



WP 11

Agenda Item: 2.3

Person Responsible: A. Terauds

XXXIII SCAR Delegates Meeting

Auckland, New Zealand, 1-3rd September 2014

State of the Antarctic Ecosystem



Executive Summary

Title: State of the Antarctic Ecosystem (AntEco)

Authors: Aleks Terauds, Don Cowan, Jan Strugnell, AntEco Steering Group.

Introduction/ Background:

The Scientific Research Programme - AntEco (State of the Antarctic Ecosystem) has a focus on understanding and clarifying the processes driving patterns of biodiversity in all environments across the Antarctic, sub-Antarctic and Southern Ocean regions. The programme prioritises applied research and aims to provide scientific knowledge on biodiversity that can also be used for conservation and management.

Important Issues or Factors:

Since its formal inception in 2013, AntEco has focused on building and extending research networks, facilitating research that is aligned with the research priorities of the programme, and publishing research findings. Members have not only published papers in high quality journals, but also ensured that findings are disseminated widely, through conference symposia, media and popular articles. Publications in high quality journals continue to be a priority, and we are currently on track to exceed the ambitious targets set out in the Implementation Plan. One of the primary goals of AntEco is to foster collaboration between scientists, institutions and countries. To this end, AntEco has provided several letters of support for a number of large-scale multinational research proposals, at least one of which has recently been approved. As a group, we have invested considerable time and resources into the 2014 SCAR OSC, with three workshops and a diverse range of sessions, all of which were very well subscribed.

Over the next two years, AntEco will not only continue to support new research, but also focus on the delivery of advice to stakeholders, in particular to the ATCM through the CEP.

Recommendations/Actions and Justification:

Given the substantial progress made in its first year, and the momentum that is building in the AntEco research community, we recommend that the Delegates (1) note and approve of AntEco actions to date, and (2) continue to support AntEco at current levels for the next two years.

Expected Benefits/Outcomes:

Continuing support will allow the number and quality of important publications to continue, will ensure outreach delivery, facilitate advice to stakeholders and enhance SCAR's profile and reputation.

Partners:

All outputs to date involve partners and collaborators both within and external to SCAR. So far these groups include SC-ATS, EG-BI, AnT-ERA, CAML, and a range of institutional research partners. Cross-disciplinary and cross-group collaborations will continue to be a driving theme in AntEco supported research.

Budget Implications:

To achieve the objectives and goals over the next two year period, we request that funding is maintained at \$US20 000 per year.

State of the Antarctic Ecosystem (AntEco)

1. Rationale for the Programme

Biological diversity is the sum of all organisms in a system. These organisms collectively determine how ecosystems function and underpin the life-support system of our planet. The SCAR Scientific Research Programme - State of the Antarctic Ecosystem (AntEco) has been designed to focus on past and present patterns of biodiversity across all environments within the Antarctic, sub-Antarctic and Southern Ocean regions. The broad objectives of the programme are to increase the scientific knowledge of biodiversity, from genes to ecosystems that, coupled with increased knowledge of species biology, can be used for the conservation and management of Antarctic ecosystems.

Through the development and maintenance of an international research network, AntEco aims to inform our understanding of current biodiversity and patterns therein, to distinguish the impact of present processes from historical signals, and to use this knowledge to develop scenarios of its future state through interdisciplinary approaches. While the scope of research activities supported will be broad, research priorities will be directed towards science that is policy relevant and assists in guiding management and conservation in the region.

AntEco is structured into five research sectors, each with a sector leader:

1. Spatial Ecology (Huw Griffiths, British Antarctic Survey, UK)
2. Molecular Ecology and Evolution (Jan Strugnell, Latrobe University, Australia)
3. Ecoinformatics and Systems Biology (Alison Murray, DRI, USA)
4. Paleoecology (Dominic Hodgson, British Antarctic Survey, UK)
5. Impacts, Trends and Conservation (Annick Willemotte, University Liège, Belgium).

Research will not be carried out in isolation within these sectors. Multidisciplinary approaches are a key guiding principle within AntEco, with collaborations encouraged not only between research sectors, but also more broadly across SCAR Research Programmes and other relevant SCAR Standing Committees and Expert Groups.

The AntEco Executive is comprised of the Chief Officer (Dr. Aleks Terauds), Deputy Chief Officer (Prof. Don Cowan), Secretary (Dr. Anton Van de Putte), Prof. Pete Convey and the research sector leaders (Appendix 1). The remainder of the Steering Group is comprised of leading researchers that together, represent a broad range of career levels, countries and disciplines (Appendix 1).

2. Important Issues or Factors

i. Scientific Highlights

In the past 12 months, AntEco Science highlights are represented by conference symposia, published papers in leading international journals and significant collaborative efforts.

1. AntEco convened an Antarctic Symposium at the joint Ecological Society of Australia and New Zealand Conference in Auckland (August 2013). Prof. Don Cowan and Dr Aleks Terauds convened this session, where research on Antarctic ecology was presented to a broad cross-section of the ecological research community. AntEco considers disseminating Antarctic research beyond the Antarctic research community an important outreach activity.
2. AntEco also supported cooperative efforts to manage large scale data sets, and in co-operation with the Expert Group on Biodiversity Informatics, has helped to progress the Microbial Antarctic Resource System (mARS) initiative (<http://mars.biodiversity.aq/blog.html>) as well as the Biogeographic Atlas of the Southern Ocean (<http://atlas.biodiversity.aq/>).

3. Publication 1. The Spatial Structure of Antarctic Biodiversity [1]. This research, published in the leading journal *Ecological Monographs* (impact factor 8.1) was led by Prof Peter Convey and involved numerous researchers from the AntEco network, and included collaborators from AnT-ERA and many other institutional partners. It sets a benchmark in the analyses of biodiversity across all Antarctic systems.
4. Publication 2. **Geothermal Activity Helps Life Survive Glacial Cycles** [2]. This research team, co-led by Dr. Aleks Terauds (AntEco), and including Prof Steven Chown (SC-ATS) and Prof Convey (AntEco) involved a continental scale analyses of the factors driving Antarctic terrestrial biodiversity. Published in the prestigious *Proceedings of the National Academy of Science USA* (impact factor 9.7), this work had over 7000 online views in the first month following publication.
5. Publication 3. **Antarctica's Protected Areas are Inadequate, Unrepresentative, and at Risk** [3]. This work, published in the world's leading biological journal *PLOS Biology* (impact factor 12.7), involved key SCAR scientists, including Dr. Aleks Terauds (AntEco) and Prof. Steven Chown (SC-ATS). For the first time, this paper allows the formal level of Antarctic protection to be viewed in a global context. Over 3000 views in the first two weeks following publication.

ii. Work Plan

AntEco is on track to deliver all work items identified and outlined in the Implementation Plan (2013) http://www.scar.org/researchgroups/progplanning/AntEco_Implementation_Plan.pdf. Publication rates are currently exceeding the metrics of performance outlined in this plan and deliverables are exceeding or in line with expectations (see Section 3).

3. Outputs/Deliverables

i. Selected Publications (Appendix 2)

As noted in the AntEco Implementation Plan, publications in peer-reviewed journals are one of the highest priority outputs for the AntEco programme. Over the last 18 months, these have included (but are not limited to): a major review of the spatial structure of Antarctic biodiversity [1]; the unprecedented documentation of the regeneration of 1500 year old moss [4]; a landmark study documenting divergence between Antarctic and South American marine organisms [5]; the identification of new Ross Sea molluscs [6]; new insights into the management of invasive species on sub-Antarctic Macquarie Island [7]; studies that have generated a better understanding of the diversity and adaptability of Antarctic microbial communities [8,9]; an editorial on threats to, and protection of, Antarctic microbiota [10]; a significant review of patterns, processes and vulnerability of Southern Ocean benthos [11]; a continental-scale study into the effects of geothermal areas on Antarctic biodiversity [2]; a comprehensive review of the molecular mechanisms of adaptation of psychrophilic microorganisms [12], the discovery of over 30 new species from the Amundsen Sea [13] and large-scale insights into marine biodiversity [14, 15, 16].

ii. Other reports

AntEco members provided advice to several ATCM parties prior to the 2013 and 2014 meetings in Brussels (CEP XVI, ATCM XXXVI) and Brasilia (CEPXVII, ATCM XXXVII) respectively. Furthermore, AntEco members were integrally involved with the development and content of Working Papers presented at these meetings. AntEco members are also actively contributing to the SCAR Antarctic Conservation Strategy, which is currently under development through SC-ATS and Monash University.

iii. Workshops and other key meetings

No AntEco supported workshops have been held since January 2013. However, several are planned for 2014, and discussions are ongoing for workshops planned for 2015 and 2016. These meetings, which bring together researchers from a range of disciplines, are a high priority AntEco activity, facilitating collaboration and cooperation between researchers, institutions and countries. See Section 5 for more details on upcoming workshops.

Two AntEco Executive members (Prof Don Cowan and Prof Pete Convey) were invited participants in the SCAR-sponsored Horizon Scanning meeting, held in Queenstown, NZ in April 2014.

In addition to the AntEco Symposium at ESA in 2013, AntEco supported sessions at ISME-2014 (Seoul, August 2014); Biodiversity of Extreme Environments (Don Cowan convened) and at Systematics without Borders conference (Sydney, December 2013); Southern Ocean Evolution (Jan Strugnell convened).

iv. Capacity building, outreach and education activities

AntEco supported research has featured in magazines, newsletters and hundreds of media reports. These outreach and educational activities ensure that our research is having as wide an impact as possible and reaching an audience well beyond our scientific peers in the Antarctic research community.

AntEco supports a number of capacity building and education activities. Dr Aleks Terauds prepared content for the Antarctic Environment Portal (beta version) that was shown at the CEP meeting in Brasilia this year [17]. The CEP has encouraged the further development of this Portal ahead of CEP XVIII, in 2015. The Portal is a New Zealand led project that will provide up-to-date, policy ready scientific information, and it is an initiative that AntEco supports.

AntEco has provided a letter of support for large scale, multi-disciplinary and multi-institutional proposals from a range of researchers and countries. These include: Korea, Australia, New Zealand, Chile and the United Kingdom with a potential total research pool of \$100 000s. AntEco promotes its role not only as a facilitator of such research, but also as a key end-user.

Content has been prepared for the new SCAR website, with links detailing the role and objectives of AntEco, major outputs and upcoming events.

Support for early career researchers has been provided in the form of travel support to attend the SCAR Open Science Conference and through prize money offered for best presentations at the 10th International Congress on Extremophiles.

The feasibility of producing an AntEco newsletter is still being discussed. Some members of the Steering Committee feel that the SCAR newsletter is adequate for highlighting AntEco business and outputs, and indeed, several AntEco items have appeared in recent issues. There is also a feeling that the new SCAR website could provide a better platform for information that may have previously appeared in a newsletter. These discussions will be finalized at the 2014 AntEco AGM in Auckland.

4. Budgetary Implications

Current (until end of 2014)

The main expenditure of AntEco is travel support for members to attend meetings and workshops that facilitate the goals and priority deliverables as outlined in the Implementation Plan (2013).

Expenditure (actual and forecast) since March 2014 (last Financial statement) to end of 2014

Activity and expenditure (to end of 2014)	Amount (US\$)
Starting Balance (March 2014)	\$33 799
SCAR OSC (Steering Group Members travel support)	\$18 500
SCAR OSC (Early Career Researchers travel support)	\$4000
SCAR OSC Workshops (See Section 5)	\$5500
Moss Workshop (see Section 5)	\$4000
CO meetings in Cambridge	\$950
Conference prize money	\$350

Future Expenditure (2015 and 2016)

Over the next funding cycle (2015 and 2016), AntEco will continue to fund activities that facilitate collaboration and progress research priorities of the programme. Focused workshops are one of the most effective ways of achieving these aims, and currently we propose to hold two workshops in 2015 (approximately \$10k allocated to each) and one in 2016 (approx. 10k allocation from 2016 budget). Funding will also be allocated to assist travel costs associated with the SCAR Open Science Conference in Malaysia in 2016 (approx. 10k allocation). These figures are only approximate at this stage and further details, including workshop convenors and topics are currently under discussion. These discussions will be progressed further at the Annual Steering Group Meeting in Auckland.

5. Future Plans

2014

SCAR OSC Workshops

AntEco Workshop 1:

Physical drivers of biodiversity at multiple spatial scales

Convened by Aleks Terauds and Huw Griffiths

Date: Saturday 23rd August (all day)

Attendance: By invitation

AntEco Workshop 2:

Antarctic Aerobiology

Convened by David Pearce

Date: August 28th (18:15)

Attendance: Contact david.pearce@northumbria.ac.uk

AntEco Workshop 3 (mini-workshop):

Eradication in Antarctica: Management and ecological considerations to inform conservation decision-making

Convened by Justine Shaw and Yi Han

Date: August 23rd (time TBC)

Attendance: By invitation

AntEco Supported Workshop (England 2014)

Moss-Dominated Ecosystems in Antarctica and surrounding regions: Past, Present and Future

Organisers: Matt Amesbury, Dan Charman, Tom Roland (University of Exeter); Zicheng Yu, (Lehigh University)

Date: 29th September – 2nd October

Attendance: By invitation

Other topics are currently under discussion for workshops to be held in 2015 and 2016.

Appendices

Appendix 1 – AntEco Steering Group

Name	Affiliation	Country	Main field of interest
Aleks Terauds	AAD	AUS	Terrestrial ecology
Don Cowan	U. Pretoria	RSA	Terrestrial microbial ecology
Pete Convey	BAS	UK	General biology
Angelika Brandt	U. Hamburg	DE	Marine biology
Alison Murray	DRI	USA	Marine microbiology
Annick Wilmotte	U. Liège	BEL	Microbiology, human impacts
Craig Cary	U. Waikato	NZ	Terrestrial microbiology
Guido di Prisco	U. Naples	IT	Marine biology
Jan Strugnell	La Trobe	AUS	Marine biology
Claudio Gonzales-Wevar	U. Chile	CHI	Marine biology
Dom Hodgson	BAS	UK	Terrestrial paleoreconstr.
Huw Griffiths	BAS	UK	Marine biology
Anton van de Putte	RBINS	BEL	Marine biology
Stefano Schiaparelli	U. Genoa	IT	Marine ecology
Mary-Ann Lea	IMAS, U Tas	AUS	Marine ecology
Conxita Avila	U. Barcelona	ESP	Marine biology
Julian Gutt	A. W. Inst.	DE	Linkage with Ant-ERA

Appendix 2 - References

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