within the context of the demands and economics of operations?

## Project details

The project will encompass five components directed at information attainment of logistic processes and propagule assessment.

### *Component 1 - Travel history questionnaire*

A carefully constructed questionnaire on travel history will be distributed to most travellers. The purpose of the questionnaire is to quantify where travellers have been, in terms of world regions, and where they have taken their gear. This is to ascertain the likely sources of propagules, and to allow climate matching.

Current data demonstrates that once the transport barrier has been passed, many taxa have the capacity to move through the other establishment barriers, ultimately to transformer status. Taxa with a native climate envelope similar to that of the Antarctic (e.g. Arctic or alpine areas) have a greater probability to passing through the colonisation barriers than those from very different climates (e.g. tropical taxa).

### *Component 2 - Survey of organisations*

This part of the project is aimed at acquiring a quantified picture of logistic arrangements for both national operators and tourist activities. This will assist with understanding the elements of the transport barrier and how this barrier is overcome.

From COMNAP we are wishing to gain the following information:

- number of voyages/ trips of ships/planes;
- amount of cargo;
- where is the cargo loaded; and
- ship track data.

From IAATO we are wishing to gain the following information:

- routes – ship track data; and
- passenger numbers and landing sites – available from IAATO web site statistics.

### *Component 3 - Human sampling program*

The aim of this component is to gain an accurate assessment of the propagule load of travellers from each of the categories listed above, as well as a detailed assessment of where propagules are located and where they were picked up.

The components of the work involve:

- detailed vacuuming of certain items of equipment and clothing accompanying passengers travelling south by ship and by aircraft;
- detailed examination by questionnaire of travellers (see above); and
- germination trials of plant propagules from selected samples.

Fifty vacuum cleaners have been donated by Phillips (electronics company) to assist us with the component.

#### *Component 4 - Cargo as a vector*

The aim of this component is to examine cargo associated with national programs. The sampling protocol is flexible to allow for all means of logistic situations.

#### *Component 5 - Data Management*

Data from this project will be lodged in the Biodiversity database established by the Australian Antarctic Data Centre, and will be publicly available. It will also be linked to the IUCN (World Conservation Union) Invasive Species Specialists Group database on invasive species. A web site for the project will be hosted by South Africa (University of Stellenbosch).

#### **Project outcomes**

The project will help inform the Antarctic Treaty parties of the size and nature of the threat and possible mitigation methods. Results are expected to be generated within 8 to 12 months, and recommendations should be available for consideration by the ATCM/CEP in 2009.

#### ***Participating countries:***

<b>Chair:</b>	Dr Dana Bergstrom, Australia	
<b>Co/chair:</b>	Prof. Steven Chown	
<b>Country project leaders:</b>	Australia	Dana Bergstrom
	Belgium	Maaïke Vancauwenberghe
	Japan	Satoshi Imura
	Netherlands	Ad Huiskes
	New Zealand	Maj De Poorter
	Poland	Maria Olech
	South Africa	Steven Chown
	United Kingdom	Kevin Hughes / Peter Convey

The program has the capacity for all ATCM countries to participate and we invite interest from any country.

For further information, please contact Dr Dana Bergstrom at [dana.bergstrom@aad.gov.au](mailto:dana.bergstrom@aad.gov.au) or:

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## **Glossary**

*Alien* – non-native species introduced to an ecosystem as a result of human activity.

*Propagule* – means of propagation e.g. seed, spore, egg, live insect.

*Expeditioner* – a person travelling with a national program.

*Tourist* – a person travelling with a tourist operation or private operation.

*Transformer* – species that change the character, condition, form or nature of ecosystems over relatively large areas.

*Traveller* – a collective term for all people travelling to the region.

*Gear* – a collective term to mean outdoor clothing, shoes and equipment that people take into the field e.g. camera bags, tripod etc.

*The Antarctic* – islands and land south of 48°S excluding New Zealand and Southern South America and associated islands. Includes New Zealand's Campbell and Auckland Is.

## **References**

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