



International
Science Council

SCAR Sub-Group

SG / SC

Person

Responsible:

ANTOS

PS / LS / GS

Craig Cary

XXXVII SCAR Delegates Meeting

India, September 2022

Antarctic Near-Shore and Terrestrial Observation System (ANTOS)

2020-22 Report

Summary

Report Author(s)

S. Craig Cary & Vonda Cummings (NZ)

Summary of activities from 2020-22

Major activities and achievements

1. Invited Talks. During the pandemic and series of global lockdowns meetings continued to be held on-line. Over this period of time ANTOS continued to get the word out that a biology centric monitoring initiative was developing that would provide the guidance and hopefully support the establishment of cross continent integrated climate monitoring network. Members of the committee presented invited talks at four conferences including one seeking to develop a similar system across the sub-Antarctic – Sub-ANTOS.
2. Technical Manual Development – the central spine of ANTOS is to design and install 25 dedicated monitoring nodes in or near per-selected biological sentinel sites. The key quality of these nodes is that the monitoring hardware is identical – every parameter being measured is measured in the same way at every sentinel site in both the terrestrial and marine systems. To achieve this, we needed to find a vendor that could develop the off-shelf capability and supply the equipment with a detailed manual of operation. After almost three years of exploring options, we found a vendor in Canada (Hoskins Scientific), who, with continued input from ANTOS, has developed three scalable monitoring systems (Tier 1-3) for both near-shore and terrestrial deployment and their respective manuals.
3. One of the greatest aspirations for ANTOS has been to attract the funding to support the installation of Tier 3 systems in 25 cross continental locations so that we could take the inevitable burden of costs off the shoulders of either individual researchers or National Programs and insure long-term persistence. Over the past two years we began this process through an opportunity in Australia to attract philanthropic support for over \$10M. ANTOS rallied behind Dana Berstrom (AAD) and Prof. Sharron Robinson (University of Wollongong) in developing the proposal that is currently in review. The timing was perfect as it motivated the finishing of the technical manual and the development of a draft prospectus.

ANTOS: 2020-22 Report, cont.

4. ANTOS was represented at two US NSF-supported workshops. (A). Developing an Antarctic Biorepository (Jan 2-4, 2022). (B). Developing a submarine fiber optic telecommunications cable from New Zealand to McMurdo Station with terabit-scale networking capability. (The cable infrastructure can also serve as a scientific platform [a Scientific Monitoring And Reliable Telecommunications “SMART” cable] with capability to monitor ocean conditions and seismic activity) (June 29-July 1, 2021).
5. Research proposals are increasingly including ANTOS systems in their science plans. For example, a proposal submitted to the BelSPO Impuls 2022 call (Verleyen) includes installing a long-term monitoring site in Yûboku Valley incorporated into the ANTOS programme and network.
6. The installation of 25 Tier 3 marine and terrestrial nodes in 25 sentinel sites – is aspirational. ANTOS fully supports the individual researchers and national programs installing smaller systems in areas of interest. ANTOS currently has six Tier one terrestrial (NZ, Italy) and three Tier 2 marine (NZ) systems installed. During the past two years ANTOS has written letters to support applications in Italy, Argentina, and Australia to install four Tier 1 and a Tier 3 terrestrial system in designated sentinel sites.
7. Committee members have been invited to attend and participate at five international conferences, symposia, and/or workshops that focus on aspects of monitoring climate change in Antarctica and the sub-Antarctic.

Upcoming Activities

1. Development of the ANTOS Prospectus: Targeting different audiences, including (i) the Antarctic community, (ii) policy makers, and (iii) operators/logistics, and philanthropists. The Prospectus will describe the purpose and value of ANTOS to potential funders.
2. Analysis of ANTOS Survey II: the survey was designed and launched in April 2020-21. It targeted participants of Survey I to gain more detailed information on the data stream available (incl. frequency and duration of measurements, observed environmental/ecological responses) and participants views on the uniqueness/value of different sites. We currently have a PhD student (Brigham Young University, USA) working up the data from both surveys into a publication.
3. The Committee developed a “Decision Tree” to help make the rational decisions on the choice of sites. Once the survey data have been fully analysed (see #2 above), a sub-set of the ANTOS committee will use the Decision Tree to pick the 25 sites. These will then be revealed to the nominees at the SCAR Biology meeting in New Zealand next year.
4. Field Survey Protocol Development. Critical to the installation of any ANTOS system into a Sentinel site is the need for and intensive baseline biological survey. We can only monitor change if we know where we have started. The development of the Field Survey Manuals was supported by an internal grant to Prof. Sharon Robinson from Wollongong University. The manuals are in their final stages of development and will be soon sent out for peer-review.

Key challenges faced:

The impacts from Covid described in our 2020 report have continued and even increased as the global Pandemic continued. Every individual involved in ANTOS has been impacted. Scheduled meetings have been cancelled or postponed due to the closure of borders and inability to travel. Several workshops had been planned for 2021 and 2022. These workshops were to finalise (i) the KOPRI-hosted database, (ii)

ANTOS: 2020-22 Report, cont.

review the second survey results, (iii) choose 25 priority ANTOS Sentinel Sites, (iv) develop the prospectus that will be used to fund raise for the ANTOS programme, and (v) to present the above to the SCAR community in 2024. The COVID impact is likely to put us back about 2 years in our projected achievements and spending especially considering that the 2022 OSC will be virtual - we had scheduled a major workshop to present the sentinel sites and manuals. That said, the delay will provide more time for the analysis of the survey data, development of manuals, and prospectus. Our hope would be to launch a fundraising campaign based on these outputs over the next 12 months and to run a comprehensive final workshop at the SCAR OSC in 2024.

Summary Budget 2021 to 2024

	2021	2022	2023	2024
	Spent	Allocated	Request	Request
(US\$)	0	3000	8000	8000

US\$5100 unspent from 2020 and 2021 was reallocated to BEPSII and ImPACT (at the request of Life Sciences).

Progress to date

Sub-group Outcomes Summary

Sub-group	Activity/Outcome/Benefit/Achievement
ANTOS	Letters of support requested (and provided) for national programmes wanting to incorporate ANTOS in their research programmes.
ANTOS	Terrestrial and Marine technical Manuals for constructing and installing ANTOS nodes have been completed (Hoskins). This was possible through the development of continued communication with our systems integrator in Canada
ANTOS	ANTOS was presented at the 'Power for Ocean Sensing: Creating Dialogue around Power Capabilities and Needs' webinar, hosted by the University Marine Energy Research Community (https://umerc-us.org/page/about), in May 2022. A recording is available at https://youtu.be/G6O9cPaxlok
ANTOS	ANTOS presented at the - Sub-Antarctic Connections and Climate Change Symposium Oct 4-6, 2021. Invited Talk
ANTOS	ANTOS presented at the APECS Workshop SCAR 2020 - Logistical Collaborations. Aug 13 th , 2020. Invited talk
ANTOS	ANTOS presented at the EU-PolarNet 2 Workshop, June 7 th . Invited Talk

Sub-group Cash Flow

(Since previous report to Delegates in 2020)

Sub-group	Allocation	Amount spent		
		2020	2021	2022
ANTOS	3500	0		
ANTOS	3000		0	
ANTOS	3000			0

US\$5100 unspent from 2020 and 2021 was reallocated to BEPSII and impACT (at the request of Life Sciences in November 2021).

Future plans

Planned activities in 2022 to 2024

Sub-group	Planned activity
ANTOS	ANTOS prospectus developed describing the purpose and value of ANTOS to potential funders.
ANTOS	Database meeting – final design and implementation – bring online all current ANTOS installations
ANTOS	Multiple workshops to finalise drafts of ANTOS terrestrial and marine protocol, guideline, and technical manuals (2020-2023). These will be reviewed by the community before final versions are released (by Feb 2024)
ANTOS	Submit proposals for philanthropic support

Planned use of funds for 2022 to 2024

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
2022	Database meeting (Korea)	2000	Charles Lee & Soon Gyu Hong	charles.lee@waikato.ac.nz polypore@gmail.com
2022	Prospectus development and printing	2000	Craig Cary & Dana Bergstrom	caryc@waikato.ac.nz dana.bergstrom@aad.govt.au
2023	Analyse survey data and prioritise 25 sentinel sites	3000	Byron Adams & Vonda Cummings	byron_adams@byu.edu vonda.cummings@niwa.co.nz
2023	SCAR Biology	6500	Craig Cary & Vonda Cummings	caryc@waikato.ac.nz vonda.cummings@niwa.co.nz
2024	Finalise all documents and hold workshop at OSC	6000	Vonda Cummings & Craig Cary	vonda.cummings@niwa.co.nz caryc@waikato.ac.nz
Total				

Any additional detail on funds usage and desired results/outcomes

Please note that these are wishful projections as much will depend on the global COVID situation and our ability to travel. We will attempt to do as much as we can with teleconferencing but nothing replaces face to face to get action and results.

Percentage of the budget to be used for support of early-career researchers

2022: 30%

2023: 30%

2024: 30%

Percentage of the budget to be used for support of scientists from countries with developing Antarctic programmes

2022: 30%

2023: 30%

2024: 30%

Membership

Leadership

Role	First Name	Last Name	Affiliation	Country	Primary Language	Email	Date Started
Co-Chair	Craig	Cary	U. Waikato	NZ	English	caryc@waikato.ac.nz	8/2014
Co Chair	Vonda	Cummings	NIWA	NZ	English	vonda.cummings@niwa.co.nz	8/2014
Secretary	*Megumu	Tsujimoto	MPR	Japan	Japanese	megumutsujimoto@gmail.com	8/2014

(Please identify early-career researchers with * in first column)

Other members

First Name	Last Name	Affiliation	Country	Email	Primary Language
Byron	Adams	Bringham Young University	USA	byron_adams@byu.edu	English
*Charles	Lee	Waikato University	NZ	cklee@waikato.ac.nz	English
Dana	Bergstrom	Australian Antarctic Division	Australia	dana.bergstrom@aad.gov.au	English
Dolores	Deregibus		Argentina	dolidd@yahoo.com	Spanish
Eli	Verleyen		Belgium	Elie.Verleyen@UGent.be	French
Marcela	Libertelli	Instituto Antártico Argentino	Argentina	mibertelli5@yahoo.com.ar	Spanish
Peter	Convey	BAS	UK	pcon@bas.ac.uk	English
Sharon	Robinson	University of Wollongong	Australia	sharonr@uow.edu.au	English
Soon Gyu	Hong	KOPRI	Korea	polypore@gmail.com	Korean
Stefano	Schiaparelli	University of Genoa/Italian National Museum	Italy	stefano.schiaparelli@unige.it	Italian
Steve	Colwell	PSG rep	UK	src@bas.ac.uk	English
Mauro	Guglielmin	ANTPAS rep	Italy	mauro.guglielmin@uninubria.it	Italian

(Please identify early-career researchers with * in first column)

Additional information (optional)

Notable Papers

Advances have been made in methods for analysis of seafloor community data obtained using remotely deployed cameras (Montes Herrera et al. 2022; Marini et al. 2022; Menna et al. 2022). This sampling and analysis is crucial for gathering underpinning biological information that the environmental data collected using the ANTOS Tier systems supports.

Montes-Herrera, J.C., Cimoli, E., **Cummings, V.**, Hill, N., Lucieer, A., Lucieer, V. (2021). Underwater Hyperspectral Imaging (UHI): A review of systems and applications for proximal seafloor ecosystem studies. *Remote Sensing* 13, 3451. <https://doi.org/10.3390/rs13173451>

Marini S., Federico B., Lorenzo C., Bordone A., **Schiaparelli S.**, Peirano A. (2022) Long-term Automated Visual Monitoring of Antarctic Benthic Fauna. *Methods in Ecology and Evolution*. <https://doi.org/10.1111/2041-210X.13898>

Menna F., Nocerino E., Malek S., Remondino F., **Schiaparelli S.** (2022) A combined approach for long-term monitoring of benthos in Antarctica with underwater photogrammetry and image understanding. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, 43, 935-943.

The four papers listed below all are considering the impact of warming on terrestrial Antarctic ecosystems. Each of these studies either describes new approaches to understanding biological responses to predicted warming or provides foundational biological data in key locations that are likely to be considered as ANTOS sentinel sites.

Wagner, M., Brunauer, G., Bathke, A.C., **Cary, S.C.**, Fuchs, R., Sancho, L.G., Türk, R., and Ruprecht, U. (2021). Macroclimatic conditions as main drivers for symbiotic association patterns in lecideoid lichens along the Transantarctic Mountains, Ross Sea region, Antarctica. *Scientific Reports*. doi:/10.1038/s41598-021-02940-6

Monteiro, M.R., Marshall, A.J., Hawes, I., **Lee, C.K., McDonald, I.R., and Cary, S.C.** (2022). Geochemically Defined Space-for-Time Transects Successfully Capture Microbial Dynamics Along Lacustrine Chronosequences in a Polar Desert. *Frontiers in Microbiology*. doi:/10.3389/fmicb.2021.783767

Bottos, E.M., Laughlin, D.C., Herbold, C.W., **Lee, C.K., McDonald, I.R., and Cary, S.C.** (2020.) Abiotic factors influence patterns of bacterial diversity and community composition in the Dry Valleys of Antarctica. *FEMS Microbiology Ecology*. doi:/10.1093/femsec/fiaa042

Levy, J., **Cary, S.C.**, Joy, K., and **Lee, C.K.** (2020). Detection and community-level identification of microbial mats in the McMurdo Dry Valleys using drone-based hyperspectral reflectance imaging. *Antarctic Science*. doi:/10.1017/s0954102020000243

Direct support from outside organisations received for your activities

In kind. Deployment of 3x Marine tiers in McMurdo Sound in 2021 was achieved with the support of the New Zealand Antarctic Science Platform, the National Institute of Water and Atmospheric Research, New Zealand, and Antarctica New Zealand - instruments and logistics >> NZD\$100K

Major collaborations your group has with other SCAR groups and with organisations/groups beyond SCAR

N/A

Outreach, communication and capacity-building activities

ANTOS presented at the APECS Workshop SCAR 2020 - Logistical Collaborations. Aug 13th, 2020. Invited talk

Committee members have reviewed SCAR fellowship proposals.

Contributions to equality, diversity, and inclusion (EDI)

N/A

SCAR fellowship reviewers

First Name	Last Name	Email	Principal Expertise
Craig	Cary	caryc@waikato.ac.nz	Microbial ecology
Vonda	Cummings	vonda.cummings@niwa.co.nz	Marine ecology, benthos, ecophysiology