

Non-native Species Manual

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Contents

1. Introduction	1
2. Key guiding principles	3
3. Guidelines and resources to support prevention of the introduction of non-native species, including the transfer of species between sites in the Antarctic	5
Annex: Guidelines and resources requiring further attention or development	7
References	10

1. Introduction

a. Objective

The overall objective for Parties' actions to address risks posed by non native species is:

To conserve Antarctic biodiversity and intrinsic values by preventing the unintended introduction to the Antarctic region of species not native to that region, and the movement of species within Antarctica from one biogeographic zone to any other.

Preventing unintended introductions is an ambitious goal, consistent with the principles of the Protocol. In practice, measures should be put in place to minimise the risk of impacts from non-native species in the Antarctic, taking all possible steps towards prevention.

b. Purpose and background

The purpose of this manual is to provide guidance to Antarctic Treaty Parties in order to meet the objective (above), and minimise the risk of accidental or unintentional introduction of non-native species. This manual includes key guiding principles and links to recommended practical guidelines and resources that operators can apply and use, as appropriate, to assist with meeting their responsibilities under Annex II to the Protocol. The guidelines are recommendatory, not all guidelines will apply to all Parties' operations, and it is a 'living' document that will be updated and added to as new work, research and best practice develops to support further guidance. These measures are recommended as appropriate to assist Parties' efforts to prevent such accidental or unintended introductions and they should not be considered as mandatory.

This work is focussed on the unintended or accidental introduction of non-native species. The introduction of non-native species under permit (in accordance with Article 4 of Annex II to the Environmental Protocol) is not included. However, guidelines for response to unintentional introductions can be applied to responding to any dispersal of species intentionally introduced under permits. Consideration of natural pathways of introduction, human "ecosystems" (e.g. stomach flora) and human to human transfer of pathogens (e.g. illness) are also outside the scope of this work.

There is a limited understanding of the risks related to non-native species introductions and their impacts on the ecosystems. Another objective of this work is to support and encourage further work to fill in the gaps in our knowledge.

c. Context¹

Biological invasions are amongst the most significant threats to biodiversity worldwide, threatening species survival and being responsible for major changes to ecosystem structure and functioning. Despite Antarctica's isolation and harsh climatic conditions, invasions are now recognised as a serious risk to the region: the ice-free areas of Antarctica and the surrounding Sub-Antarctic Islands support a large proportion of the world's seabird species, and their terrestrial biotas, though species poor, include a high proportion of endemic and well-adapted taxa. Species richness in the Southern Ocean is higher than in the Antarctic terrestrial environment, and there is a high level of endemism. With rapid climate change occurring in some parts of Antarctica, increased numbers of introductions and enhanced success of colonisation by aliens are likely, with consequent increases in impacts on ecosystems, as is already visible in the Sub-Antarctic islands. In addition to introduction of species from outside Antarctica, cross-contamination between ice-free areas including isolated nunataks, or between different marine areas, also threatens the genetic diversity of the biogeographic zones and the risk must be addressed. Further development of human activity in these regions (including science, logistics, tourism, fisheries and

¹ This section was written with the contribution of several scientists involved in the IPY "Aliens in Antarctica" project (D. Bergstrom, S. Chown, P. Convey, Y. Frenot, N. Gremmen, A. Huiskes, K. Hughes, S. Imura, M. Lebouvier, J. Lee, F. Steenhuisen, M. Tsujimoto, B. van de Vijver and J. Whinam) and adapted according to the ICG Members' comments.

recreation) will increase the risk of unintentional introductions of organisms which have a suite of life history traits that benefit them during transport, establishment and expansion phases of invasion, and are likely to be favored by warming conditions.

The vast majority of global alien species do not become invasive, but those that do are one of the main threats to global diversity. It is easier to fight invasiveness if the discovery of the alien species is made early. In addition, the presence of non-native species which are only “transient” or “persistent” but not yet “invasive” is also highly undesirable in terms of protecting the environmental and scientific values of Antarctica, especially as such species may become invasive. Therefore, prevention is the key. If not prevention, then early detection and rapid response will be very important.

The current environmental changes which occur in Antarctica, as in other parts of the world, will be very likely responsible for a natural alteration of the local biodiversity during the next decades or centuries. It is the responsibility of the Parties and others active in the region to minimise the chance of humans being a direct vector for change through introduction of non-native species and/or spread of diseases in the terrestrial and marine ecosystems of the Antarctic Treaty area.

The 2010 Antarctic Treaty Meeting of Experts on Implications of Climate Change for Antarctic Management emphasised the importance of preventing introductions, identifying species and environments at risk and developing measures to manage the issue. The meeting:

- Acknowledged that the greatest effort should be placed on preventing the introduction of non-native species, and on minimising the risk of human assisted introductions through national programmes and tourism activities. It stressed the importance of ensuring comprehensive implementation of new measures to address this risk (Para. 111, Co-chair’s report).
- Recommended that the CEP ‘consider using established methods of identifying a) Antarctic environments at high risk from establishment by non-natives and b) non-native species that present a high risk of establishment in Antarctica’ (Recommendation 22).
- Recommended that Parties be encouraged to comprehensively and consistently implement management measures to respond to the environmental implications of climate change, particularly measures to avoid introduction and translocation of non-native species, and to report on their effectiveness (Recommendation 23).

d. Glossary

Terminology for non-native and invasive species has not been standardised internationally and some of the terms below are defined in the specific context of Antarctica.

- **Non-native / alien species:** an organism occurring outside its natural past or present range and dispersal potential, whose presence and dispersal in any biogeographic zone of the Antarctic Treaty area is due to unintentional human action.
- **Introduction / introduced:** direct or indirect movement by human agency, of an organism outside its natural range. This term may be applied to intercontinental or intracontinental movement of species.
- **Transient:** non-native species that have survived in small populations for a short period in Antarctica, but which have either died out naturally or have been removed by human intervention.
- **Persistent / established:** non-native species that have survived, established and reproduced for many years in a restricted locality in Antarctica, but which have not expanded their range from a specific location.
- **Invasive / invasion:** non-native species that are extending their range in the colonised Antarctic region, displacing native species and causing significant harm to biological diversity or ecosystem functioning.
- **Endemic:** Native species restricted to a specified region or locality in Antarctica.

2. Key Guiding Principles

In order to provide greater focus on the environmental risk related to the unintentional introduction of non-native species in Antarctica and to guide Parties' actions in accordance with the overall objective, 11 key guiding principles are proposed. They are categorised according to the three major components of a non-native species management framework: prevention, monitoring and response.

Prevention

Prevention is the most effective means of minimising the risks associated with the introduction of non-native species and their impacts.

Awareness

- 1) Raising awareness at multiple levels for different audiences is a critical component of management. All people travelling to the Antarctic should take appropriate steps to prevent the introduction of non-native species.

Operational procedures

- 2) The risk of non-native species introductions should be identified and addressed in the planning of all activities, including through the environmental impact assessment (EIA) process under Article 8 and Annex I to the Protocol.
- 3) In the absence of sound scientific baseline data, a precautionary approach should be applied to minimise the risk of human-mediated introduction of non-native species, as well as the risk of intra-regional and local transfer of propagules to pristine regions.
- 4) Preventive measures are most likely to be implemented and effective if they are:
 - focused on addressing activities and areas of highest risk;
 - developed to suit the particular circumstances of the activity or area in question, and at the appropriate scale;
 - technically and logistically simple;
 - easily applicable;
 - cost effective and not unnecessarily time consuming.
- 5) Prevention should focus on pre-departure measures within the logistics and supply chain,
 - at the point of origin outside Antarctica (e.g. cargo, personal gear, packages),
 - at gateways to Antarctica (ports, airports),
 - on means of transport (ships, aircraft),
 - at Antarctic stations and field camps that are departure points for activities within the continent.
- 6) Particularly close attention should be given to ensuring the cleanliness of items previously used in cold climates (e.g. Arctic, Sub-Antarctic, mountainous areas) which may be a means for transporting species 'pre-adapted' to the Antarctic environment.

Monitoring

Monitoring can be passive observation (i.e. waiting for non-native species to appear) or targeted (i.e. an active programme of identifying potential non-native species). Having good baseline data on native fauna and flora is important to support monitoring of non-native species.

- 7) Regular/periodic monitoring of high-risk sites (e.g. including, but not restricted to the area around research stations) should be encouraged.

- 8) Preventive measures should be periodically reviewed and revised.
- 9) Information and best practice related to non-native species should be exchanged between Parties and other stakeholders.

Response

The key factor will be to respond quickly and to assess the feasibility and desirability of eradicating non-native species. If eradication is not a feasible or desirable option then control and/or containment measures need to be considered.

- 10) To be effective, responses to introductions should be undertaken as a priority, to prevent an increase in the species' distribution range and to make eradication simpler, cost effective and more likely to succeed.
- 11) Efficacy of control or eradication programmes must be regularly assessed, including follow-up surveys.

3. Guidelines and resources to support prevention of the introduction of non-native species, including the transfer of species between sites in the Antarctic

In line with the objective for Parties' actions to address risks posed by non-natives species and the key guiding principles (sections 1 and 2), the following voluntary guidelines and resources have been developed that operators can apply and use, as appropriate, to assist with meeting their responsibilities under Annex II to the Protocol.

Prevention
<p>1. Develop and deliver awareness programmes for all people travelling to and working in the Antarctic on the risks of inter- and intra-continental movements of non-native species and on the measures required to prevent their introduction, including a standard set of key messages for awareness programmes. Education and training programmes should be tailored to the activities and risks associated with the target audience, including:</p> <ul style="list-style-type: none">– managers of national programmes– logisticians / crew / contractors– tour operators– scientists– tourists– staff on fishing vessels– staff at suppliers / vendors / warehouses– other visitors <p>Guidelines:</p> <p>Checklists for supply chain managers (COMNAP, SCAR 2010). Link: https://www.comnap.aq/nnsenvironment/</p> <p>Environmental code of conduct for terrestrial scientific field research in Antarctica (SCAR, 2009). Link: http://www.ats.aq/documents/ATCM32/ip/ATCM32_ip004_e.doc</p> <p>Resources:</p> <p>Preliminary Results from the International Polar Year Programme: Aliens in Antarctica (SCAR, 2010). Link: http://www.ats.aq/documents/ATCM33/wp/ATCM33_wp004_e.doc</p> <p>Instructional video on cleaning (Aliens in Antarctica Project, 2010). Link: http://academic.sun.ac.za/cib/video/Aliens_cleaning_video%202010.wmv</p> <p>'Don't pack a pest' pamphlet (United States). Link: http://www.usap.gov/usapgov/travelAndDeployment/documents/PackaPest_brochure_Final.pdf</p> <p>'Don't pack a pest' pamphlet (IAATO). Link: http://www.iaato.org/do_not_pack_a_pest.html</p> <p>Antarctic Pre-Arrival Biosecurity Declaration (IAATO) – available from IAATO.</p> <p>Boot washing guidelines (IAATO). Link: http://www.iaato.org/docs/Boot_Washing07.pdf</p> <p>'Know before you go' pamphlet (ASOC). Link: http://www.asoc.org/storage/documents/tourism/ASOC_Know_Before_You_Go_tourist_pamphlet_2009_editionv2.pdf</p>
<p>2. Include consideration of non-native species in future ASPA and ASMA Management Plans.</p> <p>Guidelines:</p> <p>Guide for the Preparation of Management Plans. Link: http://www.ats.aq/documents/ATCM34/att/ATCM34_att004_e.doc</p>

3. Manage ballast water in accordance with the Practical Guidelines for Ballast Water Exchange in the Antarctic Treaty Area Resolution 3 (2006).

Guidelines:

Practical Guidelines for Ballast Water Exchange in the Antarctic Treaty Area Resolution 3 (2006).

Link: http://www.ats.aq/documents/recatt/Att345_e.pdf

4. Clean vehicles in order to prevent transfer of non-native species into and around the Antarctic.

Guidelines:

Procedures for vehicle cleaning to prevent transfer of non-native species into and around Antarctica (United Kingdom 2010).

Link: http://www.ats.aq/documents/ATCM33/wp/ATCM33_wp008_e.doc

Monitoring

5. Record non-native species introductions and submit records to the Aliens database managed by the Australian Antarctic Data Centre, as agreed by the CEP.

Data base for entering records:

Link: <http://data.aad.gov.au/aadc/biodiversity>

Resource:

Colonisation status of known non-native species in the Antarctic terrestrial environment (United Kingdom, 2010).

Link: http://www.ats.aq/documents/ATCM33/ip/ATCM33_ip042_e.doc

Response

6. Develop or employ assessment metrics to help determine whether a newly discovered species is likely to have arrived through natural colonisation pathways or through human means.

Guidelines:

Guidance for visitors and environmental managers following the discovery of a suspected non-native species in the terrestrial and freshwater Antarctic environment (United Kingdom, 2010).

Links: http://www.ats.aq/documents/ATCM33/att/ATCM33_att010_e.doc

http://www.ats.aq/documents/ATCM33/att/ATCM33_att011_e.doc

Suggested framework and considerations for scientists attempting to determine the colonisation status of newly discovered terrestrial or freshwater species within the Antarctic Treaty Area (United Kingdom, 2010).

Link: http://www.ats.aq/documents/ATCM33/ip/ATCM33_ip044_e.doc

Annex

Guidelines and resources requiring further attention or development.

In addition to the measures, guidelines and resources that have been developed (section 3) the following guidelines have been identified as appropriate for assisting Parties' work on non-native species. The use of these and the development of more detailed guidance under these items for inclusion in the Manual are encouraged.

Prevention
1. Revise EIA guidelines to include a special section on non-native species.
2. Improve understanding of risks and develop more specific guidelines for preventing introductions in the Antarctic marine environment.
3. Reduce non-native species risks for Antarctica, including identifying regions / activities / vectors / pathways of highest risk for introduction of non-native species, providing guidance on what will constitute a gateway between Antarctic biogeographical zones (according to organism types), and developing practical measures to address risks associated with the transport of personnel and equipment between locations in Antarctica. More generally, encourage Parties to develop baseline studies. <i>Resources:</i> Current knowledge for reducing risks posed by terrestrial non-native species: towards an evidence-based approach (SCAR, Australia, 2010). Link: http://www.ats.aq/documents/ATCM33/wp/ATCM33_wp006_e.doc A framework for analysing and managing non-native species risks in Antarctica (New Zealand, 2009). Link: http://www.ats.aq/documents/ATCM32/ip/ATCM32_ip036_e.doc
4. Provide a list, with suitable descriptions, of the potential non-native species based on the experience of the Sub-Antarctic Islands (or other relevant environments) and the biological characteristics and adaptability of the "effective" colonisers. <i>Resources:</i> Information paper: Colonisation status of known non-native species in the Antarctic terrestrial environment (United Kingdom, 2010). Link: http://www.ats.aq/documents/ATCM33/ip/ATCM33_ip042_e.doc
5. Fresh foods and food wastes are strictly managed to prevent them entering the environment (secured from wildlife and removed from the Antarctic or incinerated).
6. Unless new, clothing supplied for use in Antarctica is cleaned using normal laundry procedures prior to sending to Antarctica. Pre-worn footwear is cleaned thoroughly before arrival in Antarctica or between sites in Antarctica. Specific cleaning requirements may be required if there is reason to think that people, clothing, equipment or vehicles have been in contact with diseased animals, disease causing agents or have been in an area of known disease risk.
7. Equip research stations with the means to clean and maintain clothing and equipment that is to be used in the field, particularly in distinct or multiple locations.
8. Check cargo to ensure it is clean of visible contamination before loading on board the aircraft or vessels.
9. Confirm vessels as being rodent-free before departure to the Antarctic.

10. Pack, store and load cargo in an area with a clean, sealed surface (e.g. bitumen, concrete free from weedy plants, soil, rodents and areas of waste ground). These areas should be regularly cleaned and inspected.

11. Containers, including ISO containers and boxes/crates, are not moved from one Antarctic site to another, except if cleaned before arrival at the new location.

12. Intercontinental aircraft are checked and treated as necessary, where applicable, to ensure they are insect free before departure to the Antarctic.

13. Preventive measures to diminish risks of introduction of diseases to Antarctic wildlife could include, for example, specific guidance for handling field and station waste to minimise introduction of non-native species.

Monitoring

14. Develop generally applicable monitoring guidelines, based on several workshops held on monitoring in the 1990s and in 2005, acknowledging that more detailed or site-specific monitoring may be required for particular locations; identify who will undertake the monitoring. A status report on established monitoring to be submitted regularly to the CEP.

Resources:

Information paper: Summary of Environmental Monitoring and Reporting Discussions (Australia, 2008).

Link: http://www.ats.aq/documents/ATCM31/ip/ATCM31_ip007_e.doc

15. Baseline biodiversity surveys and compilation of existing biodiversity data (terrestrial - including aquatic and marine) should be carried out to assist with identifying scale and scope of current and future introductions. Because it is not practical to conduct surveys everywhere, priority should be given to sites of high human activity (stations, most frequently visited scientific field sites and tourist sites), high value and/or high sensitivity.

Resources:

German experience with carrying out a terrestrial survey on soil fauna organisms on highly frequented visitor sites (German IP to CEP XIV).

Existing methods from other environments, e.g. port surveys.

Response

16. Expert advice should be sought as quickly as possible when a non-native species (including diseases of wildlife) is detected. A network of experts (taxonomists and specialists of eradication or control of non-native species, should be identified, including a list of names, details and e-mail available on the ATS website) in order to react as quickly as possible when a non-native species or disease event is discovered. This network should primarily 1) provide advice and 2) facilitate action by Parties.

17. Consider a 'rapid response guideline', including possible guide with practical eradication tools / means.

Resources:

Eradication of a vascular plant species recently introduced to Whaler's Bay, Deception Island (United Kingdom, Spain 2010).

Link: http://www.ats.aq/documents/ATCM33/ip/ATCM33_ip043_e.doc

Mass animal mortality event response plan (British Antarctic Survey) – Available from BAS.

Unusual mortality response plan (Australia).

Link: referred to in: http://www.ats.aq/documents/ATCM27/ip/ATCM27_ip071_e.doc

Procedures for reporting a high mortality event (IAATO) – Available from IAATO.

18. Develop (or formally adopt existing) guidance for responses to disease events.

Resources:

Report on the open-ended intersessional contact group on diseases of Antarctic wildlife. Report 2 – Practical measures to diminish risk (draft) (Australia, 2001).

Link: http://www.ats.aq/documents/ATCM24/wp/ATCM24_wp011_e.pdf

Health of Antarctic Wildlife: A Challenge for Science and Policy (Kerry and Riddle, 2009).

References

1. ATCMXXII-IP4 (Australia) 1998 - Introduction of Diseases to Antarctic Wildlife: Proposed Workshop
2. ATCMXXIII- WP32 (Australia) 1999 - Report to ATCM XXIII on outcomes from the Workshop on Diseases of Antarctic Wildlife
3. ATCMXII- WP6 (Australia) 2000 - Diseases of Antarctic Wildlife
4. ATCMXXIV-WP10 (Australia) 2001 - Report on the open-ended intersessional contact group on Diseases of Antarctic Wildlife: Report 1 - Review and Risk Assessment
5. ATCM XXIV-WP11 (Australia) 2001 - Report on the open-ended intersessional contact group on diseases of Antarctic wildlife. Report 2 – Practical measures to diminish risk (draft).
6. ATCM XXV-IP62 (Australia) 2002 - Draft Response Plan in the Event that Unusual Animal Deaths are Discovered
7. ATCMXXVII-IP71 (Australia) 2004 - Australia's Antarctic quarantine practices
8. ATCMXXVIII-WP 28 (Australia) 2005 - Measures to address the unintentional introduction and spread of non-native biota and disease to the Antarctic Treaty Area
9. ATCM XXVIII-IP97 (IAATO) 2005 - Update on Boot and Clothing Decontamination Guidelines and the Introduction and Detection of Diseases in Antarctic Wildlife: IAATO's Perspective
10. ATCMXXIX-WP5 Rev.1 (United Kingdom) 2006 - Practical Guidelines for Ballast Water Exchange in the Antarctic Treaty Area
11. ATCMXXIX-IP44 (Australia) 2006 - Principles underpinning Australia's approach to Antarctic quarantine management
12. ATCMXXX-IP49 (Australia, SCAR) 2007 - Aliens in Antarctica
13. ATCMXXXI-WP 16 (Australia) - Antarctic Alien Species Database
14. ATCMXXXI-IP07 (Australia) 2008 - Summary of Environmental Monitoring and Reporting Discussions
15. ATCMXXXI-IP17 (Australia, China, India, Romania, Russian Federation) Measures to protect the Larsemann Hills, East Antarctica, from the introduction of non-native species
16. ATCM XXXI-IP098 (COMNAP) - A survey on existent procedures concerning introduction of non native species in Antarctica
17. ATCM XXXII-IP4 (SCAR) 2009 - SCAR's environmental code of conduct for terrestrial scientific field research in Antarctica.
18. ATCM XXXII-IP012 (United-Kingdom) 2009 – ASPA and ASMA management plans: review of provisions relating to non-native species introductions
19. ATCM XXXII-SP11 (ATS) 2009 - Topic Summary of CEP discussions on Non-native species (NNS) in Antarctica
20. ATCM XXXII-WP5 (Australia, France, New Zealand) 2009 - A Work Program for CEP Action on Non-native Species
21. ATCM XXXII-WP032 (United-Kingdom) 2009 – Procedures for vehicle cleaning to prevent transfer of non-native species into and around Antarctica
22. ATCM XXXII-WP033 (United-Kingdom) 2009 – Review of provisions relating to non-native species introductions in ASPA and ASMA management plans
23. ATCM XXXII-WP23 (South Africa) 2009 - Propagule transport associated with logistic operations: a South African appraisal of a regional issue
24. ATCM XXXIII-WP4 (SCAR) 2010 - Preliminary Results from the International Polar Year Programme: Aliens in Antarctica
25. ATCM XXXIII-WP6 (SCAR, Australia) 2010 - Current knowledge for reducing risks posed by terrestrial non-native species: towards an evidence-based approach
26. ATCM XXXIII-WP8 (United Kingdom) 2010 - Draft procedures for vehicle cleaning to prevent transfer of non-native species into and around Antarctica
27. ATCM XXXIII-WP9 (France) 2010 - Open-ended Intersessional Contact Group on "Non-Native Species" (NNS) - 2009-2010 Report
28. ATCM XXXIII-WP14 (United Kingdom) 2010 - Intra-regional transfer of species in terrestrial Antarctica
29. ATCM XXXIII-WP 15 (United Kingdom) 2010 - Guidance for visitors and environmental managers following the discovery of a suspected non-native species in the terrestrial and freshwater Antarctic environment
30. ATCM XXXIII-IP14 (Germany) 2010 - Research Project "The role of human activities in the introduction of non-native species into Antarctica and in the distribution of organisms within the Antarctic"
31. ATCM XXXIII-IP42 (United Kingdom) 2010 - Colonisation status of known non-native species in the Antarctic terrestrial environment

32. ATCM XXXIII-IP43 (United Kingdom, Spain) 2010 - Eradication of a vascular plant species recently introduced to Whaler's Bay, Deception Island
33. ATCM XXXIII-IP44 (United Kingdom) 2010 - Suggested framework and considerations for scientists attempting to determine the colonisation status of newly discovered terrestrial or freshwater species within the Antarctic Treaty Area
34. Chown S.L., Convey P. 2007 - Spatial and temporal variability across life's hierarchies in the terrestrial Antarctic. *Phil. Trans. R. Soc. B*, **362**, 2307–2331
35. Convey, P., Frenot, Y., Gremmen, N. & Bergstrom, D.M. 2006 – Biological Invasions. In Convey P., Huiskes A. & Bergstrom D.M. (eds) Trends in Antarctic Terrestrial and Limnetic Ecosystems. Springer, Dordrecht pp. 193-220.
36. De Poorter M., Gilbert N., Storey B., Rogan-Finnemore M. 2006 Final Report of the Workshop on “Non-native Species in the Antarctic”, Christchurch, New-Zealand, 10-12 April 2006.
37. Falk-Petersen J., Bohn T. & Sandlund O.T. 2006. On the numerous concepts in invasion biology. *Biological Invasions*, 8, 1409-1424.
38. Frenot, Y., Chown S.L., Whinam, J., Selkirk P.M., Convey, P., Skotnicki, M., Bergstrom D.M. 2005 - Biological invasions in the Antarctic: extent, impacts and implications? *Biological Reviews*, **80**, 45-72.
39. Hughes, K. A., and Worland, M. R. 2009 - Spatial distribution, habitat preference and colonisation status of two alien terrestrial invertebrate species in Antarctica. *Antarctic Science*, in press.
40. Hughes, K.A., and Convey, P. 2009 - The protection of Antarctic terrestrial ecosystems from inter- and intra-continental transfer of non-indigenous species by human activities: a review of current systems and practices. *Global Environmental Change*. DOI:10.1016/j.gloenvcha.2009.09.005
41. Hughes, K. A., Convey, P., Maslen, N. R., Smith, R. I. L. 2009 - Accidental transfer of non-native soil organisms into Antarctica on construction vehicles. *Biological Invasions*. DOI: 10.1007/s10530-009-9508-2.
42. Kerry, KR and Riddle, M. (Eds.) 2009 - Health of Antarctic Wildlife: A Challenge for Science and Policy, Springer Verlag, ISBN-13: 9783540939221.
43. Potter S. 2006 - The Quarantine Management of Australia's Antarctic Program. *Australasian Journal of Environmental Management*, **13**, 185-195.
44. Potter S. 2009 - Protecting Antarctica from Non-Native Species: The Imperatives and the Impediments. In G. Alfredsson and T. Koivurova (eds), D. Leary sp. ed. The Yearbook of Polar Law, vol. 1, pp383-400.
45. Tin T., Fleming Z.L., Hughes K.A., Ainley D.G., Convey P., Moreno C.A., Pfeiffer S., Scott J., Snape I. 2009 - Impacts of local human activities on the Antarctic environment. *Antarctic Sciences*, **21**, 3-33.
46. Walther G.-R., Roques A., Hulme P.E., Sykes M.T., Pysek P., Kühn I. & Zobel M. 2009. Alien species in a warmer world: risks and opportunities. *Trends in Ecology and Evolution* 26 August 2009. doi:10.1016/j.tree.2009.06.008
47. Whinam J. 2009 – Aliens in the Sub-Antarctic – Biosecurity and climate change. Papers and *Proceedings of the Royal Society of Tasmania*.