Antarctic Conservation for the 21st Century

Scoping Workshop on Practical Solutions

Final Report

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Venue: British Antarctic Survey (BAS), Cambridge

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Contents

Executive summary

A workshop, held at the British Antarctic Survey, Cambridge (24-25 September 2013), was convened jointly by COMNAP and SCAR to identify practical national Antarctic programme-led responses to short and longer-term conservation challenges in Antarctica (as identified by Chown et al., 2012). The outcomes of the workshop were to inform the drafting by SCAR of an Antarctic Conservation Strategy, the aim of which is to produce a more integrated, comprehensive and dynamic approach to conservation in the region and to inform conservation decision-making and policy.

It was clear that some Antarctic conservation challenges, such as climate change impacts in marine and terrestrial environments, ocean acidification and pollution from global sources, could not be addressed by action within the Antarctic region alone. Nevertheless, Antarctic scientists could usefully undertake important monitoring and research to inform the global debate on these issues and, where appropriate and practical, show leadership by reducing greenhouse gas emissions and pollution.

Participants felt that national Antarctic programmes were better placed to address local conservation challenges, such as invasive alien species, habitat alteration and activity impacts and pollution from local sources (including fuel handling, waste management and repair and remediation activities). In some cases, the risks presented by these challenges could be reduced by (a) the identification and dissemination of existing best practice, (b) the full implementation of existing regulations and guidelines, and (c) enhanced education of national Antarctic programme personnel visiting Antarctica.

Participants emphasised that Treaty Parties need targeted research, monitoring and evidence to support their conservation decision-making. Implementing solutions to some current and potential conservation challenges (such as sustainable marine resource use, commercial activities, hydrocarbon exploration, mineral extraction, biological prospecting and geo-engineering) was linked closely with the process of decision-making, for which a strong Antarctic Treaty System was essential. An Antarctic Conservation Strategy could help support a strong Antarctic Treaty System by collating evidence and research to support decision-making.

It was recognised generally that SCAR and COMNAP are well-placed to work together to enhance conservation in Antarctica and, in particular, through the development of the Antarctic Conservation Strategy. Areas of further work are identified in Appendices to this report.

Background

The Scientific Committee on Antarctic Research (SCAR), in partnership with other organisations such as COMNAP, has embarked on a review of conservation approaches for Antarctica for the 21st Century. The first parts of the process have been completed. These include, most significantly, (1) an assessment of current and future conservation challenges, following a horizon-scanning exercise (Chown et al., 2012, *Science*), and (2) the development of a structure for the Antarctic Conservation Strategy (or ACS).

1. *Conservation challenges horizon-scanning exercise*

To understand better current and future conservation threats in Antarctica, a workshop was held in 2011 entitled: '*Antarctic Conservation in the 21st Century*', supported by SCAR, South Africa and New Zealand. The workshop followed a horizon scanning procedure similar to those used for assessing future global conservation challenges. The 26 meeting participants identified major issues they thought either pose now (<10 years) or are likely to pose over a longer time span (c. 10-50 years) significant conservation challenges in the Antarctic region (see Appendix 1).

2. *Antarctic Conservation Strategy*

Several of the conservation challenges identified during the horizon scanning exercise are currently under consideration by the Committee for Environmental Protection and a range of inter-governmental bodies (such as the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) and the Agreement on the Conservation of Albatrosses and Petrels (ACAP)) and non-governmental organizations (such as the Antarctic and Southern Ocean Coalition (ASOC) and the International Association of Antarctica Tour Operators (IAATO)). In many instances, these discussions are taking place in relative isolation, whereas a more unified process is needed given the integrated nature of the challenges being faced. SCAR has concluded that decision-making and policy in Antarctica stand to realize substantial benefits from a more comprehensive, integrated approach to conservation in the region.

Although such integrated approaches have been developed for some systems (e.g. marine), they do not span all of Antarctica and associated and dependent systems in a holistic manner. The last comprehensive blueprint was '*A Strategy for Antarctic Conservation*' published by IUCN in 1991, more than 20 years ago, and before the Environmental Protocol entered into force. While a benchmark at the time of its publication, and an important document informing conservation since then, much has changed in the Antarctic region and in conservation science, management and policy. As a consequence, SCAR considered it timely to re-examine these issues and develop an updated, integrated, comprehensive and dynamic conservation strategy for Antarctica and associated and dependent ecosystems for the 21st century.

COMNAP and the Antarctic Conservation Strategy

The Antarctic Conservation Strategy process forms part of a suite of activities being undertaken by SCAR. One of the key steps in the development of the ACS is to collaborate to identify the ways in which national Antarctic programmes (NAPs) and others can help address conservation challenges and the requirements of conservation in a practicable manner. Much of what is required for conservation in the region, and for addressing conservation challenges, lies in the hands of those that are undertaking operations in the Antarctic region and are supporting scientific research there.

For any conservation strategy to be effective, clear information must be available on the range of possible activities that can be implemented, those that require development, and those for which no local solution exists (e.g. a global political solution might be required). Such information can only be developed through clear communication between Antarctic conservation biologists and those responsible for Antarctic operations. The input of COMNAP throughout the process is critical, therefore, to the development of a practical and implementable conservation strategy.

Workshop goal and aims

The scoping workshop goal was to provide an opportunity to progress communication between conservation scientists and NAPs (see Appendix 2 for Agenda). Specifically, the workshop aims were as follows:

1. Identify by means of a triage-type approach, those conservation challenges listed by Chown et al. (2012, *Science*, supplementary data) that can be addressed, how this can be done and what might be the current most cost-effective means to do so; More specifically, which challenges:
    a) are within close range of being addressed,
    b) cannot be addressed due to technical issues or are outside the scope of being addressed in a local context, or
    c) can be addressed technically, but are financially unreachable.
2. Set out clearly a list of priority actions for NAPs so they can start addressing the conservation challenges immediately.
3. Examine the major elements of the Antarctic Conservation Strategy and indicate what the logistic and operational implications might be of implementing such a strategy. This would be done with a view to including implementation requirements in the strategy, so providing a coherent and practicable strategy, rather than one based solely on conservation requirements some of which are not capable of being realized.

Participation

This invitation-only scoping workshop was held to consider specific practicable and implementable conservation actions and to stimulate broader discussion of possible innovative solutions and conservation science and management requirements. In

consequence, COMNAP and SCAR agreed it should be kept small and focussed, with a clear emphasis on those experienced with operational and logistics matters from a NAP perspective. See Appendix 3 for a list of invitees who were able to participate in the workshop. It should be emphasised that other key partners in the Conservation Strategy such as the International Union for Conservation of Nature (IUCN), the Antarctic and Southern Ocean Coalition (ASOC), the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) and the International Association of Antarctica Tour Operators (IAATO) are fully engaged in the strategy as a whole.

Prior to the preparation of this report, it was agreed by the workshop participants that comments would not be attributed to individual attendees. The workshop presentations and discussions were facilitated by Drs John Shears (COMNAP), Kevin Hughes (SCAR) and Aleks Terauds (SCAR).

This Final Workshop Report reflects the views of the invited participants of the workshop and does not necessarily represent a COMNAP view since it has not been reviewed nor endorsed by the whole COMNAP membership.

Anticipated workshop outputs

1. Discussion documents for the SCAR-COMNAP conservation symposium session (SCAR Open Science Conference, Auckland, August 2014)
2. Joint paper(s) for the Antarctic Treaty Consultative Meeting (ATCM) XXXVII (Brasilia, May 2014)
3. Information for the practical application of the Antarctic Conservation Strategy
4. A list of challenges that need actions from other organisations and the next steps to engage with those organisations.

NOTES FROM DISCUSSIONS ON DAY 1

Welcome

The BAS Interim Director, Professor Alan Rodger, welcomed the participants to the workshop.

Setting the scene

Kevin Hughes set the scene by describing the current system of Antarctic conservation management and the tools available, and highlighted that a modern evidence-based conservation strategy does not exist for Antarctica, in contrast to some sub-Antarctic islands. A comprehensive, dynamic and evidence-based conservation strategy, which is broadly supported by stakeholders, would help Antarctic conservation management. The workshop aims were set out along with the expected outputs. The Antarctic Conservation Strategy, presented in ATCM XXXV IP35 (see Appendix 4) was described.

Questions arose regarding how the Antarctic Conservation Strategy would fit within/outside the Antarctic Treaty System (ATS), who was the audience, and how it might influence management actions (i.e. through measures or guidelines). It was recognised that the ATCM and CCAMLR take the lead on some issues, including Marine Protected Areas. Buy-in from all Parties and organisations active in Antarctica was considered essential to the success of the ACS. The audience was to extend beyond COMNAP and SCAR to include the NAPs, and IAATO and other NGOs (e.g. ASOC). The IUCN was involved from the earliest stage of the ACS development. It was envisaged that COMNAP participation would make the ACS stronger and more relevant to the audience and the ACS would include implementation proposals and guidance on achieving priorities.

It was noted that conservation of geological values and human heritage were not included within the ACS, and some workshop participants queried this omission. It was highlighted that the ATS protected area system recognises historic values and affords some protection to historic sites but human heritage issues were not within the original remit of the conservation strategy. Nevertheless, coverage of historic sites at least, was considered desirable by some workshop participants.

Short-term conservation challenges

Kevin Hughes presented the short-term conservation challenges, identified by Chown et al. (2012), to the workshop (see Appendix 1).

Short-term conservation challenges – what might have been missed?

Aleks Terauds led discussions on other challenges that may have been missed. The issue of national operator impacts in the vicinity of stations was raised (e.g. wildlife interactions, habitat degradation and waste management), and it was considered that COMNAP was well-placed to help advise on these issues by sharing best practice. Participants suggested that guidelines on many conservation issues existed already but recommendations were not consistently implemented and/or audited effectively by some Parties. It was emphasised that COMNAP can provide advice and guidance, but it is up to individual Parties to take action.

Some questions were asked regarding the environmental baseline against which Antarctic impacts should be compared. Should the baseline be that which exists currently or should the baseline be that which existed before humans visited Antarctica and before facilities were constructed, or some other baseline?

One participant noted that inconsistencies arose in (a) conservation scientists' need to collect spatial biological data to inform their work and (b) the suggestion that human footprint should be minimised to prevent widespread impacts. Indeed, it was mooted that a reduction in NAP footprint might lead to less science. Some participants highlighted that the Environmental Protocol acknowledged that all visitors to Antarctica have some impact, but that impacts can be minimised, monitored and remediated.

Workshop participants were reminded that COMNAP has made efforts to provide advice on reducing greenhouse gas emissions within Antarctica, yet there is an on-going demand for more scientific activity, which, in general, increases emissions. For example, less shipping may mean less collection of data for the Southern Ocean Observing System (SOOS) and other resource-heavy monitoring programmes. NAPs have to balance environmental best practice (including clean-up) with science activity requirements, and this process becomes more difficult when budgets for many national operators are declining. Scientific activities that yield the best data may not be the most logistically efficient. Such inconsistencies were recognised as difficult to resolve.

It was thought that issues around clean energy could also be addressed and many nations could further improve their station operations, including changes to clean/green fuel/electricity as the opportunity permitted, or improving levels of insulation in older buildings. Reduction of fossil fuel use in the Antarctic has already been made by NAPs, particularly on ships.

Many of the environmental impacts on the Antarctic and surrounding marine area do not originate from within Antarctica itself, but rather the sources of these impacts are global in nature (e.g. climate change, ocean acidification and marine resource use). The need for more research on these impacts may well require greater levels of Antarctic visitation by

science and logistic personnel, which in turn may cause more impacts locally. Scientists may also need to consider carefully how they can reduce the footprint or impact of their activities, yet deliver top quality data (particularly, for example, activities such as ice-core drilling, or those that require new buildings and infrastructure).

Many participants agreed that Parties' full compliance with their Environmental Protocol obligations and effective implementation of existing guidelines would help address many of the local conservation challenges identified. Furthermore, the ACS could identify priorities based on risk-assessments. Some participants suggested that ACS advice and priorities may not align completely with current obligations through the Environmental Protocol, and therefore it could be difficult for Parties to decide where to commit limited financial resources. Other participants suggested that any ACS advice should recognise and compliment the standards agreed already under the Environmental Protocol.

Discussion on the IUCN document '*A Strategy for Antarctic Conservation*' (1991)

John Shears reminded the workshop that the last comprehensive conservation strategy blueprint was '*A Strategy for Antarctic Conservation*' published by IUCN in 1991 and facilitated discussions on lessons that could be learnt from this earlier initiative.
Key issues highlighted in that document were: (i) science and management, (ii) logistics and establishment of stations, (iii) protected areas, (iv) tourism, (v) marine living resources and (vi) mineral exploration.

Discussions followed on the level of buy-in and implementation of the IUCN strategy and what lessons could be learnt. Participants noted that it was not clear how much stakeholders influenced each of the IUCN recommendations, which could be essential for subsequent implementation, and suggested that attention had turned instead to the then new Environmental Protocol.

Climate change-related impacts and other global impacts were not considered in the IUCN document. The reason for this was not known, but it could be because impacts with a global source cannot be affected or changed to a significant degree by the Antarctic community alone, and were therefore considered to be a lower priority for attention. It was noted that these circumstances have not changed and that some of the recommendations made by the *Antarctic Treaty Meeting of Experts on Impacts of Climate Change for Management and Governance of the Antarctic Region* (Svolvær, Norway, 7-9 April 2010) would have only very minor benefits globally (e.g. reduction of greenhouse gas emission within the Antarctic Treaty area). The issue of mineral exploration was also considered to be beyond the influence of SCAR and COMNAP and was a matter for the ATCM.

Following the participants' discussion on lessons learnt from the IUCN strategy, it was felt that the exact remit of the proposed ACS document should be defined clearly.

Short-term conservation challenges – what can be addressed?

Workshop participants were asked to categorise each short-term challenge (identified by Chown et al., 2012) within the following categories: (a) is within close range of being addressed, (b) cannot be addressed due to technical issues or are outside the scope of being addressed in a local context, or (c) can be addressed technically, but is financially unreachable.

Many participants reiterated that there was little NAPs could do about global issues (e.g. climate change, ocean acidification, etc.) other than to support research to inform the global debate and lead by example. Nevertheless, more research was needed on the impacts of activities in Antarctica, e.g. infrastructure, human visitation impacts, etc.

Invasive alien species

Non-native/invasive species introductions were considered to be a significant challenge, but the substantial work undertaken already by COMNAP, SCAR and the Committee for Environmental Protection (CEP) was noted. Moving forward, it was considered a matter of implementing and continuing to build upon the guidelines and requirements that exist already (e.g. the *COMNAP/SCAR Non-native Species Voluntary Checklist for Supply Chain Managers, the CEP Non-native Species Manual and Annex II to the Environmental Protocol*). It was recognised that it could be difficult to differentiate between non-Antarctic species introduced by natural, as opposed to anthropogenic, mechanisms. Data on natural colonisation rates were lacking, but it has been estimated that rates of anthropogenic introductions may be roughly two orders of magnitude greater than natural introduction rates. Non-native species were likely to have greatest impacts on ice-free ground and marine environments rather than areas of permanent ice. It was recognised that some ice-free areas, particularly on the northern Antarctic Peninsula, were particularly vulnerable under current conditions to non-native species introductions and should be a focus for monitoring and biosecurity measures. More broadly, increased education of NAP personnel was considered essential alongside action to confirm implementation of the Environmental Protocol.

Climate change, marine ecosystem effects and marine resource use

It was felt that this challenge was too broad to be considered as a single challenge and sustainable marine resource use could be considered separately. Little could be done to address climate change locally, except undertake relevant scientific research to inform the global debate on the effects of greenhouse gas emissions. Parties may be in a position to 'lead by example' and do what they can to continue to cut emissions even though this action alone will make little difference on a global scale.

With regard to marine resource use, this was largely an issue for CCAMLR, but scientists should continue to provide data to inform CCAMLR's work.

Ocean acidification

As with climate change, little could be done to address this challenge locally, except undertake science to inform the global debate. It should be noted that SCAR is currently

preparing a major report about ocean acidification, which is due to be launched in August 2014.

Pollution

Participants suggested that it was important to distinguish between pollutants that had their source within Antarctica, which could be tackled, and global pollution, which is largely beyond the influence of the Antarctic community but which could be a subject for scientific research. The workshop was reminded that guidelines to reduce impacts have been produced already by COMNAP, for example, impacts resulting from fuel handling (i.e. oil spill contingency plans). However, several participants were concerned that the impacts of some classes of pollutant were not being addressed (e.g. polybrominated diphenyl ethers (PBDEs)). NAPs should continue to share best practice and increase education of their personnel on pollution issues. Use of alternative/renewable energy sources was also considered helpful in reducing local pollution.

Habitat alteration and activity impacts

It was the opinion of some participants that guidelines exist already to reduce habitat alteration and activity impacts (e.g. the CEP Clean-up Manual), but implementation of these guidelines and the Environmental Protocol was inconsistent or sometimes lacking. The importance of education and sharing best practice was again stressed, as was the need for monitoring and research, preferably adopting a common framework. Crucially, monitoring would help in the assessment of the effectiveness of existing guidelines.

Regulatory failure

Some participants noted the following issues with regard to the current regulatory system:

- There was inconsistency in the way international instruments were brought into national legislation.
- Concern was expressed that the Antarctic protected area system was not fully effective, representative or comprehensive.
- It was pointed out that the lack of agreement globally on substantial measures to reduce greenhouse gas emission was an example of regulatory failure at the largest scale.
- Environmental monitoring is generally not prioritized by Parties and data for decision-making often do not exist. If regulations are ineffective, monitoring data are required to provide evidence to Treaty Parties that more effective action is needed.
- On-going budget constraints put increased funding pressure on activities to address conservation challenges.
- Significant cost and effort is required to fully implement the Environmental Protocol, irrespective of any additional voluntary measures recommended by the ACS.

Various participants recommended:

- A better flow of information between Antarctic scientists and the policy-makers that

operate within an Antarctic and global context.

- Better cooperation between scientists and logistics co-ordinators at a national and international level to help resolve many conservation challenges. SCAR and COMNAP could play an important role here.
- Better use of Environmental Impact Assessments (EIAs) as outlined in Annex I to the Environmental Protocol. The EIA process needs to be effective and accurate to better protect conservation values.
- That regular environmental audits may help NAPs keep up to date with environmental best-practice.
- The implementation of dynamic conservation methods, using science to advise policy-makers on issues within both the marine and terrestrial environments.

Summary

Addressing climate change and ocean acidification were considered largely outside the scope of the NAPs; however, (i) monitoring, (ii) education, and (iii) implementation of existing guidelines could go a long way toward addressing issues such as invasive alien species, pollution from Antarctic sources and habitat alteration by human activities.

Short-term conservation challenges – what is technically not feasible or beyond the scope?

Participants considered several issues technically difficult or beyond the scope of the NAPs. It was considered technically impossible to build an emission-free overwintering station, and in some cases Antarctic conditions prevent the use of more environmental-friendly technical solutions used in areas outside Antarctica, e.g. 4-stroke engines are less polluting than 2-stroke engines, but may not work reliably in cold or high altitude conditions. Questions were also asked about the feasibility of the complete clean-up of abandoned waste sites, with lack of clarity over what standards of cleaning were expected.

Challenges to Parties' ability to undertake accurate and useful cumulative environmental impact assessments were also discussed. In particular, it was considered that areas may be subject to more than one conservation challenge simultaneously and that predicting and responding to the cumulative, interactive and synergistic effects of these challenges may prove difficult, and highlighted the need for reference areas. Some participants were also unsure whether adequate regulation was in place to safeguard Antarctic values when new frontier research areas were explored, such as during sub-glacial lake penetration, which have created new environmental management challenges. The total eradication of some non-native species that have already become established in Antarctic was also thought to be technically difficult, but in contrast eradication of some other established non-native species was thought likely to be simple and inexpensive. One overarching concern was the availability of sufficient financial resources to allow a national operator to be able to 'afford to care'. However, it was considered that the ACS could be used to demonstrate what could be done, at all levels of investment, to address many of the challenges.

Summary

It was remarked that the feasibility of actions depends on budgets; fully implementing the Environmental Protocol was proving difficult for some Parties. However, an ACS could demonstrate what could be done at all levels of investment. There were also challenges with new technology that worked elsewhere in the world that did not always work effectively in Antarctica. Frontier scientific research creates new conservation challenges and appropriate conservation management tools may not always be available.

Short-term conservation challenges – what is feasible but financially unreachable?

Cleaning of ship hulls, the complete removal of some existing stations and the complete implementation of best practice regarding non-native species were considered feasible but financially unreachable by some workshop participants. Cleaning only 'high risk' sections of hulls, i.e. around inlets and sea chests where sea-ice abrasion would not normally occur, was suggested as a possible cheaper alternative and a likely improvement on no action. It was highlighted that the environmental impact assessment process was important, particularly as clean-up activities to remove a station, as well as being expensive, may sometimes cause more environmental damage than if components of the infrastructure were left in place. Furthermore, it was sometimes financially unfeasible to take all waste out of Antarctica. Fully complying with the Environmental Protocol was highlighted as expensive (and sometime prohibitively so) for some Parties. It was suggested by one participant that industries operating in Antarctica (e.g. fishing, tourism and biological prospecting companies) could help finance the environmental monitoring of their work. Often there was not a straight correlation between budgets and feasibility, but environmental impact needs to be included and all three factors need to be considered as part of the EIA process. Also more subjective value judgements can come into play and it is difficult to factor these subtleties into existing regulatory systems.

It was suggested by some that widespread prevention of microbial contamination of pristine sites to allow 'clean' sites for future molecular studies is feasible but financially unreachable, particularly if other areas of science are to proceed effectively. Some participants highlighted that the existing protected area system and codes of conduct (e.g. as agreed for high altitude geothermal areas on Mt Erebus) could be usefully implemented, but it was acknowledged that to date these have been applied over a relatively small spatial scale.

Having the capacity to deal fully with a major oil spill at sea or within sea ice was considered financially unreachable and/or logistically impossible given the remoteness of the area, and instead COMNAP had focussed on encouraging application of preventative measures.

Summary

Full compliance with the Environmental Protocol is expensive and likely unachievable for some Parties. The legacy of past activities and construction techniques makes some clean-up activities unfeasible.

Bases, ships, aircraft, people, cargo – have we covered it all?

Participants suggested that some of the environmental standards set by the Environmental Protocol are unclear; Parties may interpret their obligations differently and may be influenced by their own national standards and practices. It was brought to the workshop's attention that some pollution and waste management guidelines are in place already and COMNAP intends to review existing recommended waste management procedures in the near future. While COMNAP can produce guidelines and provide advice, implementation of best practice and conforming to standards is up to each NAP. In general, environmental standards have improved in the past 30 years, but improvements must be on-going.

Ships

Shipping managers should be dealing already with issues such as rats aboard ships and be adhering to the regulations within the International Convention for the Prevention of Pollution from Ships (MARPOL), including emissions regulations. Energy management guidelines are already in place for ship emissions and most NAPs routinely monitor fuel use on ships. The International Maritime Organisation (IMO) has also set incineration standards.

Bases

Atmospherically clean bases are of scientific value as they can detect changes in the atmosphere, e.g. at Neumeyer, SF6 (sulphur hexafluoride) was detected in the atmosphere at a higher concentration than expected because of the clean atmospheric conditions around the station. With regard to incineration, it was noted that Annex III to the Environmental Protocol states that '*Any emission standards and equipment guidelines which may be recommended by, inter alia, the Committee and the Scientific Committee on Antarctic Research shall be taken into account*'. However, participants were unclear as to how this was being implemented or if any specific standards had been set. The cost and necessity for additional fuel for high temperature incineration was also highlighted.

Aircraft

Occasional aircraft incidents have resulted in local pollution. Guidelines exist to reduce the impact of aircraft overflights and landings near concentrations of wildlife, but further education of pilots may be needed. With regard to non-native species and soil transfer by aircraft, it was clear that it was not feasible to clean an aircraft undercarriage before and after takeoff.

People

As noted earlier at several points, better education of station personnel and other visitors can improve compliance with the Environmental Protocol.

Cargo and fuel

COMNAP has already prepared guidelines on cleaning cargo to reduce non-native species introductions. COMNAP also encourages operators to have oil spill contingency plans in place for both bases and ships.

Other

There was some discussion over a possible distinction between ice-free areas and permanently ice-covered areas for some environmental regulations, including disposal of human waste.

Summary

Some Antarctic activities are highly regulated, e.g. aircraft and ships operation (e.g. through the ICAO, IMO-MARPOL and the Polar Code). Other areas are regulated much less and operators may follow national guidelines and standards. Good education on environmental and conservation issues is a clear requirement for people working in Antarctica.

What are the short-term priorities and how can these be tiered for affordability for different nations?

This question was rephrased by some participants as what actions will provide the greatest conservation benefit, yet required the minimum quantity of resources to implement. Some participants said it would be useful to know which challenges presented the greatest risk to Antarctica. It was noted that the COMNAP five-year plan has an environment topic, the key issues of which are reducing risk of introduction of non-native species (including the inter-regional transfer of species), waste management, oil spill response and repair and remediation.

Intra-regional transfer of species

The risk of transfer of indigenous Antarctic species between regions within Antarctica was discussed. Understanding scales of spatial change in biodiversity and biogeography is essential for informed conservation management. The identification of 15 Antarctic Conservation Biogeographic Regions (ACBRs) has allowed a better understanding of the

distinct biodiversity found between regions. It was noted that the transfer of species between these ACBRs may be just as important as preventing transfer of species into Antarctica from other areas of the Earth. Reducing propagule transfer was identified as the main issue, but it was recognised that enhanced biosecurity might be difficult and costly for programmes operating over more than one ACBR. A potentially costly solution would be the dedication of field equipment for use within specific ACBRs. However, simple measures, such as brushing down clothing and equipment prior to inter-regional travel and considering direction of travel, types of equipment and volume of cargo, etc., could be cost-effective and reduce risk of propagule transfer between ice-free areas. Inter-regional species-transfer risks should be considered within the EIA process. It was also noted that most of the measures already in place for mitigating transfer of propagules into Antarctica could be used to mitigate inter-regional transfer.

Waste management

The COMNAP Antarctic Environmental Officers Network (AEON) prepared waste guidelines in 2006 and COMNAP intends to review these guidelines in the near future. However, no specific guidelines on waste water quality exist so a waste water workshop is being organised by COMNAP for August 2014. Technologies to convert waste to energy might be usefully implemented, but some form of cost-benefit analysis would be required.

Repair and remediation

The CEP has adopted an '*Antarctic Clean-up Manual*' to which COMNAP member countries are encouraged to contribute their expertise. It was pointed out that clean-up of contaminated ground could be a long process lasting many years or decades and that a strategy on repair and remediation, developed by CEP with advice from SCAR and COMNAP, might prove useful.

Fuel handling

It was agreed generally that Antarctic operators were not in a position to respond effectively to a major marine oil spill. Should an oil-spill occur, it was suggested that having an inventory of clean-up infrastructure at gate-way ports might be useful. In addition, technological developments may make fuel-handing safer, e.g. automated bulk fuel spill alarms being developed under a COMNAP project being led by Ukraine. COMNAP does not have a contingency plan for a major marine oil spill. It was suggested that operators may find the development of Antarctic regional spill plans useful (e.g. within Antarctic Specially Managed Areas (ASMAs) or on a broader spatial scale). Further liaisons with IAATO and the fisheries industry may help with responding to such events, particularly as there may be confusion over who is liable for any clean-up activity.

Environmental education

Every NAP supports training and education of Antarctic personnel and carries out some level of pre-deployment training. Participants again recognised the value of environmental education of personnel visiting Antarctica and the value of getting 'personal buy-in' on conservation matters from individuals. The workshop participants agreed generally that personal commitment was often more effective than a compliance driven approach. It was also recognised that there should be adequate provision of equipment to allow activities to be undertaken according to established 'best practice'. COMNAP facilitates the sharing of educational and training material between all NAPs.

Some potential actions were suggested:

- Encourage better uptake of information produced by COMNAP. Most NAPs have a conference for new staff containing information on protocols and guidelines for working in Antarctica. However, some operators are not providing this training to a degree which is effective on the ground, as evidenced by sub-optimal environmental practice in some Antarctic locations.
- Better understanding of cultural differences between programmes may facilitate environmental improvement. Some programmes may have a rapid turnover of personnel, so education and the maintenance of an environmentally-aware culture on station may be a substantial challenge. Furthermore, environmental standards considered appropriate in some home nations, may not be considered to be adequately stringent for Antarctic operations.
- COMNAP could prepare an Information Paper for the ATCM about the environmental education issues faced by different Antarctic operator components (military, governmental, science, etc.) and communications between them.
- Thought could be put into finding creative ways to educate programme personnel. IAATO uses online material for guides going to Antarctica. Tourists on cruise ships know that they may be under scrutiny by guides when ashore. NAPs could delegate one person to champion environmental issues at each station and, if necessary, enforce NAP management decisions at a local level.
- COMNAP could initiate a mentoring scheme where more experienced operators assist newer NAPs.

Climate change

Climate change can have profound impacts upon operators, for example, changes in sea-ice extent can make station resupply difficult. It was considered important to have COMNAP convey the message about climate change, and that climate change is impacting the way NAPs undertake science and logistics.

Monitoring

It was suggested that long-term and standard approaches to monitoring could be developed by COMNAP. Monitoring data should be made publically available and, if appropriate, published in appropriate journals (e.g. similar to www.biodiversity.aq, which provides a platform for biodiversity data publication).

Using risk assessments, how do we respond to the science (an 'aliens' example)

Aleks Terauds introduced the topic with a brief presentation. He described recent work on defining the 15 Antarctic Conservation Biogeographic Regions (ACBRs) that together encompassed the ice-free ground of Antarctica. Biodiversity within each ACBR was considered largely distinct from other ACBRs, and the risks to local ecosystems of moving Antarctic species between these areas was highlighted. It was suggested that managing movement of species between biogeographic regions might be an area that COMNAP may wish to undertake further work, and build upon the successes of the '*COMNAP/SCAR Non-native Species Voluntary Checklist for Supply Chain Managers*'. SCAR could also encourage the scientific community to undertake further research on the topic of inter-regional transfer of indigenous Antarctic species. The workshop was reminded that the IPY 'Aliens in Antarctica' project got substantial buy-in from the NAPs because they were involved from the start of the research.

Other conservation research that could benefit from early NAP involvement might include ANTOS (Antarctic Near-shore and Terrestrial Observing System), work on wildlife disturbance distances and the extension of the 'Aliens in Antarctica' work to include invertebrates. It was noted, however, that it is more difficult to get buy-in from NAPs on the topic of marine non-native species, perhaps because it was not considered a high risk (e.g. the Census of Antarctic Marine Life (CAML) did not report any non-native marine species). Nevertheless, marine non-native species are a major issue in all oceans elsewhere and it was considered likely that this risk may extend to Antarctica too.

Some participants noted that the new SCAR biology programme, AntEco has a strong focus on science to policy and that interaction with Antarctic operators and policy makers was of great importance. Participants suggested that NAPs should aim to be involved more closely with the Southern Ocean Observing System (SOOS) and the emerging Antarctic Near-shore and Terrestrial Observing System (ANTOS).

Summary

Past experience has shown that the close connection and involvement of NAPs often increases the success of conservation projects and initiatives. The issue of inter-regional

transfer of Antarctic species was of great concern and should be considered further by SCAR and COMNAP. It was suggested that this issue could be discussed further at the joint SCAR–COMNAP EXCOM meetings, to see how both parties can help progress this work.

Practical strategies for the short term conservation challenges: affordability and effectiveness

Discussions returned to the issue of balancing conservation aims with the resources available to NAPs. There was general agreement that conservation should not only be viewed in terms of affordability, but rather in terms of how resources can be allocated in the most effective way. It was again stressed that COMNAP cannot instruct NAPs, but rather can provide advice and facilitate sharing of information. One suggestion was that NAPs should be given incentives to enhance environmental performance, perhaps through existing systems (e.g. ISO 14001) or through some sort of recognition from COMNAP (e.g. an award for significant environmental improvement).

Summary of short-term conservation challenges

A summary of discussions on day 1 of the workshop on how NAPs can address short-term conservation challenges is contained in Appendix 5.

NOTES FROM DISCUSSIONS ON DAY 2

Longer-term conservation challenges

John Shears welcomed the workshop participants and recapped briefly on the work undertaken on day 1 on short-term conservation challenges.

Kevin Hughes set the scene for the day's work by presenting the potential conservation challenges identified by Chown et al. (2012) that may be relevant over the longer-term (see Appendix 1)

Longer-term conservation challenges - what might have been missed?

Aleks Terauds facilitated discussion on what other longer-term challenges might have been missed. Participants asked what 'conservation' actually means in terms of management. Is the intention to keep Antarctica in its present state, or should certain changes be permitted? It was suggested that the first step would be to understand what is currently present. Then it would be up to the stakeholders to define what change is acceptable (or not). Several participants agreed that it was important, from the outset, to define exactly the scope of the Antarctic Conservation Strategy (geological values, historical values, or only biology-based values, etc.).

Infrastructure for commercial applications

Antarctica's geographic position makes it potentially useful for some commercial activities. For example, Antarctica could be of use as the site of a satellite Earth station, where commercial satellites on a polar orbit could download data. It was suggested that existing regulatory systems have little experience of commercial activities of this nature. To differing degrees, governance of the fishing and tourism industries has already been incorporated into the Treaty System, but an expansion of commercial activities may require additional work by the ATCM. These sorts of activities have already been initiated by some Parties, which may present a short term, rather than longer-term, challenge. There is a risk that in coming years, the balance of activities in Antarctica could shift from science towards commercial activities. One participant reminded the workshop of precedents from other global locations where conservation values were compromised once significant economic incentives had been identified.

New Parties to the Antarctic Treaty

The number of new Parties to the Antarctic Treaty is likely to increase in the coming years, which could increase the amount of infrastructure in Antarctica. This could put further pressure on the small areas of coastal ice-free ground which are significant wildlife habitats and where most stations are already located. It was suggested that during early discussions, new members will be informed fully about the Environmental Protocol and recommended environmental practices in Antarctica. New Parties might establish bases in more remote parts of Antarctica and help provide the opportunity for scientific research in relatively unknown regions.

It was strongly agreed that better capacity building and succession planning was needed within the Treaty system, as experienced personnel were being lost through retirement. It was also emphasised that new people bring fresh ideas and a new perspective. The issue of support activities undertaken by military organisations in Antarctica was raised as a possible issue as, in some cases, the level of awareness of environmental issues may not be as high as would be appropriate. If the Treaty got into difficulty, military activity in the region could increase. This was considered a matter for the ATCM.

Summary

The use of Antarctica for commercial activities presents a new challenge to be considered under the conservation strategy. New Parties attaining consultative status to the Antarctic Treaty may present a challenge as well as an opportunity, as while they may not have

extensive experience of how the environmental standards expected in Antarctica are to be interpreted and implemented in practice, they may provide novel perspectives and solutions to existing challenges. The Antarctic Treaty and its importance can be maintained through greater co-operation in science and logistics between Parties; SCAR and COMNAP are well placed to facilitate such activities.

Longer term conservation challenges – what can be addressed, what is technically not feasible or beyond the scope and what is feasible but financially unreachable?

Discussions, led by John Shears, commenced on which longer-term challenges national operators could start addressing now.

Geo-engineering

In the context of this discussion, geo-engineering was considered to include any large-scale engineering activity that would reduced global climate change effects. Geo-engineering was not considered an issue that NAPs could address. Geo-engineering solutions to global climate change effects were thought to be controversial. It was suggested that releasing fertilizers at sea (iron enrichment) at a commercial scale might be contrary to existing international agreements. Furthermore, it was considered important that scientists undertaking research into geo-engineering solutions should be viewed differently by policy makers to those wanting to undertake large-scale geo-engineering activities, possibly as a commercial venture. Should undertaking geo-engineering activities be approved in the Antarctic marine environment, participants agreed that adequate monitoring of local and regional marine and terrestrial systems would be needed. A full environmental impact assessment would be required before permission was granted for geo-engineering activities there. One participant expressed unease over Antarctica being used as a test site for these technologies.

Bioprospecting

Overall, there was a wide and diverse range of opinions on bioprospecting and whether the issue does constitute a conservation challenge. In general, bioprospecting was not considered an issue that NAPs could address. Some participants saw bioprospecting as a current conservation challenge, as it is undertaken already by many Parties. As, in general, only small amounts of biological material are taken for this work, the main issue was considered by most to be other than environmental (i.e. the non-disclosure of information due to commercial sensitivities). As exchange of information is a fundamental component of the Antarctic Treaty System, the development of commercial confidentiality was considered contrary to the Treaty's principles. One challenge in reporting is that the development of a commercial project may occur many years after the initial Antarctic work and by different scientists if samples deposited in culture collections are used. Bioprospecting also presents difficulties with regard to benefit sharing. One participant

recognised that bioprospecting was an issue for the Treaty Parties, but was not convinced it was a scientific issue or of direct relevance to the Antarctic Conservation Strategy. Another participant pointed out that some national science funding bodies may include bioprospecting in scientific programme proposals. It was agreed that bioprospecting would be a conservation challenge if there was large-scale extraction of a living resource. If undertaken in the marine environment, harvesting of some biological groups would come under the jurisdiction of CCAMLR; however, it was less clear what would happen if the resource was harvested from the terrestrial environment, where amounts of available biological material might be small. The environmental impact assessment process was considered by some participants to afford appropriate safe-guards.

Hydrocarbon exploration and mineral extraction

To a large degree, hydrocarbon exploration and mineral extraction were not considered issues that NAPs could address. Mineral and hydrocarbon extraction are prohibited under the Environmental Protocol. In theory, non-signatory nations could undertake these activities. To date, the economics of undertaking mineral resource activities are thought not to have been favourable, but diplomacy may play a strong role in preventing nations mining or drilling should the economic situation change. A strong Treaty system is extremely important. Parties to the Environmental Protocol are committed to an indefinite prohibition on mineral resource activities; however, should the prohibition on mineral resource activities be lifted, then there may be significant local conservation impacts near extraction sites, with wider impacts likely should there be, for example, a large scale hydrocarbon spill. Extraction of certain rare earth minerals in Antarctica could become economically viable in the near future. It was pointed out that the distinction between legitimate scientific geological research and commercially focused prospecting is not always clear.

Permanent settlement

Permanent settlement was not considered an issue that NAPs could address. Participants were reminded that tourism activities are already closely integrated with NAP logistics and infrastructure in some regions and the operation of joint logistical infrastructure could make financial sense. It was therefore considered possible that land-based tourism infrastructure could become formalised in the coming years, which could lead eventually to permanent settlement of Antarctic by long-term inhabitants. The Antarctic Treaty does not expressly prohibit permanent settlement, but all activities should be carried out under the Environmental Protocol. Long-term Antarctic inhabitants may present their own environmental challenges as they may regard Antarctica as their 'home' and possibly show varying degrees of receptiveness to existing environmental regulations and guidelines.

Collapse of the Antarctic Treaty System

Collapse of the Antarctic Treaty System was not considered an issue that NAPs could address. One participant commented that conservation challenges posed by geo-engineering, hydrocarbon exploitation, mineral resource extraction and bioprospecting were all closely linked with the process of decision-making, for which a strong Antarctic

Treaty System was required. If the Treaty system is working sub-optimally at a local scale economic drivers may override the Treaty system's capacity to address larger challenges (e.g. Marine Protected Areas). It was emphasised that the Treaty Parties need research and evidence to support their decision-making and NAPs can support a strong Antarctic Treaty System by implementing it provisions and being proactive in addressing conservation challenges where feasible.

Black carbon

Workshop participants were reminded that the quantity of black carbon released to the atmosphere depends on the amount and type of fuel used in engines (with tourist, fishing and NAP ships being responsible for the bulk of these emissions in the Antarctic region, and stations contributing only a minor amount in comparison). Feasible technical solutions to limiting emissions are available (e.g. filters), but only with additional costs. However, the replacement of older engines with newer less-polluting engines means black carbon emission levels are likely to decline. In many respects black carbon is a global issue, although research has shown that local sources could be important; more research on this is needed, including on the risks of impacts upon Antarctic biodiversity.

Summary

Participants agreed generally that little could be done locally to influence climate change impacts in the Antarctic marine and terrestrial environments, but some suggested that sustainable marine resource use presented a separate longer-term conservation challenge. It was considered essential that the Antarctic Treaty System was capable of dealing with current and future challenges, and consequently the Treaty system needs to be enhanced and strengthened. A range of views were expressed on whether bioprospecting presented a conservation challenge or not. Doubt was expressed over whether mineral resource activities could be undertaken without unacceptable levels of environmental impact, but also that the distinction between scientific geological research and prospecting was not always clear. Permanent human settlement of Antarctica could create additional environmental pressures, particularly if infrastructure and footprint increased. It was pointed out that NAPs need to be fully-engaged to help prevent and manage multiple stressors impacting on sensitive areas.

Summary of longer-term conservation challenges

A summary of discussions on day 2 of the workshop on how NAPs can address longer-term conservation challenges is contained in Appendix 6.

Discussions with Prof. Steven Chown (via Skype)

Prof. Steven Chown (leader of the Antarctic Conservation Strategy initiative and Chief-

Officer of the SCAR Standing Committee on the Antarctic Treaty System) joined the workshop by Skype to answer questions regarding the Antarctic Conservation Strategy. He emphasised that the NAPs' thoughts on the feasibility of implementing solutions to the short and longer-term challenges were essential to the development of the Antarctic Conservation Strategy. He encouraged the workshop participants to examine the possible solutions available and evaluate how achievable they are.

Clarification was given that the scope of the Antarctic Conservation Strategy was conservation of Antarctic biodiversity. Advice on historical conservation and cultural heritage was not requested from workshop participants.

Steven Chown made it clear that the primary author of the conservation strategy would be SCAR with input from relevant experts and organisations. He anticipated that there would be broad discussion of a draft of the Antarctic Conservation Strategy to be presented at the Auckland workshop in August 2014, in association with the SCAR Open Science Conference. The outputs of this COMNAP/SCAR conservation workshop will be used to inform implementation of Antarctic Conservation Strategy. A joint Working Paper for the ATCM and a paper for the SCAR-COMNAP symposium at Auckland were envisaged to facilitate discussion and input from a wide range of stakeholders. Any relevant questions resulting from the SCAR Science Horizon Scan exercise would also be included. The strategy document would then be made available through the Antarctic Environments Portal being developed in partnership by SCAR, New Zealand, Australia, Belgium and Norway as a live draft document.

The anticipated audience for the Antarctic Conservation Strategy would be NAPs (including new NAPs, who can look at successful strategies and existing standard operating procedures), the CEP, ATCM, conservation best-practice experts and the broader public.

What's on the horizon? The SCAR Science Horizon Scan

Prof. Mahlon (Chuck) Kennicutt presented progress with the SCAR Science Horizon Scan. The 1st SCAR Antarctic and Southern Ocean Science Horizon Scan will assemble around 70 of the world's leading Antarctic scientists, policy makers, leaders, and visionaries to identify the most important scientific questions that will or should be addressed by research in and from the southern Polar Regions over the next two decades (for a list of invitees to the retreat in Auckland in 2014 see: http://www.scar.org/horizonscanning/news/9october2013.html). The proven method of "Horizon Scanning" will be applied to develop a community view of the 100 most important scientific questions in Antarctic science. The Scan outcomes will assist in aligning international programmes, projects and resources to effectively facilitate Antarctic science in the coming years. The Scan process of bringing the global Antarctic science and policy community together to plan for the future will also serve as an unprecedented opportunity to enhance existing partnerships, forge new relationships, mentor early career scientists and students, and communicate the importance of Antarctic science to the public and policy/decision makers. SCAR envisions a three-pronged approach to influencing conservation management in Antarctic through the Antarctic Conservation

Strategy, the Antarctic Environments Portal and the SCAR Science Horizon Scan.

Antarctic Environments Portal

Jana Newman presented developments in the Antarctic Environments Portal. The Portal is not an Antarctic Treaty System product, nor is it endorsed by COMNAP, but it is a product of the Antarctic Environmental Portal Partnership between SCAR, New Zealand, Australia, Belgium and Norway. Its goal is to facilitate a closer link between Antarctic scientists and decision makers through the provision of unbiased evidence-based information on the CEP's priority issues. It was explained that the rate of change in the environment and science is often greater than availability of policy-ready information. SCAR's dual mission is to facilitate excellence in science, but also to provide sound scientific advice to policy makers. Scientific information will be provided to policy makers through the Portal to assist them in making informed governance decisions for Antarctica. Therefore, the primary audience for the Portal was seen to be the CEP, but a secondary audience could be NAPs who could become more aware of existing and emerging environmental issues, and use the information to support the planning and conduct of activities. It was highlighted that the information on the Portal would be unbiased, based on peer-reviewed scientific research and in a format to be easily used by policy-makers.

On which aspects of the Antarctic Conservation Strategy can we take action?

Aleks Terauds went through the draft Antarctic Conservation Strategy document (Appendix 4) and facilitated discussions to identify issues that could be readily addressed by COMNAP. These discussions are summarised in Appendices 5 and 6.

Summing up and close of workshop

John Shears summarised discussions during the workshop and proposed a timetable for delivery of the workshop products.

The workshop was closed by the Chair of the COMNAP Executive Committee, Prof. Dr. Heinz Miller.

Appendix 1: Antarctic conservation challenges

As identified in Chown, S. L., Lee, J. E., Hughes, K. A., Barnes, J., Barrett, P. J., Bergstrom, D. M., Convey, P., Cowan, D. A., Crosbie, K., Dyer, G., Frenot, Y., Grant, S. M., Herr, D., Kennicutt, M. C., Lamers, M., Murray, A., Possingham, H. P., Reid, K., Riddle, M. J., Ryan, P. G., Sanson, L., Shaw, J. D., Sparrow, M. D., Summerhayes, C., Terauds, A., Wall, D. H. (2012). Challenges to the future conservation of the Antarctic. *Science* 337: 158-159.

Available at: http://www.sciencemag.org/content/337/6091/158.full?sid=bbddb6b5-babb-4e09-96f3-85f49440a8ec

The six short-term challenges (< 10 years) were:

- Climate change, marine ecosystem effects and marine resource use
- Ocean acidification
- Invasive alien species
- Habitat alteration and activity impacts
- Pollution
- Regulatory failure

The eight longer-term challenges (c. 10 - 50 years) were:

- Geo-engineering
- Climate change impacts on marine ecosystems
- Climate change impacts on terrestrial ecosystems
- Hydrocarbon exploration
- Mineral extraction
- Bioprospecting
- Permanent human settlement
- Collapse of the Antarctic Treaty System

Appendix 2: Workshop agenda

Day 1 Tuesday 24th September (commencing 09h00)

- Welcome to the SCAR/COMNAP Conservation Challenges Workshop [Professor Alan Rodger (Acting Director BAS)]
- Setting the scene - The Conservation Challenges over the immediate term [Kevin Hughes]
- What might have been missed? – discussion [Facilitator - Aleks Terauds]
- Break [10h30 – 11h00]
- The short term – what can be addressed? [Facilitator – John Shears]
- The short term – what is technically not feasible or beyond the scope? [Facilitator – John Shears]
- The short term – what is feasible but financially unreachable? [Facilitator – John Shears]
- Bases, ships, aircraft, people, cargo – have we covered it all? [Facilitator - John Shears]
- Lunch [13h00 – 14h00; Room 307]
- What are the short term priorities and how can these be tiered for affordability for different nations? [Facilitator - Kevin Hughes]
- Using risk assessments how do we respond to the science (an aliens example) [Aleks Terauds]
- Break [15h30 – 16h00]
- Practicable strategies for the short term [Facilitator - John Shears]

  End of day 1 workshop [17h00]

19h00-22h30: WORKSHOP DINNER (SPONSORED BY COMNAP), VARSITY HOTEL & SPA, 24 THOMPSONS LANE, CAMBRIDGE, CB5 8AQ

Day 2 Wednesday 25th September (commencing 09h00)

- Recapping the short-term – any additional insights? [Facilitator - John Shears]
- Setting the scene - The Conservation Challenges over the longer term [Kevin Hughes]
- What might have been missed? – discussion [Facilitator - Aleks Terauds]
- Break [10h30 – 11h00]
- The longer term – what can be addressed? [Facilitator - John Shears]

- The longer term – what is technically not feasible or beyond the scope? [Facilitator - John Shears]
- The longer term – what is feasible but financially unreachable? [Facilitator - John Shears]
- What's on the horizon? [Chuck Kennicutt]
- Lunch [13h00 – 14h00; Room 307]
- On which aspects of the Antarctic Conservation Strategy can we take action? [Facilitator - Aleks Terauds]
- Break [15h30 – 16h00]
- Summing up – a practicable strategy in all its elements [John Shears]
- Close (17h00) [Heinz Miller]

Appendix 3: List of attendees

Jeronimo Lopez-Martinez (SCAR/Spain)

Heinz Miller (COMNAP/Germany)

Michelle Rogan-Finnemore (COMNAP)

John Shears (COMNAP/UK)

Brian Stone (COMNAP/USA)

Hyoung Chul Shin (COMNAP/Republic of Korea)

John Hall (COMNAP/UK)

Birgit Njaastad (Norway)

Sandra Potter (Australia)

Kevin Hughes (SCAR/UK)

Jana Newman (New Zealand)

Mahlon Kennicutt (SCAR/USA)

Mike Sparrow (SCAR)

Renuka Badhe (SCAR - rapporteur)

Kazuyuki Shiraishi (Japan)

Peter Convey (SCAR/UK) (from Tuesday 12:00)

Aleks Terauds (SCAR/Australia)

Polly Penhale (USA)

Appendix 4: Antarctic Conservation Strategy outline

As found in Appendix 1 of Antarctic Conservation for the 21st Century: Background, progress and future direction. Antarctic Treaty Consultative Meeting XXXV, IP35

Content/Topics

1. Introduction
    a. Area of interest.
    b. Conservation in the Antarctic – The Protocol on Environmental Protection and its Annexes.
    c. Biodiversity values to be conserved and managed.
    d. Previous conservation strategies.
    e. Relationships with other international agreements.

2. Scoping
    a. Current conservation threats and responses
    b. Future conservation threats

3. Climate change and changes to human activity patterns
    a. Climate change, its spatial variation and likely course of development.
    b. Marine consequences.
    c. Terrestrial consequences.
    d. Human activity change and interactions with climate change impacts.

4. Antarctic Specially Protected and Managed Areas
    a. The current protected area system.
    b. Modern approaches to area selection in marine and terrestrial environments.
    c. Antarctic Conservation Biogeographic Regions and representation of terrestrial biodiversity.
    d. ACBRs not represented by ASPAs.
    e. Finer scale biodiversity variation and genetic isolation.
    f. Missing areas (including those such as geothermal sites) that require designation.
    g. Missing data.
    h. Marine protected areas and selection.

i. Major areas to be conserved.

j. No human activity zones (inviolate areas).

k. Dynamic management, climate change and human activity in terrestrial systems.

l. Dynamic management, climate change and fishing in marine systems.

m. Conservation of associated and dependent sub-Antarctic systems.

5. Non-indigenous species

   a. The nature of the problem.

   b. Antarctic activities and climate change.

   c. Terrestrial risk map for current and future extra-regional introductions.

   d. Closing vector pathways for extra-regional introductions.

   e. Closing vector pathways for intra-regional introductions – using the ACBRs and finer scale genetic data.

   f. Field protocols for preventing intra-regional movements.

   g. Extra-regional marine introductions.

   h. Identifying ports and species of most concern.

   i. Closing vector pathways for extra-regional marine introductions.

   j. Intra-regional marine introductions – a risk analysis map.

   k. Closing pathways for intra-regional introductions.

   l. Pathway risk assessments.

   m. Missing data for vector pathway assessment.

   n. Risk assessments for taxa – an automated first approach.

   o. Microbial introductions – a unique challenge.

   p. Surveillance protocols for terrestrial taxa.

   q. Surveillance protocols for marine taxa.

   r. Surveillance protocols for freshwater and microbial taxa.

   s. Separating colonists by origin.

   t. Eradication decision-making for multiple taxa and environments.

   u. Reporting and decision support.

   v. Associated and dependent systems as sources and areas of concern.

   w. Research requirements.

6. Indigenous species and population management
    a. Species of interest.
    b. Species by species assessment of threats, cost of action, surveillance potential.
    c. Data deficiency: spatial and temporal.
    d. Recommendations.
    e. Associated and dependent systems and marine foraging.
    f. Ecosystem management and monitoring.
    g. CCAMLR, ACAP and other agreements.

7. Human disturbance to wildlife
    a. Species of concern.
    b. Information on impacts.
    c. Approach distance information for single intrusions.
    d. Cumulative impacts.
    e. Spatial distribution of main disturbance areas.
    f. Alternative sites for science and commercial tourism.
    g. Protocols for recognizing disturbance.
    h. Protocols for reducing disturbance.
    i. Costs of implementation.

8. Pollution and waste management
    a. Point source threats, cost, solutions.
    b. Cumulative source threats.
    c. Remedial solutions and cost (environmental and financial).
    d. Plastic pollution in marine systems.
    e. Analysis of spread and threat in marine systems.

9. Habitat degradation by human activity
    a. Cumulative impacts of on-foot visits, evidence.
    b. Vehicle disturbance.
    c. Surveillance for cumulative impacts.
    d. Disturbance at infrastructural facilities.

e. Research requirements and outcomes thereof.

10. Marine noise
    a. Evidence for marine noise impacts elsewhere.
    b. Evidence from the Antarctic.
    c. Recommendations for mitigation.
    d. Research requirements.

11. Interacting impacts
    a. A scale of interactions – antagonistic, neutral, additive, synergistic
    b. Quantitative risk analysis.
    c. Likelihood based on spatial assessment.
    d. Cumulative impacts, cost, solutions.
    e. Research requirements.

12. Integrated area management plans
    a. Standards for value description.
    b. Contextual management – human activity.
    c. Connectivity, change and invasion.
    d. Wildlife disturbance.
    e. Non-indigenous species management.
    f. Cumulative impacts.
    g. Climate change responses.
    h. Alternative sites.
    i. Migration and evolutionary potential.
    j. Species management and movement.
    k. No human activity zones.

13. Permanent settlement and non-renewable resource-related research
    a. Permanent settlement and regulatory requirements.
    b. Measures for non-renewables research at sea.
    c. Measures for non-renewables research on land.

14. Decision support, state of the environment and information delivery
    a. Real-time information for decision support through a web-based portal.
    b. Monitoring and surveillance in key areas: learning from approaches elsewhere.
    c. Rapid decision-making in the event of a conservation crisis.
    d. Dynamic conservation management.

Appendix 5: Summary of participant responses relating to the short-term conservation challenges

Climate change and marine ecosystem effects
Can climate change and its impact on marine biodiversity be addressed locally?

- Cannot be addressed locally, but local research, including collection of baseline data and monitoring programmes can assist in scientific research.
- There are opportunities for the Antarctic community to lead by example by minimising fossil fuel use and therefore CO_2 emissions.

Marine resource use
Can marine resource use and its impact on biodiversity be addressed locally?

- CCAMLR has regulations in place in regards to living marine resources and their conservation and rational use.

Ocean Acidification
Can ocean acidification and its impact on biodiversity be addressed locally?

- Addressing ocean acidification is beyond the scope of the Antarctic community and so cannot be addressed locally, but local research, including collection of baseline data and monitoring programmes can assist in scientific research.
- Sharing research results is globally important.

Invasive alien species
Can the invasive alien species concern be addressed locally?

- Climate change plays a role in the introduction of non-native species into Antarctica which then may become invasive. There is little the Antarctic community can do about climate change. Practical measures can be implemented by NAPs and by others locally to reduce risk of introduction through NAP operations, and to mitigate and to eliminate those species already introduced to the Antarctic Treaty area. There is clear evidence already that this challenge can be addressed locally.
- A uniform approach for all areas may not be the best way to address the challenge. Antarctic environments vary and there are obvious differences between the marine and terrestrial environments and ice-free versus ice-covered ground for example.
- Established terrestrial invasions of plants could be removed.
- Procedures, including general biosecurity screening, are important and can be carried out upon departure for Antarctica and locally in Antarctica. These might include implementation of practical biosecurity options for movement between Antarctic Conservation Biogeographic Regions (ACBRs).

- There are local opportunities for monitoring and research.
- There already exist guidelines which, if implemented and followed, reduce risk of introduction of non-native species into Antarctica.
- Education and awareness of the issue and risks is a key to addressing this conservation challenge.

What is technically not feasible or beyond the scope of the Antarctic community in relation to invasive alien species?

- In regard to unintentional introduction of non-native species by human activity in the Antarctic Treaty region it was feasible to reduce risk of introductions to the terrestrial environment, but that total elimination of risk was impossible, particularly with a warming Antarctic region.

What is feasible but financially unachievable in regards to the invasive species challenge?

- In the case of marine introductions, it is financially challenging to undertake total vessel hull cleaning for each journey to the Antarctic region.

Habitat alteration and activity impacts

Can habitat alteration and activity impacts be addressed locally?

- Supporting science activity in the Antarctic means there will be some sort of resulting impact to Antarctic biodiversity. There is also impact to biodiversity related to fishing activities. There already exist a range of rules and guidelines including those found in the Environmental Protocol and CCAMLR to manage and minimise such impact from human activity.
- Implementation of such guidelines and rules requires a high standard with common understanding which recognises cultural differences and varying national practices.
- Education and sharing of best practices is important in order to understand what impact certain activities have and manage those impacts.
- There are certain 'hot spots of activity' which would improve from focussed attention; however, the greater majority of Antarctica remains unaltered from direct human activity there.

Is habitat protection from alteration and impact technically not feasible or beyond the scope of the Antarctic community?

- Full compliance with the Environmental Protocol will likely mitigate most impacts on habitat. However, the system struggles when dealing with cumulative impacts and their assessment.

- There is a cost associated with protection and with applying technical solutions to reducing impacts and so a scale of expense needs to be considered.
- What is technically not feasible is for the Antarctic community to restore the Antarctic Treaty area to total "pristine" condition. This is because many of the impacts to Antarctic biodiversity are not from a local source but are a result of global activities.

In regards to protection from habitat alteration and impacts, what might be feasible but is financially unreachable?

- Total clean-up of abandoned sites (legacy sites), including stations.
- Total elimination of microbial biodiversity not native to the area.

Pollution from local sources

Can local pollution be addressed locally?

- Some local pollution issues can be addressed through implementing the Environmental Protocol. Sharing of best practice can assist NAPs to address reduction of pollution.
- Improving (i) implementation practices and (ii) varying implementation standards can be done locally.

Is local pollution technically not feasible or beyond the scope of the Antarctic community to address?

- Some "pollution" such as emissions from operators in support of science is currently beyond the scope of the Antarctic community to eliminate completely. This is especially true in regards to winter-over stations.

What local pollution may be feasible to prevent/eliminate but financially unattainable?

- Reduction of emissions from operations and logistics in support of science to zero.

Pollution from global sources

Can global pollution be addressed locally?

- Conservation challenges related to global pollution reaching Antarctica cannot be addressed locally, except that Antarctica provides the ideal platform for research and monitoring of such pollution.
- Education and awareness of global pollution and its sources can be delivered locally and to the global community by the Antarctic community.

- The Antarctic community can play a leadership role by behaving in a manner that reduces pollution in Antarctica.

Is global pollution technically not feasible or beyond the scope of the Antarctic community to address?

- Global pollution challenges are beyond the scope of the Antarctic community to address and are not technically feasible to eliminate in Antarctica. Substantial funding and political will from global sources would be required to address pollution from its source.

Regulatory failure is a conservation concern - can it be addressed locally?

- The Antarctic Treaty System has been successful at agreeing a range of regulations related to conservation of biodiversity. Through their governments, NAPs are the implementers of the regulations. Any failure in creating robust regulations and implementation of same can be addressed locally.
- There are challenges related to non-compliance, in variation in implementation and in ability to easily make amendments to the current regulations.
- Regulations have been made by the community but are still not yet in force.
- There are also regulations agreed on global issues which impact Antarctic conservation. These cannot be created locally but Antarctic Treaty countries can influence decision-making in other forums.

Other conservation challenges that may have been missed?
There were a range of conservation challenges suggested. These were:

- Antarctic Treaty Consultative Parties' budget constraints.
- Implementation of use of new technologies in the Antarctic Treaty area.
- Data management and addressing gaps in data and the ability to support monitoring programmes.
- Agreeing conservation of pristine areas
- Continued international co-operation to strengthen the Antarctic Treaty System.
- Raising global awareness of Antarctica's link/importance to the world.

Appendix 6: Summary of participant responses relating to the longer-term conservation challenges

Geo-engineering activities to address climate change
Can geo-engineering be addressed locally?

There were divergent views as to whether geo-engineering could be addressed locally.

- Antarctica should not be used as a test site for geo-engineering systems and processes.
- A good case could be made to have experimentation in the Antarctic marine environment, and such geo-engineering should not be ruled out.
- If it is global engineering, then, by definition, it cannot be contained within Antarctica, if used.

What is technically not feasible or beyond the scope of the Antarctic community?

- Any geo-engineering activities taking place outside of the Antarctic region but affecting the region.
- Decisions on such activities could be made outside of the Antarctic Treaty System.

What is feasible but financially unreachable?

- There would be high speculative costings related to any geo-engineering project.

Climate change impacts on marine systems
Can climate change and its impact on marine systems be addressed locally?

- No, cannot be addressed locally.
- Addressing climate change is beyond the scope of the Antarctic community and so cannot be addressed locally, but local research, including collection of baseline data, observation and monitoring programmes can be done.
- We can identify sites in Antarctica that are climate-sensitive and avoid multi-stressors in these areas.

What is feasible but financially unreachable?

- There would be high speculative costings.

Climate change impacts on terrestrial systems

Can climate change and its impact on terrestrial systems be addressed locally?

- No, cannot be addressed locally.
- Addressing climate change is beyond the scope of the Antarctic community and so cannot be addressed locally, but local research, including collection of baseline data, observation and monitoring programmes can be done.
- We can identify terrestrial sites in Antarctica that are climate-sensitive and avoid multi-stressors in these areas.
- Local environments in the Antarctic are changing and in response national Antarctic programs are adjusting their plans and science support continuously.

What is feasible but financially unreachable?

- There would be high speculative costings.

Hydrocarbon exploration

Can hydrocarbon exploration be addressed locally?

- The Antarctic Treaty System has already dealt with this situation with a ban on extraction/exploitation already in place. Should that ban be lifted then the situation would change.
- Exploration is different than extraction/exploitation and should be differentiated.
- Investigation on hydrocarbons for scientific purposes is not prohibited but exploration is. The boundary between the two types of activities is blurred.

What is technically not feasible or beyond the scope of the Antarctic community in relation to hydrocarbon exploration?

- Those countries that choose not to join the Antarctic community are not bound by the legal obligations in the Antarctic Treaty System, and so therefore could exploit hydrocarbons.

Mineral Extraction

Can mineral extraction be addressed locally?

- The Antarctic Treaty System has already dealt with this situation with a ban on extraction/exploitation already in place. Should that ban be lifted then the situation would change. This may be especially true of rare earth elements that are scarce elsewhere in the world.

- Investigation on minerals for scientific purposes is not prohibited but exploration is. The boundary between the two types of activities is blurred.

What is technically not feasible or beyond the scope of the Antarctic community in relation to mineral extraction?

- Those countries that choose not to join the Antarctic community are not bound by the legal obligations in the Antarctic Treaty System, and so therefore could exploit minerals.

Bioprospecting

There was considerable debate on whether bioprospecting was a political/legal challenge or a conservation challenge. Some thought the real issue was non-disclosure of information for commercial reasons.

Permanent human settlement

Can permanent human settlement be addressed locally?

- Yes, this can be addressed locally and there are already examples of tourists and national Antarctic programs working together in some areas of the Antarctic.
- Any such settlements should be done in accordance with the rules of the Antarctic Treaty System, including through use of EIA.
- Any such settlements are Government decisions.

Collapse of the Antarctic Treaty System

- It is important to continue to increase international co-operation and promote joint ventures in science and science support.
- Parties who operate in the Antarctic area should be encouraged to join the Antarctic Treaty System.
- Evidence is needed to support decision-making. Such evidence will support a strong Antarctic Treaty System.

Other longer term conservation challenges that may have been missed?

Two additional conservation challenges suggested:

1. Implementation of use of new technologies in the Antarctic Treaty area. New commercial activities, which can only be done within Antarctica, may lead to local impacts: e.g. polar satellite receiving stations (not just resource based activities).
2. Incremental expansion of Antarctic infrastructure. New or existing states may expand into new areas of the Antarctic. Changes in sea and land ice may make some areas more accessible than they are currently. Conservation may be enhanced by new states continuing to join the Antarctic Treaty System.

General comments

- The Antarctic Treaty System has procedures and guidelines in place that address many conservation concerns. Any collapse of the system will likely come from outside of that system.
- Profits drive mineral exploitation. So, as long as it is too expensive to extract mineral resources from Antarctica and as long as the mineral is available elsewhere, it is unlikely companies will want to undertake these activities.