



WP

08

Agenda Item:

2.1.2

Person Responsible:

G Hosie

EXCOM 2015

Tromsø, Norway 27-28 August 2015

SSG Life Sciences Report

Executive Summary

Title: SSG Life Sciences

Authors: Graham Hosie, Marc Shepanek, Yan Ropert-Coudert, Ben Raymond, Andrés Barbosa, Kunio Takahashi, Vonda Cummings, Gary Wilson, Hans-Ulrich Peter

Introduction/ Background: SSG-LS is primarily responsible for four Expert Groups and four Action Groups. SSG-LS shares two AGs with SSG-PS, these being Remote Sensing and Ocean Acidification, although all groups actively seek multi-disciplinary activities with SSG-PS and GS groups. **EG-ABI** and **EG-BAMM** have been working together on a joint analysis of the Retrospective Analysis of Antarctic Tracking database (RAATD). This has produced a very large standardised tracking data set for 14 species of bird and marine mammals which can be used for preliminary modelling and characterisation of Areas of Ecological Significance (AES). This work will of considerable interest to CCAMLR. **EG-CPR** recently completed a major methodology and taxonomy training workshop for personnel involved with the South African CPR programme in Antarctica and the Southern Ocean CPR Survey. A similar training workshop is being developed for India to develop their contribution to SO-CPR and SOOS. The CPR dataset is a SCAR Business Product which is widely used. **Remote Sensing AG** works closely with EG-BAMM and EG-ABI to monitor bird and mammal populations and species by using satellites to count animals. Remote Sensing has been working on rules for the use of drones (UAV) over penguin colonies. Action Groups **ANTOS** and **ISSA** were established last year in Auckland, SCAR XXXIII. Both AGs having major planning workshops scheduled for August 2015 and January 2016, respectively.

Important Issues or Factors: none

Recommendations/Actions and Justification: No recommendations or actions have been received from any EG or AG.

Expected Benefits/Outcomes:

Partners: SSG-LS and its AG/EGs continue to work with groups with SCAR such AntEco, AnT-ERA, SSGs, SCATS, those allied with SCAR, e.g. SOOS, those of the wider Antarctic community such as CCAMLR and CEP, and groups outside of Antarctic such as the Global Alliance of CPR Surveys (GACS) and SCOR.

Budget Implications: No extra funding has been requested above the allocations already provided. Spending to date has been slow, which is not unusual early in the biennial funding period.

SSG Life Sciences

1. Chief Officers

CO: Graham Hosie (AUS); Deputy CO: Marc Shepanek (USA); Secretary: Yan Ropert-Coudert (FRA)

2. Major Future Initiatives and Actions

EG-ABI and EG-BAMM have been working together on a joint analysis of the Retrospective Analysis of Antarctic Tracking database (RAATD), which has produced a very large standardised tracking data set for 14 species of bird and marine mammals. These can be used for preliminary modelling and characterisation of Areas of Ecological Significance (AES). This work will be of considerable interest to CCAMLR. It expands substantially on the data gathering exercise initiated by CAML and SCAR-MarBIN during IPY and will a significant contribution to the dynamic online version of the Biogeographic Atlas of the Southern Ocean (dBASO). The next RAATD workshop is proposed to be held at AWI, Germany in May 2016. The workshop will consider the results of the initial modelling efforts, consider the biological interpretation of those models, discuss the next analytical steps and develop preliminary outlines for publications.

The EG-BAMM Working Group on Health Monitoring of Birds and Marine Mammals is collaborating with the Antarctic Environment Portal to develop a paper about Antarctic wildlife diseases to be published in the Information Summary Section. The WG along with Macquarie University has organized a workshop entitled “Antarctic microbial/parasite impacts” that will be held on 2-7 August in Sydney (Australia).

The Remote Sensing Action Group works closely with EG-BAMM and AG-ABI in relation to monitoring predator populations by remote sensing. The group has focussed on developing rules for the use of drones (UAV) over penguin colonies. This work will continue this work during the next group workshop in the Kuala Lumpur SCAR Meeting.

The EG-CPR supports the SCAR SO-CPR Survey. SO-CPR involves numerous countries with analyses conducted by experienced and well recognized plankton and Antarctic researchers albeit in several separated laboratories. We are developing a training programme for India in support of their Arabian Sea and Southern Ocean CPR work, and Dr Kunio Takahashi, chief officer of EG-CPR, has already been awarded a Scientific Committee on Oceanic Research (SCOR) Visiting Scholars Program 2015 to help teach the Southern Ocean taxonomy and methods. The timing of the Indian workshop is under negotiation but could be October 2015 or March 2016 and has the support of SCAR, SCOR, and Partnership for Observation of the Global Oceans (POGO).

Action Groups ANTOS and ISSA were established last year in Auckland, SCAR XXXIII. Both AGs having major planning workshops planned for August 2015 and January 2016, respectively to further develop their objectives, target questions to address the questions, approaches and implementation plans. ISSA aims to use to the Horizon Scan approach similar to the successful SCAR Horizon Scan, but with a focus more on the next 5 years rather 20 years for the SCAR Horizon Scan.

3. Major Activities and Significant Progress

Important publications, databases, workshops and meetings, education and outreach, data and information activities are mentioned in the reports from each Expert and Action Group.

- i) Selected publications; products; databases; workshops and meetings; Education and Outreach; Data and Information activities*
- ii) Subsidiary Bodies (Action, Expert groups etc.) Outcomes and e.g. whether any should be disbanded*

EG-ABI & EG-BAMM Joint Report

ABI Chief Officer: Bruno Danis and Secretary: Ben Raymond

BAMM Chief Officer: Mark Hindell and Secretary: Yan Ropert-Coudert

The major activity of both Expert Groups was a multi-disciplinary workshop to analyse the Retrospective Analysis of Antarctic Tracking Data (RAATD). The workshop was held at the Belgian Science Policy Office, 18-22 May 2016.

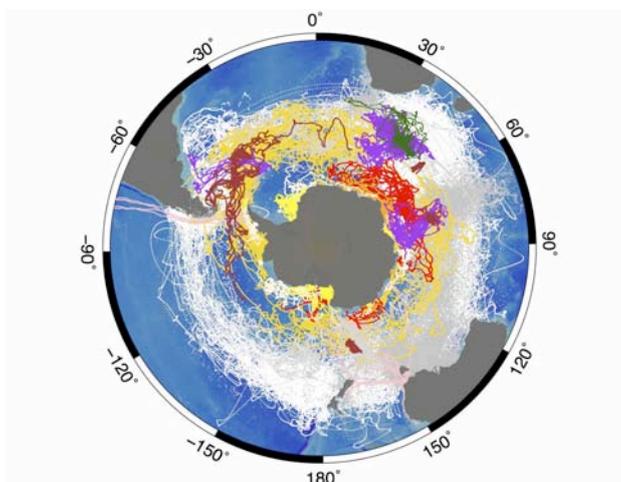
Attendees: Mark Hindell (Chair), Yan Ropert-Coudert, Phil Trathan, Ben Raymond, Bruno Danis, Horst Bornemann, Luis Huckstadt, Ian Jonsen, Anton van de Putte, Nabil Youdjou, Antonio Agüera

EG-BAMM and EG-ABI sponsored the five-day RAATD workshop. The overarching goals of the RAATD project are to undertake a multi-species assessment of habitat use of Antarctic top predators in the Southern Ocean based on existing animal tracking data to identify *Areas of Ecological Significance* (AES), which are regions that are important for foraging to a range of predators and which have high diversity and abundance of lower trophic levels. The project will provide a greater understanding of fundamental ecosystem processes in the Southern Ocean, facilitate future projections of predator distributions, and provide input into spatial management planning decisions for authorities such as CCAMLR. The synopsis of multi-predator tracking data will also expose potential gaps of data coverage in regions or seasons that are important but under-represented, either as a result of a low regional research presence or a low ecological significance. This will provide an important input for directing future studies.

The meeting discussed the analytical approaches that are best suited to this type of study (considering in particular the nuances of tracking data in the Southern Ocean) and the likely outputs from the RAATD project (publications, data sets, and model outputs). The data sets and model outputs will be considered for inclusion in the dynamic version of the Biogeographic Atlas of the Southern Ocean. This is of particular interest because the printed Atlas did not include tracking data and therefore greatly under-represents the distributions of a number of bird and mammal species. Publication of data will only be undertaken with the full involvement of the data providers.

The workshop was split into two working groups: one devoted to compiling the datasets into standardised templates, conducting initial quality control, improving the metadata files, as well as identifying additional data sets that might be added. The other group was devoted to initial data analysis including running filters, identifying trips, generating distribution maps and developing preliminary models. By the end of the workshop, the working groups had compiled 2,358 tracks from 14 species (more than 2 million data points), and developed preliminary code for filtering and pre-processing of those tracks. A preliminary distribution map of the compiled data is shown below.

The workshop was very successful in achieving all of its stated objectives, and the RAATD project now has a standardized working data set that will form the basis of future modelling and analyses. Work is now proceeding on processing and modelling of the individual species data.



The full report of RAATD Workshop has been posted on the SCAR EG-BAMM website at <http://www.scar.org/egbamm/egbamm-publications>.

Other ABI, BAMB activities include:

- the Microbial Antarctic Resource System (mARS) pages on biodiversity.aq have been updated, and preliminary plans are underway for possible workshop in September,
- planning and data gathering is also underway in relation to the trophic database, which currently sits in the Australian Antarctic Data Centre (AADC) with the aim of making the database a formal SCAR data product (<http://data.aad.gov.au/aadc/trophic/>),

EG-BAMB Working Group of Health Monitoring Of Birds and Marine Mammals

Convenor Andrés Barbosa

The new EG-BAMB WG was established at the Auckland SCAR XXXIII meeting, August 2014. The terms of reference are as follows:

- a. To monitor the health status of Antarctic birds and marine mammals.
- b. To provide advice and assessment to the SCAR through EG-BAMB about matters related to health and disease status of Antarctic wildlife.
- c. To coordinate research about health of Antarctic wildlife identifying scientific gaps and compiling the existent information.
- d. To promote the generation of knowledge and information about the presence and effects of pathogens and parasites on Antarctic birds and marine mammals.
- e. To work with other components and scientific programs of the SCAR (EB-ABI, ANTABIF, ANT-ERA, AntEco) to achieve multidisciplinary approaches to animal health issues.

The WG currently involves eight people from six countries. More people are expected to join the group in the next months.

During 2015 the group is carrying out two main activities:

- 1) Several members of the WG were commissioned to collaborate with Antarctic Environments Portal (www.environments.aq) writing a paper about Antarctic wildlife diseases that will be published in the Information Summary section. In this paper all the information published about pathogens and diseases present in Antarctic birds and marine mammals and about mass mortality events in Antarctica as well, were summarized. Some suggestions about future research work and surveillance were given. The paper is now under review and it will be published along this year. Antarctic Environments portal is an initiative specifically designed to put policy-ready information, based on peer-reviewed science, at the fingertips of the policy-makers and others in need of relevant information about the Antarctic environment. The Portal summarizes the latest information from key areas of science needed by the Antarctic Treaty when considering management needs, policy development and the making of international law.
- 2) The WG together with the Macquarie University has organized a workshop entitled “Antarctic microbial/parasite impacts” that was held on 2-7 August in Sydney (Australia). Several members of the WG and some local people involved in Antarctic research attended the workshop. The SSG-LS has provided some financial support for the workshop.

The aim of this workshop is to bring together a cross disciplinary team to address aspects of how the introduction of organisms (bacterial and parasitic) into the Antarctic environment may potentially affect native symbiotic interactions in Antarctic wildlife. The specific goals of the workshop are.

- Generate concept review on microbial threats arising from human impacts in Antarctica and the application of emerging molecular technologies and multi-layered symbiotic interactions as tools for investigation (Trends in Ecology and Evolution or Trends in Microbiology)
- Generate two reviews on diseases in Antarctic vertebrate groups (marine mammals and seabirds)
- Development of a strategic plan for large scale grant applications

EG-CPR

Chief Officer: Kunio Takahashi; Deputy-CO: Graham Hosie

We take every opportunity when we meet to run workshops on methods and taxonomy to ensure we are maintaining the highest level of procedures and identification standards for quality control and assurance. The latest methodology and taxonomy training workshop was conducted over two weeks from 2 March 2015 at laboratories of the Oceans and Coasts Research unit of South African Department of Environmental Affairs in Cape Town. The course was conducted by Dr Graham Hosie and Marco Worship who oversees CPR operations by DEA. The course was hosted by Dr Sir Hans Verheye who leads the Benguela Current CPR Survey and South Africa's CPR work in the Southern Ocean. Course participants comprised marine research technicians, research assistants and researchers of the DEA, with various prior experience in plankton research and sampling methods. Prof. Philippe Koubbi who has established the French CPR survey around Kerguelen Island also participated in the workshop. The course provided instruction in the methods used by the Southern Ocean CPR Survey, as well as the identification and taxonomy of Southern Ocean zooplankton.

The course was made possible through the support from an inaugural Scientific Committee on Antarctic Research (SCAR) Visiting Professorship awarded to Dr Graham Hosie, and the support of the Department of Environmental Affairs (DEA) South Africa.

A similar training programme is being developed for India in support of their Arabian Sea and Southern Ocean CPR work. Dr Kunio Takahashi, CO of EG-CPR, has already been awarded a Scientific Committee on Oceanic Research (SCOR) Visiting Scholars Program 2015 to help teach the Southern Ocean taxonomy and methods. The timing of the Indian workshop is under negotiation but could be October 2015 or March 2016 and has the support of SCAR, SCOR, and Partnership for Observation of the Global Oceans (POGO).

Approximately 50 CPR tows were conducted during the 2014/15 Antarctic field season. These were conducted from seven vessels, RSV *Aurora Australis* (Australia), JMSDF *Shirase* and TRV *Umitaka Maru* (Japan), FV *San Aotea II* (New Zealand), RV *Tangaroa* (New Zealand), MV *SA Agulhas II* (South Africa) and RV *Marion Dufresne II* (France). This represents approximately 4,000 samples were collected over ~20,000 nautical miles this season. The data from this season will eventually raise the database to approximately 50,000 samples representing 250,000 nautical miles.

The previous LS report advised the new database and portal would hopefully be commissioned at the end of 2014. However, delays have continued primarily due to the reduction in resources and staff numbers within the Australian Antarctic Data Centre as a result of cut backs by the Australian government. Although the new data portal is considered high priority, so are numerous other projects, and the AADC is endeavouring to complete the small amount of work required to commission database. The old database continues to be used, albeit less user friendly, and data are freely available upon request.

SCAR-COMNAP JEGHBM

Chief Officer Jeff Ayton, Deputy Chief Officer Eberhard Kohlberg, Secretary Anne Hicks, Member of executive Marc Shepanek (Dep CO SSG-LS)

The group is continuing to evolve and is hosting a workshop and doing a review of tele-health practices by the international partners at COMNAP Tromso with good attendance expected. The website has evolved as well, with general access section and a special access section for those with clinical license and privilege granted by the National programs for clinical information.

A meeting of membership who are attending the Telehealth workshop will be undertaken with sharing or research and operational matters.

Membership is expanding to include additional national medical programs. Members have published across various disciplines and shared their research outputs from both fundamental and applied sciences. Preparation has commenced for the SCAR 2016 Open Science Conference and JEGHBM meeting with Human Biology and Medicine theme in the program.

AG-ANTOS

Chief Officer: Craig Cary; Deputy CO: Vonda Cummings, Secretary: Megumu Tsujimoto

The Antarctic Near-Shore and Terrestrial Observing System (ANTOS) was established as a new Action Group in August 2014. Its major aim is to establish an integrated, coordinated transcontinental and trans-regional surveillance system to track environmental variability and change at biologically relevant scales. This valuable information will be relevant across multiple disciplines and will be used to provide a more complete understanding of changes occurring in the Antarctic region.

The first major activity to further the implementation of ANTOS is a two-day international workshop, to be held in Hamilton, New Zealand, on August 18th and 19th 2015. This workshop will work towards a clear vision for ANTOS, and will cover the following topics: implementation, specific terrestrial and marine requirements (including linkages between these systems), technology, preliminary resource analysis, development of the ANTOS 'system'. Scientists from Australia, UK, Italy, Argentina, USA, Korea and New Zealand will travel to the meeting. There will also be internet 'summary' sessions each evening to enable people that were not able to attend to have their input. These discussions and any recommendations from the workshop will be summarised in a readily available report. We are planning a follow up workshop to be held in conjunction with the 2016 SCAR OSC.

Funding to support this workshop has been obtained from the New Zealand Antarctic Research Institute (NZARI) and AntEco. We gratefully acknowledge these contributions, and that of the SCAR SSG-LS, without which this workshop would not be possible.

The workshop agenda is provided in the Appendices.

AG-ISSA

Co-Chairs: Gary Wilson and Steven Chown

ISSA is a new AG established at the Auckland SCAR XXXIII meetings. Plans are being developed for a meeting/workshop to be held in conjunction with the Southern Connections Conference in Punta Arenas in January 2016. The reason for that is that many of the people likely to be involved with ISSA are already planning to be at the Southern Connections meeting

The workshop will involve a Horizon Scan approach with a set of questions to the wider community in advance and then a smaller group on site for two days to develop a coherent set of questions and a common approach to measurements and data collection to address the questions. Unlike the Horizon Scan, the ISSA workshop will be a bit more focussed on the next five years rather than 20 years out as ISSA is starting a bit more from scratch in a lot of cases.

To assist with funding the workshop, Gary Wilson has raised an additional \$10,000 from NZARI - this will be mostly used for travel support to help ensure wide coverage of disciplines and nationalities. The co-chairs plan to meet in Tromsø next month to finalise the pre-survey questions and the workshop structure and invite lists.

While not driven by ISSA, a separate meeting is being held for South Georgia only in October 2015 and several people will also attend that meeting to ensure circum-Antarctic ideas are also considered with respect to South Georgia developments.

AG-Remote Sensing (with SSG-PS)

Chief Officer: Hans-Ulrich Peter

AG-Remote Sensing was established at the SCAR XXXII Meeting in Portland 2012, with the full name of "*Development of a satellite-based, Antarctic-wide, remote sensing approach to monitor bird and animal populations*". A working meeting of the Action group was held during the XIth SCAR Biology Symposium on 19 July 2013 in Barcelona. The last meeting was in Auckland SCAR XXXIII on August 25, 2014.

Important points were the discussion about relevant databases for collecting penguin (and other seabirds and seals) abundance data, collected using remote sensing methods. Discussions have started about the rules for

the use of drones (UAV) over penguin colonies and discussions continue in relation to new satellite technologies.

During the Kuala Lumpur SCAR Open Science Conference we are planning another workshop on the use of drones in sensitive areas, and will continue the discussions on rules for using drones. The AG aims to gain international acceptance for this.

Further details on the AG activities are available at <http://www.scar.org/researchgroups/remotesensing>

AG-Ocean Acidification (with SSG-PS)

Chief Officer: Richard Bellerby

See the SSG-PS Report (WP07) for the Ocean Acidification report, and IP12 for the abstract of the report.

4. Budgetary Implications

There are no new budget implications. No extra funding has been requested above the allocations already provided. Spending to date has been slow, which is not unusual early in the biennial funding period.

Appendices

Antarctic Near-Shore and Terrestrial Observation System Workshop Agenda

18-19th August 2015, Hamilton, New Zealand

ANTOS aims to establish an integrated, coordinated transcontinental and trans-regional surveillance system to track environmental variability and change at biologically relevant scales. This valuable information will be used to provide a more complete understanding of changes occurring in the Antarctic region. This workshop will work towards a clear vision for the implementation of ANTOS and a resource analysis, and the findings will be summarised in a report.

Day 1 (Tuesday August 18th)

0830-0900 Welcome, introductions and workshop objectives

- ANTOS philosophy – adaptable and future proof
- Thinking outside your discipline and national programme

0900-0930 Implementation of ANTOS

- Revisiting the aims of, and need for ANTOS
- What questions will ANTOS address – long and short term?
- Where does ANTOS fit within SCAR?
- How does ANTOS address Horizon Scan priorities?
- How should ANTOS be configured?
- How do we best define and validate proxies?
- Essential to have real-time and future benefits
- in 100 years, where will we be?

0930-1200 Short Talks (15 min each)

- Byron Adams - TON directives and outcomes
- SOOS development, near coastal linkages
- Stefano Schiaparelli – ICELAPSE
- Vonda Cummings/Drew Lohrer - INTERACT
- Other contributions

1000-1030 Tea/coffee break

1200 –1300 Lunch

1300-1500 Breakout Groups – nearshore marine and terrestrial

- Primary questions to be addressed – now and in the future
- Parameters to measure/detect and frequency – what do we need to measure and monitor in order to detect change?
- Scales and gradients
- Adaptability of the system
- Linkages between marine and terrestrial systems

1500-1530 Tea/coffee break

1530-1700 Breakout group reporting

- Discussion of synergies, overlaps and agreed priorities

1700-1715 Wrap-up

1830-2100 Dinner

2100-2200 Teleconference with overseas participants

Day 2 (Wednesday August 19th)

0830-0900 Introduction of Day 2 objectives
Comments from overseas telecom

0900-1000 Technology (Craig Cary, Charlie Lee and Adrian McDonald)

- Ocean observatory system
- SNOW WEB (Adrian)
- Neon program
- Developing a universal interface
- Future proofing the system

General Discussion

1000-1030 Tea/coffee break

1030-1200 Preliminary resource analysis

- What are our resource needs?
- Likely return on investment?
- Discussion of assets & liabilities

Taking this forward - community review

1200 – 1300 Lunch

1300-1500 Development of the ANTOS 'system'

- Geographic extent – critical coverage to capture questions
- Define essential qualities of ANTOS node locations
- Required local and regional scaling
- Specific locations that meet these requirements
- Data management (Soon Gyu Hong)

1500-1530 Tea/coffee break

1530-1700 Recommendations and Implementation plan

- Agree on the major recommendations from this workshop
- National programme buy-in.
- Coordination across national programmes
- Next steps

1700-1715 Wrap-up

1830-2100 Dinner

2100-2200 Teleconference with overseas participants

ANTOS Workshop outputs and Recommendations:

Aim: To track and attribute environmental variability and change at biologically relevant scales.

- Tiered measurement system addressing 6 themes, key parameters for terrestrial and nearshore environments
- Need to evaluate existence of current long-term data sets to help identify suitable areas/nodes.
- Site selection should consider: biodiversity, existing information, transition zones, terrestrial-nearshore links, gradients. Could also incorporate formal analysis of potentially useful site locations using GIS
- Develop formal paper summarising site recommendations and reasons.
- Proposal should emphasise 'flexibility' of measurement and site recommendations so that all National Programmes can participate
- The report will include a 3 separate summaries targeting the Antarctic community, policy makers, operators/logistics.
- Propose COMNAP pushes availability of spatial/temporal satellite imagery through a Data Cube approach (more of it, easier access), to help deliver horizon scan objectives.
- ANTOS database advisory committee has established (marine = Drew Loher, terrestrial = Craig Cary, Charlie Lee=technical, database = Fraser Morgan, statistics = Adrian McDonald). Will discuss with AntiBiv group and other major Antarctic databases managers
- Craig & Vonda to produce report for SSGs and National Programmes on ANTOS (with workshop input).
- Significant support that ANTOS morphs into expert group (need proposal to SCAR b4 excom meeting 2016).

Timetable:

report draft by 2nd week October
 feedback mid November
 final December
 email soon re scoping sites with data (through antera, anteco etc)

Information paper through scats into the CEP (due march)

ANTOS summary for COMNAP EXCOM meeting, August 2015

What is ANTOS?

Antarctic Near-Shore and Terrestrial Observation System (ANTOS) is a biologically focused initiative to coordinate a cross continent- and cross national programme-scale assessment of environmental variability and change. It is a SCAR Action group, established in response to the need identified in multiple sectors for long term commitment to acquire basic information to underpin identification of trends and changes in iconic Antarctic ecosystems. Such information transcends short term national funding regimes, yet is crucial for informing management approaches and strategies that national bodies must address.

ANTOS Mission Statement

To establish an integrated and coordinated trans-continental and trans-regional environmental surveillance system to identify and track environmental variability and change at biologically relevant scales. This valuable information will be used to provide a more complete understanding of changes occurring in the Antarctic region, by informing biological, physical, and earth science studies.

Goals of ANTOS:

ANTOS is being designed to be of interest to all national programmes. Its goals are to:

- Establish an observation network of representative core 'nodal' sites in the terrestrial and nearshore environments around Antarctica and the sub-Antarctic;
- Measure parameters long term that will enhance understanding of biological response to environmental change;
- Stimulate the development of new observation technologies, data capture, and data sharing;
- Encourage buy in and involvement of all national programmes through a 'tiered observation network' that requires varying levels of resourcing, logistic and scientific capabilities;
- Provide opportunity for alignment of national and international programmes and projects, and an observational platform to underpin SCAR science activities;
- Provide information to assist evidence-based conservation and policy decisions.

Recent ANTOS workshop:

On 18-19th August 2015, a workshop was held Hamilton, New Zealand to work towards a clear vision for the implementation of ANTOS. The workshop was attended by 22 researchers from 11 countries (NZ, Japan, UK, Australia, USA, Chile, Italy, Korea, France, Belgium, Germany). We discussed key characteristics of node locations, parameters to measure, frequencies, scales and gradients of measurement, and the technical requirements of the node system. In other words: what do we need to measure and monitor in order to detect change, where do we need to do this, and how? The strong consensus was for node locations that share basic characteristics of (a) representative biodiversity for the region concerned, (b) environmental features likely to be informative in a context of change studies, and (c) the practicality of access and working conditions. A 3-tiered approach both to platform complexity and cost was recommended, to enable wide national programme involvement and achievement of the scientific goals. At all tiers, biologically relevant attributes of change will be assessed within six broad criteria (physical environment, colonisation, diversity, distribution, functional and genetic). ANTOS installations will use a suite of agreed methodologies to enable robust cross-programme and continent-wide comparisons of information. An ANTOS database will be designed and established to allow easy access to the real-time data that is intimately linked to existing databases and follows internationally accepted protocols.

ANTOS and COMNAP:

Recognition of its importance and approval by national programmes will be key to the success of ANTOS. The strength of ANTOS is its (i) unification of researchers over the necessity for and the extreme value of a long-term vision for observation systems to understand biological systems in a changing environment, and (ii) the continent-wide approach. COMNAP should be integrally involved in the development of ANTOS, to help ensure its long term viability. The value of this information in informing policy and