—シンポジウム / 会合報告—
Symposium/Meeting Report

Report on 1st and 2nd Joint Workshops on Australian and Japanese Collaboration in Antarctic Science and related achievements

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豪日南極共同研究に関するワークショップの報告およびその関連成果

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要旨: 2008 年 6 月豪日両首相による共同宣言の中で豪日の南極研究協力の重要性がうたわれたことを受け，2009 年 9 月 9–11 日および 2012 年 12 月 1 日に国立極地研究所において第一回および第二回豪日南極研究合同ワークショップが開催された．一連のワークショップは南極研究における豪日共同研究を効果的に行うためのプランを議論することにより，将来の豪日双方の国内プロジェクト案に資することを目的とした．

Abstract: The 1st and 2nd Australia—Japan Joint Workshops on Antarctic Science (Sep. 9–11, 2009 and Dec. 1, 2012, respectively) were held at the National Institute of Polar Research (NIPR), Tokyo, Japan, after the importance of Australian and Japanese collaboration in Antarctic research was re-affirmed by the Prime Ministers of both countries in a June 2008 joint communiqué. The purposes of these workshops were to propose a plan to maximize the two countries' Antarctic research efforts and to produce agreed reports to form the basis of the development of future project proposals from each country.

1. Background

Currently, long-term monitoring sites that conduct comprehensive Antarctic marine ecosystem observations are mainly located in the southwest Atlantic (*i.e.*, Long Term Ecological Research at Palmer Station: Palmer LTER, the U.S. Antarctic Marine Living Resources Program: US AMLR). Similar ecosystem monitoring sites are absent in other

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areas of the Antarctic; however, Australia and Japan share a unique and important position within the Antarctic research community. Both have permanent stations in East Antarctica that continuously collect a considerable range of data as well as executing large-scale ecosystem surveys in the same region, which encompasses more than one-quarter of the Antarctic coastline. There is a proud history of successful collaborations between Australia and Japan in Antarctic ecosystem research. Further strengthening of these collaborations will provide a wealth of information for the entire Antarctic research community (Kawaguchi and Shiraishi, 2008).

The importance of these bilateral collaborations is formally recognised and supported at the very highest levels of government in both countries. A joint communiqué made by the Prime Ministers of both Australia and Japan when they met in Tokyo in June 2008 emphasized a firm commitment to collaborate on Antarctic climate change studies. It states:

The two Prime Ministers recognised the important role of continued cooperation in scientific research in the Antarctic to support the understanding of the global impacts of climate change and confirmed their commitment to further enhanced cooperation in this area.
(http://www.pm.gov.au/media/release/2008/media_release_0309.cfm (unavailable now); Japanese translation: http://www.mofa.go.jp/mofaj/area/australia/visit/0806_ks.html)

Following this communiqué, the 1st "Australia—Japan Joint Workshop on Antarctic Science: ANNREACH," was held in 2009 to discuss common key issues related to climate change; these issues were thought to be too large to be addressed by countries working in isolation. The fundamental reason for holding the joint workshop was to propose a plan to maximize the two countries' research efforts by identifying the types of activities that would benefit from collaboration and that make the best use of limited resources.

In 2012, the 14th Australia—Japan bilateral Joint Science and Technology Consultative (JSTC) meeting, one of the high-level biannual meetings between Australia and Japan, was held in Tokyo to identify and endorse priority areas for collaboration across all scientific fields. The co-chairs' summary contains the following:

Both sides shared views for the matured relationships in polar research, which began with Japan's first expedition to the Antarctica in 1911 with assistance of Australia, and confirmed the importance of future collaboration in Southern Ocean and Antarctic research, including collaboration in the Southern Ocean Sentinel program.

At this meeting, the Australian Antarctic Division (AAD) and the National Institute of Polar Research (NIPR) reported on the successful collaboration in Antarctic science since the above-mentioned joint communiqué (1st phase collaboration) and proposed the intention to hold the 2nd "Australia—Japan Joint Workshop on Antarctic Science" to discuss the 2nd phase collaboration. This proposal was endorsed by the JSTC meeting. The workshop aimed to produce an agreed report that contains the proposed opportunities for collaboration for the consideration of each government, which will then form the basis of future project proposal development in each country.

As a record of the recent progression of the collaboration between Australia and Japan

in Antarctic science, we report on the two joint workshops held in 2009 and 2012. (Note: the appendices to the reports are not available in the public domain. Contact So.Kawaguchi@aad.gov.au for further information.)

2. 1st joint workshop

Report on the 1st Australia—Japan Joint Workshop on Antarctic Science: "Australia—Japan Research on East Antarctic Climate Change"

(Co-conveners: So Kawaguchi and Kentaro Watanabe)
(Sep. 9–11, 2009, National Institute of Polar Research (NIPR), Tokyo, Japan)

2.1. Introduction

2.1.1. Opening of the workshop

1) The 1st Australia—Japan Joint Workshop on Antarctic Science was held on September 9–11, 2009 at the National Institute of Polar Research, Tokyo, Japan. The workshop was co-convened by Dr. So Kawaguchi (AAD) and Professor Kentaro Watanabe (NIPR). Local arrangements were coordinated by NIPR.
2) Dr. Kawaguchi opened the workshop and welcomed the 45 participants (11 from Australia, and 34 from Japan; a full list of participants is provided at the end of this report). He thanked NIPR, the Antarctic Climate and Ecosystems Cooperative Research Centre (ACE-CRC), AAD, and the Australia—Japan Foundation for sponsoring the workshop.
3) The opening addresses were made by NIPR Director-General Professor Yoshiyuki Fujii and Dr. Martin Riddle representing the AAD Chief Scientist at the workshop. Both reiterated the long history of successful research collaborations between Australia and Japan in Antarctic ecosystem studies in particular, and stressed the importance of further enhancing the collaboration. It was further noted that the workshop would provide an ideal opportunity to consider common research interests and capabilities.

2.1.2. Adoption of the agenda and organization of the workshop

1) The workshop revised the provisional agenda and agreed to include an introduction by the ACE-CRC on day 2. It was also clarified that day 3 of the workshop would be dedicated to group discussions for each project, and therefore the workshop plenary session would conclude at the end of day 2.
2) The report was prepared by Dr. Kawaguchi.

2.2. National programs and project priorities

2.2.1. Background and purpose of the workshop

1) Dr. Kawaguchi gave a short presentation to explain the background and the purpose of the workshop, referring to the Prime Ministers' joint communiqué released in June 2008. He also stressed the significance of having both countries' key scientists from a wide range of Antarctic disciplines gathering in a single room to discuss future collaborations, which is a rare opportunity, and highlighted the importance of focusing on high-level discussions.
2) Participants were reminded that the collaborative plans to be developed must be aligned

with the overarching key questions addressing climate change problems as well as both countries' strategic plans for the coming years, and must also help inform and benefit users of such outputs (*i.e.* government policy makers, general public).

3) The workshop participants agreed that the kind of output expected at the end of the two-day plenary sessions would be a list of priority areas of research which have common benefits to both nations that allow both national programs to further develop a framework in order to achieve the best outcomes.

2.2.2. National programs

1) Dr. Riddle explained Australian Antarctic Science, government goals, directions, the structure of National Antarctic Program (institutions, their roles, and relations), areas of science undertaken, project assessment process, areas of interests *etc*.
2) Dr. Riddle further summarised the Australian scientific proposal assessment and approval system, and explained that there is a lead time of at least 2 years (or 3 years for large projects involving substantial logistic implications) from proposal to project execution.
3) Professor Kazuyuki Shiraishi (NIPR) summarised the Japanese Antarctic Research Expedition (JARE) program. Japan has just started the 8th JARE plan for the next 6 years (Japanese Antarctic Research Project phase 8th). It was noted that the plans for the first 3 years (2010–2012) have now been fixed, but the plans for the last 3 years (2013–2015) are flexible and will be finalised in the coming years.
4) The workshop participants agreed that a good understanding of each nation's funding cycles, assessment processes and the lead time from proposals to execution of the projects, as well as sharing common interests and goals are thought to be the key to strategic planning of a collaboration.

2.2.3. Identification of common interests

1) Through the course of discussion in relation to common interests, the workshop noted the following points:
   - The general view of impacts and response of the Antarctic system is dominated by the view generated from research in West Antarctica.
   - Rates of change are not uniform between West and East Antarctica (*e.g.* atmospheric temperature, sea ice extent, predator population trends).
   - Climate effects may not be as dramatic in the East Antarctic region but may still indicate events that could occur later in other regions, and hence East Antarctica may operate as an early warning system.
   - Due to the large size and relative remoteness of East Antarctica, there is considerable cost benefit of bilateral coordination.
2) The workshop recognized that the following:
   - Data from East Antarctica are sparse, and the Australia—Japan collaboration is a great opportunity to both synthesize existing data and extend the database.
   - Collaboration in East Antarctica will inform us more about climate change than just relying on information from West Antarctica, especially in the global context.
   - There are differences in the spatial and temporal scales among disciplines that need to be considered when synthesising datasets.
   - Research efforts should be complementary and avoid unnecessary duplication.
   - It is important to identify the areas where multidisciplinary data collection exists, and

to analyse existing trends.

- It is important to consider co-incidental data acquisition from various key disciplines when conducting research in East Antarctica.

3) The workshop further reiterated the importance of providing scientific information in the form that policy makers need for decision making as well as to provide feedback to the general public (*e.g.* contribution to the next Intergovernmental Panel on Climate Change (IPCC) report, evaluation of ecosystem services).

2.2.4. Presentations and discussion of the projects

1) A series of short project presentations was made, which were broadly categorized into three clusters: ocean, ice-core/glaciology, and atmospheric science. Professor Mitsuo Fukuchi (NIPR) gave a brief overview of all ocean cluster presentations prior to the individual presentations. These were followed by presentations on atmospheric science, terrestrial ecology, glaciology, and carbon circulation science.
2) The participants were encouraged to view the presentation series within a wider context, to link the projects across different clusters and to look into any benefits to addressing big key questions related to climate change and how to do this. Following the presentations, the participants were invited to give comments and to share their thoughts regarding what appeared to be gaps in research and possible areas of integration.
3) The plenary broke into clusters/sub-groups to further discuss their projects. The outcomes from each group were reported back to the plenary.
4) The collective view of the workshop, after the presentations, was that physical oceanography is crucial to understanding the carbon cycle and that the carbon cycle cannot be separated from biological activity. Thus, all global processes are interlinked but at various scales in time and space. The workshop participants further agreed that this is the reason why integration across disciplines is so important.

2.2.5. Importance of Australia—Japan collaboration for enhancing understanding of the East Antarctic system

1) The workshop listed reasons why research in the East Antarctic is and could be so important:
   - East Antarctica plays an important role in the global system, and may have an important global impact as a consequence of climate change. For example, 40% of ocean deep water, which contributes to global ocean thermohaline circulation and helps to regulate the Earth's climate, originates in the East Antarctic region.
   - The East Antarctic Ice Sheet is the oldest on the continent, and contains ice core records that are key to reconstructing ancient climate. East Antarctica holds the largest mass of ice (compared with West Antarctica), and can be viewed as a "sleeping giant" in terms of its potential contribution to the magnitude of global sea level rise.
   - East Antarctica represents an ideal early warning system, and this may attract global public attention. The Antarctic (Southern Ocean) ecosystem is thought to be one of the first ecosystems on Earth to be affected by ocean acidification. The deep cold-water coral community is found just above the aragonite saturation horizon in East Antarctica, and could be used as factual demonstration/indicator of what may happen if the rest of the world's ocean acidifies.
   - Iconic species reside in the region such as Emperor penguins, Adélie penguins, and it is thought that these are yet to be affected by a reduction in sea ice. Collaborative

monitoring of their population trends using Australian and Japanese extensive observation sites would provide an excellent means of testing hypotheses on the ecological effects of ice and changes in ice. Also, it will be an effective tool to raise public awareness. However, it was also noted that iconic does not necessarily mean useful, and the value of non-iconic species (*e.g.* mosses and plankton) should not be dismissed.

2) The workshop further noted that the long-term monitoring sites currently conducting comprehensive marine ecosystem observations (Palmer LTER, US AMLR) are all located in the Southeastern Pacific in the West Antarctic Peninsula region. Similar ecosystem monitoring sites are lacking in other areas of the Antarctic.
3) Environmental trends and rates of change differ between areas around the Antarctic continent. Data from East Antarctica are sparse, and this is the region where the workshop sees its importance in conducting science as listed in paragraph 2.2.3. To view Antarctica as an entire system, the workshop reiterated importance of acquiring such information from key regions of Antarctica.
4) Australia and Japan share a unique and important position within the Antarctic research community, by being the two major operators in the East Antarctic region, running permanent stations in the region, continuously collecting large amount of data, and conducting a series of large-scale snapshot ecosystem surveys in a region which encompass more than a quarter of the entire Antarctic coastline. The workshop agreed that further strengthening of Australian—Japanese cooperation/collaboration will provide a wealth of information for the whole Antarctic research community.

2.2.6. Project integration and priority projects

1) The workshop initiated a discussion how to coordinate cross-disciplinary integration to effectively address the key questions related to climate change, and agreed that having "focal points" of research would constitute a basis of project integration.
2) As an example, a question such as "what is happening in the pelagic system?" could be a focal point for an integrated study of climate change impact on important regional ecosystems. This recognizes the pelagic component (plankton, krill, and fish) as the "engine room" that drives the Antarctic marine ecosystem.
3) Ocean acidification could also be a focal point for the integration of various disciplines into a unified project involving participation by predator groups, physical oceanographers, biogeochemical groups, pelagic groups, benthic groups, and terrestrial groups among others.
4) In situ measurement and remote sensing projects will form the basis of assessments of environmental change and the impact of sea ice change/variability on high-latitude marine ecosystems. Coordinated monitoring of sea ice production rates within the Mertz Glacier and Cape Darnley polynyas using similar/identical instrumentation and techniques will provide a unique opportunity to monitor the comparative "behaviour" of two globally-significant sites of Antarctic Bottom Water formation from widely-separated East Antarctic regions. In addition, coordinated monitoring of fast ice at Australian and Japanese bases will be carried out as part of the Antarctic Fast Ice Network (AFIN) program.

2.3. Gaps and capacity building

2.3.1. Gaps

1) The gaps in the expertise needed to address key questions on climate change are as follows:
   - *Cross cutting skills*: To serve cross-disciplinary needs for information (*e.g.* an oceanographer working on the scales relevant to those of biological activity).
   - *Research meteorologists*: Lack of research meteorologists, since weather conditions are the direct interface between marine/terrestrial ecosystem and lower-middle-upper atmospheric phenomena which operate in different scale in time and space. Changes in large-scale atmospheric circulation patterns are also driving environmental changes around Antarctica.
   - *Carbon chemists*: Antarctic science has limited engagement with carbon chemists. The high-latitude importance of carbon chemistry revolves around its role as a link between biology and physical oceanography.
   - *Experimental biology*: Projection of future ecosystem change requires modeling based on both improved information and a sound understanding of the biology and physiology of ecosystem components. Parameterization of ecosystem models outside the empirical range needs to rely on information from sound experimentation. Currently there is a limited amount of experimental information available for climate change research.
   - *Ecosystem modelers*: Such researchers are required to unite disparate data sets, highlight critical gaps in understanding of processes and develop frameworks for predicting possible scenarios for change.
   - *Sediment core palaeobiologists*: Research in this area is needed to extend the palaeoclimate record back to earlier periods.
2) The gaps in area and vertical range are as follows:
   - *Under ice*: Information on under-ice processes is still limited. This could be improved by the use of the latest technologies such as AUV (autonomous underwater vehicle), ROV (remotely operated vehicle), under-ice moorings, and under-ice trawling nets.
   - *Surface layer ecology*: The Southern Ocean surface layer is another area that is poorly understood. Freshwater discharge from continental ice sheets is increasing due to warming, and its impact on the surface layer ecosystem needs to be evaluated.
   - *Ecosystem modeling, ice sheet mass balance, upper atmosphere physics*: There is a general shortage of scientists specialized in these areas for which there is high demand.

2.3.2. Capacity building

1) The importance of engaging other nations with East Antarctic interests was stressed. Frameworks currently in operation include the Asian Forum for Polar Sciences (AFoPS) consisting of China, India, Japan, Korea, and Malaysia. Australia has also been working closely with Malaysia and Indonesia through bilateral arrangements. The bilateral arrangement between New Zealand and Italy in the Ross Sea region was also mentioned. Help increasing capacities of nations that are new to the Antarctic Treaty system and interested in East Antarctica leads to raised future allies for the both Australia and Japan and also increase resource capacity within the region (Paragraph 2.5).
2) Developing the next-generation of Antarctic scientists has been recognized as a high priority issue. There are already systems to encourage the next generations to become

involved in Antarctic science internationally, such as the International Antarctic Institute (IAI). However, the importance of establishing an active framework to directly encourage, teach and exchange students and young scientists between the two nations was suggested as a useful way forward.

2.4. Logistics

2.4.1. Logistics and project flexibility

1) Australia: Science strategy is currently not fixed but there is a strong emphasis on climate change. The funding cycle, project assessment, and approval requires 2 years, although major projects with substantial logistic requirements need a 3-year lead time.
2) Japan: 2010 is the start of the Japanese Antarctic Research Project phase 8th. The projects and logistics for the first 3 years are already fixed, but not yet for the latter three years. The latter will be able to reflect the outcomes of the workshop and the discussions to follow the workshop.

2.4.2. Resource sharing

1) Professor Shiraishi introduced the outcomes of the East Antarctic Logistic Cooperation Workshop held in Shanghai in September 2008. The purpose of the Shanghai workshop was to share information on the logistic capacity of each national program with a view to identifying possible options for closer cooperative logistic arrangements and to develop a mechanism for working together in the future.
2) The workshop listed a number of possible resource sharing opportunities, and their benefits. The effective use of inter- and intra-continental flights including helicopters will enhance the capacity to efficiently transport personnel between bases and experimental sites. Coordination of helicopter operations with ships will further enhance the capacity to transport personnel to remote areas that are normally out of reach.
3) The use of the multi-beam system on the new *Shirase* will greatly contribute to extending the spatial coverage (between Syowa Station and Casey Station) where bathymetric information is extremely limited.
4) Where possible observations should be linked to international initiatives such as the Southern Ocean Observing System (SOOS), Southern Ocean Sentinel, and Integrating Climate and Ecosystem Dynamics in the Southern Ocean (ICED) to enable effective contributions to external organizations.
5) Agreeing on standard observation protocols and/or the development of standardized methods is essential for collecting standardized data.

2.5. Relations to international initiatives

1) Summaries of the SOOS, Southern Ocean Sentinel, and ICED programs were presented by Drs. Graham Hosie and Dirk Welsford (AAD), and by Professor Tsuneo Odate (NIPR).
2) The workshop further noted that SOOS, Southern Ocean Sentinel, and ICED are just a part of many possible international relations/contributions. Working closely with nations operating actively within the neighbouring regions such as France, New Zealand, Italy, and Germany is important in further extending the area of experimental coverage. Helping develop the capacity of nations new to Antarctic operation is also important for raising future research capacity in the region (Paragraph 2.3.2).

2.6. Common interests and key questions

1) The workshop agreed that five specific cross disciplinary questions would assist in focusing joint research on climate change:
   - What are the potential impacts?
   - What are the synergistic effects?
   - What parts of system are to be affected?
   - How will the ecosystem respond?
   - What are the consequences?
2) The workshop further agreed that the following key questions applied to climate change studies in Antarctica and the Southern Ocean:
   - How does change in East Antarctica compare with trends observed in West Antarctica?
   - How will change within Antarctica affect other systems on the globe?
   - How will physical changes affect ecological systems?
3) Furthermore, the workshop agreed on the importance of interdisciplinary science that:
   - addresses climate and ecosystem change within regions,
   - addresses within-region impacts which also impact the external system, and
   - helps to better understand the consequences of climate change, and to inform policy makers.

2.7. The roadmap

1) The workshop agreed that possible collaborative projects could be categorized into the following two groups:
   - immediate projects, including historical data analysis or those that could be accommodated within existing approved projects, and
   - future projects, including major projects that have substantial logistic implications and those requiring 2–3 years of lead time before project execution.
2) The importance of developing roadmap and milestones to address "the common interests and key questions" was stressed. It was noted that the current workshop represents only the very beginning and is constrained by the time. A series of further interactions during the coming years is necessary to come up with an agreed roadmap. The importance of maintaining the momentum was stressed and reiterated.

2.7.1. A broad milestone in 5 years

1) The workshop recommended that, in 5 years time, the Australia—Japan collaboration should have:
   - established cohesive, targeted, cost effective collaborative research on climate change,
   - confirmed involvement of other nations in the East Antarctica collaborative framework,
   - established routine participation in the planning of science activities, and
   - developed an enhanced mechanism for data storage and exchange.

2.8. Closing of the workshop

1) In closing the workshop, Dr. Kawaguchi thanked all the participants and the staffs of NIPR on behalf of the co-conveners for their helpful engagement and high level of input into the workshop.
2) Professor Fukuchi, on behalf of the participants, thanked Dr. Kawaguchi and Professor Watanabe for their leadership and enthusiasm throughout the workshop.

Table 1. List of participants in the first joint workshop (in alphabetical order).

AUSTRALIA	
Hosie, Graham	Australian Antarctic Division (AAD)
Kawaguchi, So (WS Co-Convener)	Australian Antarctic Division (AAD)
Massom, Rob	Australian Antarctic Division (AAD)
Meiners, Klaus	Antarctic Climate and Ecosystems Cooperative Research Centre (ACE-CRC)
Murphy, Damian	Australian Antarctic Division (AAD)
Press, Tony	Antarctic Climate and Ecosystems Cooperative Research Centre (ACE-CRC), CEO
Riddle, Martin	Australian Antarctic Division (AAD), Representing AAD Chief Scientist at the WS
Sokolov, Serguei	The Commonwealth Scientific and Industrial Research Organisation (CSIRO)
Southwell, Colin	Australian Antarctic Division (AAD)
van Ommen, Tas	Australian Antarctic Division (AAD)
Welsford, Dirk	Australian Antarctic Division (AAD)
JAPAN	
Aoki, Shigeru	Institute of Low Temperature Science, Hokkaido University (ILTS)
Fujii, Yoshiyuki	National Institute of Polar Research (NIPR), Director-General
Fukamachi, Yasushi	Institute of Low Temperature Science, Hokkaido University (ILTS)
Fukuchi, Mitsuo	National Institute of Polar Research (NIPR)
Hashida, Gen	National Institute of Polar Research (NIPR)
Honda, Makio	Japan Agency for Marine-Earth Science and Technology (JAMSTEC)
Iida, Takahiro	National Institute of Polar Research (NIPR)
Imura, Satoshi	National Institute of Polar Research (NIPR)
Ishimaru, Takashi (absent)	Tokyo University of Marine Science and Technology (TUMSAT)
Ishimatsu, Atsushi	Institute for East China Sea Research, Nagasaki University
Kamiyama, Koukichi	National Institute of Polar Research (NIPR)
Kurihara, Haruko	University of Ryukyus
Lindsay, Dhugal J.	Japan Agency for Marine-Earth Science and Technology (JAMSTEC)
Moteki, Masato	Tokyo University of Marine Science and Technology (TUMSAT)
Motoyama, Hideaki	National Institute of Polar Research (NIPR)
Motoyoshi, Youichi	National Institute of Polar Research (NIPR), Vice Director-General
Nakamura, Takuji	National Institute of Polar Research (NIPR)
Nomura, Daiki	National Institute of Polar Research (NIPR)
Odate, Tsuneo	National Institute of Polar Research (NIPR)
Ohshima, Kay I.	Institute of Low Temperature Science, Hokkaido University (ILTS)
Okamoto, Takuya	National Institute of Polar Research (NIPR)
Ono, Yukitsugu	Ministry of Education, Culture, Sports, Science and Technology
Sasaki, Hiroshi	Faculty of Science and Engineering, Ishinomaki Senshu University
Sato, Natsuo	National Institute of Polar Research (NIPR), Vice Director-General
Shiraishi, Kazuyuki	National Institute of Polar Research (NIPR), Vice Director-General
Takahashi, Akinori	National Institute of Polar Research (NIPR)
Takahashi, Kunio	National Institute of Polar Research (NIPR)
Tamura, Takeshi	Institute of Low Temperature Science, Hokkaido University (ILTS)
Tanimura, Atsushi	Mie University
Tsutsumi, Masaki	National Institute of Polar Research (NIPR)
Ushio, Shuki	National Institute of Polar Research (NIPR)
Watanabe, Kentaro (WS Co-Convener)	National Institute of Polar Research (NIPR)
Watanabe, Shuichi	Japan Agency for Marine-Earth Science and Technology (JAMSTEC)
Watanabe, Yuki	National Institute of Polar Research (NIPR)
Yamanouchi, Takashi	National Institute of Polar Research (NIPR)

3. 2nd joint workshop

Report on the 2nd Joint Australia — Japan Workshop: "Australia — Japan Collaboration in Antarctic Science: 2nd Phase"

(Co-conveners: So Kawaguchi and Yoichi Motoyoshi)
(Dec. 1, 2012, National Institute of Polar Research (NIPR), Tokyo, Japan)

3.1. Opening of the workshop

1) The 2nd Joint Australia—Japan Workshop on Antarctic Science was held on December 1, 2012 at the National Institute of Polar Research, Tokyo, Japan. The workshop was co-convened by Dr. So Kawaguchi (AAD) and Professor Yoichi Motoyoshi (NIPR). Local arrangements were coordinated by NIPR.
2) Professor Motoyoshi opened the workshop and welcomed the 45 participants (9 from Australia (including those remotely participating via Skype), 22 from Japan, and 1 from SCAR as an observer; full list of participants is given at the end of this report).
3) The opening addresses were made by Professor Kazuyuki Shiraishi, NIPR Director-General, and Dr. Nick Gales, AAD Chief Scientist. Both reiterated the long history of successful research collaborations between Australia and Japan in Antarctic ecosystem studies starting in 1911 when Professor Edgeworth David provided support to Lt. Nobu Shirase in Sydney. It was further noted that the workshop would provide a basis for coordination between the two nations and across disciplines to maximise efficiency in scientific operations.
4) The workshop revised the provisional agenda and agreed to include a short presentation by Professor Fukuchi.
5) The report was jointly prepared by Dr. Kawaguchi and Professor Motoyoshi.

3.2. Background and purpose of the workshop

1) Informal group discussions were held by each discipline (Nov. 26–29, 2012) prior to the formal workshop in order to review and develop plans for future collaboration. Group discussions reviewed the status of the collaboration within each discipline, identified the gaps and areas of priority for future collaboration in-principle, and developed plans for the 2nd phase collaborations. Outcomes of the discussion from each discipline were summarised in an agreed report format, and were circulated to the workshop participants prior to the start of the one-day formal workshop.
2) A discussion during the one-day formal workshop was held based on these project proposals. Dr. Kawaguchi explained that the purpose and the expected outcomes of the workshop were to initiate discussion for the 2nd phase collaboration, and to produce an agreed report that would provide options for collaboration and that could then be considered by each government regarding their feasibility and relative priority.
3) Professor Fukuchi mentioned in his presentation that good science leads to good policy, and stressed the benefit of bilateral collaboration to both countries, which he explained using the phrase "1 plus 1 must equal more than 2".
4) Professor Motoyoshi from Japan and Dr. Gales from Australia gave an overview of each nation's strategy for Antarctic science, government goals, funding cycles, and project

approval systems to set the scene for the workshop.

5) Professor Motoyoshi explained the framework of the Japanese Antarctic Research Expedition (JARE), the objectives of the ongoing phase 8th plan, and the program expected in the future phase 9th plan (2016–). This future program is entitled "Antarctic Highland — Frontiers of Earth and Planetary Science" and will be conducted at a new research station in the deep interior of the Antarctic continent. The disciplines to be studied include glaciology, atmospheric sciences, aurora observations, astronomical observations, biology, and geology.
6) Dr. Gales explained Australian Antarctic Science, government goals, research directions, the structure of the National Antarctic Program (institutions, their roles, and relations), areas of science undertaken, project assessment process, areas of interests, *etc*. He further summarised the system for the assessment and approval of Australian Antarctic scientific proposals.
7) In his presentation Dr. Gales stressed that the Australia—Japan collaboration must:
   - aim for the best science,
   - explore the efficient use of ship time especially in marine science under limited resources by integrating physical and biological campaigns, program streams, and deliver more than one component, and
   - consider regional campaign of involving multiple integrated projects.

3.3. Discussion outcomes

Principal investigators (PIs) from each discipline presented the discussion outcomes from their group meetings based on the submitted reports. These presentations were followed by broad-ranging discussions. For the purpose of this report the discussions were categorised into marine science, off-station research, and on-station research.

3.3.1. Marine science (Southern Ocean ecosystems and modelling, sea ice and physical oceanography)

1) Australia and Japan have a history of successful past and ongoing marine science projects. During the 2nd phase collaboration, listing and clarifying all initiatives occurring in the area, and linking ecosystem and physical observing systems are expected to lead to a better coordination.
2) The workshop stressed that future Australia—Japan collaboration must be considered within the international context; *e.g.* interactions with SOOS, ICED Sentinel, and the Council of Managers of National Antarctic Programs (COMNAP), and increased momentum in relations to the activities of China, India, Russia, and the USA in the Prydz Bay area; French activities in the Kerguelen area; and the activities of the USA, New Zealand, and Korean in east margin of the sector.
3) The workshop highlighted various forms of collaboration and stressed that collaboration/coordination must not be opportunity-driven but must have a clear scientific advantage. For example, the collaboration could be area-based (working at the same site) or systems-based (working in different areas to collect similar information), involve personnel or instrument exchange, offering/mounting sensors on collaborators' boats and underwater vehicles, the synthesis of existing data or development of technological capability. The importance of equipment standardisation was also stressed.
4) As a first step toward coordination among nations and disciplines to maximise the

efficiency of science operations, the workshop attempted to map out the overall science activities expected through the Australia—Japan collaboration. The timings of major activities, ship time, and major logistical requirements for each proposed project were considered vital information for the development of work plans. These work plans need to be presented in a standardised way for the workshop to explore where opportunities for integration and collaboration exist.

5) The workshop realised the reports, including proposed projects assembled during the informal discussions, varied in format and level of information detailed between projects and disciplines, and there was a need to standardise the information across projects. Consequently, the workshop agreed to form a small working group to review all projects and come up with synergies by displaying the range of work planned, thereby helping identify where future opportunities lie.
6) Dr. Andrew Constable (AAD) agreed to facilitate this small working group by assembling key individuals from each discipline from both countries, and to provide a standard format of the project description, which all projects proposals need to follow when submitting to the small group for review.
7) The workshop agreed to the following terms of reference for the small working group for the Australia—Japan workshop.
   i) Review physical/biological/chemical observing systems in East Antarctica in terms of the following:
      ・current level of 'maturity' of each project (*e.g.* in planning, early implementation, ongoing),
      ・spatial extent and timing of each project,
      ・general activities,
      ・map out planned and possible coincident measurements (*e.g.* satellite, underway sampling, station sampling),
      ・vessels/nations/PIs involved,
      ・how area dependent are they? Fixed or flexible in time and space? and
      ・input into larger programs (*e.g.* SOOS, ICED).
   ii) Produce a map to represent these observing systems.
   iii) Explore which projects would benefit from joint operations in the future and how and when those joint operations may be coordinated.
   iv) Explore which projects would benefit from either:
      ・integration with other projects to form one multi-disciplinary project or
      ・shared resources, *e.g.* run multiple projects on one voyage.
   v) Explore the degree to which projects can be aligned to normal annual operations, *e.g.* regular transects between ports and stations.
   vi) Provide information that will be useful for discussion at the SOOS workshop in China in May 2013 and COMNAP meeting in July 2013.

3.3.2. Off-Station research

Glaciology

Ice coring and their analyses are primarily being done in an international framework, *e.g.* International Partnerships in Ice Core Sciences (IPICS). The main resource required is computer time using super computers at national facilities such as Japan Agency for Marine-Earth Science and Technology (JAMSTEC). The research community will benefit

from formalising such use of more computer time and human resources.

Geoscience

1) An idea of developing a comprehensive field campaign program in Enderby Land and the adjacent continental shelf was proposed by the geoscience group. The workshop noted that such region-based campaign style multi-disciplinary and multi-national collaboration may need support from other disciplines for an area oriented campaign. Therefore there is a need to gauge interest from other disciplines, including possibility for a ship-based program off Enderby Land. The first step should be seeking a round of expressions of interest for an Enderby Land campaign.
2) The workshop further noted other nation's movements/initiatives that may relate to possible Enderby Land campaigns, which were:
   - information on the recently launched new South African research vessel *Agulhas II*,
   - the Indian initiative of an idea for Gondwana research consortium,
   - the following new SCAR Scientific Research programs (commencing January 1, 2013):
     - Solid Earth Response and influence on Cryosphere Evolution (SERCE; http://www.scar.org/researchgroups/progplanning/#SERCE), *e.g.* geology-ice sheet interaction
     - Antarctic Threshold - Ecosystem Resilience and Adaptations (AnT-ERA; http://www.scar.org/researchgroups/progplanning/#AntETR)
     - State of the Antarctic Ecosystem (AntEco; http://www.scar.org/researchgroups/progplanning/#AntEco), and
   - the German ice breaker *Polarstern* to be based at Cape Town.
3) The workshop also noted that the comparison between terrestrial, near-shore, and lacustrine sediment cores/sampling and ice core investigations could potentially form an excellent cross-disciplinary project (*e.g.* palaeoclimate and ice dynamics of the ice sheet margin).
4) High-resolution bathymetry and seabed morphology would be useful for oceanography, sea-ice science, and benthic ecosystem studies, and could also potentially form a broad-based and mutually beneficial collaboration.

3.3.3. On-station research (atmospheric science)

Research into observations and modelling of the boundary layer, *i.e.* air-sea interaction, is extremely important for linking the marine and atmospheric sciences to enhance climate change science. This is currently a major gap in this research field and there is an urgent need to draw in scientists specialising in this area.

3.3.4. General points

1) The workshop re-iterated the key role of the ACE-CRC in Antarctic climate change science in Australia and expressed its serious concern regarding the possible impacts of the cessation of the ACE-CRC in 2014.
2) The education and training of young scientists is extremely important for successful collaborations to continue into the future. Effective interaction with initiatives such as the IAI and the Association of Polar Early Career Scientists (APECS) will attract new students to Antarctic science and encourage them to become the next generation of polar scientists. The use of marine stations and training ships is not only an excellent outreach tool but also provides excellent opportunities for testing new instruments and techniques.

Table 2. List of participants in the second joint workshop.

AUSTRALIA	
Alexander, Simon	Australian Antarctic Division (AAD)
Carson, Chris	Program Leader, Antarctic Geoscience
Constable, Andrew (Through Skype in the afternoon)	Australian Antarctic Division (AAD)
Corney, Stuart	Antarctic Climate and Ecosystems Cooperative Research Centre (ACE-CRC)
Gales, Nick	Australian Antarctic Division (AAD), Chief Scientist, Austrlian Antarctic Program
Kawaguchi, So (WS Co-Convener)	Australian Antarctic Division (AAD)
Massom, Rob	Australian Antarctic Division (AAD)
Melbourne-Thomas, Jessica	Antarctic Climate and Ecosystems Cooperative Research Centre (ACE-CRC)
Rintoul, Steve	The Commonwealth Scientific and Industrial Research Organisation (CSIRO)
JAPAN	
Abe, Koichi	National Institute of Polar Research (NIPR)
Aoki, Shigeru	Institute of Low Temperature Science, Hokkaido University (ILTS)
Ejiri, Mitsumu	National Institute of Polar Research (NIPR)
Fukuchi, Mitsuo	National Institute of Polar Research (NIPR)
Hattori, Hiroshi	Tokai University
Iida, Takahiro	National Institute of Polar Research (NIPR)
Kanda, Jota	Tokyo University of Marine Science and Technology (TUMSAT)
Kawamura, Kenji	National Institute of Polar Research (NIPR)
Kitade, Yujiro	Tokyo University of Marine Science and Technology (TUMSAT)
Moteki, Masato	Tokyo University of Marine Science and Technology (TUMSAT)
Motoyoshi, Yoichi (WS Co-Convener)	National Institute of Polar Research (NIPR), Vice Director-General
Nakamura, Takuji	National Institute of Polar Research (NIPR), Vice Director-General
Odate, Tsuneo	National Institute of Polar Research (NIPR)
Ojima, Motoha	National Institute of Polar Research (NIPR), The Graduate University for Advanced Studies (Sokendai)
Shiraishi, Kazuyuki	National Institute of Polar Research (NIPR), Director-General
Takahashi, Kunio	National Institute of Polar Research (NIPR)
Takasawa, Nobue	Tokyo University of Marine Science and Technology (TUMSAT)
Tanimura, Atsushi	National Institute of Polar Research (NIPR)
Tsutsumi, Masaki	National Institute of Polar Research (NIPR)
Ushio, Shuki	National Institute of Polar Research (NIPR)
Watanabe, Shuichi	Japan Agency for Marine-Earth Science and Technology (JAMSTEC)
Yamanouchi, Takashi	National Institute of Polar Research (NIPR), Vice Director-General
SCIENTIFIC COMMITTEE OF ANTARCTIC RESEARCH (SCAR) Observer	
Hosie, Graham	Chief Officer of SCAR Life Sciences

3.4. Next workshop

1) The workshop discussed the timing of the next workshop. It was decided that holding the next workshop in two years time was appropriate. This timing fits in well with the start of the JARE planning process in 2 years time and the next round of project applications for the Australian Antarctic Science process, which opens in mid-2013 (the outcome being notified in late 2013 to early 2014).
2) Dr. Gales announced that Australia is willing to host the 3rd Australia—Japan Joint Workshop in 2014/2015. The exact dates are to be announced in the future.

3.5. Closing of the workshop

1) In closing the workshop, Dr. Kawaguchi, on behalf of the co-conveners thanked all the

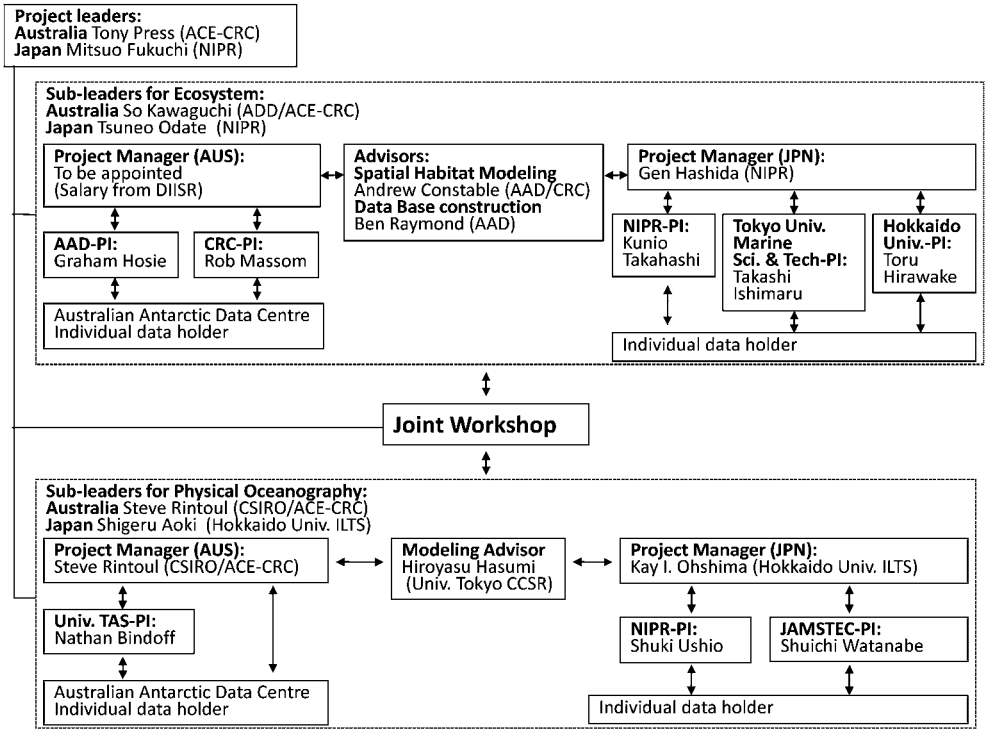

Fig. 1. Structure of the JST—DIISR project.

participants and the staff of NIPR for their helpful engagement and high level of input into the workshop.

2) Professor Shiraishi, on behalf of the participants, thanked Dr. Kawaguchi and Professor Motoyoshi for their leadership and enthusiasm throughout the workshop.

4. Achievement of a bilateral program by JST—DIISR undertaken between the two workshops

During the period between the two above mentioned Australia—Japan joint workshops, 2 years of intensive joint study on marine ecosystem was undertaken through the Japan Science and Technology Agency (JST)—Department of Innovation, Industry, Science and Research (DIISR) funded project "Establishing a Benchmark to Assess Climate Change Impact in the Eastern Antarctic Marine System" (co-project leaders: Tony Press and Mitsuo Fukuchi). The structure of the project is shown in Fig. 1. The project held three major workshops (the physical group workshop, the ecosystem group workshop and the final joint workshop) and a series of progress meetings and small workshops. Intensive data analyses were carried out by scientists in both countries including usage of teleconference system. A common database on zooplankton, krill, and other components of the ecosystem (including physical parameters) was created, and pursued analyses of trends and decadal change.

Through these workshops and meetings, the project sought to identify gaps in the existing observation networks and made a series of recommendations for future collaborative research to address climate change issues in the Indian Ocean sector of the Antarctic Ocean. The project produced a comprehensive database on the pelagic ecosystem, and some of the results from this project have already been published in international journals. Further analyses are to be published as a "theme collection" of papers in the international journal "*PLoS One*".

4.1. Goals of the project "Establishing a Benchmark to Assess Climate Change Impact in the Eastern Antarctic Marine System"

The following are the four goals of the project:

- to create a comprehensive database on key ecosystem components of the Indian Sector of the Antarctic Ocean,
- to showcase changes of the zooplankton assemblages and distributions in relation to changes in the ocean frontal structure,
- to establish a benchmark to assess climate change impact in the eastern Antarctic marine system, and
- to provide improved physical parameter for modeling.

4.2. Project achievement

The following are the achievement of the project:

- The project established a comprehensive database, currently held at the Australian Antarctic Data Centre, on the key ecosystem components of the Indian Sector of the Antarctic Ocean.
- The project provided the foundation for benchmark analysis of the Indian Ocean ecosystem in an accessible form.
- A series of databases constructed were further extended to make connections between biological and ice core proxies, succeeding in bringing together scientists from various disciplines and to relate observed signals.
- A number of changes and trends were detected and demonstrated in relation to changes in the ocean system. The project provided improved physical parameters for modelling physical oceanography in order to detect and attribute these to climate change.
- The project identified gaps in past data and provided a number of recommendations for future observation and monitoring.
- The project provided opportunities to develop hypotheses and questions for future research.

4.3. Recommendations: Observation and data collection

The following are the recommendations of the final joint workshop of the project:

- The project established a comprehensive database of the key ecosystem components of the Indian Sector of the Antarctic Ocean in an accessible form and to provide a foundation to undertake benchmark analysis of the Indian Ocean ecosystem. The database created through this project needs to be kept updated into the future. Establishing a standard format for other Antarctic databases is also needed.
- Currently surveyed areas A (off Syowa Station), B (Prydz Bay—Kerguelen Plateau), and C (off Dumont d'Urville Station), as well as the transects along 110°E and 150°E, were

all confirmed to be important for future observations. Further reorganisation of research efforts is recommended.

- Repeat experiments and within-season high resolution observations are required to enhance our understanding of the system.
- Effective link to other datasets adds value to the database, *e.g.* sea ice physics and ice algae, as well as ice core proxies, dusts, sea salts; subsurface physical and chemical data that are important for biology; and acoustic data.

5. Future plans

Through the series of workshops and the project mentioned above, it was agreed that future projects need a holistic approach, and systems questions driven by high-quality science with a real impact on understanding climate change processes.

It is essential to start planning the future projects as soon as possible, especially for the major projects that have substantial logistic implications and those requiring at least 2–3 years lead time before project execution. Also, under limited resources international coordination and resource sharing is a prerequisite for a successful campaign.

As a starting point, a small working group comprising key individuals from each discipline from both countries will review the physical/biological/chemical observing systems in East Antarctica, to explore the benefit of future joint operations, coordination and integration across disciplines, and to assess how resource sharing could provide useful information for discussions at the May 2013 SOOS workshop in China and the July 2013 COMNAP meeting.

The next Australia—Japan workshop will be held in 2014/2015 to fit in with the start of the next JARE planning process in 2 years time and the next round of project applications for the Australian Antarctic Science process that opens in mid-2013 (with final decisions made in late 2013 to early 2014).

This next workshop will lead to a longer-term (10 year) plan, to establish well organised and standardised observation and data collection through joint/international projects as an integral part of developing integrated physical and biological observation/monitoring systems in the Southern Ocean (*e.g.*, Southern Ocean Sentinel Program).

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