



**Antarctic Treaty
Consultative Meeting XXXV**

H O B A R T 2 0 1 2

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Outcomes of the International Polar Year Programme: Aliens in Antarctica

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Summary

The International Polar Year Project Aliens in Antarctica has provided a spatially explicit, activity-differentiated assessment of the risks of establishment of terrestrial non-native species across Antarctica, both currently and with climate change. The Western Antarctic Peninsula coast and the islands off the coast of the Peninsula have the highest current risk for the establishment of non-native species. By 2100 the risk of non-native species establishment will continue to be highest in the Antarctic Peninsula area, but will also increase substantially in the coastal, ice-free areas to the west of the Amery Ice Shelf and to a lesser extent in the Ross Sea region. SCAR recommends that the CEP: (i) includes the spatially explicit, activity-differentiated risk assessments in further development of strategies to mitigate the risks posed by terrestrial non-native species; (ii) develops a surveillance strategy for areas at high risk of non-native species establishment; (iii) gives additional attention to the risks posed by intra-Antarctic transfer of propagules.

Introduction

1. Non-native species have been recognized as one of the major concerns facing conservation in the Antarctic Treaty area. Much information is now available on the likely risks posed to the Antarctic Environment by marine and terrestrial non-native species as reviewed in a range of scientific publications and submissions made to the Antarctic Treaty Parties (see Rogan-Finnemore 2008; ATCM XXXII SP11 *Topic Summary of CEP discussions on Non-native species (NNS) in Antarctica*). Recommendations for actions to mitigate the introduction and impacts of such species have also been made and encapsulated in the CEP's Non-Native Species Manual (ATCM XXXIV Resolution 6 (2011) *Non-Native Species*) and in the COMNAP/SCAR Checklists for Supply Chain Managers (ATCM XXXIV WP012).
2. Further recognizing the need to understand and to mitigate the risks posed by non-native species, at ATCM XXXIV (Resolution 6 (2011) *Non-Native Species*) the Parties recommended that the CEP continue to develop the Non-Native Species Manual with the input of SCAR and COMNAP on scientific and practical matters, respectively. Moreover, the Antarctic Treaty Meeting of Experts on Implications of Climate Change for Antarctic Management and Governance (ATME), recommended that the CEP identifies Antarctic environments at high risk from establishment by non-natives, recommendations taken up through CEP endorsement of the Non-Native Species Manual.
3. The International Polar Year 2007-2008 Project 'Aliens in Antarctica' has provided such information for a range of activities and organisms (e.g. Lee & Chown 2009, 2011; Hughes *et al.* 2010, 2011; Cowan *et al.* 2011). Its major focus, however, has been on the risks of establishment of non-native vascular plants across the Antarctic continent both now and under a scenario of future climate change. Here we report on the outcome of the study (Chown *et al.* 2012; BP 1), and make recommendations for use of the evidence.

Approach

4. The number of propagules (vascular plant seeds) per visitor for *c.* 2% of all visitors (853 individual scientists, science-support personnel, tourists, tourist support personnel and ships' crew) to all major areas of the Antarctic during the first summer season of the International Polar Year (2007-2008) was estimated by collecting seeds from their outer clothing, footwear, walking poles, day packs and camera bags. Seeds were identified and the proportion of visitors carrying seeds and numbers of seeds carried per visitor was estimated for the main visitor categories.
5. The numbers of visitors to Antarctica differentiated by their participation in either science or tourism, as reported by IAATO and COMNAP, were plotted onto a regular spatial framework of 81, 50 x 50 km grid cells representing ice-free areas of the continent where visitors have landed. By multiplying visitor number

by seeds carried, an estimate of the number of seeds being introduced was made per area. The area of origin of the seeds (e.g. Arctic vs. tropical) was used in conjunction with climate information and physiological information to estimate the likelihood of establishment of seeds at present.

6. The CSIRO Climate System Model Mk 3.5 under Intergovernmental Panel on Climate Change Scenario A1B was used to arrive at a spatially explicit prediction of temperatures in 2100, and therefore an indication of establishment risk for that period.

Outcomes

7. For those visitors carrying seeds, the number per visitor is approximately 9.5 seeds. The largest risk of propagule transfer per visitor is associated with science programmes and tourist support personnel, rather than with tourists themselves. Differences in the numbers of science and tourist visitors temper this among-category variation.

8. The probability of propagule transport to the region is highest for the Antarctic Peninsula, followed by the Ross Sea region, and then by several sites in East Antarctica. An estimated 31732 (95% C.I.: 8885–51021) seeds entered the Antarctic on tourists and 38897 seeds (95% C.I.: 24089–74534) on scientists during the first summer of the IPY.

9. Approximately 49-61% of vascular plant seeds reaching the Antarctic are from environments (e.g. Arctic, sub-Antarctic, alpine) that include species capable of surviving the conditions likely to be encountered in the areas of Antarctica most commonly visited.

10. A risk index, based on propagule pressure and origins, and climatic suitability of the ice-free areas of the continent, indicates that the Western Antarctic Peninsula coast and the islands off the coast of the Peninsula have the highest current risk for the establishment of non-native species.

11. Substantiation of this assessment is provided by: **a.** The spread of the invasive grass species *Poa annua* at King George Island from the Arctowski research station to areas much less subject to human traffic (Olech & Chwedorzewska 2011). **b.** The recent establishment of *Poa annua* at three other research stations (*viz.* General Bernardo O'Higgins, Gabriel Gonzalez Videla, and Almirante Brown) (Molina-Montenegro *et al.* 2010). **c.** The recent colonization of Deception Island by two vascular plant species of South American origin (Smith & Richardson 2011) (though they have since been removed).

12. The establishment of two alien springtail species at Deception Island (Greenslade & Convey 2012), at least one of which has substantial impacts on some sub-Antarctic systems, suggests that the findings apply more generally to terrestrial organisms.

13. By 2100 the risk of non-native species establishment will continue to be highest in the Antarctic Peninsula area, but will also increase substantially in the coastal, ice-free areas to the west of the Amery Ice Shelf and to a lesser extent in the Ross Sea region.

Conclusions

14. The Aliens in Antarctica project has provided a spatially explicit, evidence-based risk assessment for the establishment of non-indigenous vascular plants, and likely for other terrestrial species, for the entire Antarctic continent. It is now clear which areas are most at risk and which areas may be most at risk in the future.

15. In addition, the Aliens in Antarctic project has identified the risks for non-native species transfer posed by other vectors and pathways (such as aircraft and cargo) (see Lee & Chown 2009; Hughes *et al.* 2010).

16. By providing spatially explicit, activity-differentiated risk assessments, SCAR and its partners and collaborators have provided the basis for evidence-based management of the risks posed by terrestrial non-native species, so addressing major requirements of the CEP and recommendations of the ATME.

Recommendations

Based on the outcomes of the Aliens in Antarctica project, SCAR recommends that the CEP:

17. Includes the spatially explicit, activity-differentiated risk assessments in further development of strategies to mitigate the risks posed by terrestrial non-native species.

18. In collaboration with SCAR, COMNAP, IAATO, the IUCN and Parties, develops a surveillance strategy for areas at high risk of non-native species establishment as identified by the Aliens in Antarctica project. Such a strategy should include a mechanism to differentiate natural from anthropogenic colonizations (see Hughes & Convey 2012; ATCM XXXIII WP 15 *Guidance for visitors and environmental managers following the discovery of a suspected non-native species in the terrestrial and freshwater Antarctic environment*; ATCM XXXIII IP44 *Suggested framework and considerations for scientists attempting to determine the colonisation status of newly discovered terrestrial or freshwater species within the Antarctic Treaty Area*).

19. Gives additional attention, in collaboration with its partners, to the risks posed by intra-Antarctic transfer of propagules, given that such assessments only formed a small part of the Aliens in Antarctica project.

Acknowledgments

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In a separate attachment:

ATCM XXXV BP 1 Continent-wide risk assessment for the establishment of nonindigenous species in Antarctica

Chown, S.L., Huiskes, A.H.L., Gremmen, N.J.M., Lee, J.E., Terauds, A., Crosbie, K., Frenot, Y., Hughes, K.A., Imura, S., Kiefer, K., Lebouvier, M., Raymond, B., Tsujimoto, M., Ware, C., Van de Vijver, B. & Bergstrom, D.M. 2012. Continent-wide risk assessment for the establishment of nonindigenous species in Antarctica. *Proceedings of the National Academy of Sciences of the U.S.A.* **109**, 4938-4943. (<http://www.pnas.org/content/early/2012/02/27/1119787109.full.pdf+html>)