



SDM **16**
Agenda Item 4.3.2
Person Responsible: Yan Ropert-Coudert et al.

SCAR Delegates Meeting 2018
Davos, Switzerland, June 2018

SCAR Life Sciences Group
2016-2018 Report

Report Author(s)

Yan Ropert-Coudert (CO, FRANCE), Marc Shepanek (Deputy CO, USA), Ian McDonald (Sec., New Zealand)

Summary of activities from 2016-18 and other important issues

Life Sciences group heads or their representatives have been attending a number of meetings (OSC Kuala Lumpur in 2016, Monaco Assessment workshop in Monaco in 2017, SCAR Biology Symposium in Leuven 2017, MEASO in Hobart in 2018), while managing the budgets of the different subgroups. Life Sciences participated to the elaboration of several Information papers, including #53 (Code of Conduct on Wildlife Use for Scientific Purpose).

Three new AGs will be proposed in Davos: Input Pathways of persistent organic pollutants to AntarCTica (ImpACT) (LS and PS), Plastics in Polar Environments (PLASTIC-AG) (LS and PS) and SCAR Krill Action Group (SKAG) (LS).

Recommendations that EXCOM and Scientific Group Chief Officers should consider

- Approve the three new Action Groups.
- Approve Action Group BEPSII as an Expert group
- Approve Action Group Remote Sensing extending for 2 more years
- Approve Action Group ISSA to extend for one more year

Summary Budget 2017 to 2020

	2017	2018	2019	2020
	Spent	Allocated	Request	Request
(US\$)	7,941	55,500	43,212	48,140

Progress and Plans

Major Outcomes/Activities

1. **Remote Sensing:** Organizing workshop “Drones in Polar Biology” during SCAR Biology Symposium 2017 July 9. This technology is used for ground truthing of satellite imagery and as a standalone survey method. To understand the opportunities and challenges of this promising technology the following topics were discussed: i) Monitoring of Antarctic wildlife, esp. penguins and seals (new penguin colonies where found); ii) Botanical and physiological research; iii) Avoidance of disturbance of birds and seals: Recommendations for guidelines for CEP.
2. **ANTOS:** We have conducted a survey to identify potential high priority ANTOS sites. The survey was designed by the Expert group and implemented following the SCAR Biology meeting (Leuven, Belgium). The survey is now closed and the data are being analyzed for presentation at the Genoa workshop. These results will be critical to identify and justify the placement of critical ANTOS nodes around the continent.
3. **EGBAMM:** The Retrospective Analysis of Antarctic Tracking Data (RATTD) project has compiled a major, publically available database consisting of tracking data from 17 species of birds and mammals collected by more than 40 researchers from 20 countries. These data form the basis of an on-going major synthesis identifying Areas of Ecological Significance in the Southern Ocean. The results of this synthesis will be helpful to CCAMLR in its Marine Spatial planning, and to the broader community in understanding ecosystem responses due to climate change. The working group has attracted funding from the French Centre for the Synthesis and Analysis of Biodiversity. CESAB have funded a post-doc for 20 months as well as biannual meetings of the group.
4. **SO-CPR:** Since the last report 2016, we have completed about 100 CPR tows during the 2016/17 and 2017/18 Antarctic field season from seven vessels from Australia, Japan, New Zealand, South Africa and Brazil. Approximately 250,000 nautical miles have been sampled since the commencement of the SO-CPR Survey in 1991, representing some 50,000 samples for nearly 260 zooplankton taxa coupled with environmental data. The workshop on a special report of the Status and Trends of Southern Ocean Zooplankton was conducted in late November 2016 at the National Institute of Polar Research Japan. The purposes of the workshop were to summarize the SO-CPR Survey activities of the first 25 years of the survey, and to advance the writing task of the Status and Trends Report of Southern Ocean Zooplankton. The standards workshop was held at the Australian Antarctic Division on 12 to 16 December 2016. The purposes of the workshop were to confirm that consistent and high standards of species identification, methodology, and data quality were being maintained amongst the main analysts in the SO-CPR Survey.
5. **ISSA:** A major work effort for a wide group of ISSA membership has been the development of the science case to establish Subantarctic Islands as sentinels for change. The effort includes a multidisciplinary approach to

map the biodiversity, define the processes, develop time series and establish an ANTOS style nearshore and terrestrial array alongside an LTER style approach to time series measurements of biodiversity and distribution of ocean and climate controlled environments. The effort includes New Zealand subantarctic Islands, South Georgia, Kerguelen Islands and Macquarie Island. Progress on the South Georgia plan was presented at the recent Marine Ecosystem Assessment for the Southern Ocean.

Sub-group Outcomes

Sub-group	Activity/Outcome/Benefit/Achievement
AG ISSA	Development of a proposal to establish South Georgia as a sentinel for change, in relation with Long-Term Ecological Research Program.
AG BEPSII	
AG Remote sensing	Successful request of the AG to European Space Agency on expanding the coverage of Sentinel-2 mission satellites from 56°S to the Antarctic continent for selected periods of 2016/17 and with regular coverage from 2017/18 season onward, allowing Antarctic researchers to use freely the high quality imagery of this new platform. Organized workshop “Drones in Polar Biology” during SCAR Biology Symposium 2017, leading to recommendations for CEP guidelines.
EG ANTOS	Continued to develop the ANTOS database and technical manual. Conducted a web-based survey to poll the research community about existing long-term ecological and environmental data (summer 2017). Technical attributes for the terrestrial three-Tier systems have been configured and work is underway on development of the marine three-Tier systems.
EG EGBAMM	The SO-Diet working group developed the Diet and Energetics Database that includes data related to diet and energy flow from conventional and molecular studies. The Retrospective Analysis of Antarctic Tracking Data working group compiled a major, publically available database (data paper submitted) that forms the basis of a synthesis identifying Areas of Ecological Significance in the Southern Ocean. The working group attracted funding from a French Biodiversity Research center which funded a post-doc and biannual meetings of the group.
EG ABI	The Register of Antarctic Marine Species has been now expanded to terrestrial and limnetic realms. In June 2017 a user survey was disseminated to over 90 potential users to query user needs and plans for engaging in use of the microbial Antarctic Resources System in the future (the users group now exceeds 110 people and a workshop planned for Davos will provide users with hands on experience in managing and analyzing data). In 2017 EG-ABI started an Antarctic science special interest group within the rOpenSci project (https://ropensci.org).
EG SO-CPR	The group completed about 100 CPR tows during the 2016/17 and 2017/18 Antarctic field seasons from research vessels from Australia, New Zealand, South Africa, Brazil and

	Japan. A workshop was held in Tokyo to set the framework of the special report to SCAR on the Status and Trends of Southern Ocean Zooplankton, bringing together all information from 25 years of the SO-CPR Survey.
JEGHBM	JEGHBM continues to support individual requests for support from member nations honoring the need for confidentiality. The group has been working on commonalities between physical qualification processes, cross disciplinary research and, operational paradigms for overwinter practice as well as supporting the SCAR Horizon Scan human health issues, including climate change, human and pathogen adaptation in Antarctica. Antarctica as an analog for space missions has been an international effort both with respect to space agency research and the active deployment of independent virtual reality behavioral health countermeasures.
ICED	ICED has continued to develop whole ecosystem level understanding of the structure and functioning of Southern Ocean of ecosystems, their variability and response to change across a range of spatial and temporal scales through a series of publications. ICED also continued model development work in support of creating a suite of models of physical dynamics, biogeochemical cycles, and biological dynamics within a hierarchical framework of models of different spatial, temporal and trophic resolution. ICED has worked with stakeholders to ensure science is incorporated into adaptation, mitigation and sustainable management procedures, notably the Antarctic Treaty Commission, the Committee for Environmental Protection and CCAMLR.

Sub-group Cash Flow

Sub-group	Allocation	Amount spent		
		2016	2017	2018
EGBAMM	10000		4982	
ISSA	3000		0	
ANTOS	7000		0	
BEPSII	5000		0	
EGABI	8000		805	
JEGHBM	4000		0	
Remote Sensing	1000		0	
SO-CPR	6000		0	
Life Sciences	11500		2154	

Sub-groups recommended for closure

Sub-group	Leaders	Reasons for closure
AG Ocean Acidification	R. Bellerby	Non delivery of report, no responses to any solicitations since 2012

New sub-groups being proposed

Sub-group	Leaders	Cross-reference SCAR Delegates WP
Input Pathways of persistent organic pollutants to AntarCTica (ImPACT)	Susan Bengston-Nash	Oral Report
PLASTIC-AG – Plastics in Polar Environments	Cath Waller, Claire Waluda	Oral Report
SCAR Krill Action Group (SKAG)	Bettina Meyer	Oral Report

Notable Papers

1. Reisinger, R.R., Raymond, B., Hindell, M.A., Bester, M.N., Crawford, R.J.M., Davies, D., de Bruyn, P.J.N., Dilley, B.J., Kirkman, S.P., Makhado, A.B., Ryan, P.G., Schoombie, S., Stevens, K., Sumner, M.D., Tosh, C.A., Wege, M., Whitehead, T.O., Wotherspoon, S. & Pistorius, P.A. (2018) Habitat modelling of tracking data from multiple marine predators identifies important areas in the Southern Indian Ocean. **Diversity and Distributions**, 24, 535-550.

EGBAMM: This paper is an early application of the analysis and synthesis approach developed by RAATD to identify areas of Ecological significance in the Southern Indian Ocean based on tracking data from 14 species. It demonstrates that the management and conservation of these predators and their environment relies on understanding their distribution and its link with the biophysical environment, as the latter determines the distribution and abundance of prey.

2. Ropert-Coudert, Y., plus 79 contributing authors (submitted). The Retrospective Analysis of Antarctic Tracking Data Project. **Nature Scientific Data**.

EGBAMM: This data paper represents the public release of the RAATD database and details the technical aspects of data collection, processing and quality control. The database is a significant output for EG-BAMM and will be a valuable resource to researchers and managers.

3. Murphy, E.J., Thorpe, S.E., Tarling, G.A., Watkins, J.L., Fielding, S., Underwood, P. (2017b) Restricted regions of enhanced growth of Antarctic krill in the circumpolar Southern Ocean. **Scientific Reports** 7, 6963.

ICED: The work is part of a large project aimed at developing a series of models of the population dynamics and life-cycle of Antarctic krill. The results and model analyses presented in this study contribute to core ICED activities aimed at developing projections of the impacts of change in Southern Ocean ecosystems and will be input to CCAMLR to inform decision making.

4. Meyer, B., Freier, Ulrich, Grimm, Volker, Groeneveld, Jürgen, Hunt, Brian P.V., Kerwath, S., King, R., Klaas, C., Pakhomov, E., Meiners, K.M., Melbourne-Thomas, J., Murphy, E.J., Thorpe, S.E., Stammerjohn, S.,

Wolf-Gladrow, D., Auerswald, L., Götz, A., Halbach, L., Jarman, S., Kawaguchi, S., Krumpfen, T., Nehrke, G., Ricker, R., Sumner, M., Teschke, M., Trebilco, R., Yilmaz, N. I. (2017). The winter pack-ice zone provides a sheltered but food-poor habitat for larval Antarctic krill. **Nature Ecology & Evolution** <https://doi.org/10.1038/s41559-017-0368-3>

ICED: This study is an important development in our understanding of the overwintering biology of Antarctic krill, which is crucial for developing projections of the impacts of future change, and will be incorporated into further ICED and CCAMLR work in this area.

5. Takahashi, K.T., Kitchener, J.A., Robinson, K., Hosie, G.W. (2017). Report on the Southern Ocean Continuous Plankton Recorder (SO-CPR) Standards Workshop 2016: SCAR SO-CPR Database Export Group. **Nankyoku Shiryô** (Antarctic Record), 61: 1-10

SO-CPR: This work is the report of the newest workshop held in Australian Antarctic Division in December 2016. During the workshop, we discussed a range of topics including: taxonomic resolution issues; laboratory method; shipboard techniques; training methods; data handling; gap analysis; and future workshops/conferences, including comprehensive training workshops for emerging SO-CPR survey partners.

6. Deagle, B.E., Clarke, L.J., Kitchener, J.A., Polanowski, A.M., Davidson, A.T. (2017). Genetic monitoring of open ocean biodiversity: An evaluation of DNA metabarcoding for processing continuous plankton recorder samples. **Molecular Ecology Resources**, 2017;00:1-16. <https://doi.org/10.1111/1755-0998.12740>

SO-CPR: This is the newest scientific paper that used our dataset. This paper investigated the potential for use of metabarcoding in CPR surveys. They suggested that the metabarcoding approach will play an important role in future plankton monitoring.

7. Borowicz, A., McDowall, P., Youngflesh, C., Sayre-McCord, T., Clucas, G., Herman, R., Forrest, S., Rider, M., Schwaller, M., Hart, T., Jenouvrier, S., Polito, M.J., Singh, H., Lynch, H.J. (2018). Multi-modal survey of Adélie penguin mega-colonies reveals the Danger Islands as a seabird hotspot. **Scientific Reports**, 8, 3926. <https://doi.org/10.1038/s41598-018-22313-w>

Remote Sensing: The first complete census of *Pygoscelis* spp. penguins in the Danger Islands, estimated from a multi-modal survey consisting of direct ground counts and computer-automated counts of unmanned aerial vehicle imagery is presented. The survey reveals that the Danger Islands host 751,527 pairs of Adélie penguins, more than the rest of AP region combined, and include the third and fourth largest Adélie penguin colonies in the world.

8. Weimerskirch, H., Prudor, A., Schull, Q. (2018). Flights of drones over sub-Antarctic seabirds show species- and status-specific behavioural and physiological responses. **Polar Biology**, 41, 259–266. <https://doi.org/10.1007/s00300-017-2187-z>

Remote Sensing: The behavioural response of 11 southern seabird species at the Crozet Islands, Southern Indian Ocean, to drone approaches at specific altitudes was assessed and compared. There are differences between species depending on the altitude of the drone approach. These results have important implications for the conservation of species and should be helpful for future legislations on the use of drones.

9. Gonzalez-Wevar, C.A., Segovia, N.I., Rosenfeld, S., Ojeda, J., Hane, M., Naretto, J., Saucaude, T., Brickle, P., Morley, S., Facral, J.-P., Spencer, H.G., Poulin, E. (2018). Unexpected absence of island endemics: Long-distance dispersal in higher latitude sub-Antarctic Siphonaria (Gastropoda: Euthyneura) species. **Journal of Biogeography**, 45, 874-884.

ISSA: This paper documents stronger marine connectivity between subantarctic islands than expected. Indicating active dispersal between subantarctic islands rather than endemism.

Forthcoming Activities

For the future activities of sub-groups please refer to each sub-group report. Life Sciences current leaders will be rotating in 2020. Deputy CO Dr. Marc Shepanek will be ending his second term as deputy CO. Dr. Yan Ropert-Coudert will be ending his first term as CO and will only do a second term if there is no candidate to take the succession. Prof. Ian McDonald will be finishing his first term as Secretary and has expressed interest in running for CO position for the next mandate.

Three new AGs will be proposed for endorsement by the Delegates in Davos:

- **Input Pathways of persistent organic pollutants to AntarCTica (ImPACT)** (LS and PS) led by Susan Bengston-Nash. The purpose of this working group is to facilitate coordinated investigation of chemical input to the Antarctic region. This is a policy-impact driven Action Group which aims to serve both the Global Monitoring Plan of the Stockholm Convention on Persistent Organic Pollutants (POPs), as well as the Protocol on Environmental Protection to the Antarctic Treaty (the Madrid Protocol) which explicitly prohibits the importation of POPs (chemicals of known risks) to Antarctica. Targeted system chemical input pathways of investigation include; atmospheric transport; oceanic transport; *in-situ* usage, and migratory biota. The Action Group will draw together the Antarctic POP research community in order to devise a long-term coordination body, and underpinning funding strategy, for realising Action Group goals.
- **Plastics in Polar Environments (PLASTIC-AG)** (LS and PS) led by Cath Waller and Claire Waluda. Although plastic pollution is a global problem, little is known about the distribution and sources of plastic in the Polar Regions. We will examine the presence, origin and biological effects of macro-, micro- and nanoplastics, quantify the scale of the problem and propose solutions for minimising the environmental risk and impacts on Polar ecosystems.

- **SCAR Krill Action Group (SKAG)** (LS) led by Bettina Meyer. Recent findings on krill have demonstrated that, even after almost 100 years of krill research, our understanding of krill life history, performance to climate change, spatial dynamics and the environmental drivers associated with them are largely unknown. At the recent international Krill Symposium in St. Andrews, UK, in June 2017, it was identified that, regardless of our massively improved understanding of krill biology and ecology the scientific community and the public are still holding onto the out-dated perceptions on krill from the 1980s, which are still widespread in the scientific community. This is preventing and holding back new directions in krill research. Given the changes occurring to Southern Ocean ecosystems owing to climate change and krill's prominent role in polar ecosystems it is crucial to make the lack of knowledge visible, reconsider the current methods used and to develop new line of thoughts in krill research. SKAG aims to become the prime conduit between CCAMLR and wider krill science community to provide forum to set research directions and promote collaboration to improve understanding of krill biology and ecology, and to assist providing critical scientific information that matters the krill fishery management. SKAG will identify out-dated ideas that continue to influence management and limit scientific inquiry. Ship time for krill fieldwork is becoming scarcer. The group will provide a forum for an information exchange on upcoming cruises and opportunities as well as on lab facilities for experimental krill work and a platform for the development of future international collaborative research proposals and programs.

Scientific Research Program Planning Groups

1. Integrated Conservation Planning for Antarctica and the Southern Ocean (Ant-ICON) – (see SDM 14a for details)

Lead Proponents: Aleks Terauds (Australia)

Contributors: Annicke Wilmotte (Belgium), George Watters (USA), Daniela Liggett (New Zealand), Luis Pertierra (Spain), Megumu Tsujimoto (Japan), Cassandra Brooks (USA), Marcelo Regeuro (Argentina), Tom Bracegirdle (United Kingdom), Gabriela Mataloni (Argentina), Juan Salazar (Australia), Diana Wall (USA), Jasmine Lee (Australia), Neil Gilbert (New Zealand), Andrew Lowther (Norway), Hans Ulrich-Peter (Germany), Craig Cary (New Zealand), Elle Leane (Australia), Heather Lynch (USA), Kevin Hughes (United Kingdom), Rowan Trebilco (Australia), Antonio Quesada (Spain), Huw Griffiths (United Kingdom), Justine Shaw (Australia), Fraser Morgan (New Zealand), Cath Waller (United Kingdom), Yan Ropert-Coudert (France), Mecha Santos (Argentina), Luis Ferrada Walker (Chile), Nadine Johnston (United Kingdom).

Description: The SRP will answer fundamental science questions (as identified by the SCAR Horizon Scan), relating to the conservation and management of Antarctica and the Southern Ocean and focus on research to drive and inform international decision-making and policy change. While there is a strong biological focus for much of the research, the proposed SRP will integrate research from multiple disciplines together with feedback from policy

bodies. The SRP will focus on 4 research themes, covering: i) integrated forecasting of future change to support conservation planning; ii) environmental sustainability of human activities in Antarctica; iii) Antarctic conservation in a global context; and iv) socio-ecological approaches to conservation planning.

Budget

Planned use of funds for 2018 to 2020

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
2018	Travel Sec. to Davos	2400	Ian McDonald	irmcdon@waikato.ac.nz
2018	Travel CO to Davos	700	Yan Ropert-Coudert	Yan.ropert-coudert@cebc.cnrs.fr
2019	Travel CO, deputy CO or Sec. to SRP planning meeting	2100	Yan Ropert-Coudert	Yan.ropert-coudert@cebc.cnrs.fr
2020	Travel CO to Hobart (OSC)	2100	Yan Ropert-Coudert	Yan.ropert-coudert@cebc.cnrs.fr
2020	Travel Sec. to Hobart (OSC)	800	Ian McDonald	irmcdon@waikato.ac.nz
2020	Travel Deputy CO to Hobart (OSC)	2100	Marc Shepanek	marc.a.shepanek@nasa.gov
2020	Grant ECR to attend OSC	2100	Yan Ropert-Coudert	Yan.ropert-coudert@cebc.cnrs.fr

Briefly describe funds usage and desired results

- 2018 Travels to Davos: The remaining of the funds for 2018 will be used to assist the Secretary and the CO to attend the Davos meeting.
- 2019: Although there will be no official SCAR meeting this year, we request 2100 U\$ to allow one of the leads of LSG to attend the new LSG-related SRP planning meeting.
- 2020 Travels to Hobart to attend the OSC: The OSC will be the last one for the current leaders of LSG. We thus request travel funds for the CO, Deputy CO and secretary to attend the meeting and pass over the torch to the next team. In addition, we plan to use some of the money to invite an early career scientist from a country with a developing Antarctic program to participate at the meeting.

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

2018: 0%
 2019: 0%
 2020: 30%

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

2018: 0%
2019: 0%
2020: 30%

Linkages

Direct support from outside organisations received for your activities

None directly (except salaries of course).

Major collaborations

Within SCAR

1. All groups in Life Sciences
2. Physical Sciences and Geosciences Group
3. Basically, more or less all actors in SCAR...

Outside SCAR

1. CCAMLR, etc.

Outreach and Capacity Building

We invited two ECR to attend the SCAR Biology meeting to present their work.

SCAR Fellowship Reviewers

First Name	Last Name	E-mail	Principal Expertise
Yan	Ropert-Coudert	Yan.ropert-coudert@cebc.cnrs.fr	Birds and Marine Mammals
Ian	McDonald	irmcdon@waikato.ac.nz	Microbiology

Membership

Leadership

Role	First Name	Last Name	Affiliation	Country	Email	Date Started	Date Term is to End
CO	Yan	Ropert-Coudert	CEBC-CNRS	France	Yan.ropert-coudert@cebc.cnrs.fr	2016	2020
DCO	Marc	Shepanek	NASA	USA	marc.a.shepanek@nasa.gov	2012	2020
Sec.	Ian	McDonald	Waikato Univ.	New Zealand	irmcdon@waikato.ac.nz	2016	2020

Requests to the Secretariat - None



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Attachment 1. Subsidiary/Joint Groups and Co-sponsored Program Reports

Action Groups

- **Biogeochemical Exchange Processes at Sea-Ice Interfaces (BEPSII)**
- **Development of a satellite-based, Antarctic-wide, remote sensing approach to monitor bird and animal populations**
 - **Integrated Science for the SubAntarctic (ISSA)**

Expert Groups

- **Antarctic Biodiversity Informatics (EGABI)**
- **Antarctic Terrestrial Observing System (ANTOS)**
 - **Birds and Marine Mammals (EGBAMM)**
- **Southern Ocean Continuous Plankton Recorder (SO-CPR)**

Joint Expert Group

- **Human Biology and Medicine (JGHBM)**

Co-Sponsored Program

- **Integrating Climate and Ecosystem Dynamics in the Southern Ocean (ICED)**



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**Biogeochemical Exchange Processes at
 Sea-Ice Interfaces
 BEPSII - Action Group**

Report Author

Jacqueline Stefels, Netherlands

Summary of activities from 2016-18 and other important issues

Started as a SCOR working group (#140) between 2012-2016, BEPSII is now a global community of sea-ice researchers including biogeochemists, ecologists, atmospheric scientists, oceanographers and physicists. BEPSII is now also endorsed by SOLAS (Surface-Ocean Lower-Atmosphere Studies) and CliC (Climate and Cryosphere) and in 2017 received additional support from IASC (International Arctic Science Committee). In this new phase, BEPSII will focus on developing the tools to tackle big-picture questions of global relevance and feedbacks of sea ice in the Earth system.

BEPSII held a 3-day workshop in April 2017 in La Jolla, California, jointly with the new SCOR Working Group (#152) on Measuring Essential Climate Variables in Sea Ice (ECV-Ice), which emerged from the BEPSII community. A 5-year science plan was drafted to streamline BEPSII's future activities. A model intercomparison workshop and a field intercomparison campaign were organized. Under the auspices of BEPSII an *Elementa* Special Feature was finalized, containing 18 contributions including more than 5 synthesis papers. During POLAR2018 a Foresight Workshop will be organized to discuss the impacts of Arctic Sea-ice Change on biogeochemical and ecosystem processes.

Recommendations

We ask to be considered as a SCAR Expert Group.

Summary Budget 2017 to 2020*

	2017	2018	2019	2020
	Spent	Allocated	Request	Request
(US\$)	-	5000	10000	2000

**Since travel and meeting costs for the 2017 meetings could be covered by support from IASC, SOLAS and CLIC, it was decided to leave all SCAR support for the side meeting during POLAR2018. Expenses have not been claimed yet.*



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Progress and Plans

Sub-group Major Outcomes/Activities

BEPSII started as a working group of SCOR (WG#140) in 2012. This first phase finished in 2016, after which the community decided to continue and seek for endorsement from various science programs. In 2016, BEPSII was approved by SOLAS (Surface-Ocean Lower-Atmosphere Studies) and CliC (Climate and Cryosphere) as a longer-lived activity and by SCAR as an Action Group under the LS-SG. Given the relatively new and small research community working on sea-ice biogeochemistry, BEPSII unites scientists from both the Arctic and the Antarctic and covers most of the research questions related to sea-ice biogeochemistry and ecology.

This 2nd phase of BEPSII is focused on developing the tools to tackle big-picture questions about the global relevance of biogeochemical processes within and around sea ice, including climate-change feedbacks. During the **April 2017 meeting**, the BEPSII goals and objectives were updated as follows:

- 1) to develop dedicated and consistent methodologies for sea-ice biogeochemical research;
- 2) to establish effective sea-ice biogeochemical data-archiving approaches and databases;
- 3) to foster process studies determining impacts of sea ice on ecology and biogeochemical cycles;
- 4) to foster technological developments and international knowledge transfer towards large-scale, autonomous and high-frequency sampling of sea-ice biogeochemical parameters
- 5) to improve the representation and evaluation of sea-ice biogeochemistry in regional and Earth system numerical models;
- 6) to synthesize and integrate observational and modeling efforts;
- 7) to regularly revise and renew scientific foci, teams, and objectives;
- 8) to develop conceptual models describing sea-ice interactions in or within the Earth system.

These formed the basis of a **5-year science plan** that has just been finalized in which five task groups, each focused on one of the goal-encompassing topics that follow below, will address **BEPSII's new goals**:

- **Methodologies:** Method intercalibration studies – a need strongly highlighted in the BEPSII research community – will be developed within a new SCOR working group ECV-ice that originated from BEPSII (= SCOR-WG152: Measuring Essential Climate Variables in Sea Ice).
- **Leads:** Francois Fripiat (Max Plank Institute for Chemistry), Daiki Nomura (Hokkaido University), Brent Else (University of Calgary). **In spring 2018**, a first campaign was carried out in Saroma-Ko lagoon to evaluate different methodologies assessing sea-ice primary production and air-sea ice CO₂ flux.
- **Technology & Data Collation:** to support the development and validation of in-situ platforms and sensors development. BEPSII as a community of researchers will also continue to pursue its initial work on historical data collation and analysis. In 2018, the *Elementa* Special Feature was finalized, containing 18 papers and 5 reviews (e.g. Fripiat et al. 2017 on sea ice and nutrients, Lannuzel et al., 2017 on sea ice and iron). **Leads:** Klaus Meiners (Australian Antarctic Division), Lisa Miller (Institute of Ocean Sciences, Canada).
- **Modeling and Observational Process Studies:** One of BEPSII's efforts is to design consistent and reproducible time-series process studies for multidisciplinary projects, so as to improve the usefulness and efficacy of observational data for models. **Leads:** Nadja Steiner



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(Institute of Ocean Sciences, Canada), Hauke Flores (Alfred Wegener Institute). A 1-D model intercomparison workshop was organized in **November 2017** in Finland.

- **Syntheses:** One essential component of synthesizing processes and developing model parameterizations is the development of conceptual models that describe linkages between sea-ice biogeochemical processes and polar to global environments. Identifying and analyzing these and other linkages are crucial to infer the impacts of changing Arctic and Antarctic environments on polar ecosystems, biogeochemical dynamics and biodiversity and to improve confidence in ecosystem models. Leads: Delphine Lannuzel (University of Tasmania), Martin Vancoppenolle (LOCEAN/IPSL, France).
- **Outreach:** BEPSII is committed to provide guidance to stakeholders and policy makers on feedback processes of sea-ice BGC and society in times of climate change. BEPSII is building capacity by strongly supporting early-career scientists and students. Efforts include the organization of a field school in April 2019 at CHARS station (Cambridge Bay, Canada), travel support to annual meetings, and encouragement to take on leadership roles in synthesizing available information within their own field of expertise with mentoring from senior scientists. Leads: Letizia Tedesco (Finnish Environment Institute), Bruno Delille (Université de Liège)

Activities of the five Task Groups during the period 2016-2018 are provided in the table below.

As a side meeting of **POLAR2018**, BEPSII will organize a combined 3-day meeting, comprising **the BEPSII and ECV-Ice annual meetings and a Foresight Workshop:** “Arctic Sea-Ice Change: Insights into near-future changes in Arctic sea-ice biogeochemistry and associated ecosystems”, which is co-sponsored by the EuroMarine Network. Sea ice is one of the largest and most dynamic ecosystems on Earth, covering ~10% of the ocean and harboring, in some regions, standing crops similar to productive oceanic regions. In addition to affecting climate through physical feedbacks, sea ice provides an active but still poorly understood biogeochemical interface at both the ocean and atmosphere, affecting the cycling and budgets of essential climate variables (CO₂, DMS, N₂O, halogens, ...). Arctic sea-ice volume and extent are decreasing at an alarming rate and faster than the mean of climate projections. In addition, the nature of sea ice is changing. Yet the magnitude of these changes and their biogeochemical and ecological consequences are neither fully explored, nor described and quantified. The workshop aims to: 1) Summarize existing knowledge of changes for a number of selected physical and biogeochemical variables and parameters, representative of the sea-ice ecosystem; 2) Make a first tentative analysis of the effects of the predicted changes in the sea-ice horizon on the Arctic ecosystem. 3) Generate an accessible description of future changes in sea-ice biogeochemistry to focus scientific efforts, raise public awareness and facilitate climate policymaking. The workshop will consist of three plenary sessions organized around specific parameters, followed by parallel discussion groups.

Sub-group Outcomes Summary

Sub-group	Activity/Outcome/Benefit/Achievement
BEPSII	Joint ECV-ICE BEPSII Meeting in La Jolla, CA, Apr 3-5, 2017. (~30 participants).
BEPSII	ECV-ICE SCOR WG kickoff focused on the design of inter-calibration experiments for sea-ice biogeochemical observation techniques.
BEPSII	BEPSII 1D Model Inter-comparison Project meeting, Helsinki, Finland, Nov 2017
BEPSII	BEPSII <i>Elementa</i> Special Feature finalized: 18 contributions; https://collections.elementascience.org/biogeochemical-exchange-processes/
BEPSII	EU-COST action proposal EN-Ice submitted (not granted)



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 Person Responsible: J Stefels

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BEPSII	BEPSII 5-yr Science Plan finalized
BEPSII	Belmont Forum / BiodivScen proposal submitted
BEPSII	ECV-Ice intercalibration campaign, Saroma-Ko Bay, Hokkaido, Japan
BEPSII	Position Analysis on sea-ice biogeochemical response to climate change: Foresight Workshop on Arctic Sea-Ice Change during POLAR2018
BEPSII	During POLAR2018, several of BEPSII's young investigators will convene a sea-ice session.

Sub-group Cash Flow

Sub-group	Allocation	Amount spent		
		2016	2017	2018
BEPSII	5000			?

Due to substantial contributions of other organisations (see under Linkages), the SCAR contribution for 2016 and 2017 has been saved for 2018.

Notable Papers

1. Van Leeuwe MA, L Tedesco, KR Arrigo, P Assmy, K Campbell, KM Meiners, J-M Rintala, V Selz, DN Thomas & J Stefels (2018): Microalgal community structure and primary production in Arctic and Antarctic sea ice: A synthesis. *Elementa: Science of the Anthropocene* 6(1):4. doi: <http://doi.org/10.1525/elementa.267>. *This work contains an analysis of sea ice microbial diversity from >300 ice cores in both the Arctic and Antarctic*
2. Fripiat, F, Meiners, K M, Vancoppenolle, M, Papadimitriou, S, Thomas, D N, Ackley, S F, Arrigo, K R, Carnat, G, Cozzi, S, Delille, B, Dieckmann, G S, Dunbar, R B, Fransson, A, Kattner, G, Kennedy, H, Lannuzel, D, Munro, D R, Nomura, D, Rintala, J-M, Schoemann, V, Stefels, J, Steiner, N and Tison, J-L (2017) Macro-nutrient concentrations in Antarctic pack ice: Overall patterns and overlooked processes. *Elementa: Science of the Anthropocene*, 5: 13, DOI: <https://doi.org/10.1525/elementa.217>. *This work contains a large-scale compilation of the macronutrients N, P and Si in Antarctic pack ice (>300 ice cores from 19 expeditions).*
3. Steiner N, Stefels J (2017) Commentary on the outputs and future of Biogeochemical Exchange Processes at Sea-Ice Interfaces (BEPSII). *Elementa: Science of the Anthropocene* 5:81. DOI: <http://doi.org/10.1525/elementa.272>. *This is the Introduction to the BEPSII special feature of Elementa, which finalizes the first phase of BEPSII as a working group of SCOR.*

Forthcoming Activities

Summary of planned activities:

- Expert contribution to ongoing discussions on the design of biogeochemistry and ecosystem components of the International Arctic drift experiment MOSAiC.
- Finalization 1D-model inter-comparison.
- Model development and inter-comparison (links to CMIP6, SIMIP and FAMOS).
- ECV-Ice intercalibration efforts focused on gas concentration measurement techniques in sea ice. Experiments will be performed at the Roland von Glasow ice tank facility at the University of East Anglia (UK).
- ECV-Ice intercalibration campaign on primary production and coupling with emerging technologies
- BEPSII field school to be held at CHARS station, Cambridge Bay, Canada, Apr 2019.



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 Person Responsible: J Stefel

**XXXV SCAR Delegates Meeting
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Budget

Planned use of funds for 2018 to 2020

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
2020	annual meeting	2000	J. Stefels	j.stefels@rug.nl
2019	field school	8000	L. Tedesco	Letizia.Tedesco@ymparisto.fi
2019	annual meeting	2000	J. Stefels	j.stefels@rug.nl
2018	modeling workshop	2000	L. Tedesco	Letizia.Tedesco@ymparisto.fi
2018	annual meeting, Davos	3000	J. Stefels	j.stefels@rug.nl
Total		25000 (+5000)*		

** The \$5000 for 2018 is in fact the allocated sum of the past period, which was not yet spend due to contributions received from other organisations.*

Briefly describe funds usage and the desired results

- Due to available funding from other sources, we can cover most expenses for the Davos meeting and ask to use left-over funding from the 2016-18 period for a modeling workshop to finalise the 1D-intercomparison.
- The most important activity in the 2019-20 period is the field school for which we ask support to teach a new generation of sea-ice scientists on sea-ice biogeochemistry. BEPSII has been offered free accommodation and use of field facilities at the CHARs station. Although in the Canadian Arctic, the teaching will explicitly cover the similarities and differences of both poles in line with the Davos 2018 scope.
- The contribution from SCAR should be considered seed money as total costs for transportation only is estimated at USD 60 000 (avg €1500 for 30 participants + 10 teachers). This is expensive, but more accessible stations in e.g. Europe are no longer guaranteed to have sea ice. We are currently investigating additional funding organizations for support: the Canadian Government, SOLAS, CLiC, IASC.

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

2018: 50%
 2019: 80%
 2020: 50%

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

2018:
 2019: 10%
 2020:

Linkages

Direct support from outside organisations



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For 2017, we received funds from **IASC**, **SOLAS**, and **CLiC** to organize the 2017 meeting in La-Jolla, California. Funds from CLiC also helped to organize the modeling workshop in Helsinki. For 2018, we received funds from the **EuroMarine** Network to support a Foresight Workshop during POLAR2018 and additional funds from CLiC to support the annual BEPSII meeting. In both 2017 and 2018, **SCOR** provides funding for full members of the ECV-Ice working group, who have strong overlap with BEPSII's task group 1.

Major collaborations

Within SCAR

1. ASPeCT

Outside SCAR

1. the IGAC activity: CATCH
2. SCOR working group ECV-Ice (which has strong overlap with BEPSII's TG1)

Outreach and Capacity Building

Communication & Outreach:

- BEPSII mailinglist: bepsii@lists.scar.org at <http://lists.scar.org/mailman/listinfo/bepsii>
- BEPSII website: <https://sites.google.com/site/bepsiiwg140/home> (links from the SCAR website refer to this site)
- BEPSII Twitter profile: @BEPSII_seaice
- BEPSII Facebook page: <https://www.facebook.com/SCOR.BEPSII/>
- BEPSII *Elementa* special feature website: <https://home.elementascience.org/special-features/biogeochemical-exchange-processes-at-sea-ice-interfaces-bepsii/>

Capacity building:

The organization of a "field school" for Ph-D candidates and post docs is under construction. Potential place: Cambridge Bay, Canada. Tentative time: spring 2019

SCAR Fellowship Reviewers

First Name	Last Name	E-mail	Principal Expertise
Janne-Markus	Rintala	janne.rintala@helsinki.fi	algal taxonomy
Klaus	Meiners	Klaus.Meiners@aad.gov.au	sea-ice biogeochemistry
Maria	van Leeuwe	m.a.van.leeuwe@rug.nl	phytoplankton ecophysiology
Hauke	Flores	hauke.flores@awi.de	sea ice fauna and zooplankton ecology
François	Fripiat	f.fripiat@mpic.de	Biogeochemistry, paleoceanography



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 Person Responsible: J Stefel

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Membership

Leadership

Role	First Name	Last Name	Affiliation	Country	Email	Date Started
Chair	Jacqueline	Stefels	University of Groningen	Netherlands	j.stefels@rug.nl	Sept. 2016
co-chair	Janne-Markus	Rintala	University of Helsinki	Finland	janne.rintala@helsinki.fi	Sept. 2016
connect to ASPeCT member	Klaus	Meiners	Australian Antarctic Division	Australia	Klaus.Meiners@aad.gov.au	Sept. 2016
member	Maria	van Leeuwe	University of Groningen	Netherlands	m.a.van.leeuwe@rug.nl	Sept. 2016
member *	Jeff	Bowman	Scripps Institute of Oceanography	USA	jsbowman@ucsd.edu	Sept. 2016

* *Early Career Scientist*

Other members

First Name	Last Name	Affiliation	County	Email
Nadja	Steiner	Fisheries & Oceans Canada	Canada	Nadja.Steiner@canada.ca
Martin *	Vancoppenolle	LOCEAN – UPMC, Paris	France	martin.vancoppenolle@locean-ipsl.upmc.fr
Bruno	Delille	University of Liege	Belgium	Bruno.Delille@ulg.ac.be
Letizia *	Tedesco	SYKE, Helsinki	Finland	Letizia.Tedesco@ymparisto.fi
Hauke *	Flores	AWI, Bremerhaven	Germany	Hauke.Flores@awi.de
Francois *	Fripiat	MPI	Germany	f.fripiat@mpic.de
Daiki *	Nomura	Hokkaido University	Japan	daiki.nomura@fish.hokudai.ac.jp
Brent *	Else	Univ Calgary	Canada	belse@ucalgary.ca
Delphine	Lannuzel	University of Tasmania	Australia	Delphine.Lannuzel@utas.edu.au
Lisa	Miller	Fisheries & Oceans Canada	Canada	Lisa.Miller@dfo-mpo.gc.ca

* *Early Career Scientist*

These members are BEPSII steering committee members, in addition to the SCAR AG members. In addition there are 100+ more persons on the mailing list.

Requests to the Secretariat

Online meeting tools



SDM **16**
 Agenda Item: 4.3.2
 Person Responsible: H-U Peter and O Mustafa

**XXXV SCAR Delegates Meeting
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**Action Group
 “Development of a satellite-based, Antarctic-wide, remote sensing approach to monitor bird and animal populations”**

Report Authors:

Hans-Ulrich Peter (CO, Germany), Osama Mustafa (Deputy CO, Germany)

Summary of activities from 2016-18 and other important issues

- Organizing session during SCAR Open Science Conference 2016
- Organizing Action group-meeting during SCAR OSC 2016
- Initiation and preparation of an official request of SCAR to Copernicus Program/ European Space Agency (ESA) concerning coverage of satellites
- Presentation of first results of the coverage extension at the Annual Forum for Remote Sensing and Copernicus 2017
- Organizing a workshop during SCAR Biology Symposium 2017
- Organizing an Action-Group Meeting during the Polar18-Conference in Davos
- Discovery of new penguin colonies

Recommendations

none

Summary Budget 2017 to 2020 (LS) - for PS the same

	2017	2018	2019	2020
	Spent	Allocated	Request	Request
(US\$)	0	1000	1000	1000



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 Person Responsible: H-U Peter
and
O Mustafa

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Progress and Plans

Sub-group Major Outcomes/Activities

- Organizing session during the SCAR OSC 2016: Session 21: Remote sensing of the Antarctic environment: Multidisciplinary Advances: 20 talks and 16 poster presentations. One young scientist got financial support. (and organizing Action group-meeting during SCAR Open Science Conference: Joint meeting of the SCAR Action Group on remote sensing of animals and the new SOOS working Group Censusing Animal Populations from Space (CAPS).
- Initiation and preparation of an official request of SCAR to European Space Agency (ESA) concerning coverage of satellites. Following a discussion at the workshop during SCAR OSC 2016 members of the Action Group initiated and prepared an official request of SCAR as representative of the Antarctic scientific community to the European Space Agency (ESA) on expanding the coverage of Sentinel-2 mission satellites. In November 2016, this request was positively answered and fully supported by ESA. The image acquisition of Sentinel-2 was extended from its former limitation to 56°S to the Antarctic continent for selected periods of the season 2016/17 and with regular coverage from 2017/18 season on. With this, Antarctic researchers from various fields have the opportunity to use the free available and high quality imagery of this new platform.
- Presentation of first results of the coverage extension at the Annual Forum for Remote Sensing and Copernicus 2017 (The analysis outlines the potential of Sentinel -2 images for monitoring bird populations in the Antarctic
- Organizing workshop “Drones in Polar Biology” during SCAR Biology Symposium 2017 July 9. This technology is used for groundtruthing of satellite imagery and as a standalone survey method. To discuss the opportunities and challenges of this promising technology the SCAR Action The use of drone technology by the following topics were discussed: i) Monitoring of Antarctic wildlife, esp. penguins and seals (new penguin colonies where found); ii) Botanical and physiological research; iii) Avoidance of disturbance of birds and seals: Recommendations for guidelines for CEP.
- Meeting during Polar18 (June17, 2018) for discussion of new technologies (satellites and drones) and for further cooperation.

Sub-group Outcomes Summary

Sub-group	Activity/Outcome/Benefit/Achievement
Remote Sensing	<ul style="list-style-type: none"> - Organisation of workshops and meetings, - exchange of information on new technologies and methods - Search for new penguin colonies by using new technologies - Recommendations for guidelines for CEP - Contact to ESA.

Sub-group Cash Flow

Sub-group	Allocation	Amount spent		
		2016	2017	2018
Remote Sensing		1000	0	1000



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Person Responsible:	H-U Peter and O Mustafa

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Notable Papers

1. Borowicz, A., McDowall, P., Youngflesh, C., Sayre-McCord, T., Clucas, G., Herman, R., Forrest, S., Rider, M., Schwaller, M., Hart, T., Jenouvrier, S., Polito, M.J., Singh, H., Lynch, H.J., 2018. Multi-modal survey of Adélie penguin mega-colonies reveals the Danger Islands as a seabird hotspot. *Sci Rep* 8, 3926. <https://doi.org/10.1038/s41598-018-22313-w>. *The first complete census of Pygoscelis spp. penguins in the Danger Islands, estimated from a multi-modal survey consisting of direct ground counts and computer-automated counts of unmanned aerial vehicle (UAV) imagery is presented. The survey reveals that the Danger Islands host 751,527 pairs of Adélie penguins, more than the rest of AP region combined, and include the third and fourth largest Adélie penguin colonies in the world. Found Antarctic petrel breeding areas using Landsat-8 Operation Line Imager data.*
2. Schwaller, M., H. Lynch, A. Tarraux, B. Prehn (2018): Continent-wide search for Antarctic petrel breeding sites with satellite remote sensing. *Remote Sensing of Environment* 210, 444-451. *During a survey of the entire continent of Antarctica for Antarctic petrel colonies with Landsat 86% of the known Antarctic petrel breeding population was found. Additionally, previously unknown Antarctic petrel breeding colonies were discovered.*
3. Weimerskirch, H., Prudor, A., Schull, Q., 2018. Flights of drones over sub-Antarctic seabirds show species- and status-specific behavioural and physiological responses. *Polar Biol* 41, 259–266. <https://doi.org/10.1007/s00300-017-2187-z>. *The behavioural response of 11 southern seabird species at the Crozet Islands, Southern Indian Ocean, to drone approaches at specific altitudes was assessed and compared. There are differences between species depending on the altitude of the drone approach. These results have important implications for the conservation of species and should be helpful for future legislations on the use of drones.*

Forthcoming Activities

- Activities during the Polar18-Conference in Davos (Meeting of the AG on June 17), the World Ornithological Congress in Canada 2018, Meeting of the AG in 2019, SCAR OSC 2020 in Hobart etc.
- Further strong cooperation with EGBAMM, CAPS and SOOS with colleagues from the Intersessional contact group to develop guidelines for the environmental aspects of the use of UAVs/RPAS in Antarctica within CEP.



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Budget

Planned use of funds for 2018 to 2020 (only part LS)

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
2018	Polar18-participation	1000	Hans-Ulrich Peter	bpe@uni-Jena.de
2019	Meeting of the AG	1000	Hans-Ulrich Peter	bpe@uni-Jena.de
2020	OSC Hobart	1000	Hans-Ulrich Peter	bpe@uni-Jena.de
Total		3000		

Briefly describe funds usage and desired results

The funds will be used for young people to take part on SCAR conferences (OSC and others) and workshops/meetings of the AG Remote sensing.

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

2018: 100%
 2019: 100%
 2020: 100%

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

2018: 30 %
 2019: 30 %
 2020: 30 %

Linkages

Direct support from outside organisations

Committee on Environmental Protection

Major collaborations

Within SCAR

The AG is supported by LS and PS.
 There is a strong cooperation with EGBAMM, CAPS and SOOS

Outside SCAR

The results of several group members regarding the disturbance of wildlife by drones were the base for a number of conference papers submitted to ATCM/CEP giving an input for the discussion on guidelines for the use of drones near bird and seal concentrations. An Intersessional contact group to develop guidelines for the environmental aspects of the use of UAVs/RPAS in Antarctica within CEP was opened.



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 Person Responsible: H-U Peter and O Mustafa

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Outreach and Capacity Building

The results of several group members regarding the disturbance of wildlife by drones were the base for a number of conference papers submitted to ATCM/CEP giving an input for the discussion on guidelines for the use of drones near bird and seal concentrations.

SCAR Fellowship Reviewers

First Name	Last Name	E-mail	Principal Expertise
Hans-Ulrich	Peter	bpe@uni-jena.de	Bird and seal ecology
Osama	Mustafa	osama.mustafa@think-jena.de	Drones, satellites and there use for birds and seals

Membership

Leadership

Role	First Name	Last Name	Affiliation	Country	Email	Date Started	Date Term is to End
Co-chair	Osama	Mustafa	THINK	Germany	osama.mustafa@think-jena.de	2014	?
Chair	Hans-Ulrich	Peter	FSU	Germany	bpe@uni-jena.de	2014	?

*Please identify Early Career Scientists with * in first column*

Other members

First Name	Last Name	Affiliation	County	Email
Heather	Lynch	Stony Brook Univ.	USA	<heather.lynch@stonybrook.edu>
Michelle	La Rue	Univ. of Minnesota	USA	< larue010@gmail.com >
Peter	Fretwell	BAS	UK	<ptf@bas.ac.uk>
Osama	Mustafa	Think	Germany	<osama.mustafa@think-jena.de>
Ewe	Hong Tat	Universiti Tunku Rahman	Malaysia	<eweht@utar.edu.my>,
Shridhar	Jawak*	Nat.Centre for Antarctic	India	<shridhar.jawak@gmail.com>,



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and
O Mustafa

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Davos, Switzerland, 25-26 June 2018**

		and Ocean Research		
Rob	Massom	Australian Antarctic Division	Australia	<Rob.Massom@aad.gov.au>
Oscar	Schofield	Rutgers University	USA	<oscar@marine.rutgers.edu>
Mathew	Schwaller	NASA Goddard Space Flight Center	USA	mathew.r.schwaller@nasa.gov
Malgorzata	Korczak-Abshire	Polish Academy of Sciences	Poland	mka@ibb.waw.pl
Paul	Morin	Polar Geospatial Center	USA	lpaul@umn.edu
Marie-Charlott	Rümmeler*	Jena University	Germany	marie-charlott.ruemmler@uni-jena.de
Barbara	Bollard Breen	Auckland University of Technology	New Zealand	bbreen@aut.ac.nz
Horst	Bornemann	AWI	Germany	Horst.Bornemann@awi.de
Henri	Weimerskirch	CNRS	France	henriw@cebc.cnrs.fr

Requests to the Secretariat - none



SDM **16**
Agenda Item 4.3.2
Person Responsible: Gary Wilson

SCAR Delegates Meeting 2018
Davos, Switzerland, June 2018

Integrated Science for the SubAntarctic ISSA
2016-2018 Report

Report Author(s)

Gary Wilson, University of Otago, New Zealand
Justine Shaw, University of Queensland, Australia

Summary of activities from 2016-18 and other important issues

Following on from the ISSA workshop at the SCAR Biology Symposium, several ISSA scientists moved on to the development of the Discovery 100 (D100) proposal to establish South Georgia as a sentinel for change. The programme will be linked to the Long Term Ecological Research Program and will develop the important time series of observations needed to document change in environment and process and attribute these change to a driver. The new level of understanding should demand a more coherent and urgent policy response on conservation and climate and ocean change. While only one of the Subantarctic regions it is hoped that rolling out a programme for South Georgia will catalyse similar efforts in other regions. A presentation at the Marine Ecosystem Assessment for the South Ocean meeting indicated substantial interest in doing so. The D100 and ISSA efforts have developed strong relationships with the Antarctic Nearshore and Terrestrial Observing System and the Southern Ocean Observing System.

Recommendations

For noting: Continued support for ISSA to develop the next stage of position papers required to roll D100 out more widely: Common policy position for the subantarctic on pest eradication and top predators, biodiversity protection, and bio-indicators, and to forge a stronger relationship with the Long Term Ecological Research Program.

Summary Budget 2017 to 2020

	2017	2018	2019	2020
	Spent	Allocated	Request	Request
(US\$)		\$2,000	\$2,000	\$2,000

Progress and Plans

Sub-group Major Outcomes/Activities

1. ISSA progress workshop held in association with the SCAR Biology symposium in Leuven. The workshop reviewed progress on ISSA objectives developed by the Cerro Castillo meeting and focussed on implementation plans to help ensure data from different subantarctic islands were being collected using comparable gradients, transects and time series. The group also reviewed efforts in the different sectors and had a report of the recently completed Antarctic Circumnavigation Expedition.

2. Discovery 100. A major work effort for a wide group of ISSA membership has been the development of the science case to establish Subantarctic Islands as sentinels for change. The effort includes a multidisciplinary approach to map the biodiversity, define the processes, develop time series and establish an ANTOS style nearshore and terrestrial array alongside an LTER style approach to time series measurements of biodiversity and distribution of ocean and climate controlled environments. The effort includes New Zealand subantarctic Islands, South Georgia, Kerguelen Islands and Macquarie Island. Progress on the South Georgia plan was presented at the recent Marine Ecosystem Assessment for the Southern Ocean. ISSA members have co-written the science case along with collaborators working on the ocean, cryosphere and subantarctic ecosystem. The project was presented at the recent Marine Ecosystem Assessment for the Southern Ocean.

3. Manuscript. A review manuscript is in development. Its purpose is as a “position paper” to outline the current status of the Subantarctic research effort, current circum-subantarctic understanding and the importance of the region. Several other reviews have been written recently for example on the glacial evolution of the islands, but the focus here is on biodiversity, biogeography and range in environments and the opportunity to identify key species and environments to track oceanic, climatic and human impact changes (old and new).

Sub-group Outcomes Summary

Sub-group	Activity/Outcome/Benefit/Achievement
ISSA	SCAR Biology side workshop
ISSA	Development of the Discovery 100 Science Implementation Plan
ISSA	Review Manuscript preparation

Sub-group Cash Flow

Sub-group	Allocation	Amount spent		
		2016	2017	2018
ISSA	\$3,000			\$2,000

\$1,000 is allocated to support the “Identifying bio- indicator species for Sub-Antarctic conservation assessments” workshops to be held at Davos and a further \$1,000 is allocated to assist with travel to DAVOS

Notable Papers

Whinam, J. & J.D. Shaw 2018 Australia's World Heritage Islands. In: Australian Island Arks. D. Moro, D. Ball, S. Bryant (Eds.). CSIRO Publishing (in press)

The paper provides a synthesis of Heard Island and Macquarie Island values.

Gonzalez-Wevar C.A., Segovia N.I., Rosenfeld S., Ojeda J., Hane M., Naretto J., Saucaude T., Brickle P., Morley S., Facral J.-P., Spencer H.G., Poulin E., 2018. Unexpected absence of island endemics: Long-distance dispersal in higher latitude sub-Antarctic Siphonaria (Gastropoda: Euthyneura) species, Journal of Biogeography, vol. 45, 874-884.

This paper documents stronger marine connectivity between subantarctic islands than expected. Indicating active dispersal between subantarctic islands rather than endemism.

Browne I.M., Moy C.M., Riesselman C.R., Neil H.L., Curtin L.G., Gorman A.R., Wilson G.S., 2017. Late Holocene intensification of the westerly winds at the subantarctic Auckland Islands (51° S), New Zealand, Climate of the Past, vol. 13, 1301-1322.

This paper provides the first time series of ocean and climate evolution from fiord sediments of Subantarctic Auckland Islands and demonstrated the current trend of intensification of winds in the subantarctic region.

Forthcoming Activities

ISSA have an ambitious work plan for the next few years.

1. Policy and strategy review across different Subantarctic nations – unlike SCAR and the Antarctic Treaty these are held by different government agencies in each country and have different objectives. Effective implementation of a circum- and integrated subantarctic initiative with effective uptake will require this.
2. Bio-Indicator workshop - a targeted meeting on “Identifying bio- indicator species for Sub- Antarctic conservation assessments” with key sub-Antarctic researchers. This meeting will be associated with the June 2018 ISSA workshop to be held in Davos.
3. LTER workshop - ISSA will host a workshop to develop a common set of measurements and approaches, and a suite of testable hypotheses to underpin an LTER approach to monitoring, documenting and attributing change in the subantarctic.
4. Launch of new subantarctic research efforts – this next period should see the successful launch of the South Georgia Initiative and increased international collaboration.
5. Top Predator / Pest Eradications – with increasing efforts to eradicate top predator pests on the subantarctic, ISSA will prepare a position paper to outline a consistent monitoring approach that will ensure ecosystem stability.
6. Biodiversity Survey – ISSA will initiate a series of biodiversity surveys linked to the LTER programmes.

Budget

Planned use of funds for 2018 to 2020

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
2019	Subantarctic LTER workshop	2,000	Gary Wilson	gary.wilson@otago.ac.nz
2020	Policy, pest eradication, top predator, biodiversity workshop	2,000	Justine Shaw	j.shaw6@uq.edu.au
Total		4,000		

Briefly describe funds usage and desired results

1. Subantarctic LTER Workshop. Funds are requested to assist with travel and participation for early career participation and for scientists from new SCAR members.
2. Policy, pest eradication, top predator, biodiversity workshop. Funds are requested to assist with holding the meeting at a policy host rather than traditional university or institute venue. Funds are also requested to assist with travel and participation for early career participation and for scientists from new SCAR members.

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

2018: 50%
 2019: 50%
 2020: 50%

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

2018: 0
 2019: 50%
 2020: 25%

Linkages

Direct support from outside organisations received for your activities

- South Atlantic Environmental Research Institute – travel costs for proposal development (~\$20,000)
- University of Otago – travel support for Gary Wilson (~\$6,000)

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

Within SCAR

1. Antarctic Nearshore and Terrestrial Observing Systems
2. Southern Ocean Observing Systems

Outside SCAR

1. Long Term Ecological Research Program

Outreach and Capacity Building

1. Presentations and discussions at the Marine Ecosystem Assessment for the Southern Ocean meeting
2. Conference talk at Ecological surprises and Rapid collapse of Ecosystem. Presentation on the ecosystem responses to invasion and management across sub-Antarctic islands
3. British Ecological Society 2017: Evidence based science for sub-Antarctic biosecurity
4. Public talks on the Falkland Islands and in New Zealand
5. Sustainability initiatives with Air New Zealand and Chapman Tripp (large legal company in New Zealand)
6. Speaker series on Antarctic and the Southern Ocean to the University of the Third Age
7. Lectures to University students at two Australian Universities- UTAS, UQ
8. Subantarctic Expedition with the Sir Peter Blake Trust (young adults)
9. Justine Shaw- Radio interview on wilderness values and invasive species research- ABC national radio Australia
10. Parallel discussion with Parks & Wildlife Services, DPIPWE, (Australia), Department of Conservation (New Zealand) and Department of Environment Affairs and Tourism (South Africa) regarding future of research and management of Subantarctic Islands.
11. Engagement with the Department of Premier and Cabinet, Tasmania regarding support for a future ISSA- SCAR workshop in 2020 Hobart

SCAR Fellowship Reviewers

First Name	Last Name	E-mail	Principal Expertise
Gary	Wilson	gary.wilson@otago.ac.nz	Paleoceanography / Paleoclimatology but broad range from time as chief scientist for the New Zealand programme and Subantarctic as well as Antarctic initiatives

Membership

Leadership

Role	First Name	Last Name	Affiliation	Country	Email	Date Started	Date Term is to End
Co-chair	Gary	Wilson	University of Otago	New Zealand	gary.wilson@otago.ac.nz	2015	2020
Co-chair	Justine	Shaw	University of Queensland	Australia	j.shaw6@uq.edu.au	2017	2020

Other members

First Name	Last Name	Affiliation	Country	Email
Dana	Bergstrom	Australian Antarctic Division	Australia	Dana.Bergstrom@aad.gov.au
*Marius	Rossouw	University of Stellenbosch	South Africa	mariusrossouw@sun.ac.za
*Claudia	Maturana	Universidad de Chile	Chile	cmaturana.ciencias@gmail.com
Ian	Hogg	Polar Knowledge Canada	Canada	ian.hogg@polar.gc.ca
Bettine	Van Vuuren	University of Johannesburg	South Africa	bettinevv@uj.ac.za
Craig	Cary	University of Waikato	New Zealand	caryc@waikato.ac.nz
Andrew	Lowther	Norwegian Polar Institute	Norway	Andrew.Lowther@npolar.no
Irene	Schloss	Instituto Antartico Argentino	Argentina	ischloss@dna.gov.ar
Thomas	Saucede	Universite de Bourgogne	France	Thomas.Saucede@u-bourgogne.fr
Pete	Convey	British Antarctic Survey	UK	pcon@bas.ac.uk

* *early career researchers*

Requests to the Secretariat

ISSA needs some assistance to bring its web page up to date.



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**Expert Group on
 Antarctic Biodiversity Informatics**

Report Authors

Bruno Danis (Belgium, Chief Officer), Ben Raymond (Australia, Secretary), Alison Murray (USA, Member), Anton Van de Putte (Belgium, Member), Horst Bornemann (Germany, Member), Huw Griffiths (United Kingdom, Member), Jose Xavier (Portugal, Member), Yan Ropert-Coudert (France, Member)

Summary of activities from 2016-18 and other important issues

The Expert Group on Antarctic Biodiversity Informatics has been involved in a series of projects and developments pertaining to the exploration of complex data to delineate patterns in ecological, biogeographic or taxonomic processes. The projects in which EG-ABI was involved include:

- The Register of Antarctic Marine Species (RAMS), now expanding to terrestrial and limnetic realms (RAS)
- The microbial Antarctic Resources System (mARS), now expanding to include biogeographic coverage to the Arctic and sub-Arctic
- The Retrospective Analysis of Antarctic Tracking Data (RAATD)
- The Southern Ocean Diet and Energetics Database (SO-Diet)
- The SCAR/rOpenSci initiative

Its members have and participated in several workshops dedicated to these projects and met remotely as well as virtually, on several occasions.

Recommendations

To note: EG-ABI's intention to promote the rOpenSci and GitHub initiatives for wider SCAR participation (see details below).

Summary Budget 2017 to 2020

	2017	2018	2019	2020
	Spent	Allocated	Request	Request
(US\$)	710	7195	5000	5000



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Progress and Plans

Sub-group Major Outcomes/Activities

EG-ABI is involved in a number of long-term developments, some of them having started before the group formally existed. The group has also achieved a number of outcomes since the last reporting period, which are included in the descriptions below.

Long-term projects:

- **The Register of Antarctic Marine Species (RAMS), has been now expanded to terrestrial and limnetic realms**
The Register of Antarctic Species (RAS) aims to provide an authoritative and comprehensive list of names of marine and terrestrial species in Antarctica and the Southern Ocean. It serves as a reference guide for users to interpret taxonomic literature, as valid names and other names in use are both provided. During the 2016-2018 period, we organized an Antarctic species editors workshop (20-22 September 2016 in Leuven, Belgium, supported by the Antarctic Biodiversity Portal), and a new information portal was released in 2017: <http://ras.biodiversity.aq>.
- **The microbial Antarctic Resources System (mARS)**
mARS is an information system dedicated to facilitate the discovery, access and analysis of molecular microbial diversity (meta)data generated by Antarctic researchers. This includes the ability to upload information that describes (i) a research project that involves molecular microbial diversity sequence information (this goes into the Integrated Publishing Toolkit system that was developed by GBIF), (ii) communicating descriptive environmental information through a relatively newly accepted standard set of terms (Genomic Standards Consortium, MiMARKS), (iii) uploading links to DNA, RNA, proteomic or metabolomic data sets that have been deposited in public repositories, and the required metadata describing them.
Between 2016-2018, we held open community meetings in Malaysia during the SCAR open science conference, and at the SCAR Biology meeting in 2017 in Leuven Belgium to inform the community on the resource, and engage the community in discussion of future developments. Importantly, in June 2017 a user survey was disseminated to over 90 potential users (distributed amongst 6 continents and 15 countries to query user needs and plans for engaging in use of mARS in the future. The mARS users group now exceeds 110 people and a workshop planned for Davos will provide users with hands on experience in managing and analyzing data and will create a forum to develop future ideas in community driven science.
- **The Retrospective Analysis of Antarctic Tracking Data (RAATD)**
The Retrospective Analysis of Antarctic Tracking Data (RAATD) is a Scientific Committee for Antarctic Research project led jointly by the Expert Groups on Birds and Marine Mammals and Antarctic Biodiversity Informatics, and endorsed by the Commission for the Conservation of Antarctic Marine Living Resources.



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For details of 2016-2018 progress on RAATD please refer to the EG-BAMM report. Briefly, however, outcomes have included successful compilation of data from a large number of researchers and national programs, drafting of a data paper now in peer review, development of methods and corresponding code for modelling, and application of those methods to obtain preliminary species habitat usage models.

EG-ABI's particular contributions to the RAATD project include development of R code to support the project's modelling work (once finalized this code will be made publicly available at <https://github.com/SCAR/RAATD>), and hosting and management of the project's computational/modelling requirements on a virtual server (compute resources provided by the Australian government through their National Collaborative Research Infrastructure Strategy; software framework and server administration performed by EG-ABI members).

- **The [Southern Ocean Diet and Energetics Database \(SO-Diet\)](#)**

Information related to diet and energy flow is fundamental to a diverse range of Antarctic and Southern Ocean biological and ecosystem studies. The Diet and Energetics Database includes data related to diet and energy flow from conventional (e.g. gut content) and modern (e.g. molecular) studies, stable isotopes, fatty acids, and energetic content. It is a product of the SCAR community and open for all to participate in and use.

This project is the successor of an earlier Australian-led diet data project, and has been officially under the SCAR moniker since late 2016. Since that time, significant progress has been made:

- expansion of the data domain to include molecular (DNA)-based diet data, lipids/fatty acids, energetics data, and allometric equations
- wider project engagement across the SCAR community. A project overview was presented at the recent MEASO conference, and included 37 co-authors from 12 countries. We are also encouraging regional foci within the project: for example, Claudia Andrade (Instituto de la Patagonia, Universidad de Magallanes) is coordinating the subantarctic South American component of the database
- data holdings now comprise ~37000 records in total, which are disseminated via the Australian Antarctic Data Centre and will soon be available through SOOS
- two R packages to support use of the data
- several papers in preparation, one in review (lead author Fokje Schaafsma; see publications section of this report)

- **The SCAR/rOpenSci initiative**

rOpenSci (<https://ropensci.org>) is an initiative to build a diverse global community of R software users and developers from a range of research domains. It aims to build people's capacity at all levels, from novices to experts. In 2017 SCAR, through the EG-ABI group, started an Antarctic science special interest group within the rOpenSci project. Activities will include supporting the development of R packages to meet Antarctic and Southern Ocean science needs, guides for R users and developers, and active fora for open discussions about using R in Antarctic and Southern Ocean science. To date the activities have been focused on R package developers and power users (currently we have ~25 members in



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our online discussion channel), but we will promote the initiative and engage more widely with the SCAR community over the coming year.

- **Establishment of SCAR GitHub presence**
 Reproducible, open workflows are a cornerstone of Antarctic science, and the GitHub platform is one of the most popular open-source software development frameworks. In late 2016 the EG-ABI group on behalf of SCAR established a SCAR organization account on GitHub (see <https://github.com/SCAR>). The aim is to use this space for development and promotion of SCAR software and other informatics products. It is closely linked with the rOpenSci initiative described above. Currently it hosts several R packages, resources for the diet database and Atlas, and RAATD-related code. Usage of this space has to date been EG-ABI-focused; a plan to roll out access of this space to other SCAR groups will be discussed with SCAR exec over the coming months.
- **The Biogeographic Atlas of the Southern Ocean (BASO)**
 The multi-authored "CAML Biogeographic Atlas of the Southern Ocean" was published in print form in 2014. PDF copies of the book are now freely available online, and discussions are continuing on the best and most sustainable way to integrate this work into an online, enduring successor that will also support related initiatives such as SOOS, MEASO, and others.

Sub-group Outcomes Summary

Sub-group	Activity/Outcome/Benefit/Achievement
EG-ABI	RAS (Register of Antarctic Species): new data portal on systematics for all Antarctic species
EG-ABI	mARS (microbial Antarctic Resource System): user survey, scientific community development, hands-on training opportunity
EG-ABI	RAATD (Retrospective Analysis of Antarctic Tracking Data): data compilation, data paper submission, development of code and methods for modelling
EG-ABI	SO-Diet (Southern Ocean Diet and Energetics database): expansion of data system, R packages, wider engagement
EG-ABI	rOpenSci initiative: R package development and community engagement
EG-ABI	SCAR GitHub: development and promotion of SCAR software
EG-ABI	BASO (Biogeographic Atlas of the Southern Ocean): made freely available as downloadable PDF documents + Book reduced in Price

Notable Papers

EG-ABI has produced a number of peer-reviewed papers as well as contributions in terms of software development:

1. Griffiths, H. J., Meijers, A. J., & Bracegirdle, T. J. (2017). More losers than winners in a century of future Southern Ocean seafloor warming. *Nature Climate Change*, 7(10), 749. *This work provides insights into the potential impacts of climate change on benthic species and communities in the Southern Ocean. It uses data collected for the SCAR Biogeographic Atlas to form the basis of the analyses.*



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2. Reisinger RR, Raymond B, Hindell MA, Bester MN, Crawford RJM, Davies D, de Bruyn PJN, Dilley BJ, Kirkman SP, Makhado AB, Ryan PG, Schoombie S, Stevens K, Sumner MD, Tosh CA, Wege M, Whitehead TO, Wotherspoon S, Pistorius PA (2018) Habitat modelling of tracking data from multiple marine top predators reveals important habitat in the Southern Indian Ocean. *Diversity and Distributions*. <http://doi.org/10.1111/ddi.12702>. *An analysis of tracking data from multiple species to identify regions of ecological importance. The methods used in this paper were shared in their development with the RAATD project.*
3. Schaafsma FL, ChereL Y, Flores H, Van Franeker JA, Lea M-A, Raymond B, Van de Putte AP (submitted) Review: the energetic value of zooplankton and nekton species of the Southern Ocean. *Marine Biology*. *The energetics data component of the SCAR Diet and Energetics database was used to produce a review and overview of energetics research in Southern Ocean ecosystems.*

Software packages include [bowerbird](#) (a package for managing large data libraries used for e.g. modelling purposes; this package has undergone formal peer review), [antanym](#) (a package supporting the SCAR Composite Gazetteer, currently being peer reviewed), and other packages discoverable on the [SCAR GitHub page](#).

Forthcoming Activities

The ongoing projects, as described above (RAS, mARS, RAATD, SO-Diet), require constant attention and will be maintained in the next period, as part of the core EG-ABI activities.

We also plan to develop new linkages with emerging groups such as AntOS, or the expert group on microplastics. These linkages will happen by identifying liaison persons, common project and by exchanging data-related technologies and content.

The rOpenSci and GitHub activities will be continued and wider SCAR engagement sought, as described above. In particular, we will consider allocating small scientific coding grants from EG-ABI funds. These grants will support researchers (particularly ECRs) to partner with more experienced coders to convert their research code into usable products of value to the wider SCAR community. Initially this will focus on R packages, because of the synergies with existing community capabilities and the rOpenSci idea, but if successful may consider other software platforms (e.g. Python) at a later date.

In collaboration with EG-BAMM we plan to help finalise a research publication based on the outcomes of the RAATD effort.



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Budget

Planned use of funds for 2018 to 2020

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
2018	EG-ABI participation in the Polar2018 conference	1500	Bruno Danis	bdanis@ulb.ac.be
2018	Support for organization of the mARS workshop at the Polar2018 conference	5000	Bruno Danis	bdanis@ulb.ac.be
2019	Support grants for biodiversity informatics developments	5000	Bruno Danis	bdanis@ulb.ac.be
2020	Support grants for biodiversity informatics developments	5000	Bruno Danis	bdanis@ulb.ac.be
Total		16500		

Briefly describe funds usage and the desired results

- 2018: EG-ABI participation in the Polar2018 conference: travel support for the participation of SCAR COs
- 2018: Support for organization of the mARS workshop at the Polar2018 conference: mARS is organising a hands on workshop at the Polar2018 conference and requested support for reimbursement of travel cost for the course teachers, cost for the venue and catering
- 2019 - 2020: Support grants for biodiversity informatics developments: ABI intends to provide seed money for various software developments, concretely to facilitate hands-on work and travel of selected specialists.

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

2018: 10%
2019: 50%
2020: 50%

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

2018: 10%
2019: 25%
2020: 25%



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Linkages

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

Within SCAR

1. EG-BAMM
2. AntECO
3. AntOS
4. SOOS
5. AntERA
6. SO-CPR
7. SCADM

Outside SCAR

1. OBIS
2. GBIF
3. CCAMLR
4. rOpenSci

Outreach and Capacity Building

SCAR Fellowship Reviewers

First Name	Last Name	E-mail	Principal Expertise
Bruno	Danis	bdanis@ulb.ac.be	Biodiversity, information science, modelisation
Huw	Griffiths	hjg@bas.ac.uk	biodiversity, marine biology etc
Ben	Raymond	ben.raymond@aad.gov.au	ecosystem modelling, software development

Membership

EG-ABI includes a core “organisation” group, but EG-ABI membership is open to all and spans many SCAR activity areas as indicated above. We will look to expand/refresh the EG-ABI core group membership this year, with active encouragement of early career scientists and members of countries that currently might not have strong SCAR representation.

Leadership

Role	First Name	Last Name	Affiliation	Country	Email	Date Started	Date Term is to End
Chief Officer	Bruno	Danis	ULB	Belgium	bdanis@ulb.ac.be	July 2012	
Secretary	Ben	Raymond	AAD	Australia	Ben.Raymond@aad.gov.au	July 2012	



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Other members

First Name	Last Name	Affiliation	Country	Email
Anne-Sophie	Archambeau	MNHN	France	archambeau@gbif.fr
Horst	Bornemann	AWI	Germany	Horst.Bornemann@awi.de
Claude	De Broyer	IRSNB	Belgium	claudе.debroyer@naturalsciences.be
Huw	Griffiths	BAS	UK	hfg@bas.ac.uk
Alison	Murray	DRI	USA	Alison.Murray@dri.edu
Anton	Van de Putte	IRNSB	Belgium	avandeputte@naturalsciences.be
Yan	Ropert-Coudert	CEBC	France	yan.ropert-coudert@iphc.cnrs.fr
Jose	Xavier	UCoimbra	Portugal	jccx@cantab.net

Requests to the Secretariat

None



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Notable Papers

- Convey, P., Cary, C., Cummings, V. 2017. Antarctic Near-shore and Terrestrial Observation System (ANTOS). Poster presented at the Past Antarctic Ice Sheet Dynamics (PAIS) meeting, Trieste Italy, 10-15th September.
- Cummings, V.J. (2017). ANTOS (Antarctic Near-shore and Terrestrial Observing System). **Oral presentation** at the Southern Ocean Observing System Ross Sea Regional Workshop. Shanghai, China. 10-13th September.
- Cummings, V.J. (2017). ANTOS - Antarctic Near-shore and Terrestrial Observation System. Poster presentation at the Southern Ocean Observing system Ross Sea workshop. Shanghai, China. 10-13th September.

Forthcoming Activities

- Genoa Workshop (Committee only) - 2018
- Davos Workshop (Open) - 2018
- Database working group meeting – 2018
- Technical working group meeting – 2019
- ANTOS Workshop (open) – Hobart - 2020

Budget

Planned use of funds for 2018 to 2020

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
2020	Workshop – Hobart SCAR-OSC	\$11,000	Craig Cary, Vonda Cummings	craig.cary@waikato.ac.nz Vonda.Cummings@niwa.co.nz
2019	Technical Task Group meeting	\$11,000	Charles Lee	c.lee@waikato.ac.nz
2018 - late	Database task group meeting	\$4324	Soon Gyu Hong	polypore@gmail.com
2018 - Davos	Workshop (open)	\$3500	Craig Cary, Vonda Cummings	craig.cary@waikato.ac.nz Vonda.Cummings@niwa.co.nz
2018 - Genoa	Workshop (Committee)	\$3500	Craig Cary, Vonda Cummings	craig.cary@waikato.ac.nz Vonda.Cummings@niwa.co.nz
Total		33,324		

Briefly describe funds usage and the desired results:

- 2020 – Major ANTOS workshop presenting continental wide success of node installation and data management. This, we hope, will be the final meeting as an Expert Group having achieved the desired result. The rest is in the research.



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- 2019 – Support is requested for 2-3 individuals from the technical team to meet and compile the final version of the technical manual and to oversee the deployment of the first Tier 3 nodes.
- 2018 – The database team will meet in Korea to finalize the database implementation and to oversee the first live streaming of data from a Tier 1 terrestrial installation.
- 2018 – Matching support being provided for 3-4 early career researchers to attend the ANTOS meeting at the Davos SCAR-OSC.
- 2018 – Funds will be used towards support for multiple committee members to travel to the ANTOS workshop in Genoa (e.g. Bergstrom, Sultan). We will also use some funds to support room and board for the 6 committee members attending this workshop.

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

2018: 30%
2019: 20%
2020: 40%

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

2018: 30%
2019: 10%
2020: 20%

Linkages

Direct support from outside organisations

- PSG - \$2000 USD
- GSG - \$1324 USD
- Substantial in kind support comes from all of the ANTOS committee home institutions that must amount to well over \$20,000USD/year
- NIWA and University of Waikato - \$7000 USD – *in-kind*

Major collaborations

Within SCAR

- PS- SSG – committee member
- GS-SSG – Committee member
- AntEco– Committee member
- Ant ERA– Committee member
- ANTPAS
- PAIS



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Outside SCAR

- New Zealand Antarctic Research Institute

Outreach and Capacity Building

- 2 of the ANTOS committee members are considered early career
- Charles Lee, Univ. of Waikato, Early Career brought on the lead technical effort within ANTOS
- NZ Antarctic conference poster on ANTOS – June 2017
- NZ CEP representatives have been briefed at regular intervals on ANTOS development.
- Co-chairs were invited to attend the SOOS Ross Sea Working Group Workshop in China in Sept 2017.
- ANTOS meeting is scheduled for the SCAR OSC meeting in Davos on June 15, 2018. This will consist of an open meeting in the afternoon for the entire community in the afternoon. Several committee members unable to attend the meeting will connect through video conferencing.

SCAR Fellowship Reviewers

First Name	Last Name	E-mail	Principal Expertise
Craig	Cary	Caryc@waikato.ac.nz	Terrestrial ecology/ microbiology
Vonda	Cummings	vonda.Cummings@niwa.co.nz	Marine ecology

Membership

Leadership

Role	First Name	Last Name	Affiliation	Country	Email	Date Started	Date Term is to End
Co-Chair	Craig	Cary	U. of Waikato	NZ	Caryc@waikat o.ac.nz	8/2014	8/2020
Co Chair	Vonda	Cummings	NIWA	NZ	Vonda.Cummi ngs@niwa.co. nz	8/2014	8/2020
Sec	*Megumu	Tsujimoto	MPR	Japan	megumutsujim oto@gmail.co m	8/2014	8/2020

Other members

First Name	Last Name	Affiliation	County	Email
Byron	Adams	BYU	USA	byron_adams@byu.edu
*Charles	Lee	Waikato University	NZ	cklee@waikato.ac.nz



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Dana	Bergstrom	Australian Antarctic Division	Australia	dana.bergstrom@aad.gov.au
Dolores	Deregibus		Argentina	dolidd@yahoo.com
Eli	Verleyen		Belgium	Elie.Verleyen@UGent.be
Emmanuelle	Sultan	Museum National d'Historie Meleuelle	France	esulod@locean-ipsl.upmc.fr
Marcela	Libertelli	Instituto Antártico Argentino	Argentina	mibertelli5@yahoo.com.ar
Mauro	Guglielmin	ANTPAS rep	Italy	mauro.guglielmin@uninsubria.it
Peter	Convey	BAS	UK	pcon@bas.ac.uk
Sharon	Robinson	Woolingong University	Australia	sharonr@uow.edu.au
Soon Gyu	Hong	KOPRI	Korea	polypore@gmail.com
Stefano	Schiaparelli	Unige of MNA	Italy	stefano.schiaparelli@unige.it
Steve	Colwell	PSG rep	UK	src@bas.ac.uk

Requests to the Secretariat

None



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 Person M Hindell
 Responsible: and Y
 Ropert-
 Coudert

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**Expert Group on Birds and Marine Mammals
 (EGBMM)**

Report Authors

Mark Hindell (CO, Australia) and Yan Ropert-Coudert (Deputy CO, France)

Summary of activities from 2016-18 and other important issues

The group and all of its working groups (RAATD, Health Monitoring, Trophic database and outreach) made good progresses. We held productive meetings at the SCAR OSC in Kuala Lumpur (2016) and Biology meeting in Leuven (2017). The RAATD group met 4 times at CESAB in France to work on the analysis and syntheses of Antarctic animals tracking database. The Animal Health Monitoring group will convene a Polar Wildlife Health and Diseases Workshop during the SCAR-IASC OSC in 2018, and is developing 2 research programs: a citizen science disease reporting program in conjunction with IAATO and a new Adélie penguin disease network/sampling protocol. EG-BAMM also participated in several international fora, such as CCAMLR, SOOS and MEASO, and is part of SCATS, ANT-Eco and ANT-Era. EG-BAMM was subject to an external review in 2017 and following a very positive assessment was renewed as a SCAR Expert Group for a further 8 years. EG-BAMM also has an active outreach program that provides information on our activities to schools and other organisations, such as APECS.

Recommendations

- EG-BAMM has successfully used its SCAR funds to leverage external support for our numerous activities. We would like to slightly increase our SCAR funding to improve our capacity to support our working group activities and as well as foster Early Career researcher interest in SCAR.
- Also note, that both CO and Deputy CO plan to step down from their roles after the 2020 OSC. Leading up to this we will carefully consider the best options for the new leadership team, and ensure a transition process that will not interrupt existing EG-BAMM projects. We will provide EXCOM with suggestions for the new team (CO and Deputy CO) early in 2020.

Summary Budget 2017 to 2020

	2017	2018	2019	2020
	Spent	Allocated	Request	Request
(US\$)	5000	5000	4712	7640



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Progress and Plans

Sub-group Major Outcomes/Activities

- **Retrospective Analysis of Antarctic Tracking Data (RATTD).** This project has compiled a major, publically available database consisting of tracking data from 17 species of birds and mammals collected by more than 40 researchers from 20 countries. These data form the basis of an on-going major synthesis identifying Areas of Ecological Significance in the Southern Ocean. The results of this synthesis will be helpful to CCAMLR in its Marine Spatial planning and to the broader community in understanding ecosystem responses due to climate change. The working group has attracted funding from the French Centre for the Synthesis and Analysis of Biodiversity. CESAB have funded a post-doc for 20 months as well as biannual meetings of the group. Part of the requested 2019 budget will be used to support SCAR attendance at the 2019 workshop.
- **Animal Health Monitoring:** The main achievement of this group has been convening the Polar Wildlife Health and Diseases Workshop during the upcoming SCAR-IASC Open Science Conference. The aim of this workshop is to identify key scientific knowledge gaps in wildlife health and disease and to foster new research initiatives and collaborations at the interface between ecology and diseases in Polar Regions, (Arctic, Antarctic and sub-Antarctic). They will discuss the importance of representing parasites and disease issues in biodiversity observatory networks in polar areas. The implications of some wildlife diseases for human populations in polar areas will also be addressed. Main outputs of this workshop will include updating the recommendations from the 1998 Antarctic wildlife disease workshop, discussion of protocols for wildlife disease and health surveillance in both Arctic and Antarctic, and identification of major research and monitoring gaps for wildlife health in both regions.
- **The Southern Ocean Diet and Energetics Database (SO-Diet):** The Diet and Energetics Database includes data related to diet and energy flow from conventional (e.g. gut content) and modern (e.g. molecular) studies, stable isotopes, fatty acids, and energetic content. It is a product of the SCAR community since late 2016 and open for all to participate in and use. Data holdings now comprise ~37000 records in total, which are disseminated via the Australian Antarctic Data Centre and soon will be available through SOOS. Recent progresses include i) the expansion of the data domain to include molecular (DNA)-based diet data, lipids/fatty acids, energetics data, and allometric equations; ii) the presentation of the project overview at MEASO conference (37 co-authors from 12 countries); iii) two R packages to support use of the data and several papers in preparation.



SDM **16**
 Agenda Item: 4.3.2
 Person M Hindell
 Responsible: and Y
 Ropert-
 Coudert

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Sub-group Outcomes Summary

Sub-group	Activity/Outcome/Benefit/Achievement
EG-BAMM/RAATD	Antarctic Animal Tracking Database, Ecological assessment and marine spatial planning, Publication of database (data paper submitted to Nature Scientific Data) and related papers in preparation
EG-BAMM/SO-Diet	Active database with associated publications.
EG-BAMM/Health	Animal Health Monitoring: Polar Wildlife Health and Diseases workshop, standardised protocols improved capacity to detect/monitor wildlife disease

Sub-group Cash Flow

Sub-group	Allocation	Amount spent		
		2016	2017	2018
EG-BAMM	10000	4982	5018	

Notable Papers

- Diaz, JI., Fusaro, B., Vidal, V., Gonzalez-Acuña, D., Costa, ES., Dewar, M., Gray, R., Power, M., Miller, G., Blyton, M., Vanstreels, R., Barbosa A. (2017). Macroparasites in Antarctic penguins. In, Klimpel, S., Kuhn, T., Mehlhorn, H (Eds.) Biodiversity and evolution of parasitic life in the Southern Ocean. Chapter 9. Springer International Publishing. *This is the first comprehensive review of Southern Ocean parasites, and provides important baseline information against which to compare future assessments of parasite diseases in the Southern Ocean.*
- Reisinger, R.R., Raymond, B., Hindell, M.A., Bester, M.N., Crawford, R.J.M., Davies, D., de Bruyn, P.J.N., Dilley, B.J., Kirkman, S.P., Makhado, A.B., Ryan, P.G., Schoombie, S., Stevens, K., Sumner, M.D., Tosh, C.A., Wege, M., Whitehead, T.O., Wotherspoon, S. & Pistorius, P.A. (2018) Habitat modelling of tracking data from multiple marine predators identifies important areas in the Southern Indian Ocean. *Diversity and Distributions*, **24**, 535-550. *This paper is an early application of the analysis and synthesis approach developed by RAATD to identify areas of Ecological significance in the Southern Indian Ocean based on tracking data from 14 species. It demonstrates that the management and conservation of these predators and their environment relies on understanding their distribution and its link with the biophysical environment, as the latter determines the distribution and abundance of prey.*
- Ropert-Coudert plus 80 contributing authors (submitted). The Retrospective Analysis of Antarctic Tracking Data Project, Scientific Data. *This data paper represents the public release of the RAATD database and details the technical aspects of data collection, processing and quality control. The database is a significant output for EG-BAMM and will be a valuable resource to researchers and managers.*



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Forthcoming Activities

- EG-BAMM will continue with its current working groups for the next two years, but will also consult with its membership to potentially develop new groups or research programs. The RAATD program will end its current phase by 2020, resulting in several high-level publications, including: (i) a synthetic analysis of the database considering a revised bio-regionalisation of the Southern Ocean an assessment of threats to important areas in these regions and consideration of current spatial management of the important regions. (ii) an assessment of how important regions will be influenced by future climate and (iii) quantify the role of predator communities in ecologically significant areas. Other outputs will be an R package for habitat modelling of based on tracking data. RAATD is seeking support form SCAR for the final workshop to be held in early 2019.
- The trophic database group will continue the collection, collation and documentation of predator prey, bio-marker and DNA data for use in ecological modelling in the Southern Ocean. Outputs for the group in the next two years will include publication of several papers using the database, one of which will be major review of trophic interactions.
- The Wildlife Health Monitoring group will work towards publishing key outcomes of the up-coming workshop and also continue with its other two initiatives: the citizen science reporting of wildlife disease in association with IAT, and the Adelie Penguin Network.
- The outreach group will continue to work with schools through the Polar Educators International (PEI) and Association of Polar Early Career Scientists (APECS), and on the International educational activity POLAR WEEKS. In addition to this on-going outreach work, EG-BAMM is keen to foster Early Career involvement in its activities as part of its on-going outreach activities. An efficient mechanism for this is to facilitate attendance of ECRs, particularly from developing countries in Asia, Africa and South America, at SCAR meetings. We are therefore seeking support from SCAR to fund travel to the 2020 Open Science meeting in Hobart.

Budget

Planned use of funds for 2018 to 2020

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
2020	Chief Officer travel to Open Science conference	4340	M. Hindell	Mark.hindell@utas.edu.au
2020	Support for ECR	3300	Jose Xavier and Mary-Anne Lea	jxavier@zoo.uc.pt maryanne.lea@utas.edu.au



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2019	Support for SCAR to attend RAATD workshop	4712	Y. Ropert-Coudert	docyaounde@gmail.com
2019	Workshop of the health monitoring group	6000	Andres Barbosa	barbosa@mncn.csic.es
2018	Chief Officer travel to Open Science conference	5340	M. Hindell	Mark.hindell@utas.edu.au
Total		23692		

Briefly describe funds usage and desired results

- **2020:** Support for ECR. We are seeking partial support (\$1100) for three ECR from developing countries to attend SCAR Open Science in 2020. We will call for applications from Africa, Asia and South America, and successful candidates will be selected by the EG-BAMM outreach working group.
- **2020:** Chief Officer travel to Open Science conference. We seek support for the EG-BAMM CO to attend this meeting to run the annual meeting and to contribute to other SCAR side meetings (Remote sensing, EG-ABI SCATs, etc). The estimated cost of \$4340 is based on current Europe to Hobart air fares, accommodation at \$150 per night, living expenses of \$80 per day and \$500 conference registration. Note that the CO will be in Europe on sabbatical during 2020.
- **2020:** Support for Workshop of the health monitoring group. The money would be essentially to support the attendance of early career researchers and to partially support attendance of some lecturers. The venue would be at the National Museum in Madrid, Spain.
- **2019:** Support for SCAR to attend I RAATD workshop. The sixth and final RAATD workshop to be held at CESAB in Aix en Provence in 2019. At the workshop the team will complete the analysis of the projected changes to Areas of Ecological Significance under various IPCC scenarios. CESAB will provide €\$10K towards the workshop but we need to pay for 2 additional airfares for international participants from SCAR (from Australian and the US).

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

2018: 0%
 2019: 0%
 2020: 43%

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

2018: 0%
 2019: 0%
 2020: 43%



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Linkages

Direct support from outside organisations

The Centre de synthèse et d'analyse sur la biodiversité (CESAB, France) has provided RAATD full-time Post-doc (€90K) and funding for 5 data workshops in France (€80K), totalling €170K.

Major collaborations

Within SCAR

1. EG-ABI
2. SCATS

Outside SCAR

1. CCAMLR
2. AT-CEB
3. SOOS
4. MEASO

Outreach and Capacity Building

The EG-BAMM outreach group will continue to contribute to publications in Education and reporting to the ATCM (see report above). The group will also work closely with Polar Educators International (PEI) and Association of Polar Early Career Scientists (APECS), on the International educational activity POLAR WEEKS (to promote EGBAMM related research).

SCAR Fellowship Reviewers

First Name	Last Name	E-mail	Principal Expertise
Mark	Hindell	Mark.hindell@utas.edu.au	Marine birds and mammals
Ropert-Coudert	Yan	Yan.ropert-coudert@cebc.cnrs.fr	Marine birds and mammals

Membership

Leadership

Role	First Name	Last Name	Affiliation	Country	Email	Date Started	Date Term is to End
Chief Officer	Mark	Hindell	IMAS	Australia	Mark.hindell@utas.edu.au	2008	2020
Deputy CO	Yan	Ropert-Coudert	CEBC	France	docyaounde@gmail.com	2008	2020



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Other members

First Name	Last Name	Affiliation	County	Email
Dan	Costa	UCSC	USA	costa@biology.ucsc.edu
*Jaimie	Cleeland	IMAS (APECs)	Australia	Jaimie.cleeland@gmail.com
Jose	Xavier	BAS	UK	jxavier@zoo.uc.pt
*Meagan	Dewar	APECS	Australia	meagandewar@hotmail.com
*Alex	Thorton	APECS	UK	alexander.e.thornton@gmail.com
*Ryan	Reisinger	CEBC	France	ryan.r.reisinger@gmail.com
Ben	Raymond	AAD	Australia	Ben.Raymond@aad.gov.au
Phil	Trathan	BAS	UK	pnt@bas.ac.uk
Mary-Anne	Lea	IMAS	Australia	maryanne.lea@utas.edu.au
Horst	Bornemann	AWI	Germany	horst.bornemann@awi.de
Akinori	Takahashi	NIPR	Japan	atak@nipr.ac.jp
Andres	Barbosa	CSIC	Spain	barbosa@mncn.csic.es

**Early Career Scientists*

Requests to the Secretariat

Big thanks to the secretariat for their help!



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Agenda Item: 4.3.2
Person Responsible: K Takahashi and J Kitchener

**XXXV SCAR Delegates Meeting
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Expert Group Southern Ocean Continuous Plankton Recorder (SO-CPR)

Report Authors

Kunio T. Takahashi (CO, JAPAN), and John A. Kitchener, (Deputy CO, AUSTRALIA)

Summary of activities from 2016-18 and other important issues

Since the last report 2016, we have completed about 100 CPR tows during the 2016/17 and 2017/18 Antarctic field season from seven vessels from Australia, Japan, New Zealand, South Africa and Brazil. Approximately 250,000 nautical miles have been sampled since the commencement of the SO-CPR Survey in 1991, representing some 50,000 samples for nearly 260 zooplankton taxa coupled with environmental data. The workshop on a special report of the Status and Trends of Southern Ocean Zooplankton was conducted in late November 2016 at National Institute of Polar Research Japan. The purposes of the workshop were to summarize the SO-CPR Survey activities of the first 25 years of the survey, and to advance the writing task of the Status and Trends Report of Southern Ocean Zooplankton. The standards workshop was held at the Australian Antarctic Division on 12 to 16 December 2016. The purposes of the workshop were to confirm that consistent and high standards of species identification, methodology, and data quality were being maintained amongst main analysts in the SO-CPR Survey.

Recommendations

None

Summary Budget 2017 to 2020

	2017	2018	2019	2020
	Spent	Allocated	Request	Request
(US\$)	0	6000	3000	3000



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 Person K
 Responsible: Takahashi
 and J
 Kitchener

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Progress and Plans

Sub-group Major Outcomes/Activities

- We have completed about 100 CPR tows during the 2016/17 and 2017/18 Antarctic field season from research vessels from Australia, New Zealand, South Africa, Brazil and Japan. Approximately 250,000 nautical miles have been sampled since the commencement of the SO-CPR Survey in 1991, representing some 50,000 samples for nearly 260 zooplankton taxa coupled with environmental data.
- As a last task of the EG-CPR of eight years, we are continuing to work on a special report to SCAR on the Status and Trends of Southern Ocean Zooplankton. This report will bring together all information from 25 years of the SO-CPR Survey into one report. In order to advance the writing task of the Status report, we held a workshop in Tokyo to set the framework of the report, collate publications and commence the review. We were reviewing all publications, more than 50, which included peer reviewed papers, proceedings, reports, and theses.
- Our important future task for maintaining high quality data is developing and enhancing the skills of current and new technicians. Therefore, as first step, we held the workshop with important technicians at the AAD in December 2016. The primary aim of the workshop was to confirm that main analysts of the long-standing SO-CPR survey are maintaining consistent high standards of species identification, methodology, and data quality. A secondary aim of the workshop was to discuss future training methods such as a SO-CPR procedures manual and zooplankton counting rule book. We re-assessed the current taxonomic and counting rules from the larger workshop report in Tokyo 2010 and we updated the SO-CPR taxonomic list. The new counting rule and taxonomic list will be further described in a new procedures manual.

Sub-group Outcomes Summary

Sub-group	Activity/Outcome/Benefit/Achievement
EG-CPR	Workshop on SO Zooplankton Status Report
EG-CPR	Standards Workshop 2016

Sub-group Cash Flow

Sub-group	Allocation	Amount spent		
		2016	2017	2018
EG-CPR	6000	6000	0	0



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Notable Papers

1. Wiebe, P.H., Atkinson, A., O'Brien, T.D., Thompson, P.A., Hosie, G., Lorenzoni, L., Meredith, M., 2017. Southern Ocean. In What are Marine Ecological Time Series telling us about the ocean? A status report, pp. 97–112. Ed. by T. D. O'Brien, L. Lorenzoni, K. Isensee, and L. Valdés. IOC-UNESCO, IOC Technical Series, No. 129. 297 pp. *This is the first international Group for Marine Ecological Time Series (IGMETS) status report. Our dataset contributed to analysis and overview of oceanic trends through the end of 2012, based on a collection of over 340 in situ marine ecological time series data.*
2. Takahashi, K.T., Kitchener, J.A., Robinson, K., Hosie, G.W., 2017. Report on the Southern Ocean Continuous Plankton Recorder (SO-CPR) Standards Workshop 2016: SCAR SO-CPR Database Export Group. Nankyoku Shiryô (Antarctic Record) 61: 1-10. *This work is the report of the newest workshop held in Australian Antarctic Division in December 2016. During the workshop we discussed a range of topics including: taxonomic resolution issues; laboratory method; shipboard techniques; training methods; data handling; gap analysis; and future workshops/conferences, including comprehensive training workshops for emerging SO-CPR survey partners.*
3. Deagle, B.E., Clarke, L.J., Kitchener, J.A., Polanowski, A.M., Davidson, A.T. (2017) Genetic monitoring of open ocean biodiversity: An evaluation of DNA metabarcoding for processing continuous plankton recorder samples. Molecular Ecology Resources, 2017;00:1-16. <https://doi.org/10.1111/1755-0998.12740>. *This is the newest scientific paper that used our dataset. This paper investigated the potential for use of metabarcoding in CPR surveys. They suggested that metabarcoding approach will play an important role in future plankton monitoring.*

Forthcoming Activities

- We proposed production of a special report to SCAR on the status and trends of Southern Ocean zooplankton. This would be based primarily on 25 years of the SO-CPR data, and would collate current knowledge of the status of zooplankton including known species, community structure and biogeography, and perhaps assessment of their possible roles in the ecosystem. The report will also identify any trends in relation to changes in abundance, shifts in distribution, timing of events, or changes in composition and community composition. We will hold the second workshop on a special report of the Status and Trends of Southern Ocean Zooplankton in May, 2018.
- To date we have surveyed approximately 70% of the Southern Ocean, but clearly there are distinct gaps where sampling has been limited or has not occurred because of the lack of shipping activity. To expand the program we are at various stages of involving and assisting other nations in participating. We are planning a training workshop for 2018 to help India initiate Southern Ocean CPR work. We have had discussions with scientists at the Goa National Centre for Antarctic and Oceanic Research (NCAOR) about running a CPR from Goa to Antarctica during the annual resupply of India's Antarctic station.



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- The SO-CPR Database Group have focused more on maintaining the quality control and assurance of data entered into the SCAR SO-CPR Database. Our dataset is an important SCAR Business Product, and is dependent on regular taxonomy and methodology standardization workshops to maintain and ensure quality assurance and control of the data. We agreed that there should be a larger workshop every two years to ensure that the high standards of the SO-CPR program are maintained. We will plan a larger standardization workshop in 2019. Countries interested in joining SO-CPR will be encouraged to participate in those workshops

Budget

Planned use of funds for 2018 to 2020

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
2018	Training workshop in India	6000	Kunio Takahashi	Takahashi.kunio@nipr.ac.jp
2019	Standards workshop	3000	Kunio Takahashi	Takahashi.kunio@nipr.ac.jp
2020	Standards workshop	3000	Kunio Takahashi	Takahashi.kunio@nipr.ac.jp

Briefly describe funds usage and the desired results

- We are continuing to work with NCAOR in Goa India to provide a training workshop on Southern Ocean CPR methodology and taxonomy in order to bring them into the SO-CPR programme. The training workshop is currently scheduled on 2018. I am going to invite Mr. John Kitchener (Deputy Chair of EG-CPR, AAD) to the India training workshop and to use a SCAR budget for his travel fund.
- The SCAR funding provides the opportunity to bring the various groups together to ensure that their taxonomic analysis, sampling methodology, quantitative analysis methodology and data quality remains at the highest common standard. The SCAR funding does not cover all costs of the workshops, but does provide very useful seed money to leverage additional support. It is difficult to define the precisely the percentage of future funds that will be directed to early career scientist, or scientists with developing Antarctic programmes.

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

2018:0%
2019:?
2020:?



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

2018:0%
2019:?
2020:?

Linkages

Direct support from outside organisations

Each national partner in the SO-CPR Survey financially support their own tows, logistics, analysis and contributions to the database.

Major collaborations

Within SCAR

1. The SO-CPR database is hosted by the Australian Antarctic Division Data Centre. The data are transmitted to SCAR's biodiversity.aq.

Outside SCAR

1. Global Alliance of CPR Surveys (GACS)
The SO-CPR Survey is a founding member of the Global Alliance of CPR Surveys (GACS). The general goal of GACS is to understand changes in plankton biodiversity at ocean basin scales through a global alliance of CPR surveys
2. Our data are transmitted to other data portals such as Ocean Biogeographic Information System (OBIS), Southern Ocean Observing System (SOOS), Global Ocean Observing System (GOOS), Atlas of Living Australia, and the data are offered to Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR).

Outreach and Capacity Building

Over the last decade, EG-CPR has conducted numerous training workshops in Australia, Japan, New Zealand, UK, Brazil, and South Africa. A training workshop is planned for India. A standardisation workshop for the current team of SO-CPR analysts was held on December 2016 to confirm that consistent and high standards of species identification, methodology, and data quality were being maintained amongst the main analysts in the SO-CPR Survey. Small training sessions have been conducted for those participating in Australia's and Japan's Antarctic programme. Mr. John Kitchener has assisted graduate students and post-doctoral fellows in Australia in the use and analysis of the dataset.



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Person Responsible: K Takahashi and J Kitchener

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Membership

Leadership

Role	First Name	Last Name	Affiliation	Country	Email	Date Started	Date Term is to End
Chair	Kunio	Takahashi	NIPR	Japan	Takahashi.kunio@nipr.ac.jp	2012	2024 ^a
Deputy	John	Kitchener	AAD	Australia	John.kitchener@aad.gov.au	08/2016	2024 ^a

Other members

First Name	Last Name	Affiliation	County	Email
Karen	Robinson	NIWA	NZ	Karen.robinson@niwa.co.nz
Marianne	Wootton	SAHFOS	UK	mawo@sahfos.ac.uk
Hans	Verheye	DHA	South Africa	hans.verheye@gmail.com
Philippe	Koubbi	UPMC	France	phiippe.koubbi@upmc.fr
Erik	Muxagata	URG	Brazil	e.muxagata@gmail.com
Julie	Hall	NIWA	NZ	j.hall@niwa.co.nz
Ben	Raymond	AAD	Australia	Ben.Raymond@aad.gov.au
Graham	Hosie	SAHFOS	Australia	Graham.hosie@iinet.net.au

Requests to the Secretariat

None



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 Agenda Item: 4.3.2
 Person Responsible: A Hicks et al.

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**Joint Expert Group on Human Biology and
 Medicine
 (JGHBM)**

Report Authors

Anne Hicks (CO, USA), Gichiro Ohno (Deputy CO, Japan), Nathalie Pattyn (Sec., Belgium), Paul Laforet (Sec., France)

Summary of activities from 2017-18 and other important issues

- JEGHBM is looking to continue supporting SCAR, COMNAP and ACTM. In order to honor individual, organizational, national priorities, boundaries, and confidentiality, JEGHBM provides input and analysis mostly upon request. JEGHBM continues to support SCAR Horizon Scan with respect to human health issues, including climate change, infectious disease in Antarctica, human adaptation to disease and how disease adapts to, and in, Antarctica. The APECS group is interacting more with the JEGHBM to facilitate wider participation of the next generation of human biology and medicine researchers.
- JEGHBM is advising international research expeditions on medical support matters, encouraging collaborative and cross disciplinary research amongst member nations in general and for SCAR Biology symposia. JEGHBM is keeping abreast of upcoming threats and clinical evidence-base requirements from emerging infectious disease and changing operational paradigms for overwinter practice.

Recommendations

None

Summary Budget 2017 to 2020

	2017	2018	2019	2020
	Spent	Allocated	Request	Request
LS	0		2000	2000



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 Person Responsible: A Hicks et al.

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Progress and Plans

Sub-group Major Outcomes/Activities

- 1) Joint activity with Space Agencies engaging Antarctic Stations as a ground based analog for space missions with respect to behavioural health and human factors. Space Agency funded research on individual and group dynamics in process as well as the application of virtual reality countermeasures to stress.
- 2) Presentation of the Humans behind the crisis by Dr. Anne Hicks- addressing the psychosocial impact of disasters from both a medical and management perspective for deployed teams.
- 3) Discussion of how to better implement communication amongst medical members including improvements in the medical Antarctic website. Plan to compare and contrast physical qualification programs between stations.
- 4) Discussion of winter over impacts and presentations from several programs about their past seasons.

Budget

Planned use of funds for 2018 to 2020

Please note that these are estimates and will be discussed and refined in consultation with the wider ANTOS committee at an upcoming workshop in Genoa (June 2018).

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
2019		\$2 000		
2020		\$2 000		
Total		4,000		

Briefly describe funds usage and the desired results:

- JEGHBM is committed to providing the best possible support to both nations and individuals in SCAR and participating Antarctic Treaty Nations. Toward that end JEGBM is putting 2,000 a year for website development and security. JEGHBM is looking to provide publically accessible information as well as secure access for treaty nations and clinical confidentiality as appropriate. This requires additional programming and security.
- JEGBM is also committed to supporting young investigators and clinical professionals in their research and clinical applications. Toward that end JEGHBM is looking to provide travel and other support.
- JEGHBM is also looking to support secure, common standards and platforms for sharing important medical or clinical information as needed



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Outreach and Capacity Building

Several talks were given at NASA HQ, JSC, KSC, MSFC, ARC, JPL meetings on the exceptional opportunities available with our international partners for mutually beneficial research and technology development. Addressed topics range from medical standards to pharmacy, isolation and confinement to plant growth chambers, nutrition, communications delay, virtual reality, ...

Requests to the Secretariat - none



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Person Responsible:	ICED

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Integrating Climate and Ecosystem Dynamics in the Southern Ocean (ICED)

Report Authors

Integrating Climate and Ecosystem Dynamics in the Southern Ocean programme (ICED).

Summary of activities from 2016-18 and other important issues

ICED is a regional programme of Future Earth and the Scientific Committee on Ocean Research's (SCOR) Integrated Marine Biosphere Research programme (IMBeR), and is a Co-sponsored Group of SCAR. ICED is undertaking integrated circumpolar analyses to improve our understanding of change and the implications for Southern Ocean ecosystems and their management. By providing a focus for linking Southern Ocean research communities across disciplines a diverse range of science is underway. Recent highlights include an expanding body of research on key species and food webs, on the links between biogeochemistry and ecology, and on the effects of change. ICED's current major focus is to build on this to comprehensively assess (and where possible quantify) the impacts of change on Southern Ocean ecosystems. This will be achieved through the analysis and integration of available data together with the development of models, scenarios and projections. These activities and outputs will provide valuable information for ecosystem-based management and policy. A summary of key ICED scientific highlights during the ten years since its inception was presented at the ICED-sponsored conference on Marine Ecosystem Assessment of the Southern Ocean (MEASO) held in April 2018.

Recommendations

ICED wishes to continue to work with SCAR to complement and add value to our work, learn from shared experience, and collectively address common goals. We would like SCAR to particularly note the mutually beneficial opportunities for strengthening interactions and collaborations with ICED. This includes (i) our ongoing work with the Commission for the Conservation of Marine Living Resources (CCAMLR) and the Committee for Environmental Protection (CEP), see below Plans and Linkages, and (ii) our work on models, scenarios and projections of change in Southern Ocean ecosystems (including our recent Projections Workshop (April 2018) and the ICED-sponsored MEASO Conference (April 2018)). As such we recommend that where possible, SCAR encourages, endorses and participates in relevant ongoing and upcoming ICED activities (see below).

Summary Budget 2017 to 2020 – no budget request



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Person Responsible:		ICED

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Progress and Plans

Sub-group Major Outcomes/Activities

- (1) Understanding and quantifying the state and variability of marine ecosystems.** ICED has continued to develop whole ecosystem level understanding of the structure and functioning of Southern Ocean of ecosystems, their variability and response to change across a range of spatial and temporal scales. We have focused detailed work on key species from phytoplankton to whales (Arthur et al, Kaufman et al 2017, Meyer et al 2017), and the structure of food webs (e.g. Saunders et al 2017). We have also examined physical, chemical and biological interactions (e.g Belcher et al 2017, Beekmans 2017) and the effects of past (Tarling et al 2018) and recent variability and change, such as ocean acidification (e.g. Bellerby et al. in prep, Manno et al 2017, Peck et al 2017, Trimbourne et al 2017). Much of this work was brought together during the recent
- (2) Improving scenarios, predictions and projections of future ocean-human systems at multiple scales.** We have continued our model development work in support of creating a suite of models of physical dynamics (ocean circulation and climate), biogeochemical cycles, and biological dynamics (life histories, population dynamics, food web structure) within a hierarchical framework of models of different spatial, temporal and trophic resolution. The ultimate aim of these activities will be to advance end-to-end ecosystem modelling approaches that integrate physical, chemical and biological processes. Recent work includes: Dinniman et al 2017, Freer et al 2017, Kruger et al 2018, Silber et al 2017, Murphy et al. 2017, Meyer et al, 2018, Klein et al. 2018. We have used our understanding of the drivers and impacts of climate change in the Southern Ocean to further our work on developing scenarios of key drivers and projections of ecological change. For example, ICED scientists have published a recent ICED community paper Cavanagh et al. (2017). To follow on from this work, an ICED Projections workshop was held in April 2018, in collaboration with the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), to further the scenarios and projections work.
- (3) Improving and achieving sustainable ocean governance.** ICED has worked with stakeholders to ensure our science is incorporated into adaptation, mitigation and sustainable management procedures by improving two way communications and understanding between science, policy and society. ICED is continuing its work with the Antarctic Treaty Commission SCAR, and with the Committee for Environmental Protection (CEP) and CCAMLR. ICED is also continuing to work with other relevant international environmental treaties and organisations, conservation groups, and international committees. Examples include: an ICED Information Paper for the 2017 ATCM (ICED 2017) outlining the role that ICED can continue to play in providing information on climate change impacts on ecosystems to the Antarctic Treaty; an ICED paper was submitted to the WG-EMM meeting in July 2017 held in Buenos Aires, Argentina (Murphy et al. 2017a) detailing the ICED Projections Workshop that was held in April 2018 bringing together scientists involved in ICED and CCAMLR, as well as future joint research between ICED, CCAMLR and SCAR; several publications were



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submitted by ICED scientists to CCAMLR in support of fisheries management and development of future MPA's (see Appendix); a range of ICED science and position papers have been submitted to the International Whaling Commission (IWC) and the Agreement on the Conservation of Albatrosses and Petrels (ACAP); ICED scientists have also led a science-policy initiative in Cambridge, UK and a science-policy fora as part of the MEASO2018 Conference; ICED scientists are also involved in high level IPCC work.

Sub-group Outcomes Summary

Sub-group	Activity/Outcome/Benefit/Achievement
ICED	ICED Community Paper (Cavanagh et al. 2017)
ICED	ICED Projections Workshop, Hobart, April 2018
ICED	10 years of ICED at the MEASO Conference, Hobart, April 2018

Notable Papers

1. Cavanagh RD, Murphy EJ, Bracegirdle TJ, Turner J, Knowland CA, Corney SP, Smith WO, Waluda CM, Johnston NM, Bellerby RGJ, Constable AJ, Costa DP, Hofmann EE, Jackson JA, Staniland IJ, Wolf-Gladrow D, Xavier JC. (2017). A Synergistic Approach for Evaluating Climate Model Output for Ecological Applications doi:10.3389/fmars.2017.00308. *This work was developed as an ICED Community paper and followed a workshop on Southern Ocean change. The multidisciplinary study stresses the need for an integrated approach to understand the effects of climate change on Antarctic marine ecosystems.*
2. Murphy, E.J., Thorpe, S.E., Tarling, G.A., Watkins, J.L., Fielding, S., and Underwood, P. (2017b) Restricted regions of enhanced growth of Antarctic krill in the circumpolar Southern Ocean. Scientific Reports 7, 6963. *The work is part of a large project aimed at developing a series of models of the population dynamics and life-cycle of Antarctic krill. The results and model analyses presented in this study contribute to core ICED activities aimed at developing projections of the impacts of change in Southern Ocean ecosystems and will be input to CCAMLR to inform decision making.*
3. Meyer, Bettina, Freier, Ulrich, Grimm, Volker, Groeneveld, Jürgen, Hunt, Brian P. V., Kerwath, Sven, King, Rob, Klaas, Christine, Pakhomov, Evgeny, Meiners, Klaus M., Melbourne-Thomas, Jessica, Murphy, Eugene J., Thorpe, Sally E., Stammerjohn, Sharon, Wolf-Gladrow, Dieter, Auerswald, Lutz, Götz, Albrecht, Halbach, Laura, Jarman, Simon, Kawaguchi, So, Krumpfen, Thomas, Nehrke, Gernot, Ricker, Robert, Sumner, Michael, Teschke, Mathias, Trebilco, Rowan, Yilmaz, Noyan I. (2017). The winter pack-ice zone provides a sheltered but food-poor habitat for larval Antarctic krill. Nature Ecology & Evolution 10.1038/s41559-017-0368-3. *This study is an important development in our understanding of the overwintering biology of Antarctic krill, which is crucial for developing projections of the impacts of future change, and will be incorporated into further ICED and CCAMLR work in this area.*

Forthcoming Activities

- **Future directions in Southern Ocean ecosystems research (running title).** (in prep.). Johnston et al. and the ICED SSC. This ICED community



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manuscript will include motivations for the future development of the ICED Programme in coordinating and directing circumpolar integrated ecosystem science, its achievements over the past decade, and future scientific directions in Southern Ocean ecosystems and climate research;

- **Southern Ocean Acidification (in prep.). Bellerby, Constable, Hoppema, Hoppema, Kurihara, Lenton, Lo Monaco, Lovenduski, Meredith, Murphy, Shadwick, Suckling Trimborn. SCAR Reports.** SCAR formed an Action Group (AG) on Ocean Acidification to write this report. The AG and publication has been led by Richard Bellerby (ICED scientist and SSC member), and includes contributions from Constable (ICED SSC scientist member) Murphy (ICED scientist and SSC chair);
- A set of ICED papers from the recent ICED Projections Workshop and MEASO conference (see above).

Forthcoming ICED activities will include:

- A range of ICED-led workshops and meetings to synthesise our research to date, forming a comprehensive view of status and changes in Southern Ocean ecosystems. Planned activities include:
 - ICED will have a strong presence at Polar2018, Davos, Switzerland, June 2018;
 - ICED input to CCAMLR's Working Group on Ecosystem Monitoring and Management, June 2018;
 - ICED plans to convene a session/workshop on Southern Ocean scenarios and projections at the IMBeR OSC in 2019.
- ICED scientists are involved in planning a repeat of the CCAMLR2000 krill synoptic survey led by scientists from Norway.
- New National Science Foundation Funded project Foraging Ecology and Physiology of the Leopard Seal (*Hydrurga leptonyx*). This three-year project will focus on the Antarctic Peninsula. 1st field effort April-May 2018. Livingston Island. PI Dan Costa, CoPIs, Steve Trumble, Shane Kanatous and Dan Crocker. This project will be aimed at better understanding the ability of the leopard seal, an apex predator in the Antarctic ecosystem, to cope with a changing environment.

Briefly describe funds usage and the desired results

ICED activities planned for 2018-19 will benefit from SCAR involvement and expertise and as such may benefit from SCAR funds. This could include, for example, financial assistance for attendance of key individuals involved in other SCAR groups at future ICED workshops, and ongoing work with CCAMLR and CEP.

Linkages

Direct support from outside organisations

We will receive funds from IMBeR to conduct our next SSC meeting (2019).



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Major collaborations

Within SCAR

1. **AnT-ERA:** ICED has links with SCAR's AnT-ERA programme, including most recently via contributions to the paper (Gutt et al. 2018) from the SCAR Cross-Program Workshop (on Interactions between Biological and Environmental Processes in the Antarctic, Institut de Ciències del Mar, 16-18 September 2015, Barcelona).
2. **SCAR's Action Group on Ocean Acidification:** ICED scientist and SSC member, Richard Bellerby, leads SCAR's Action Group on Ocean Acidification. This group are due to complete an Ocean Acidification report for SCAR, for imminent publication.
3. **SCAR-SCOR Southern Ocean Observing System (SOOS):** ICED SSC Member Andrew Constable is Co-Vice Chair (Biology) and leading the development of ecosystem Essential Ocean Variables. Constable is facilitating collaboration between ICED and SOOS in delivering co-ordinated field activities in different sectors of the Southern Ocean, co-ordinated delivery of data and field planning products, and assessments of change. He is also facilitating joint activities to deliver a benchmarking of Southern Ocean ecosystems in 2022. Dan Costa, Walker Smith and Eileen Hofmann of the ICED SSC are also involved in strengthening SOOS-ICED collaborations. ICED scientists will contribute to other SOOS regional working group meetings to be held during the course of 2018, as well as to a number of SOOS Capability Working Groups, including on benchmarking Southern Ocean ecosystems, ecosystem Essential Ocean Variables and sensing Antarctic predators from satellites.

Outside SCAR

1. **CCAMLR:** ICED is continuing close work with CCAMLR to ensure that ICED science is relevant to CCAMLR and that scientific results are translated appropriately into messages that resonate with policy makers (see above for details). ICED is also working with SCAR to encourage closer links between ICED, SCAR and SC-CAMLR (see previous annual report).
2. **CEP:** ICED scientists continue to engage with CEP, particularly regarding their climate change programme planning (see above for details).
3. **IMBeR and Future Earth:** ICED is a regional programme of IMBeR and as such connects upwards to Future Earth. Through these links ICED is continuing to raise the international profile of Southern Ocean science and ensure that our activities reflect international as well as regional priorities.
4. **EuroMarine:** ICED scientists are involved in the EuroMarine Network (see www.euromarinenetwork.eu), ensuring links between ICED and the shared vision of this European network whilst building on the legacy of EUR-OCEANS in developing the ICED network and science strategy.
5. **IPCC:** ICED scientists are involved in the Polar Regions Chapter for the IPCC Special Report on the Ocean and Cryosphere in a Changing



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Climate (lead author), and the Changing Ocean, Marine Ecosystems, and Dependent Communities Chapter (contributing authors).

6. **International Whaling Commission (IWC)**: ICED scientists are involved in key IWC work.

Outreach and Capacity Building

ICED has continued to progress with education and outreach activities, highlights include:

- Encouraging girls to pursue STEM careers (ICED Scientist Nadine Johnston);
- ICED contribution to the Portuguese National Workshop on Polar Education, March 2018;
- ICED contributions to APECS including presentations (at SCAR Biology, Leuven, 2017) and a panel discussion (MEASO, April 2018).

Requests to the Secretariat - none



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Appendix 1.

ICED Publication list- April 2018

N.B. Many of these involve collaborations with SCAR scientists and scientists from other relevant programmes.

1. Reports and Books

Bellerby, R, Andrew Constable, Mario Hoppema, Haruko Kurihara, Andrew Lenton, Claire Lo Monaco, Nikki Lovenduski, Michael Meredith, Eugene Murphy, Elizabeth Shadwick, Coleen C. Suckling, Scarlett Trimbora. Southern Ocean Acidification report (In Prep).

Constable, A.J., Melbourne-Thomas, J., Trebilco, R., Press, A.J., Haward, M. (2017) ACE CRC Position Analysis: Managing change in Southern Ocean ecosystems. Antarctic Climate and Ecosystems Cooperative Research Centre, Hobart, Australia. 39 pp.

2. Management and Policy related reports and papers to CCAMLR, IWC, ACAP etc

ICED (2017). Report on the activities of the Integrating Climate and Ecosystem Dynamics in the Southern Ocean (ICED) programme. ATCM XL 2017

Murphy, Cavanagh, Johnston on behalf of the ICED SSC. 2017a. [Integrating Climate and Ecosystem Dynamics in the Southern Ocean \(ICED\) program: developing ICED and CCAMLR joint activities](#). CCAMLR [WG-EMM-17/36](#). CCAMLR Working Group on Ecosystem Monitoring and Management 2017.

Other papers to CCAMLR Working Group on Ecosystem Monitoring and Management 2017 can be found here: <https://www.ccamlr.org/en/wg-emm-17>

3. Scientific publications

Ancel, André; Cristofari, Robin; Trathan, Phil N.; Gilbert, Caroline; Fretwell, Peter T.; Beaulieu, Michaël. 2017. Looking for new emperor penguin colonies? Filling the gaps. *Global Ecology and Conservation*, 9. 171-179.10.1016/j.gecco.2017.01.003
<<http://dx.doi.org/10.1016/j.gecco.2017.01.003>

Arthur, Benjamin; Hindell, Mark; Bester, Marthan; Nico De Bruyn, P.J.; Trathan, Phil; Goebel, Michael; Lea, Mary-Anne. 2017 Winter habitat predictions of a key Southern Ocean predator, the Antarctic fur seal (*Arctocephalus gazella*). *Deep Sea Research Part II: Topical Studies in Oceanography*, 140. 171-181. <https://doi.org/10.1016/j.dsr2.2016.10.009>



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Baylis, A. M. M., R. A. Orben, D. P. Costa, M. Tierney, P. Brickle, and I. J. Staniland. 2017. Habitat use and spatial fidelity of male South American sea lions during the nonbreeding period. *Ecology and Evolution* 7:3992-4002.

Beekmans, Bas W.P.M. 2017. Wandering whales? Relationship between whales and the sea ice environment in the Southern Ocean. University of Groningen, PhD Thesis, 149pp.

Belcher, Anna; Tarling, G.A.; Manno, C.; Atkinson, A.; Ward, P.; Skaret, G.; Fielding, S.; Henson, S.A.; Sanders, R. 2017. The potential role of Antarctic krill faecal pellets in efficient carbon export at the marginal ice zone of the South Orkney Islands in spring. *Polar Biology*, 40 (10). 2001-2013. <https://doi.org/10.1007/s00300-017-2118-z>

Belcher, Anna; Manno, Clara; Ward, Pete; Henson, Stephanie; Sanders, Richard; Tarling, Geraint. 2017. Copepod faecal pellet transfer through the meso- and bathypelagic layers in the Southern Ocean in spring. *Biogeosciences*, 14 (6). 1511-1525. <https://doi.org/10.5194/bg-14-1511-2017>

Cavanagh RD, Murphy EJ, Bracegirdle TJ, Turner J, Knowland CA, Corney SP, Smith WO, Waluda CM, Johnston NM, Bellerby RGJ, Constable AJ, Costa DP, Hofmann EE, Jackson JA, Staniland IJ, Wolf-Gladrow D, Xavier JC. (2017). A Synergistic Approach for Evaluating Climate Model Output for Ecological Applications doi:10.3389/fmars.2017.00308.

Cherel, Yves; Xavier, Jose C.; de Grissac, Sophie; Trouvé, Colette; Weimerskirch, Henri. 2017. Feeding ecology, isotopic niche, and ingestion of fishery-related items of the wandering albatross *Diomedea exulans* at Kerguelen and Crozet Islands. *Marine Ecology Progress Series*, 565. 197-215. [10.3354/meps11994](https://doi.org/10.3354/meps11994) <<http://dx.doi.org/10.3354/meps11994>>

Dinniman, M.S., J.M. Klinck, E.E. Hofmann, and W.O. Smith, Jr. 2018. Effects of projected changes in wind, atmospheric temperature and freshwater inflow on the Ross Sea. *J. Climate* 31: 1619-1635.

Freer, Jennifer J.; Partridge, Julian C.; Tarling, Geraint A.; Collins, Martin A.; Genner, Martin J.. 2018 Predicting ecological responses in a changing ocean: the effects of future climate uncertainty. *Marine Biology*, 165 (1), 7. 18, pp. <https://doi.org/10.1007/s00227-017-3239-1>



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<https://doi.org/10.1007/s00227-017-3261-3>

Goedegebuure, M., Melbourne-Thomas, J., Corney, S.P., Hindell, M.A., and Constable, A.J. (2017) Beyond big fish: The case for more detailed representations of top predators in marine ecosystem models. *Ecological Modelling* 359, 182-192.

Goetz, K. T., J. M. Burns, L. A. Huckstadt, M. R. Shero, and D. P. Costa. 2017. Temporal variation in isotopic composition and diet of Weddell seals in the western Ross Sea. *Deep-Sea Research Part II-Topical Studies in Oceanography* 140:36-44.

Gregory, Susan; Collins, Martin A.; Belchier, Mark. 2017 Demersal fish communities of the shelf and slope of South Georgia and Shag Rocks (Southern Ocean). *Polar Biology*, 40 (1). 107-121. <https://doi.org/10.1007/s00300-016-1929-7>

Gutt J, Isla E, Bertler AN, Bodeker GE, Bracegirdle TJ, Cavanagh RD, Comiso JC, Convey P, Cummings V, De Conto R, De Master D, di Prisco G, d'Ovidio F, Griffiths HJ, Khan AL, López-Martínez J, Murray AE, Nielsen UN, Ott S, Post A, Ropert-Coudert Y, Saucède T, Scherer R, Schiaparelli S, Schloss IR, Smith CR, Stefels J, Stevens C, Strugnelli JM, Trimborn S, Verde C, Verleyen E, Wall DH, Wilson NG, Xavier JC (2018) Cross-disciplinarity in the advance of Antarctic ecosystem research. *Marine Genomics* 37: 1-17 doi <https://doi.org/10.1016/j.margen.2017.09.006>

Horswill C., Trathan. P. N., Ratcliffe, N. 2017. Linking extreme interannual changes in prey availability to foraging behaviour and breeding investment in a marine predator, the macaroni penguin. *PLoS ONE* 12(9): e0184114.
<https://doi.org/10.1371/journal.pone.0184114>

Huckstadt, L. A., M. D. McCarthy, P. L. Koch, and D. P. Costa. 2017. What difference does a century make? Shifts in the ecosystem structure of the Ross Sea, Antarctica, as evidenced from a sentinel species, the Weddell seal. *Proc Biol Sci* **284**.

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Hughes, Kevin A.; Grant, Susie M.. 2017 The spatial distribution of Antarctica's protected areas: a product of pragmatism, geopolitics, or conservation need? *Environmental Science & Policy*, 72. 41-51. <https://doi.org/10.1016/j.envsci.2017.02.009>



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Koubbi, Philippe; Grant, Susie; Ramm, David; Vacchi, Marino; Ghigliotti, Laura; Pisano, Eva. 2017 Conservation and management of Antarctic silverfish *Pleuragramma Antarctica* populations and habitats. In: Vacchi, Marino; Pisano, Eva; Ghigliotti, Laura, (eds.) *The Antarctic silverfish: a keystone species in a changing ecosystem*. Springer, 287-305. (*Advances in Polar Ecology*, 3).

Krüger, L., Ramos, J.A., Xavier, J.C., Grémillet, D., González-Solís, J., Petry, M.V., Phillips, R.A., Wanless, R.M. & Paiva, V.H. (2018). Projected distributions of Southern Ocean albatrosses, petrels and fisheries as a consequence of climatic change. *Ecography* 41: 195-208 DOI: [10.1111/ecog.02590](https://doi.org/10.1111/ecog.02590)

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Lourenço, Sílvia; Saunders, Ryan A.; Collins, Martin; Shreeve, Rachael; Assis, Carlos A.; Belchier, Mark; Watkins, Jonathan L.; Xavier, Jose C.. 2017 Life cycle, distribution and trophodynamics of the lanternfish *Krefftichthys anderssoni* (Lönnberg, 1905) in the Scotia Sea. *Polar Biology*, 40 (6). 1229-1245. <https://doi.org/10.1007/s00300-016-2046-3>



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<https://doi.org/10.1016/j.earscirev.2017.04.005>

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Agenda Item: 4.3.2
Person Responsible: ICED

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