



THE COUNCIL OF
MANAGERS OF
NATIONAL ANTARCTIC
PROGRAMS

Over the past twenty-five years, the Council of Managers of National Antarctic Programs (COMNAP) has grown into an international association of twenty-nine national Antarctic programmes. This book celebrates the twenty-fifth anniversary of COMNAP. It highlights the influential advice COMNAP has provided to the Antarctic Treaty Consultative Meetings and to the Committee for Environmental Protection. It also demonstrates that the association adds value to the significant work of the individual national Antarctic programmes. COMNAP does this by developing best practice based on the first-hand knowledge of the Antarctic that the people within the national Antarctic programmes possess in the greatest measure. This book will become a reference for Antarctic scholars who wish to explore the achievements of one of the three Observer organisations to the Antarctic Treaty Consultative Meetings. It is a record of the successes that are possible in the Antarctic only through international co-operation.



Gillian Wratt (MNZM)

Gillian Wratt was the Chair of COMNAP from 1997 to 2001 while manager of the New Zealand Antarctic Programme. A graduate in botany, her first involvement with Antarctica was as a field research assistant for a team of limnologists in the McMurdo Dry Valleys in 1985–86. One visit to Antarctica was enough to capture her imagination. After management roles in the New Zealand Department of Scientific and Industrial Research and completing an MBA, in 1992 she came back

to head the Antarctic Programme, first as its Director, and then, from 1996 to 2002, as Chief Executive of the New Zealand Antarctic Institute. Gill was a Vice-Chair of the Antarctic Treaty Committee on Environmental Protection (CEP) from 1998 to 2001.

Upon leaving the New Zealand Antarctic Programme Gill worked with the Antarctic tourism industry for several years – lecturing and expedition-leading for Aurora Expeditions and Polar Star Expeditions, and chairing several of the IAATO annual meetings.

She has since worked as an advisor to the New Zealand Ministry for the Environment, has been Chief Executive of the private, not-for-profit research organisation the Cawthron Institute, and is a Board Member of the New Zealand Environmental Protection Authority.

Gill identifies the fascinating mix of international co-operation and the management of science, environment and operations, along with the need to tell a story she felt deserved to be told, as the drawcards that tempted her to take on the task of writing this book.

In 2004 Gill was made a Member of the New Zealand Order of Merit for services to Antarctica.

Gillian
Wratt

A STORY OF ANTARCTIC CO-OPERATION
25 Years of the Council of Managers of National Antarctic Programs



A STORY OF ANTARCTIC CO-OPERATION

25 Years of the Council of Managers
of National Antarctic Programs

Gillian Wratt

A STORY OF
ANTARCTIC
CO-OPERATION

25 Years of the Council of Managers
of National Antarctic Programs

First published by the Council of Managers of National Antarctic Programs (COMNAP) in 2013

Copyright © 2013, COMNAP

ISBN 978-0-473-24776-8 (Softcover)

ISBN 978-0-473-24777-5 (PDF)

This publication may be reproduced in part for educational and non-profit purposes without special permission from the copyright holder, provided acknowledgement of the source is made. No use of this publication for sale or resale or for any commercial purpose whatsoever may be made without prior permission in writing from COMNAP.

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of COMNAP concerning the legal status of any country, territory or authority. Mention or photo of a commercial entity or product does not imply endorsement by COMNAP.

Correspondence to:
COMNAP Secretariat
Private Bag 4800
Christchurch, New Zealand 8140

Copy-edited by Janet Bray

Graphic design by Jane Blatchford

Indexing service provided by Carol Dawber

Printed and bound by Toltech Print

Cover photo is *Bell 202 helicopter Mistake Peak area* by Andris Apse,
Antarctica New Zealand Pictorial Collection K414 0708

Throughout this book, photographs submitted for and displayed at the SCAR–COMNAP "Images from the Great White South" Photographic Competition and Exhibition, Portland, Oregon, USA (July 2012) are included. Each such photo appears in this publication with a credit to its photographer and with the words "SCAR–COMNAP Photographic Exhibition" in the caption. We thank the photographers for their permission to use these photographs in this manner as per the terms of participation in the competition and exhibition.



A STORY OF ANTARCTIC CO-OPERATION

25 Years of the Council of Managers
of National Antarctic Programs

Gillian Wratt

CONTENTS

PREFACE	6	4: Supporting Scientific Co-operation as Envisioned by the Antarctic Treaty	92
FOREWORD by Heinrich Miller, COMNAP Chair	8	Joint Committee on Antarctic Data Management	98
INTRODUCTION	10	The International Polar Year (2007–08)	100
PART I: The History of COMNAP	11	Outreach	104
1: The Evolution of COMNAP and its Role in the Antarctic Treaty System	12	Antarctic Peninsula Advanced Scientific Information System (APASI)	106
Establishment	14	5: Looking to the Future by Michelle Rogan-Finnemore, COMNAP Executive Secretary	108
COMNAP in Action	18	Facilitating Delivery of Antarctic Science	110
Evolution	21	Contributing to the Antarctic Treaty System	112
Contributions to the ATCM and the CEP Information Exchange	32	Engaging Future Generations	114
	36	Standards Based on Best Practice	114
		Conclusion	114
2: Managing Support to Antarctic Science	40	PART II: COMNAP Member National Antarctic Programmes contributed by the programmes	116
Air Operations	44	Appendix 1: Abbreviations Used in This Book	178
Shipping Operations and Hydrography	52	Appendix 2: Record of COMNAP Meetings and Officers	180
Telecommunications	54	Appendix 3: COMNAP Working Papers and Information Papers	185
Meteorology	55	Appendix 4: Guidelines and Publications	190
Search and Rescue	56	Appendix 5: Workshops and Symposiums	191
Medicine	58	Appendix 6: Subgroups, Working Groups, Co-ordinating Groups, Committees, Projects and Expert Groups	193
Personnel Recruitment and Training	60	Appendix 7: Map	200
Safety	61	Index	202
Field Operations	61		
Antarctic Station Construction and Operations	63		
3: Developing Effective Environmental Practices	66		
Environmental Impact Assessment	73		
Environmental Monitoring	74		
Waste Management and Remediation	75		
Contingency Planning and Fuel Management	78		
Alternative Energy and Energy Management	81		
Environmental Risks, Incidents and Reporting	84		
Unintentional Introduction of Non-native Species	87		
Environmental Training	88		
Operation of Aircraft Near Concentrations of Birds	89		
Marine Pollution	90		
Facing the Next Environmental Challenge	90		

OTHER CONTRIBUTIONS

COMNAP and SCAR – Getting the “Federal” Feeling! <i>David Drewry</i>	16	The Antarctic Environmental Officers Network: A New Way of Working? <i>Emma Waterhouse</i>	71
COMNAP 1988 to 1997 <i>Alfred Fowler</i>	20	AEON in Action: 2006–09 <i>Rodolfo Sánchez</i>	72
COMNAP 2001 to 2007 <i>Karl Erb and Gérard Jugie</i>	22	A 20 Year COMNAP and SCAR Partnership: Environmental Monitoring in Antarctica <i>Mahlon C. Kennicutt II</i>	76
In the Interest of “All Mankind”: Women in COMNAP <i>Michelle Rogan-Finnemore</i>	30	Oil Spill Prevention and Response <i>Jack Sayers</i>	79
From SCALOP Symposium to COMNAP Symposium <i>Kazuyuki Shiraishi</i>	45	Ross Island Wind Energy Project: Sustainability Through Collaboration <i>Lou Sanson and Brian Stone</i>	83
COMNAP – The Guiding Force in Antarctic Co-operation <i>Rasik Ravindra</i>	46	COMNAP and the Environmental Liability Annex <i>Erick Chiang</i>	86
The Antarctic Flight Information Manual (AFIM) <i>Jack Sayers</i>	47	The EPICA Project <i>Heinrich Miller</i>	95
The Dronning Maud Land Air Network (DROMLAN) <i>Ulf Hedman and Hartwig Gernandt</i>	50	First Meeting with Antarctica as a Symbol of Future Co-operation <i>Valery Lukin</i>	96
Search and Rescue – Towards a Safer Future <i>Antoine Guichard</i>	57	COMNAP and the International Polar Year <i>Anders Karlqvist</i>	101
Concordia: A French–Italian Research Station on the Antarctic Plateau <i>Yves Frenot and Massimo Frezzotti</i>	64	Managing International Science Projects – The Cape Roberts Project and ANDRILL <i>Gillian Wratt</i>	102
The Dirck Gerritsz Laboratory at Rothera Research Station: UK–Netherlands Collaboration <i>Dick van der Kroef and John Shears</i>	65	Making an Impact – Communications, Public Engagement and Outreach <i>Linda Capper</i>	105
Chinese Kunlun Station <i>Qu Tanzhou</i>	65	The Antarctic Peninsula Advanced Science Information System <i>José Retamales</i>	107
COMNAP and the SCAR Group of Specialists on Environmental Affairs and Conservation (GOSEAC) <i>David Walton</i>	69		

PREFACE

A natural reserve devoted to peace and science. It is hard to believe that, for more than 50 years, this simple and aspirational principle has been successfully adhered to in the governance of nine per cent of the world's land area. This book traces the contribution to this achievement made by a grouping of the Antarctic programmes of 29 countries who are Parties to the Antarctic Treaty.

The members of COMNAP are the organisations and people who are responsible for the operation of around 80 stations and the other infrastructure that supports science across Antarctica. They put the Antarctic Treaty principles into effect on a day-to-day basis. They have unparalleled first-hand knowledge of Antarctica and of the international co-operation on which Antarctic science and operations are based.

As the manager of the New Zealand Antarctic Programme, I chaired COMNAP for four years from 1997 to 2001. I learned first-hand that Antarctica is not only the highest, driest, windiest, coldest place on earth, it is also the most co-operative, despite the different culture, languages and priorities of the countries involved.

My own practical experience in Antarctic co-operation began with the close New Zealand–United States relationship that dates back to the 1950s. In 1997, at a 40th anniversary celebratory dinner at Scott Base during a visit by Sir Edmund Hillary and then New Zealand Prime Minister the Right Honourable Jim Bolger, Dwight Fisher, Deputy Head of the Polar Research Support Section of the US Antarctic Program described the New Zealand–United States Antarctic programmes' relationship as like a long marriage: it had been through rocky times but the partners were still together!

Another personal recollection is visiting British and Chilean Antarctic Peninsula stations in 1998. The British and Chilean Managers had decided that, as the new COMNAP Chair and with responsibility for a New Zealand operation that was only in the Ross Sea Region of Antarctica, I should see some of the operations in the Antarctic Peninsula area. At the British Rothera station there were a number of plaques and flags from visitors to the station on the wall of the bar. In one corner I noticed Argentinian flags and plaques from the neighbouring St Martin Station dated 1978, 1979, 1987 and 1988. During a period of significant tensions between the UK and Argentinian governments,

staff from those countries' Antarctic stations had still been paying neighbourly visits.

The COMNAP family is built on many personal connections, from working together on the Ice, and from conversations around meeting tables and in cafes and bars in various parts of the world where COMNAP members have hosted annual meetings, symposiums and workshops.

With no formal intergovernmental status, COMNAP has sometimes been looked at askance by the diplomats who represent their countries in the Antarctic Treaty Consultative Meetings (ATCMs). There were sceptics when it was established, as to whether the grouping would last, and suggestions that it should be more tightly controlled by the ATCM.

Reference to the pages of this book shows that not only has COMNAP survived, it has become stronger and has undertaken an impressive range of initiatives. It has delivered over 100 papers to the ATCM, held 12 Standing Committee on Antarctic Logistics–COMNAP Symposiums, run workshops on a wide range of topics, developed guidelines and manuals, set up online systems, and engaged effectively on Antarctic science and operational issues with the Scientific Committee on Antarctic Research (SCAR) and other organisations. Some initiatives have developed quickly, others have taken time, and yet others that had not progressed initially have come back to life at a time when the ground was more fertile. Some initiatives have been picked up and implemented immediately by individual programmes; others have not.

The pages of this book tell a great story of the contribution of COMNAP to the management of Antarctica as a region devoted to peace and science. They also show the challenges of effective international co-operation.

Recent ATCMs have called for increased international collaboration. The geopolitical interests of the individual Consultative Parties can sometimes work counter to co-operation. There are risks to the Antarctic Treaty principles from the seemingly insatiable human appetite to exploit the world's resources, and threats to the Antarctic environment from external factors as well as human activities in Antarctica and the Southern Ocean. Pressures on the Antarctic Treaty are not new – the Treaty has survived through the cold war and tensions between individual Antarctic Treaty Consultative Parties.

As I have drawn together the information for this book, the reasons that COMNAP has successfully negotiated a way through these tensions have emerged:

- Relationships of trust developed through face-to-face contact in the COMNAP forum and working together in the challenging physical and political Antarctic environment, and a shared passion for Antarctica
- Hard work by the leaders of COMNAP to keep the organisation apart from political agendas and to focus on management of science, operations and the environment
- A proactive approach, anticipating the operational challenges likely to be faced by the COMNAP members and the ATCM
- Provision of practical, non-political advice to the ATCM and the Antarctic Treaty Committee for Environmental Protection, based on hands-on knowledge of operating in Antarctica
- Facilitation of the sharing of knowledge and experience by specialists within the national programmes through symposiums and workshops
- Development of practical guidelines and manuals built on the collective expertise within COMNAP and the Standing Committee on Antarctic Logistics (SCALOP)
- Good working relationships with other organisations, such as SCAR and the International Association of Antarctica Tour Operators
- A pragmatic and patient approach, recognising the different cultures, languages, resourcing levels and government priorities of the COMNAP members

With lessons learnt over 25 years, I am sure COMNAP will continue to support the national Antarctic programmes and to be an important contributor to the Antarctic Treaty System. COMNAP's role is as a facilitator. How effectively the work of COMNAP will be applied to maintaining the Treaty principles into the future is up to the individual national programmes and their governments.

It has been a privilege to be asked to write this account of COMNAP. The views expressed in the following pages are those of the writers, not a collective COMNAP view. Together they paint a picture of a unique story of international co-operation.

Acknowledgements

Firstly I would like to acknowledge the people who have made COMNAP: the national Antarctic programme managers and staff whose passion and commitment are the foundation of COMNAP's success.

Christo Pimpirev, the head of the Bulgarian Antarctic Programme, and now one of the longer-standing members of COMNAP, was the inspiration behind this book – putting a proposal to the 2011 COMNAP meeting for the publication of a history to mark COMNAP's 25th anniversary in 2013.

COMNAP Executive Secretary Michelle Rogan-Finnemore has put many hours into encouraging contributions from COMNAP members, reading drafts and gathering information, and has provided support through the writing process.

Reviews of sections of the book have kindly been provided by David Walton, Erick Chiang, Emma Waterhouse, Anders Karlqvist and Jack Sayers.

A number of people involved in COMNAP, past and present, have provided accounts of COMNAP activities and projects: David Drewry, Al Fowler, Karl Erb, Gérard Jugie, Michelle Rogan-Finnemore, Kazuyuki Shiraishi, Rasik Ravindra, Jack Sayers, Ulf Hedman, Hartwig Gernandt, Antoine Guichard, Yves Frenot, Massimo Frezzotti, Dick van der Kroef, John Shears, Qu Tanzhou, Emma Waterhouse, Rodolfo Sánchez, Lou Sanson, Brian Stone, Erick Chiang, Heinz Miller, Valery Lukin, Anders Karlqvist, Linda Capper, José Retamales. Thank you for providing a personal perspective to the COMNAP story. Thank you also to past SCAR President Mahlon Kennicutt, past GOSEAC Chair David Walton, and past Liability Annex Negotiations Chair Don MacKay for their contributions.

Al Fowler's 2000 publication *COMNAP: The National Managers in Antarctica* provided great background on the establishment and early years of COMNAP.

Editor Janet Bray has not only got her head around the multitude of Antarctic acronyms, but also provided an invaluable eye to pick up inconsistencies and question the sense of what has been presented on the page.

And last but not least, my partner Don McFadzien, who after expecting me to have more free time once I ceased being Cawthron Institute Chief Executive discovered, along with me, that writing a book is a time consuming process.

FOREWORD

This book documents the rich contribution that COMNAP, the Council of Managers of National Antarctic Programs, has made to both the Antarctic community and the global community. It has been prepared to mark the occasion of the 25th anniversary of COMNAP as an “international association” of the now 29 national Antarctic programmes. It serves as a reference to the work that COMNAP has achieved in its relatively young history.

The book is a record of what COMNAP has accomplished. The success of COMNAP is a tribute to those who established the organisation and have put their time and energy into it over the past 25 years. COMNAP is all about people and people are the greatest strength of COMNAP. A second book could be written on the personalities and relationships that have been the essence of COMNAP.

When COMNAP constituted itself 25 years ago it was looked upon with some trepidation by the Antarctic science community of the day, who had relied on the Scientific Committee on Antarctic Research (SCAR) Working Group on Logistics, where the respective programmes’ logistic officers had discussed their mutual experiences and organised their collaborations to come up with the best possible logistic support for delivery of their science. This approach had worked fine when there had been only the relatively small number of the original twelve SCAR members, but by the 1980s the number of national Antarctic programmes had doubled and it was timely and appropriate to create a new structure to meet the new challenges.

Through COMNAP the national Antarctic programme managers have created an organisation that recognises different priorities to those of SCAR. COMNAP sees itself as the group with first-hand knowledge on Antarctic operations, in the best and most effective position to provide the support necessary for achieving the common science goals provided by SCAR. COMNAP is small enough for all the individuals to know each other and more easily understand the constraints and national agendas that each works within, yet large enough and professional enough to address management questions with confidence and provide informed advice and comment on any aspect of Antarctic operations. This network amongst the managers themselves and within the various Expert Groups is at the very heart of the co-operation that is enshrined in Article III of the Antarctic Treaty.

The success of COMNAP is a tribute to those who established the organisation and have put their time and energy into it over the past 25 years. COMNAP is all about people and people are the greatest strength of COMNAP. A second book could be written on the personalities and relationships that have been the essence of COMNAP.

In their short histories, both COMNAP, and its Standing Committee on Antarctic Logistics and Operations, SCALOP, have had a series of strong Chairs and Executive Committee members to provide leadership and direction. It will be essential for future success to continue to elect such dynamic people to the leading positions and to continue to ensure that the many different cultures and practices within the membership are adequately represented.

The role of the COMNAP Executive Secretary has developed significantly since Al Fowler was first appointed to this post. Each of the incumbents has brought something different to the role, and it will be essential to continue to attract experienced people to this post that has proved crucial to supporting all COMNAP members and to projecting COMNAP into the wider Antarctic community.

COMNAP in its role as an Observer to the Antarctic Treaty Consultative Meeting (ATCM) has been a significant contributor of a number of Working and Information Papers. Beyond the numbers of papers, other contributions from COMNAP are not so easy to count and many may never be capable of quantification. How do you measure the value of trust or the long history of collaboration that are the backbone of COMNAP?

A COMNAP survey of members in 1998 on the extent of international co-operation amongst national Antarctic programmes showed that on average each programme worked with eight other programmes in support of science in Antarctica. A further survey in 2007 showed 96 per



Iceberg, Paradise Bay
The national Antarctic programmes provide support to science that is often invisible, like the bulk of this iceberg.

Photo: E. Baritic, INACH

cent of national Antarctic programmes hosted scientists from other programmes and 78 per cent provided logistics facilities for other nations. While the reported level of international co-operation is significant, the structure of such surveys would fail to capture the many times that a manager of a national Antarctic programme would have picked up the phone and spoken with their colleague, a manager from another programme, in order to find a solution to a problem, to request assistance in one form or another, or to begin the discussions that would ultimately lead to outcomes such as the sharing of aircraft operations or vessel support, collaboration on a major energy-saving project, funding for a collaborative science project, or evacuation and repatriation of someone injured in Antarctica. These things are all impossible to capture and quantify. Yet, one could argue that this sense of trust and willingness of the managers of national Antarctic programmes to co-operate with each other is a direct result of the existence of COMNAP and may well be the organisation’s greatest strength.

I am quite sure that COMNAP, based upon its broad knowledge-base will, first, continue to serve the Antarctic science community and, second, continue to provide advice in a proactive manner to the ATCM and Committee for Environmental Protection (CEP) in a way that draws on national Antarctic programme experiences in Antarctica. COMNAP will also continue to provide opportunities for national Antarctic programmes to develop and share that advice based on best practice and field tested applications.

Professor Heinrich Miller
COMNAP Chair

INTRODUCTION

Antarctica, remote, uninhabited and inhospitable, has been an exploration challenge for over 200 years. The expeditions of the Heroic Age, with their foolhardy plans and inadequate equipment, struggled to make headway against the endless snow and ice. As recently as 100 years ago, Antarctica was a great unknown. In the last century, and especially in the last 50 years, the Antarctic region has become an essential element in global science. Once an arena of national expeditions, it has become one of international science and multilateral co-operation in science support.

In making Antarctica a continent for peace and science there have been three major drivers – the Antarctic Treaty, the Scientific Committee for Antarctic Research (SCAR), and, most recently, COMNAP, the Council of Managers of National Antarctic Programs – which have all contributed to internationalising science on the continent, to organising and informing its management, and to making possible efficient and effective research under challenging conditions.

COMNAP was set up in 1988 by the managers of the Antarctic programmes of the 22 countries who were Consultative Parties to the Antarctic Treaty. It had and still has a pragmatic rationale of sharing knowledge and expertise, facilitating co-operation, and providing practical, technical and non-political advice to the Antarctic Treaty Consultative Meetings (ATCM), within the spirit of the Antarctic Treaty and its Protocol on Environmental Protection (the “Environmental Protocol”, also known as the “Madrid Protocol”) – Antarctica, a natural reserve devoted to peace and science.

It is a unique international entity set up for a unique region of the world where science and peace take precedence. Science is the currency of the Antarctic Treaty. SCAR provides a forum for and directly represents Antarctic scientists. COMNAP facilitates the co-operative support of science by those who manage activities in Antarctica. An association of government Antarctic programmes, it was not set up at the instigation of governments or as a formal mechanism of the Antarctic Treaty. It does not have any official intergovernmental status or funding. In its relations with the formal Antarctic Treaty mechanisms, it has to tread carefully between formal positions of its members’ governments, and providing practical advice based on the realities of managing national programme activities in the uncompromising Antarctic environment.

A unique international entity set up for a unique region of the world where science and peace take precedence

COMNAP now brings together the national Antarctic programmes of 29 countries: from Africa (1), the Americas (7), Asia (4), Australasia (2) and Europe (15). These countries are all Consultative Parties to the Antarctic Treaty. Between them the COMNAP members run some 80 Antarctic stations, 10 intercontinental runway operations and 39 research and resupply vessels. Many of the COMNAP members have operated in the Antarctic since the International Geophysical Year in 1957–58. As with many international organisations, its members have different languages, cultures and levels of resourcing for their activities, as well as markedly different organisational bases within government.

COMNAP is recognised as an ATCM Observer, alongside SCAR and the Commission for the Conservation of Antarctic Marine Living Resources. This requires the provision of a report to each ATCM, and entitles COMNAP to present advice and recommendations to the ATCM in the form of Working Papers.

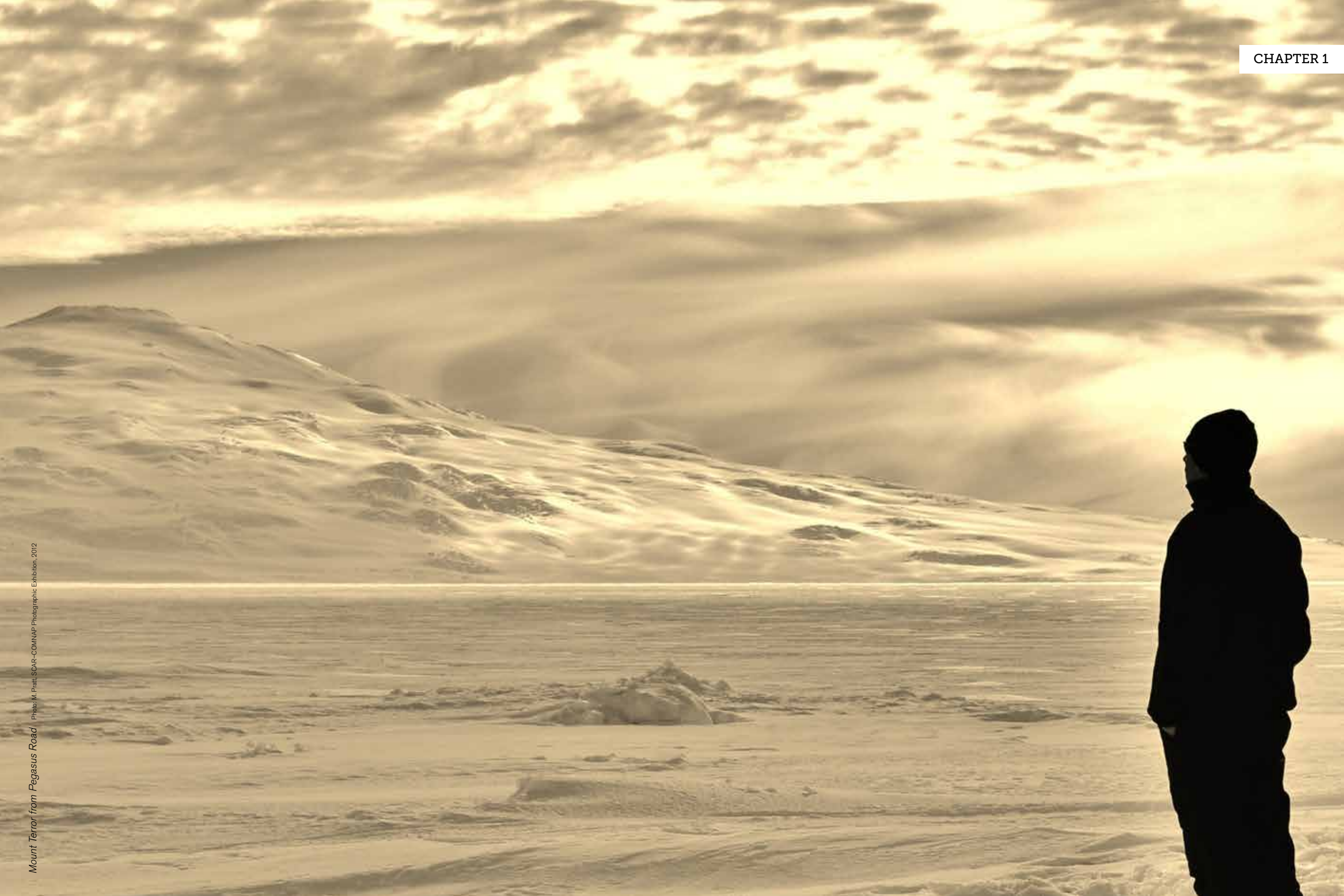
COMNAP’s purpose was reviewed and refined in 2008. The purpose, as stated in the COMNAP constitution, is to develop and promote best practice in managing the support of scientific research in Antarctica. It does this by

- serving as a forum to develop practices that improve effectiveness of activities in an environmentally responsible manner;
- facilitating and promoting international partnerships;
- providing opportunities and systems for information exchange; and
- providing the Antarctic Treaty System with objective and practical, technical and non-political advice drawn from the national Antarctic programmes’ pool of expertise.

COMNAP’s accumulated expertise and practical solutions to working in a difficult environment are essential to meeting the demanding international and scientific objectives for Antarctica in the 21st century.

PART I

The History of COMNAP



Mount Terror, from Pegasus Road Photo: M. Pratt, SCAR-COMNAP Photographic Exhibition, 2012

The Evolution of COMNAP and its Role in the Antarctic Treaty System

Establishment

The genesis of COMNAP dates to the national scientific expeditions of the International Geophysical Year (IGY) of 1957–58 and the early days of the Antarctic Treaty and the Scientific Committee on Antarctic Research (SCAR) in the late 1950s.

Men from many countries were involved in the early expeditions to Antarctica in the 19th and early 20th centuries. Even though these expeditions were based on national agendas, the first two overwintering expeditions were remarkably international. On board the *Belgica* (1897–99) under Belgian Adrien de Gerlache, and at Cape Adare (1898–1900) under Norwegian Carsten Borchgrevink, the first two wintering parties involved twenty-nine men from nine different nations, all of which remain active in the Antarctic today. The principle of planned Antarctic international co-operation that is the foundation of COMNAP was first demonstrated by the Norwegian–British–Swedish Expedition of 1949–52.

In 1952 the International Council of Scientific Unions (ICSU) established a special committee for an International Geophysical Year (Comité Spécial de L'Année Géophysique International (CGASI)), with an Antarctic subcommittee. The agenda for the first CGASI meeting in 1955 included co-ordination of the distribution of bases in Antarctica. By 1957 ICSU had established a Special Committee on Antarctic Research (later the Scientific Committee on Antarctic Research). The first meeting of this committee was held in The Hague in February 1958, with the main objectives including the drafting of a constitution and preparation of a science plan for the years after IGY. The international scientific collaboration developed through the IGY – with 12 nations establishing 57 stations in the Antarctic and sub-Antarctic – was one of the key drivers for the development and negotiation of the Antarctic Treaty, which was signed in Washington DC on 1 December 1959. A Working Group on Logistics (WGL), initially known as SCARLOG, was one of 10 SCAR Permanent Working Groups established in 1960 and was the precursor of COMNAP.

“In addition to scientific issues, which have been ably handled by SCAR, the Treaty is faced with a growing number of operational issues . . . and an expanding number of national programmes that are required to put the Treaty agreements into practice. There is an increasing need to co-ordinate and make effective the logistics support for the expanding scientific programmes being planned for the next decade.”

– 1st COMNAP ATCM report (to ATCM XVI, 1991)

The initial WGL projects were the organisation of the first Antarctic Logistics Symposium, held in Boulder, Colorado in 1962, and subsequent publication of a 788-page Symposium Report, and the design of a system for sharing information on infrastructure. Advance notice of travel plans of each country was also identified as a potential project that would be useful for facilitating co-operation, but it was not achieved at that time. Another early SCAR initiative, involving the WGL and the SCAR Communications Working Group, was the development, at the request of the 1963 Antarctic Treaty Meeting of Experts (ATME) on Telecommunications, of a communications manual to assist meteorological reporting and station communications. A SCAR *Radio Communications Guidance Manual (SCARCOM)* was produced and distributed by the WGL in 1969.

In 1974 discussion on potential savings from sharing supporting infrastructure, in particular shipping and air transport, resulted in the establishment of a Subcommittee

on Co-operative Air Transport. This work received considerable effort from the subgroup, but, with little support from the managers of Antarctic programmes, by 1980 it had run out of momentum.

A second logistics meeting was held in 1968 under the Antarctic Treaty Consultative Meeting (ATCM) umbrella: an ATME on Logistics. The third Antarctic Logistics Symposium was organised in Leningrad in 1982 by the SCAR WGL.

Some national programme staff were members of the WGL. It provided opportunity for the exploration of common logistics and operational issues, but its effectiveness was limited by a lack of involvement by the managers of the national Antarctic programmes, who often sent junior staff to the SCAR meetings. The managers of the programmes were meeting only informally on the margins of other meetings, such as ATCMs or other forums.

An example of the lack of effective engagement of programme managers in the SCAR WGL, relating to *SCARCOM*, is given by Al Fowler, past Deputy Director of the United States National Science Foundation (NSF) Division of Polar Programs, and COMNAP Executive Secretary from 1989 to 1997, in *COMNAP: The National Managers in Antarctica*.¹ He notes that Recommendations on Antarctic telecommunications had been adopted at Antarctic Treaty meetings in 1961, 1962, 1964, 1966, 1970, 1972, 1977 and 1979. ATCM Recommendation X-3 in 1979 invited SCAR to prepare a telecommunications handbook and in 1980 the SCAR WGL reported that a first draft was being prepared for review. At the WGL meeting it was noted that a SCARLOG publication “Antarctic Telecommunications Manual – SCARCOM” had been distributed in 1969 and the last recorded amendment to it had been circulated in November 1969. Fowler adds that an ensuing search at the NSF found no evidence or recollection of a *SCARCOM* manual, and that other operators shared the experience or a similar one:

I look back at the SCARCOM exercise as an example of an internationally perceived operational requirement that was propelled to fulfilment within the diplomatic consultative process by using the conveniently available (albeit non-governmental) scientific forum. In the real world the solution never made it through to the operators, who hadn't in any event been that concerned about the problem.

By the mid-1980s there was growing discontent from national programme managers with the way logistics were being handled in SCAR.^{2,3} Attendance at the WGL never included all the active nations, the biennial SCAR meetings were too infrequent for operational decision making, and logistics was not a priority for the SCAR Executive, which comprised academic scientists. The political problems of co-ordinating logistics across the management systems of different countries were almost completely unappreciated by Antarctic scientists, who could not understand why, when SCAR agreed on an international programme, the logistics were so hard to deliver. The managers were also frustrated with their lack of influence into SCAR science priority processes.

With the managers' concerns with the SCAR WGL, and significant growth in the number of countries with research programmes in Antarctica – from the original 12 Antarctic Treaty Consultative Parties to 22 national programmes in 1987 – the scene was set for change. Driven by two relative newcomers to the Antarctic scene, the heads of the United States and Australian Antarctic programmes, Peter Wilkness and Jim Bleasel, the idea of a new forum of Antarctic programme managers was taking shape.

Informal discussions between national programme managers in 1985 and 1986 led to a special meeting of the SCAR WGL and managers of national Antarctic programmes in Boulder, Colorado in 1987. This meeting agreed to the establishment of a managers' council to enhance direct contact among members, discuss common problems and solutions, and consider matters referred by the ATCM and SCAR. Twelve matters of top priority and greatest management concern were identified:

- establishment of scientific priorities and long term scientific goals
- environmental issues
- non-governmental activities
- budget problems
- provisions for applied science in Antarctica
- public information about national programmes
- co-operation in research
- selective international exchange in order to co-ordinate national investment
- excessive concentration of national activities in the Peninsula area, especially on King George Island (25 de Mayo)

1 A. F. Fowler, *COMNAP: The National Managers in Antarctica* (Baltimore, Md., American Literary Press, 2000), pp. 26–28

2 Ibid.

3 D. W. H. Walton and P. D. Clarkson, *Science in the Snow* (Cambridge, SCAR, 2011)

COMNAP and SCAR – Getting the “Federal” Feeling!

David Drewry

Reflecting after a quarter of a century, it is evident that COMNAP had its beginnings in a complex mix of institutional disparities, changing practices, and power agendas. For those of us involved they were exciting and memorable times – we were, after all, at the opening of a new era.

In the mid-to-late 1980s the ground was extremely fertile for the idea of an Antarctic managers' group to take root. It is important to recall that COMNAP arose largely from a profound dissatisfaction by several influential managers at having little or no locus within SCAR, which was very much a club of seasoned Antarctic scientists, many of whom had cut their teeth through the period of the IGY and beyond into the 1960s and 1970s.

Managers such as Jim Bleasel in Australia and Peter Wilkness in the USA had come to office from outside this traditional SCAR circle, viewed Antarctic matters differently and sought a much closer articulation between the responsibilities and actions of their government-sponsored organisations, the prioritising of the international science agenda and meeting the commitments of Antarctic Treaty Consultative Meetings' Recommendations. Their only official presence in SCAR was in the Working Group on Logistics, which was still in a time warp and clearly viewed as a means for sharing information regarding national logistics capabilities, and co-ordinating logistics efforts in support of the expanding number of multinational programmes. In respect of meeting with and discussing with their opposite numbers (ie, the managers of the national Antarctic programmes) the critical, changing and growing demands on Antarctic operators, SCAR was hopelessly inadequate – there was no official forum.

Furthermore, there was rising unease over the effectiveness of SCAR, which was experiencing a sea change; it was coming to terms with the increasing sophistication of Antarctic science, the need to build international critical mass, the increasing size and complexity of projects, especially in the field of “global change”, and the emerging and insistent demands for scientific underpinning of the ATCM, especially its environmental agenda.

It was not surprising, therefore, that a fledgling managers' group quickly took on form and substance. One of the most difficult issues it faced was the relationship with SCAR, whose Executive were not happy with its emergence. At the heart of the matter was the play for power – SCAR considered any managers' group should be a part of SCAR, whilst the managers wished to be an independent body

exercising their national responsibilities. As COMNAP established itself as an independent body SCAR became increasingly agitated and the interplay had to be resolved.

I attended the SCAR Executive Meeting in Paris in late March of 1988, representing the managers. There were intense and heated discussions about the superiority or inferiority of COMNAP with SCAR. Several of the sessions attempted to construct organisational diagrams to show the relationship and to accommodate the critical issues. One was the SCAR view that Antarctic programme managers' organisation should simply become another, but admittedly more important, of its Working Groups – a perception underpinned by the fact that SCAR had its existing Working Group on Logistics, which it considered would merely transform itself, by and large, into the new managers' group. Another was SCAR's anxiety over loss of control; that a separate managers' group with massive resources and leverage might move in different directions!

So, it was at this Paris meeting, in trying to obtain reasonable accord, that we latched onto the “federated” formula. I have to confess that at the time, having made the initial suggestion, I had not given its exact meaning much thought, but it had gravitas and sounded balanced and suitably “political”! Surprisingly, the device was readily embraced by both parties (more probably in desperation than as a carefully crafted solution). Its apparent effectiveness was that everyone, like me, thought they knew what it meant (especially in countries that operated a federal system); no one wished to challenge the notion, yet nothing was written down precisely defining the relationship! It was clear, in principle, that it meant a significant level of mutual articulation yet also preservation of independence; most importantly there was no hierarchy involved. So, the story moved on and the wording was agreed at the Hobart meeting of Antarctic programme managers and also by SCAR: there would be a Council of Managers of National Antarctic Programs, “federated” to SCAR. The relationship was resolved; the die was cast.

David Drewry

Chair, COMNAP 1988–91

Director, British Antarctic Survey 1987–94

Director, Scott Polar Research Institute 1983–87

President, International Arctic Science Committee 1997–2002

Member, European Committee on Ocean and Polar Science 1989–96

UK Alternate Delegate, Scientific Committee on Antarctic Research 1985–97

- international co-operation in research related to ozone depletion
- measures for co-ordination and safety of air operations
- marine navigation safety (hydrographic survey, search and rescue)⁴

These issues have been addressed by COMNAP to varying degrees over subsequent years, sometimes in response to ATCM concerns, other times in support of and/or in co-operation with SCAR, and at other times when COMNAP has taken the lead.

COMNAP was formally established on 15 September 1988 at a special meeting in Hobart, Australia. The 22 member programmes, all from Consultative Party countries to the Antarctic Treaty, were Argentina, Australia, Brazil, Chile, China, Finland, France, Germany, India, Italy, Japan, Republic of Korea, New Zealand, Norway, Poland, South Africa, Spain, Sweden, Uruguay, USSR, UK and USA.

It was agreed that COMNAP would have a Standing Committee on Antarctic Logistics and Operations (SCALOP) comprising the logistics and operations co-ordinator or equivalent of each programme. Al Fowler, then Deputy Director of the United States NSF Office of Polar Programs, was appointed on his retirement from NSF in November 1988, as part-time Executive Secretary. He began this role, based at the American Geophysical Union (AGU) headquarters in Washington DC, on 1 January 1989. NSF committed to provide the initial funding to cover the Secretariat costs for the first year. The head of the United Kingdom programme, British Antarctic Survey Director David Drewry, was appointed as the Chair, initially for a one year period. The Argentinian COMNAP representative had been unhappy with a UK COMNAP Chair, and a one year term was a compromise reached in informal discussions. Such was his success in the first year that David Drewry went on to chair COMNAP for a further two years, until the end of the COMNAP annual meeting in 1991.

The proposal to establish an independent Antarctic Managers Council had been initially resisted by SCAR, and over the time that COMNAP was emerging there was a series of formal and informal meetings of key COMNAP proponents and the SCAR President and Executive Committee.⁵ It was eventually agreed that COMNAP should be federated to SCAR, with the COMNAP Chair as an *ex officio* member of the SCAR Executive. This was a clever sleight of hand, since the term “federated” was never defined and both COMNAP and SCAR were able to interpret it as they required for their memberships. It

Box 1: Council of Managers of National Antarctic Programs Terms of Reference, 1988

1. To establish a Council of Managers of National Antarctic Programs (MNAPs) federated to SCAR.
2. To review on a regular basis, operational matters and exchange information.
3. To examine, discuss and seek possible solutions to common operational problems.
4. To provide a forum for discussion in order to frame better, and in a timely, efficient and harmonious manner:
 - (i) national responses to common issues directed to National Antarctic Operators.
 - (ii) appropriate input to SCAR responses to questions involving science and operations/logistics.
5. To review, with appropriate SCAR Working Groups and Groups of Specialists, projected programmes requiring international collaboration on logistics/operations and to provide appropriate advice to the SCAR Executive.
6. To respond to requests by SCAR for information, advice and comment.
7. To create sub-groups as necessary, of which one will be the Standing Committee on Antarctic Logistics and Operations (SCALOP) and which will replace the SCAR Logistics Working Group upon its termination.
8. Copies of all written outputs of the Council of MNAPs and its sub-groups to be passed to the SCAR Secretariat.

was also agreed that every second year the COMNAP meetings would be held at the same time and location as the biennial SCAR delegates meetings, to help maintain a close connection between the two organisations. In 1991 the COMNAP Chair was invited to be an *ex officio* delegate at SCAR meetings, with the SCALOP Chair also invited to attend appropriate parts of the SCAR delegates meeting. Despite these initiatives many SCAR delegates saw the establishment of COMNAP as undermining the comprehensive role of SCAR. They were concerned that with more funding at their disposal than SCAR, the managers would attempt to compete with SCAR in offering

4 A. F. Fowler, *COMNAP: The National Managers in Antarctica* (Baltimore, Md., American Literary Press, 2000), p. 44

5 D. W. H. Walton and P. D. Clarkson, *Science in the Snow* (Cambridge, SCAR, 2011)

Box 2: Standing Committee on Antarctic Logistics and Operations Terms of Reference, 1988

1. To serve SCAR by providing advice on Antarctic operations and logistics.
2. To investigate and, if necessary, arrange for research on operational problems identified by the Council of MNAPs or by SCAR and its Working Groups.
3. To establish ad hoc groups of experts to discuss and foster advances in technology.
4. To hold symposia and exhibitions to inform of and review technological advances.
5. To exchange timely information on Antarctic logistics and operations.

Source: Fowler, A. F. (2000). Appendix 1. In *COMNAP: The National Managers in Antarctica*. Baltimore, Md.: American Literary Press

advice to the Treaty meetings. The early relationship between COMNAP and SCAR was one of considerable wariness.

The Terms of Reference of COMNAP and SCALOP focussed on sharing of operational information and knowledge, responding to common issues, and engaging with SCAR programmes requiring major international collaboration on logistics and operations (Boxes 1 and 2). The original 1988 objectives do not explicitly mention the relationship with the ATCM; however, this is changed in the objectives presented in the first COMNAP report to the ATCM in 1991, with specific mention of responding and providing advice to the ATCM (Table 1). It was agreed that all COMNAP meetings and communications would be in English, following the practice in SCAR and not that of the Treaty.

COMNAP's first annual meeting was held in Cambridge, UK in 1989, with 22 national programmes as members. The topics covered at that meeting included air operations (following an ATME on Air Operations held in Paris earlier that year), environmental protection and management, waste disposal, contingency plans to combat oil pollution, tourism and non-governmental activities, forthcoming large scale international science programmes, telecommunications, Antarctic maps and charts, the status of ATCM recommendations that referred to national operating agencies, and financial support for COMNAP.

COMNAP in Action

The activities of COMNAP are routinely summarised into a report that is provided to each ATCM. Since the signing of the Antarctic Treaty the governments that are parties to the Treaty have met, initially every two years, and since 1994 annually, in the ATCM forum. COMNAP was invited to provide a report to the first ATCM after its establishment: ATCM XVI in 1991. This report included an outline of the rationale for the formation of COMNAP:





In addition to scientific issues, which have been ably handled by SCAR, the Treaty is faced with a growing number of operational issues, eg environmental protection under vastly changed perceptions, commercial uses of the Antarctic (ie tourism), and an expanding number of national programmes that are required to put the Treaty agreements into practice. There is an increasing need to co-ordinate and make effective the logistics support for the expanding scientific programmes being planned for the next decade. Furthermore, there is a certain level of urgency that bears on the national programme operators to implement the Treaty Recommendations. It stems from the political pressures on the Treaty, the heightened level of public attention, and from the expanded scope and complexity of the topics and measures adopted. The operators must not only act, but must do so in a manner consistent with uniform interpretation and prompt co-operation in the sharing of expertise and technology. Lastly the Treaty needs timely information on the progress in implementation by the National Antarctic programmes in order to evaluate and to maintain a dynamic agenda.

In recognition of these developments the Managers of National Antarctic Programs have formed a Council (COMNAP) affiliated to SCAR . . .

The underlying principles outlined here – facilitating co-operation and sharing of information and expertise amongst Antarctic operators, and providing a mechanism for operational advice and an effective conduit for communication to and from the ATCM – have provided the foundation for COMNAP until the present.

From its beginning one of the key mechanisms for COMNAP activity has been the establishment of subgroups. These might deal with a particular response to the ATCM or SCAR, or provide a forum for operators to share experience and develop guidelines for dealing with common challenges. The report to the 1991 ATCM notes subgroups assigned to *important agenda items* of waste management, air safety, marine pollution, alternative energy, environmental assessments, siting of stations and reporting procedures.

VISITORS' GUIDE TO THE ANTARCTIC

CARE FOR THE ENVIRONMENT	LITTER AND HUMAN IMPACT	SAFETY	SCIENCE STATIONS AND PROGRAMS
			
The Antarctic environment can easily be damaged. Please respect it.	In Antarctica it can take decades for human trash or artifacts to break down.	Antarctica is a very hazardous place.	Research in Antarctica is making a special contribution to international understanding of the globe.
<ul style="list-style-type: none"> Plants are rare, fragile and slow growing. Avoid walking on moss and lichens. It takes years for these to recover. Do not collect organic matter such as lichens and mosses. If birds or seals react to your presence, you are too close. Keep your distance! Allow fossils and rocks to remain undisturbed. Keep to established tracks or trails. Avoid walking on undisturbed ground. Be sensitive in the way you take photographs. Do not disturb plants or animals to enhance your pictures. 	<ul style="list-style-type: none"> Take all your litter with you. Do not throw litter overboard from ships. The Antarctic Treaty's Code of Conduct on Waste Management provides solid guidance on minimizing adverse effects of human presence. Avoid trampling of sites. Please respect historic sites. They are protected by the Antarctic Treaty. Emergency depots and refuges must not be disturbed. 	<ul style="list-style-type: none"> Be alert! Plan your activities with safety in mind at all times. Be prepared to survive in the cold. Be self-sufficient in your plans and the equipment you carry. Do not expect a rescue service. Learn about Antarctic hazards Always stay with your group. 	<ul style="list-style-type: none"> Check with the station managers in the area you are visiting before you visit Antarctica. They can inform you of their activities. Stations are home for antarctic personnel. Please respect their property and privacy. Do not disturb sites where scientific research is going on. Check on the research activities that are underway in the area you are visiting. Do not automatically expect support from research stations. They are not set up as visitor hostels.

COMNAP Visitors' Guide to the Antarctic reported to ATCM XVI (1991)

By 1991 COMNAP had published *Practical Guidelines for Environmental Impact Assessment*, a *Waste Management Report Format*, and a *Visitors' Guide to the Antarctic*. These were annexed to the first COMNAP ATCM report in 1991, as was advice of implementation of ATCM Recommendations XIV-9 and XV-20 on Air Safety in Antarctica, including collection and distribution of advance notices of planned air operations, air information stations and INMARSAT phone numbers, the implementation of the TIBA procedure (Traffic Information Broadcasts by Aircraft) using a common frequency, and the development of an Antarctic Flight Information Manual (AFIM). Even noting the groundwork done in the SCAR WGL, these were impressive achievements only three years from establishment.

The Final Report of ATCM XVI (1991) notes in paragraph 23 that *The meeting recognised the important role of COMNAP in examining and solving practical problems relating to the implementation of scientific activities and their associated logistics*. Furthermore, in paragraph 24 it is recorded that the meeting *agreed that COMNAP should be*

invited in future to participate on the same basis as SCAR under Recommendation XIII-2. This determined COMNAP's status as a formal observer to the ATCM alongside SCAR and the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), required to provide an annual report to the ATCM and able to submit Working Papers with recommendations for ATCM consideration. A number of other organisations are invited to attend ATCMs as expert organisations and provide reports and Information Papers, but not to present Working Papers.

In subsequent years COMNAP has continued to address a range of environmental management, science support, and operations and logistics issues at the operational level, encouraging co-operation and best practice, and providing advice to the ATCM. These are outlined in subsequent chapters.



Delegates at COMNAP AGM I, Cambridge, UK, 1989

COMNAP 1988 to 1997

Alfred Fowler

Antarctic international co-operation took on a whole new meaning of real-world expectation when the COMNAP–SCALOP procedures were established. The collective forum of managers and operators resulted in well-motivated formal and informal discourse, trust and understanding. Prior to COMNAP there was no successful way to deal with the tremendous gap between the dreams of international science projects and the reality of the meagre limits of national and collective resources.

Today, in 2013, mankind can be proud that the area of our world south of 60 degrees is subject to peaceful international governance under the Antarctic Treaty System. The co-operative collective approach taken by COMNAP, to assure the stewardship and implementation involved in the management of Antarctica, makes an important contribution to this.

This is well illustrated in a summary of COMNAP's achievements in its first 10 years:

- The self-creation and birth of COMNAP in the face of critical comment by international diplomatic and science entities.
- Recognition, at ATCM XVI (Bonn, 1991), of COMNAP as a component of the Antarctic Treaty System with the granting of Observer status to the ATCM, along with the presentation of its first report to the meeting.

- Publication of the *Antarctic Flight Information Manual*, as had been directed by the ATCM: the first edition in 1991 and the second improved edition in 1995.
- The successful and excellent work by the SCALOP subgroup on Oil Spill Prevention and Response, chaired by Jack Sayers. Following years of work, recommended procedures and guidelines were published and distributed in 1992.
- Dealing with the fine line between getting ahead of the ATCM and being responsive, while taking responsible initiatives.
- Maintaining an effective level of co-ordination with SCAR while providing a forum for progress toward the shared goal of Antarctic science.
- Appropriate handling of the interface with
 - intergovernmental organisations (IHO, IMO, United Nations);
 - countries not party to the Treaty;
 - tourism.

Alfred Fowler

COMNAP Executive Secretary 1989–97
Deputy Division Director, Division of Polar Programs, United States
National Science Foundation 1974–88
Commander, US Naval Support Force Antarctica 1972–74

Evolution

When COMNAP was established in 1988 it comprised a Chair, a part-time Executive Secretary, 22 member national programmes, and a logistics and operations standing committee (SCALOP). An office and funding for the Secretariat were provided by the United States. At the first annual meeting several subgroups were set up to address areas of concern to members and/or specific tasks. At the third COMNAP annual meeting in 1991, when the term of the initial Chair ended, it was agreed to establish an Executive Committee of the current Chair, two Vice-Chairs – immediate-past-Chair and Chair-elect – the Chair of SCALOP and the Executive Secretary.

The use of subgroups – Working Groups, networks, Project Groups and Expert Groups – has continued to the present. Despite the burden of subgroup work tending to fall on a subset of active programmes and people, it has proved an effective mechanism for encouraging the sharing of information, addressing specific issues, and/or responding to ATCM or SCAR requests. In some cases there have been joint subgroups and projects with SCAR, and on occasion with the International Association of Antarctica Tour Operators (IAATO), the International Hydrographic Organisation (IHO), the World Meteorological Organization (WMO) and the Search and Rescue (SAR) Co-ordination Centres (RCCs) with SAR responsibility for regions of the Antarctic.

In the subsequent twenty-five years there have been two formal reviews of COMNAP's constitution/structure and processes: in 1995–96 and 2006–08. The first review was initiated by the third COMNAP Chair, Anders Karlqvist. He undertook, in taking over the role of Chair at the end of the 1994 COMNAP meeting, that he and the Executive Committee members would take the lead in a close look at the methods and efficiency of COMNAP's work. In a paper to the seventh COMNAP meeting in 1995, Karlqvist noted that *COMNAP/SCALOP is today a rather big organisation with many complex topics on its agenda and with important relations to several external organisations . . . it would be useful to review the role of COMNAP and to clarify to ourselves and others how COMNAP should operate in the future.*

Specific aspects of COMNAP's operation identified for review included external relationships and a number of organisational matters: the format of COMNAP–SCALOP meetings, the role and operation of Working Groups, strengthening COMNAP financial management, modern information technology and symposia/workshops/exhibitions. A background paper on organisation and procedures was provided by the Executive Secretary, and there was a suggestion that this be developed into a COMNAP–SCALOP

handbook; a draft handbook was provided to members in 1997. The structure of the meeting was also changed, with the first two days comprising Working Group meetings, and more time given to joint COMNAP–SCALOP plenaries than to the two groups meeting separately.

It was agreed that there should be continuing groups of mixed COMNAP and SCALOP members overseeing related topics or themes, and small task groups of limited duration to carry out specific work. Current COMNAP interests were grouped into themes: environment, operations, technology, commercial and non-government activities, science support and information. A Finance Committee was established, and it was agreed that all other Working Groups would be disbanded at the next meeting unless a deliberate decision had been taken to retain. Another outcome of the discussion was that COMNAP input to the ATCM should be more proactive, addressing key COMNAP concerns as well as responding to ATCM requests. Involvement of observers in COMNAP meetings was discussed. It was decided that plenary meetings would continue to be open only to national delegates/representatives and a SCAR observer; expert advisors could attend Working Group meetings at the invitation of the Working Group Chair and with agreement of the COMNAP Chair. There had been concern from some members that opening up the COMNAP meetings to other observers would constrain the free flow of information and discussion.

Another change in COMNAP in the mid-to-late 1990s was the evolution of networks. An Antarctic Environmental Officers Network (AEON) was established in 1996, Training and Information Officers Networks (TRAINET and INFONET) followed, then an Energy Management Network (ENMANET), and in 2003 a Medical Network (MEDINET). The COMNAP networks have provided a forum for exchange of information and experience between staff carrying out the operational tasking in national programmes, and have provided expertise for development of guidelines and input into ATCM advice. A small co-ordinating group of COMNAP members was established for each network to provide a formal link into COMNAP and oversee the work of the network.

There were differing views around the COMNAP table as to the degree to which the networks should operate just as email contact groups as opposed to groups that had face-to-face meetings, and to what extent they should be encouraged to initiate work. In reality this varied according to the enthusiasm of the network members, and topical issues in COMNAP, the ATCM and the Committee on Environmental Protection (CEP).

COMNAP 2001 to 2007

Karl Erb and Gérard Jugie

Motivated by its overarching goal of supporting scientific research in Antarctica in an environmentally responsible manner, COMNAP works at the intersection of operational challenges, environmental constraints and public policy issues. In doing so it brings to the table the collective experience and capabilities of its members.

Scientists who work in Antarctica benefit from a long tradition developed largely within COMNAP of sharing knowledge, logistics, infrastructure and other resources among national programmes. The information sharing occurs not only at COMNAP meetings and workshops but also through the one-on-one contacts that members develop via the COMNAP forum and in the field. These also often lead to bilateral arrangements for sharing logistics and infrastructure support, generally on a quid pro quo basis that equally benefits both parties, which enable researchers to gain access to locations that would otherwise be inaccessible to them.

One seemingly minor but frustrating issue that can arise when scientists from one national programme wish to work at a station operated by another involves medical standards for deployment to Antarctica. Noting that each country had its own standards, COMNAP members agreed in 2002 to share information on their countries' medical requirements, and develop a network of experts to work toward a system of reciprocal clearances. Many national programmes now accept each other's medical clearances. This greatly enhanced the ability of members to support multinational research programmes during the 2007–08 International Polar Year (IPY). The sharing of information by members of the expert network has also resulted in a growing

body of medical knowledge concerning health challenges associated with deployments, as well as ways to address those challenges.

Another COMNAP activity intended to facilitate international research collaboration began with members outlining their countries' plans for IPY at the COMNAP meetings in 2002 and 2003. The goal was to provide COMNAP members and their national programmes with a sense of upcoming logistics requirements that could inform advance planning. This activity was formalised in 2004 with the formation of a COMNAP IPY co-ordinating group.

When concerns about the impact of aircraft operations near bird communities raised questions about the viability of a range of research activities in Antarctica, COMNAP worked with SCAR to develop guidelines for the operation of aircraft near wildlife. Endorsed by the Antarctic Treaty Parties, the guidelines addressed a key aspect of the thorny question of how researchers could gain access to bird colonies in order to study their reaction to climate change and other factors, without themselves constituting a disturbance. In this way COMNAP members, working closely with SCAR colleagues, were able to support an area of research that provides important information about the impacts of climate change.

Attention by COMNAP to the broader question of how to monitor, assess and mitigate the impact of science support operations on Antarctica's environment and wildlife has been a longstanding priority of the organisation and its members' environmental officers. The priority continued throughout the 2000s, leading first to COMNAP's *Practical Guidelines for Developing and Designing Environmental*

Monitoring Programmes in Antarctica. The Guidelines were presented in 2005 to ATCM XXVIII, which recommended that they be used by national programmes, in conjunction with the COMNAP–SCAR *Antarctic Environmental Monitoring Handbook: Standard Techniques for Monitoring in Antarctica*.

COMNAP and SCAR Working Groups then collaborated to develop monitoring guidelines that addressed biological as well as chemical and physical change indicators. The resulting COMNAP–SCAR document, *Practical Biological Indicators of Human Impacts in Antarctica*, was discussed at ATCM XXIX in 2006, where it was agreed that all three types of indicators must be monitored and considered together in evaluating environmental impacts.

Other 2001–07 COMNAP studies that assisted members in designing environmentally responsible research support programmes addressed fuel handling and storage; waste management at ice-free research sites; heavy fuels, anti-fouling paint and ballast water exchange in shipping; energy management; air operations; and many other subjects.

A major COMNAP focus has always been on safety: avoiding accidents and responding effectively when they do occur. Exchange of information among medical specialists and safety workers grew stronger and more effective throughout this entire period. Special COMNAP emphasis in 2005–09 on collaborations among national programmes and with the national search and rescue Regional Co-ordination Centres with Antarctic responsibilities led to greatly improved co-ordination in Antarctic search and rescue operations, at sea and on the Ice.

In anticipating the kind of response that would be needed in the event of a major environmental emergency, such as a ship foundering and its fuel bunkers leaking, COMNAP developed several papers in 2002 and 2003 that described a range of environmental incidents and their potential consequences. This work provided critical benchmarks for the Antarctic Treaty System's activity, leading to the 2005 agreement on Annex VI to the Protocol on Environmental Protection to the Antarctic Treaty: *Liability Arising from Environmental Emergencies*.

COMNAP's accomplishments were the result of studies carried out by the members of the COMNAP and SCALOP Working Groups and the COMNAP networks, often in close collaboration with SCAR colleagues whose scientific knowledge provided essential grounding for COMNAP work. Members' dedication to constant improvement in the way they provide essential logistics and infrastructure support to research scientists in Antarctica is a major reason why the 2007–08 IPY, extending to 2009, was such a huge scientific success. Their dedication to environmental stewardship in Antarctica is the reason the research could be performed consistently within the goals and requirements of the Protocol on Environmental Protection to the Antarctic Treaty.

Karl Erb
Chair, COMNAP 2001–04
Head, Office of Polar Programs
of the US National Science
Foundation, Director of US
Antarctic Program and USA
COMNAP representative
1999–2012

Gérard Jugie
Chair, COMNAP 2004–07
Director, French Polar Institute
and French COMNAP
representative 1997–2010
Chair, European Polar Board
2003–06
Chair, European Polar Consortium
2006–10

AEON was a very active group and proved an effective forum to assist the national programmes to address environmental management challenges and to assist COMNAP to address issues raised by the CEP. INFONET became much more active in response to needs and opportunities for outreach associated with the International Polar Year (IPY) in 2007–08. TRAINET was active in the early-to-mid-2000s, running several workshops and developing a library of training-related material in 2007–08 that incorporated course syllabuses, standard operating procedures, and training regulations and policies from a number of programmes and in various languages. This does not seem to have been picked up by COMNAP, which suggests the possibility that TRAINET was an

example of an enthusiastic group of practitioners not well enough connected with programme managers. ENMANET and MEDINET have also held workshops and shared information across their members.

The COMNAP and SCALOP objectives were revised in 1999 (Table 1), and in 2006 the Executive Committee initiated a review of the COMNAP constitution and rules of procedures. A revised constitution was adopted in 2008 and formal Rules of Procedure were adopted in 2011.

At the same time as reviewing the constitution, the *modus operandi* of COMNAP was reviewed. The report of the 2008 meeting records that

The crucial change was from an organisation based on expert groups to a project-based organisation. COMNAP would be restricted to only two groups with formal membership and meetings: the assembly of the MNAPs and the Executive Committee. Work would be kept focused and strategic through time limited projects with a well defined deliverable outcome. . . . The valuable channels of communications between specialists in specific areas would be maintained through simple mailing lists . . .

There is some similarity with the outcome of the 1995–96 review, when a number of Working Groups were disbanded and the need identified for small task groups of limited duration to carry out specific work.

The Executive Committee (EXCOM) was restructured in 2008 to comprise the Chair, five Vice-Chairs, each with a focus area and responsibility for EXCOM oversight of specific projects, and the Executive Secretary. Another significant change at this time was the winding up of SCALOP, the standing committee of national programme operations and logistics managers that had been in existence since COMNAP was established in 1988 and had been preceded by the SCAR WGL since 1960. This was replaced with each programme nominating a Deputy Manager. In the revised Executive Committee, either Managers of National Antarctic Programs (MNAPs) or nominated Deputy MNAPs could hold a Vice-Chair position.

Continues on page 26

Table 1: COMNAP objectives/purpose 1991, 1999 and 2008

Objectives 1991 (COMNAP Report to ATCM XVI)	Revised Objectives 1999 (COMNAP XI (1999) meeting report)	Purpose 2008 (COMNAP XX (2008) meeting report)
<p>To review, on a regular basis, operational matters and exchange information</p> <p>To examine, discuss and seek possible solutions to common operational problems</p> <p>To provide a forum for discussion in order to frame better, and in a timely, efficient and harmonious manner:</p> <ul style="list-style-type: none"> • responses to common issues directed to Antarctic Operators, in particular requests from and Recommendations of the ATCM* • appropriate input to SCAR responses to questions involving science and operations/logistics <p>To review, with appropriate SCAR Working Groups and Groups of Specialists, projected programmes requiring international collaboration on logistics/operations and to provide appropriate advice to the SCAR Executive</p> <p>To respond to requests by the ATCM and SCAR for information, advice and comment*</p> <p>To create sub-groups as necessary, of which one will be the Standing Committee on Antarctic Logistics and Operations (SCALOP), and which will replace the SCAR Logistics Working Group upon its termination</p> <p>* The wording of these objectives varies from the original 1988 objectives shown above, with the additional mention of responding to the ATCM.</p>	<p>To enhance the conduct of scientific research, operational effectiveness, safety and environmental stewardship in Antarctica, and the effectiveness of national Antarctic programs</p> <p>These objectives are addressed by encouraging and facilitating international co-operation between Antarctic programs including:</p> <ul style="list-style-type: none"> • facilitating the exchange of information, views and experience • establishing and maintaining reference materials such as manuals and operational guidelines • examining, discussing and seeking possible solutions to common operational problems • facilitating international co-operation in the planning and support of Antarctic science • interacting with and providing advice to SCAR and other organisations with related interests • reporting to the ATCM on operational matters and responding to requests for information and advice 	<p>To develop and promote best practice in managing the support of scientific research in Antarctica, by:</p> <ul style="list-style-type: none"> • serving as a forum to develop practices that improve effectiveness of activities in an environmentally responsible manner • facilitating and promoting international partnerships • providing opportunities and systems for information exchange • providing the Antarctic Treaty System with objective and practical, technical and non-political advice drawn from the National Antarctic Programs' pool of expertise

Table 2: COMNAP and SCALOP subgroups 1992, 2002 and 2012

Year	COMNAP and SCALOP Working Groups, Co-ordinating Groups and Networks	COMNAP Working Groups, Co-ordinating Groups and Networks
1992	<p>Working Groups</p> <ul style="list-style-type: none"> • Environmental Assessment and Monitoring • Regional Contingency Planning • Air Operations • Financial Support • Siting of New Stations and Facilities • Tourism and Non-governmental Activities (TANGO) • Information Exchange • Oil Spill Prevention and Response • Alternative Energy • Human Resources Management <p>Project Groups</p> <ul style="list-style-type: none"> • SCALOP Symposium 	<p>Expert Groups</p> <ul style="list-style-type: none"> • Air Operations • Energy and Technology • Environment • Medical (joint with SCAR) • Outreach • Safety • Science • Shipping • Training <p>Project Groups</p> <ul style="list-style-type: none"> • Antarctic Flight Information Manual (AFIM) Review • Accidents, Incidents, and Near Miss Reporting (AINMR) • Antarctic Glossary • Energy Management • COMNAP Book • Contingency Survey • Antarctic Peninsula Advanced Scientific Information (APASI) System • Southern Ocean Observing System (SOOS) Workshop
2002	<p>Working Groups</p> <ul style="list-style-type: none"> • Tourism and Non-governmental Activities (TANGO) • Finance • Air Operations (AIROPS) • Ship Operations (SHIPOPS) <p>Project Groups</p> <ul style="list-style-type: none"> • SCALOP Symposium • Liability Annex (MoLIBA) • Data Management (STADM) <p>Co-ordinating Groups and Networks</p> <ul style="list-style-type: none"> • Environmental Co-ordinating Group (ECG) • Antarctic Environmental Officers Network (AEON) • Energy Management Network (ENMANET) • Co-ordinating Group on Education and Training (EDAT) • Training Network (TRAINET) • Information Officers Network (INFONET) 	



Delegates at SCALOP meeting, Tokyo, 2000

Photo: K. Shirashi

The record of discussion at the 2009 AGM indicated that members had concerns about the loss of the opportunity to share experiences and discuss common issues that SCALOP and the COMNAP subgroups had provided. The COMNAP structure in 2012 (Table 2) shows a number of Expert Groups. Some – environment, energy and technology, air operations, ship operations – are in areas that have been common themes through the history of COMNAP. Others, although not new to COMNAP, are being given a stronger focus now than in the past: science, outreach, safety and medical. Each Expert Group has a leader as well an Executive Committee member with oversight. There is more focus on project work, both in the structure of the COMNAP meetings and in the planning and management of COMNAP work (Tables 2 and 3).

COMNAP now comprises twenty-nine national programme members; a Chair, five Vice-Chairs and a full time Executive Secretary that form the Executive Committee; and nine Expert Groups: Air, Energy and Technology, Environment, Medical, Outreach, Safety, Science, Shipping and Training. Projects are proposed at AGMs, from the floor, an Expert Group, or the EXCOM. The decision to support a proposed project may include COMNAP funding support if requested. Each project is led by a Project Manager, with oversight from an Executive Committee member.

The original 22 member national Antarctic programmes have been joined by the programmes of Belgium, Bulgaria, Czech Republic, Ecuador, the Netherlands, Peru and Ukraine. Recently the national Antarctic programme of Belarus indicated its interest in acquiring COMNAP membership, and it has been granted observer status, allowing it to attend COMNAP AGMs and to access COMNAP information for a three year period. Consideration for COMNAP membership requires that the national Antarctic programme that is applying be from a country that has ratified the Antarctic Treaty and has at least signed the Environmental Protocol.

The Antarctic Treaty Secretariat, IAATO, the International Hydrographic Organisation (IHO) Hydrographic Commission on Antarctica (HCA), the International Maritime Organization (IMO) and other appropriate organisations are also invited to attend COMNAP meetings as observers from time to time.

The Chairs of COMNAP and SCALOP have generally changed after three years, and occasionally after a four year term. Over COMNAP's twenty-five year history there have been eight COMNAP Chairs, and six SCALOP Chairs. Appointments to chairing roles have been elected by consensus at COMNAP and SCALOP meetings. The COMNAP rules of procedure specify that consideration should be given to representation and balance in the

election of the Chair and Vice-Chairs. The COMNAP Chair position and, previously, that of SCALOP, have no formal regional or national representational requirement, and historically the focus has been on the election of individuals able to provide strong chairing and COMNAP representation in various Antarctic forums.

The position of Executive Secretary is important to the effectiveness of COMNAP. This person is often the contact point for external stakeholders, represents COMNAP alongside the Chair in other forums, is the worker responsible for implementing COMNAP decisions and initiatives and, as an EXCOM Member, often initiates ideas and provides direction. They need to be aware of topical issues being addressed within the ATCM and other Treaty forums, sensitive to the Antarctic Treaty System dynamics, and able to provide advice to COMNAP. There have been three Secretariat locations and four COMNAP Executive Secretaries over its first twenty-five years of operation. The Executive Secretaries have all had some background in Antarctic operations and/or Antarctic science.

The original Executive Secretary, Al Fowler, was Deputy Director at the United States NSF Division of Polar Programs from 1974 to 1988, and prior to that a Captain in the US Navy and head of the military task force supporting the United States Antarctic Program. The office location moved from the AGU offices in Washington DC to the Tasmanian Office of Antarctic Affairs in Hobart, Australia on 1 October 1997, with Jack Sayers, previous SCALOP Chair and Head of Operations for the Australian Antarctic Programme, taking over the Executive Secretary role. The office stayed in Hobart with the appointment to the position in October 2003 of Antoine Guichard, who had been a research engineer at the French Dumont d'Urville station and worked as a scientist, engineer and advisor for both the Australian and French Antarctic programmes. In 2009 the office shifted to the Gateway Antarctica Centre for Antarctic Studies and Research at the University of Canterbury in Christchurch, New Zealand, with the appointment to the Executive Secretary role of Michelle Rogan-Finnemore, a geologist with a postgraduate qualification in Antarctic law, who had worked as a scientist with the United States Antarctic Program at the South Pole and McMurdo stations and with Antarctica New Zealand at Scott Base.

COMNAP members are invited to submit proposals for the hosting of the Secretariat, and at the same time propose suitable candidates for the Executive Secretary role. The host institute of the Secretariat provides office space and administrative support. The location of the Secretariat away from the offices of any national programme, while not specified as a requirement, has helped ensure its independence. The funding of the costs related to the running of the Secretariat and to the employment of the

Continues on page 30

The COMNAP Chairs

Since the establishment of COMNAP in 1988 there have been eight elected Chairs. Each had their own distinct approach to the role and each has left their mark on the organisation. The depth and breadth of knowledge of each Chair is a strong reflection of the depth of understanding that the national Antarctic programmes have in regards to science support and the breadth of knowledge of Antarctica that each brings to the COMNAP table.



**Professor David Drewry
COMNAP Chair 1988–91**

Professor David Drewry was Director of the British Antarctic Survey (BAS) from 1987 to 1994. A geophysicist, with research interests in glaciology and climate change, the science and politics of the polar regions and higher education policy, Professor Drewry was Director of the Scott Polar Research Institute at the University of Cambridge (1983–87) prior to his appointment to BAS. He has subsequently been Deputy Chief Executive of the Natural Environment Research Council (1994–97), Director-General of the British Council (1998–99) and Vice-Chancellor of the University of Hull (1999–2009). He is now Vice-President of the European University Association, Brussels (and Chair of its Research Policy Working Group), a Trustee of the London Natural History Museum, Chairman of the South Georgia Association, Honorary Fellow at Emmanuel College Cambridge, and visiting Professor at the Universities of London and Xiamen, China. His other roles have included President of the International Arctic Science Committee, member of the Executive Council of the European Science Foundation and the European Committee on Ocean and Polar Science, and Visiting Fellow at Green College, Oxford University.



**Dr Mario Zucchelli
COMNAP Chair 1991–94**

Dr Mario Zucchelli was appointed head of the *Progetto Antartide* of ENEA (Italy's National Agency for New Technologies, Energy and Sustainable Economic Development) in 1987 with responsibility for the implementation of the Italian Antarctic Programme. Sadly, Dr Zucchelli died in 2003 having led ENEA for 17 years. He was the driving force behind the construction and development of the station at Terra Nova Bay that now bears his name. He was a founding executive member and former Chairman of the European Polar Board, one of the promoters of the French–Italian agreement for developing scientific research at Dome C and the construction of the permanent joint station Concordia, a contributor to the success of the European Project for Ice Coring in Antarctica (EPICA), and a member of the Cape member of the Cape Roberts Project Operation Management Group. Prior to his polar work, he was employed at the Italian nuclear energy agency. His academic background was in nuclear engineering.



Professor Anders Karlqvist
COMNAP Chair 1994–97

Professor Anders Karlqvist was Director of the Swedish Polar Research Secretariat, which he led from its start in 1985 until his retirement 25 years later. He has an academic background in physics and mathematics and has worked as professor in systems analysis at several universities in Sweden. In the 1990s Professor Karlqvist held a position for several years as Assistant Undersecretary at the Swedish Ministry of Education and Science. In his role as Manager for Swedish Polar Science he took an active part in the foundation of IASC and its affiliated organisation FARO, Arctic "sister organisations" to SCAR and COMNAP. His international experience also involves research work in systems analysis at MIT, Stanford, the Santa Fe Institute, the International Institute for Applied Systems Analysis in Vienna and CSIRO in Melbourne.



Ms Gillian Wratt
COMNAP Chair 1997–2001

Ms Gillian Wratt was Director of the New Zealand Antarctic Programme (NZAP) from 1992 to 1996, and Chief Executive of Antarctica New Zealand from 1996 to 2002. With a degree in botany, she had worked in a range of roles for the New Zealand Department of Scientific and Industrial Research, including as an Antarctic research assistant, prior to her appointment to NZAP. She has subsequently been an Advisor for the New Zealand Ministry for the Environment (2003–05) and Chief Executive of the Cawthron Institute (2006–12). Other roles have included Vice-Chair of the Antarctic Treaty Committee on Environmental Protection, Chair of the Cape Roberts Project Operations Management Group, Chair of the International Association of Antarctica Tour Operators' Annual Meetings, Expedition Leader and lecturer for Antarctic tourism companies, Chair of the Independent Research Association of New Zealand, and Board member of the New Zealand Environmental Protection Authority. Ms Wratt is a Member of the New Zealand Order of Merit for services to Antarctica.



Dr Karl A. Erb
COMNAP Chair 2001–04

Dr Karl Erb headed the Office of Polar Programs of the US National Science Foundation (NSF) and managed the US Antarctic Program from 1999 to 2012, having previously served as Assistant and Associate Director for Physical Sciences in the White House Office of Science and Technology Policy and as Senior Scientist to the NSF Director. He began his career as an experimental nuclear physicist and had been a faculty member at Yale University. In recognition of his work building international partnerships, Dr Erb was awarded the New Zealand Antarctic Medal in 2006 and was invested as Chevalier in the French Legion of Merit in 2007. In 2006 he was awarded the rank of Distinguished Executive in the Senior Executive Service "for sustained extraordinary accomplishment in management of programs of the United States Government and for leadership exemplifying the highest standards of service to the public".



Dr Gérard Jugie
COMNAP Chair 2004–07

Dr Gérard Jugie was the Director of the French Polar Institute (IPEV) from 1997 to 2010. He has a research background in the field of co-ordination chemistry and nuclear resonance spectroscopy. Prior to his appointment to IPEV Dr Jugie was Director of the industrial office of the French government-funded research organisation CNRS; he then had regional responsibility for CNRS in the western part of France and later in Languedoc Roussillon region. He is now an Emeritus Research Director of CNRS. He was also a research fellow of the Royal Society (1973–74) at Queen Elizabeth College (London-Kensington). He chaired the European Polar Board from 2003 to 2006 and the European Polar Consortium from 2006 to 2010. Dr Jugie was invested as Chevalier in the French Legion of Merit in 1994. In 2007 he won the European Prize "Descartes" and the NSF Antarctic medal, and in 2011 was awarded the German Merit Order.



Dr José Retamales
COMNAP Chair 2007–11

Dr José Retamales is Director of the Chilean Antarctic Institute (INACH). He has chaired the ATCM Working Group on Operational Matters for the past nine years (2005–13) and is the Head of the Chilean Delegation to the meetings of RAPAL (Reunión de Administradores de Programas Antárticos Latinoamericanos), SCAR and COMNAP. He is currently the COMNAP Science Expert Group leader. His academic background is in chemical engineering in both Chile and the UK. He was Rector of the University of Magallanes, Punta Arenas (1990–94). He has been a Board Member of the Chilean Nuclear Energy Commission and a member of the Advisory Committee of the Chilean National Oil Company. He is the author of numerous scientific papers and co-author of a patent in his area of expertise.



Professor Heinrich Miller
COMNAP Chair
2011–present

Dr Heinrich "Heinz" Miller is Deputy Director of the Alfred Wegener Institute for Polar and Marine Research (AWI), head of the Glaciology Section and Professor of Geophysics at the University of Bremen and speaker of the Helmholtz Research Programme in Polar, Marine and Coastal Science. His academic background is in geophysics, and he has led seven Antarctic research cruises and three Arctic cruises as chief scientist. He has led various Antarctic deep field expeditions and participated personally in a number of deep ice coring field seasons in Greenland and Antarctica, including directing the EPICA programme. He has authored or co-authored over 100 papers on various polar subjects and has supervised more than 40 PhD theses. Dr Miller was the German national representative on the SCAR Working Group on Solid Earth Geophysics, one of the founding fathers of the Seismic Data Library System, member and Chair (1992–2000) of the SCAR Working Group on Glaciology and has served as AWI COMNAP delegate since 1998.

Executive Secretary is covered by COMNAP membership fees, with each national Antarctic programme contributing an equal annual amount. The membership fees cover all COMNAP costs, including the Executive Secretary salary and any COMNAP project expenses.

In 2010, building on the review of the constitution and rules of procedure, the Executive Secretary presented a draft Strategic Framework and five-year work plan to the COMNAP meeting. This is now reviewed on an annual basis and provided in the members' section of the COMNAP website. The current plan lists 28 projects under 11 topic headings (Table 3).

Twenty-five years after it was established COMNAP membership has increased by 32 per cent – reflecting growth in the number of Consultative Parties to the Antarctic Treaty. COMNAP's objectives/purpose have been refined and its structures for subgroups and meetings tightened to give a more efficient, project-focussed approach. The fundamental principles remain the same: facilitating international co-operation in managing support to Antarctic science, and providing practical, technical and non-political advice to those who govern the Antarctic region through the Antarctic Treaty System.

In the Interest of "All Mankind": Women in COMNAP

Michelle Rogan-Finnemore

In the early days of exploration of the Antarctic, and even up to the beginning of what might be called the modern era of Antarctic exploration, there was a significant imbalance between the number of men and the number of women who went to the Antarctic. Whaling ships may have carried the wives of some of the men on board, but you will note no female names in the history books about the Heroic Era of exploration. Except of course for Harry McNeish's cat, "Mrs. Chippy"... who, in fact, was actually a male cat given a female-sounding name!

Two American women, Edith Ronne and Jennie Darlington, wintered-over in Antarctica with their husbands in 1947. The Soviet Union's Antarctic International Geophysical Year research team of 1957–58 included Maria Klenova, a geologist, on the vessel *Ob*. These were isolated instances, and it was not until much later that national Antarctic programmes regularly allowed women to participate.

In 1969 a woman was first allowed to participate in a US government Antarctic expedition. Thereafter, many of the national Antarctic programmes began to receive and accept job applications from qualified persons of either gender. Today the ratio of male to female personnel working in Antarctica hovers around 8:1.

It should be no surprise then, that most of the Antarctic organisations that serve the Antarctic community are predominately composed of males. But it might be a

surprise to consider that COMNAP was the first of the Antarctic Observer organisations to have a female Chair (Gillian Wratt, 1997–2001), and then a female Executive Secretary (Michelle Rogan-Finnemore, 2009–present). In fact, COMNAP also can state that it had its first female delegates as far back as the early 1990s, with Carol Roberts as the US Antarctic Program representative (1989–92), Josefina Castellvi as the Spanish national Antarctic programme representative (1990–93) and Gillian Wratt as the Antarctica New Zealand representative (1992–2002). Recently there have been two female COMNAP Vice-Chairs: Virginia Mudie, Australian Antarctic Division, 2008–10 and Maaïke Vancauwenberghe, Belgian Antarctic Programme, 2009–12. It was not until 2012 that SCAR appointed its first woman Executive Committee member and, as with CCAMLR (Commission for the Conservation of Antarctic Marine Living Resources), it has never had a female President or Executive Secretary.

Today most would agree that gender is no longer an issue when it comes to research in the Antarctic or to managing support to such research. But it is a significant change, which has occurred over this 25 year period of COMNAP, and deserves to be highlighted as part of this anniversary publication.

Michelle Rogan-Finnemore

COMNAP Executive Secretary, 2009–present
21st woman to winter-over at the US Amundsen–Scott South Pole Station, 1989–90

Table 3: COMNAP five-year plan 2012–17

Topic	Project	Topic	Project
Environment	Understanding the issue of introduction of non-native species in the Antarctic from a national Antarctic programme (NAP) perspective	Outreach and Communications	Improve COMNAP internal communications – website guidelines, NAP information
	Consider implication of climate change for management of Antarctic activities (practical consequences of change in Antarctica); understand and advance relevant recommendations from the climate change Antarctic Treaty Meeting of Experts (ATME)		COMNAP Presentation at ATCM–CEP 2013
	Review COMNAP guidelines on best practice in response to oil spills (small scale/local); develop a report which might include an inventory of response equipment available at NAP Stations	Data Management	Interaction with SCAR Standing Committee on Antarctic Data Management (SCADM)
	Hydroponics survey		COMNAP data management and information exchange – continued review
	Waste management workshop to review waste water management	Air Operations	<i>Antarctic Flight Information Manual (AFIM)</i> – move to new electronic format
	Repair & remediation of environmental damage – contribute to CEP development of a site clean-up manual		Risk to Antarctic aviation from ash
Conservation challenges workshop	Training	Antarctic Glossary	
Science	Consider implications of multinational, multidisciplinary, far reaching science activity – Southern Ocean Observing System (SOOS)/Sentinel Workshop, International Polar Initiative (IPI) workshop	Medical	COMNAP Medical Expert Group – telemedicine workshop and website discussion forum and document area
	Develop tools to assist in the co-ordination of science activity	Energy and Technology	Symposium – Publication of Proceedings; Information Paper for ATCM
Safety	AINMR (Accidents, incidents and near miss reporting) tool that can assist NAPs by providing lessons learned for AINM in Antarctica		Carbon reporting survey
	Risk/hazards related to tsunami impacts on coastal Antarctic infrastructure/personnel – tsunami communication plan	Review of <i>Energy Management Guidelines</i> implementation	
	Ship Position Reporting System (SPRS) for Search and Rescue – improved national usage	Database of preferred suppliers	
		Shipping	IMO (International Maritime Organisation) Polar Code – keep under review and inform national IMO delegates of Antarctic requirements
		Communications	SPRS (Ship Position Reporting System) – explore existing systems and potential to link with AFIM reformat
			Survey of collective/regional needs for Antarctic communications (technology)

Contributions to the ATCM and the CEP

The ATCM and, since 1998, the CEP are the formal governance mechanisms of the Antarctic Treaty. One of the reasons given for the establishment of COMNAP was that the SCAR Working Group on Logistics was not proving an effective means in connecting the ATCM and national programme managers. Effective response to and communication with the ATCM have been included in the COMNAP objectives and purpose since its early days (Table 1). The aim is to provide the Antarctic Treaty System with objective, practical, technical and non-political advice, drawn from the national Antarctic programmes' collective pool of expertise and their first-hand knowledge of the Antarctic. This was recognised at ATCM XVI (1991) with COMNAP being given formal status as an Observer to the ATCM.

Discussion of the most recent ATCM and CEP deliberations has always been on the agenda of the COMNAP AGMs. Lists of ATCM/CEP issues relevant to COMNAP can be extensive – in 2007 for example, 40 specific items were listed, covering environmental monitoring, waste management and non-native species, contingency planning and emergency response, hydrography and information exchange.

From the first ATCM attended by COMNAP – ATCM XVI in 1991 – there have been 20 Annual Reports, 53 other Information Papers and 28 Working Papers presented by COMNAP to ATCMs and CEP meetings (Appendix 3). Of the Working Papers 61 per cent have been on environmental topics, 25 per cent on other operational topics and 14 per cent on other Treaty topics. Information Papers have spanned a wider range of topics, also including tourism, scientific and operational co-operation, education, data management, and information exchange. Presentations to the ATCM and CEP on various topics are covered in subsequent chapters.

In a paper by Dudeney and Walton published in *Polar Research* in 2012,⁶ COMNAP is noted as a "consistent contributor" in the top half of the Parties to the Treaty in terms of the number of ATCM and CEP Working Papers.

This analysis is supported by the number and range of ATCM recommendations, decisions and resolutions since 1991 that acknowledge and/or adopt COMNAP work, and invite COMNAP input (Table 4).

6. J. R. Dudeney and D. W. H. Walton "Leadership in Politics and Science within the Antarctic Treaty" *Polar Research* 31 (2012), doi:10.3402/polar.v31i0.11075.

Table 4: ATCM recommendations, decisions and resolutions that specifically mention COMNAP

Outcome	Topic	COMNAP mention
Recommendation ATCM XVII-1 (1992)	Environmental Monitoring and Data Management	COMNAP representatives in consultation with SCAR to establish research programmes at a representative subset of facilities in Antarctica to determine how different types and sizes of facilities in different localities (eg coastal and inland stations, on rocks and on ice shelves) affect the Antarctic environment
Resolution 4 (1995) – ATCM XIX	Fuel Storage and Handling	COMNAP , through their members, to identify steps that could be taken to improve fuel storage and handling and that this item be included on the Agenda for the next ATCM
Resolution 1 (1997) – ATCM XXI	Emergency Response Action and Contingency Planning	That those Consultative Parties whose research stations and vessels operating in Antarctica are not covered by contingency plans should take the necessary steps to ensure that the operators of the stations and vessels introduce plans based on the 1992 Guidelines prepared by COMNAP
Decision 3 (1998) – ATCM XXII – CEP I	Liability Annex to the Environmental Protocol	Taking into account inputs from SCAR, COMNAP and others on risk assessments
Resolution 4 (1998) – ATCM XXII – CEP I	Antarctic Data Management	Consultative Parties . . . establish National Antarctic Data Centres and link these to the Antarctic Data Directory System managed by the Joint Committee on Antarctica Data Management of SCAR and COMNAP

Outcome	Topic	COMNAP mention
Resolution 6 (1998) – ATCM XXII – CEP I	Emergency Response Action and Contingency Planning	The Consultative Parties adopt the COMNAP/SCALOP Guidelines for Fuel Oil Handling, Spill Prevention and Containment, Oil Spill Contingency Planning and Reporting of Oil Spill Incidents COMNAP/SCALOP requested to review the guidelines, undertake an assessment of the risks of environmental emergencies arising from activities in Antarctica, and identify and formulate additional steps for incidents other than oil spills
Decision 2 (1999) – ATCM XXIII – CEP II	Guidelines for Antarctic Shipping and Related Activities	Invite experts from Non-Consultative Parties, COMNAP , SCAR
Resolution 1 (1999) – ATCM XXIII – CEP II	Guidelines for EIA in Antarctica	Seek relevant information from SCAR and COMNAP
Resolution 5 (1999) – ATCM XXIII – CEP II	Advice from COMNAP and SCAR: liability negotiations	Request that COMNAP and SCAR continue to provide representatives throughout all meetings of the Consultative Parties at which the question of liability is discussed and provide advice in a joint Working Paper to the XXIV ATCM
Decision 3 (2001) – ATCM XXIV – CEP IV	Elaboration of Draft Liability Annex	Decision . . . taking into account the paper produced by SCAR and COMNAP
Decision 5 (2003) – ATCM XXVI – CEP VI	Meeting of Experts on Tourism and Non-Governmental Activities	Encourage attendance at the Meeting by representatives from COMNAP
Resolution 2 (2003) – ATCM XXVI – CEP VI	Support for the International Polar Year	Call upon SCAR and COMNAP to work with International Council for Science (ICSU) to pursue actively the planning and implementation of an International Polar Year (2007–9)
Resolution 3 (2003) – ATCM XXVI – CEP VI	Co-operation in Hydrographic Survey and Charting of Antarctic Waters	Noting the valuable contribution to the INT chart scheme by SCAR, COMNAP and IAATO
Decision 4 (2004) – ATCM XXVII – CEP VII	Guidelines for Ships Operating in Arctic and Antarctic Ice-Covered Waters	Noting the intersessional efforts of COMNAP
Resolution 2 (2005) – ATCM XXVIII – CEP VIII	Practical Guidelines for Developing and Designing Environmental Monitoring Programs in Antarctica	The Practical Guidelines for Developing and Designing Environmental Monitoring Programs in Antarctica [developed for COMNAP by its Antarctic Environmental Officers Network] annexed to this Resolution . . . be used in conjunction with the COMNAP/SCAR Antarctic Environmental Handbook
Resolution 3 (2005) – ATCM XXVIII – CEP VIII	Fuel Storage and Handling	Governments either replace bulk fuel facilities currently lacking secondary containment with double-skinned tanks or provide them with adequate bunding, and have adequate oil spill contingency plans in place; COMNAP consider undertaking a further assessment of fuel handling and storage facilities and procedures in Antarctica

Continues overleaf

Outcome	Topic	COMNAP mention
Resolution 2 (2009) – ATCM XXXII – CEP XII	Role and Place of COMNAP in the Antarctic Treaty System	<i>Emphasizing the important contribution of COMNAP in establishing and developing effective collaboration among National Antarctic programs, recommend that the Parties continue to recognize the importance of COMNAP as a body supporting the Antarctic Treaty Parties and promoting close co-operation among the National Antarctic programs</i>
Decision 7 (2009) – ATCM XXXII – CEP XII	Meeting of Experts on the Management of Ship-borne Tourism in the Antarctic Treaty Area	<i>Invite experts from Non-Consultative Parties, COMNAP</i>
Resolution 6 (2009) – ATCM XXXII – CEP XII	Ensuring the Legacy of the International Polar Year (IPY)	<i>The Parties continue to . . . work with SCAR and COMNAP to extend and develop long-term scientific monitoring and scientific observations in Antarctica and the Southern Ocean</i>
Resolution 6 (2010) – ATCM XXXIII – CEP XIII	Improving the Co-ordination of Maritime Search and Rescue in the Antarctic Treaty Area	<i>Recalling the key outcomes and recommendations from the COMNAP Antarctic SAR Workshops recommend that their Governments recognise the importance of ensuring the effectiveness of search and rescue efforts</i>
Resolution 6 (2011) – ATCM XXXIV – CEP XIV	Non-Native Species	<i>The CEP continue to develop the Non-Native Species Manual with the input of the SCAR and COMNAP on scientific and practical matters, respectively</i>
Resolution 3 (2012) – ATCM XXXV – CEP XV	Improving Co-operation in Antarctica	<i>Recognising, with appreciation, the contributions of SCAR and COMNAP to scientific and logistical co-operation among the Antarctic Treaty Parties. . . . recommend that the Parties and other Antarctic Treaty Consultative Meeting participants conduct a discussion on promoting broader Antarctic co-operation</i>
Resolution 8 (2012) – ATCM XXXV – CEP XV	Improved Co-ordination of Maritime, Aeronautical and Land-Based Search and Rescue	<i>Invite COMNAP to provide an update on actions resulting from the two COMNAP SAR workshops</i>

The contribution of COMNAP into the Antarctic Treaty System was specifically acknowledged in ATCM Resolution 2 (2009), in which the representatives

Noting that in 1989 the Council of Managers of National Antarctic Programs (COMNAP) evolved from a permanent SCAR working group on Antarctic logistics as an important mechanism for co-operation of the Parties,

Further noting that Rules 2, 3 and 31 of the Rules of Procedure for meetings held pursuant to Article IX of the Antarctic Treaty provide that COMNAP attends these meetings as an observer,

Noting the adoption by COMNAP of its new Constitution at XX COMNAP Meeting (Saint Petersburg, Russia, July 2008),

Emphasizing the important contribution of COMNAP in establishing and developing effective collaboration among National Antarctic programs, Recommend that the Parties continue to recognize

the importance of COMNAP as a body supporting the Antarctic Treaty Parties and promoting close co-operation among the National Antarctic programs.

The relationship with the ATCM has not always been this positive. A Symposium on the Future of Antarctica was held in Ushuaia, Argentina in 1995, with attendance that included government officials from 15 Antarctic Treaty Consultative Parties. In the proceedings of the symposium⁷ concern about the unsanctioned role of COMNAP is recorded as the major topic of the plenary discussion under Theme 5, Relations Between Elements of the Antarctic Treaty System. One of the recommended action points from this symposium was that the role of COMNAP should be integrated more closely with the Antarctic Treaty System.

⁷ A. Jackson (editor), *On the Antarctic Horizon: Proceedings of the International Symposium on the Future of the Antarctic Treaty System, Ushuaia, Argentina, 10 to 20 March 1995* ([Hobart], Australian Antarctic Foundation, [1996])



Geological research on Livingston Island

COMNAP had been in existence for only seven years and it is evident that at least some of the Treaty Parties were still working out how this self-generated entity, not created by any diplomatic or ATCM decision, might fit into the system. One of COMNAP's strengths has in fact been its separation from the ATCM, which enables the provision of objective, practical, technical and non-political advice to the Antarctic Treaty System.

The concerns about COMNAP may in part have been driven by the perception of COMNAP acting ahead of the ATCM. The development by COMNAP of Environmental Impact Assessment (EIA) Guidelines that were appended to the first COMNAP report to the ATCM in 1991 received some criticism in this context. One commentator at the Ushuaia symposium stated, *COMNAP seemed to think it was within their responsibilities to take the environmental impact assessment rules and convert them into practical guidelines. Unfortunately the guidelines they produced were legally inconsistent with the rules and this has created some problems.*⁸ To the managers it seemed logical to anticipate the signing of the Environmental Protocol, and work collectively to develop generic guidelines that would assist all COMNAP members in responding to the Antarctic Treaty requirements. In part this was a reactive response to ATCM developments, and in part a proactive anticipation of demands on the national programme managers.

⁸ *Ibid.*, p. 61

Reflection on COMNAP papers to the ATCM (Appendix 3) and ATCM outcomes (Table 4) shows that many topics have progressed by an iterative process between the ATCM/CEP, SCAR and COMNAP, sometimes also with involvement of other groups, such as IAATO, IMO, WMO and IHO. Working Papers and Information Papers from COMNAP inform the ATCM and respond to ATCM requests and formal measures; COMNAP is often involved in ATCM/CEP intersessional work; and ATCM measures sometimes respond to Working Papers presented by COMNAP. COMNAP sees it as part of its role to both advise the ATCM on operational realities and to draw Treaty Parties' attention to forthcoming problem areas and suggest possible solutions.

While not officially recognised as such, COMNAP, it could be argued, has grown to provide one of the pillars of the Antarctic Treaty System. The first pillar, the ATCM and CEP, is the formal international governmental mechanism of the Treaty; SCAR provides an independent international science pillar for non-political advice; and COMNAP provides the operational reality informed by managing science and logistics support in Antarctica. The COMNAP member organisations are also those who, in the main, put the Treaty requirements into effect in Antarctica.

Ultimately, however, whatever work is done by COMNAP, it is only each Treaty Party that can ensure implementation, by prioritising and resourcing initiatives at a national level. The topic of fuel handling and spill contingency planning is a good example of this. COMNAP first presented fuel handling and spill contingency planning guidelines to the

ATCM in 1992. The ATCM passed related measures in 1995 (Resolution 4 (1995) ATCM XIX), 1997 (Resolution 1 (1997) ATCM XXI), 1998 (Resolution 6 (1998) ATCM XXII), and 2005 (Resolution 2 (2005) ATCM XXVIII). The 2005 Resolution followed inspection reports to CEP VIII–ATCM XXVIII that had highlighted issues with storage and handling of fuel, and encouraged governments to *either replace bulk fuel facilities currently lacking secondary containment with double skinned tanks or provide them with adequate bunding, and have adequate oil spill contingency plans in place*. These practices had been recommended 13 years earlier in the 1992 COMNAP guidelines.

The relationship between COMNAP and the ATCM has strengthened since the establishment of the Antarctic Treaty Secretariat in 2004. The Antarctic Treaty Executive Secretary has typically participated as an observer at COMNAP, and a strong working relationship has developed between the COMNAP and Treaty Secretariats.

In 2008–09 the Antarctic Treaty Secretariat undertook an initial review of ATCM operational Recommendations, with informal input from COMNAP. This initial review highlighted the value of undertaking a complete review of these Recommendations that would lead to clarifications, updates or withdrawals of Recommendations, as appropriate. COMNAP participated in an Intersessional Contact Group established at ATCM XXXIV in 2011, providing significant input on the Recommendations related to logistics and operations issues. At ATCM XXXV in 2012 an offer was accepted from COMNAP to lead a project, inviting input from other organisations with expertise on particular technical topics, that would provide draft revised language for Recommendations with operational paragraphs that needed updating. A COMNAP Working Paper, co-authored by IAATO, IHO, SCAR and WMO was presented to ATCM XXXVI in 2013 as a result of this work.

The recent change by the ATCM to its annual meeting length and schedule has meant that COMNAP has informally reconsidered its relationship to the ATCMs. There has been discussion regarding the timings of COMNAP AGMs and the contributions COMNAP can make to the ATCM Operations Working Group, which for the 2013 ATCM has been shortened from two days to one day.

Information Exchange

Article VII of the Antarctic Treaty requires each party to freely exchange information about its activities by giving advance notice of

- (a) all expeditions to and within Antarctica, on the part of its ships or nationals, and all expeditions to Antarctica organized in or proceeding from its territory;
- (b) all stations in Antarctica occupied by its nationals; and
- (c) any military personnel or equipment intended to be introduced by it into Antarctica . . .

Recommendation VI from ATCM I in 1961 set out the basic form for exchange of information between the Treaty Parties. This requirement has been elaborated in various ATCM measures. On the Antarctic Treaty website 44 measures relating to information exchange between 1961 and 2012 are listed.

Much of the provision of information to fulfil the requirements for the Antarctic Treaty exchange of information falls on COMNAP members. There is also a range of practical exchanges of information between COMNAP members that assist with safe and efficient operation in Antarctica, including some of the manuals that have been developed as a result of specific ATCM measures: the *Antarctic Flight Information Manual (AFIM)* and *Antarctic Telecommunications Operators Manual (ATOM)*, for example. COMNAP members have also provided information on science programmes for the annual reports that each country provides to SCAR. A SCALOP Information Exchange subgroup reported to the COMNAP meeting in 1992 that there were at least 13 separate information exchange and report requirements on programme managers.

Until the decision in 2001 to establish an Antarctic Treaty Secretariat, exchange of information under the Treaty System was by hard copy means through diplomatic channels. For the advance exchange of information this process was too slow to be of any practical value, so COMNAP established its own advance exchange-of-information process, covering much of the information that was fed into the diplomatic processes. The SCALOP Information Exchange subgroup developed *Guidelines for Advance Exchange of Operational Information on Antarctic Activities*, which were published by COMNAP in 1995. Information covering programme contact details, ship operations, air operations, stations, communications facilities, logistics activities affecting other nations, major field activities, other Antarctic activities (including non-governmental), emergency contacts, shipping itineraries,



Delegates to COMNAP AGM XXV, Seoul, Republic of Korea, 2013

Photo: KOPRI

aircraft operations schedules, and *AFIM* and *ATOM* updates was provided to the COMNAP Secretariat by 1 September each year. From 1999 the COMNAP Advance Exchange of Operational Information has been completed online, on the COMNAP website. The Advance Exchange of Information has never been provided by all COMNAP members. With the online system there were 17 entries, covering 60 per cent of the COMNAP membership, for the 2000–01 and 2001–02 seasons.

In 2001, with the decision of the ATCM to establish an Antarctic Treaty Secretariat in Buenos Aires, Argentina agreed to establish a central information exchange website. ATCM Resolution 6 (2001) recommended that the Treaty Parties provide information to this website, and Appendix 4 of the XXIV ATCM Final Report detailed the information exchange requirements. In addition to the information outlined in the COMNAP guidelines, ATCM requirements include pre-season information on research rockets, military personnel, and visits to protected areas; a Post Season Annual Report that includes a list of science projects from the previous year, planned major international collaborative science programmes/projects, compliance with the Environmental Protocol, Initial and Comprehensive Environmental Evaluations (IEEs and CEEs) completed during the year, monitoring activities and Treaty inspections; and Permanent Information, including waste management plans, contingency plans, and inventories of past activities.

Since the establishment of the Antarctic Treaty Secretariat in 2004 these information exchange requirements have been refined into the Antarctic Treaty Electronic Information Exchange System (EIES): a central repository on the Antarctic Treaty System website for pre-season information, a post-season annual report and permanent information. From 2005 to 2009 there was reference in COMNAP meetings and COMNAP reports to the ATCM to the need to co-ordinate the development of the ATCM and COMNAP information systems. It was proposed that relevant information on the COMNAP site should be easily

exportable to the EIES. In reality the EIES covers all the advance exchange of information requirements, and rather than national programmes providing information into two systems, all information can be entered once. Access into the EIES is easy and timely. COMNAP still runs an Advance Exchange of Operational Information facility on its website, but with the EIES now operating effectively few countries provide information to the COMNAP system: from seventeen in 2001–02 to four in 2012–13.

The COMNAP Advance Exchange of Operational Information and now the EIES provide an easily accessible and timely summary of planned Antarctic programme activities. This helps deliver the transparency principles of the Antarctic Treaty, but the planning of co-operative activities between national programmes needs a much longer lead time than this provides – several years, not one month. Bilateral and multilateral meetings, including those in the margins of the COMNAP meetings, together with the regional meetings that have become a formal part of the COMNAP annual meetings, are the forums where future plans are exchanged and collaborative programmes and projects developed.



Delegates to COMNAP AGM XXIII, Stockholm, Sweden, 2011

Photo: Swedish Polar Research Secretariat



Photo: E. Baricevic, INACH

Microbiologist gathering data, with Marguerite Bay, Antarctic Peninsula in the background

A significant change since the establishment of COMNAP has been the development of the World Wide Web. In 1988 all information exchange was in hard copy documents, with only a few national programmes having email facilities. At the first COMNAP meeting in 1989 the Executive Secretary, Al Fowler, introduced the proposition that COMNAP establish an electronic mail network to expedite and facilitate their communications. This was a broader concept than just a formal exchange-of-information tool; it was a mechanism that would enable easier and timelier communication across the COMNAP membership. An Antarctic Managers Electronic Network (AMEN) was set up and a first email circular was distributed in February 1994.

By 1995 AMEN had been established as a COMNAP website, and was demonstrated to members at the 1995 annual meeting. An Electronic Information Working Group (ELINF) was established to work on getting the Advance Exchange of Operational Information online. In 1998 the Italian national programme was the first to successfully enter its advance exchange of information onto AMEN.

Subsequent COMNAP Executive Secretaries have refined the COMNAP website. It now provides both a range of publically accessible information on COMNAP, its member programmes and the Antarctic, and a communication mechanism for COMNAP members.



Photo: V. Troyanov, SCAR-COMNAP Photographic Exhibition, 2012



Managing Support to Antarctic Science

COMNAP initiatives and meetings on operations and logistics have resulted in a range of operational manuals, collaborative operations in Antarctica, sharing of information and learning, and advice to the Antarctic Treaty Consultative Meetings (ATCMs) and the Committee on Environmental Protection (CEP). These have facilitated the development of uniform good practice across national operations and common interpretations of Treaty Recommendations. The SCALOP–COMNAP Symposiums have been important forums for sharing information on the latest technology and approaches across a wide range of operational topics. This work has contributed to safe, effective, efficient operations in the remote and high-risk Antarctic operating environment.

International co-operation has been a feature in the operation of Antarctic stations, transport and field activities supporting science since the beginning of the modern era of Antarctic activity, formally marked by the International Geophysical Year (IGY) in 1957–58, despite bilateral tensions between some of the Antarctic Treaty parties both in the Antarctic region and in other parts of the world. In 1962 the Scientific Committee on Antarctic Research (SCAR) organised the First Symposium on Antarctic Logistics for *the co-partners in the gigantic task of uncovering the scientific secrets of Antarctica . . . the men with their ships, aircraft and vehicles, and those who plan and toil to provide shelter*.¹ The topics covered in this first Symposium included science and logistics, air operations, buildings, vehicles, provisioning, and field operations, and are recorded in the 812-page proceedings.²

In 1968 an Antarctic Treaty Meeting of Experts (ATME) on Antarctic Logistics covered a similar range of topics, and concluded that the exchange of logistic, operational and technical information was very useful and productive and that there should be a regular practice of such meetings. While the ATCM has a Working Group on Operations, there have been no further Treaty meetings devoted to logistics. COMNAP and its Standing Committee on Antarctic Logistics (SCALOP), and, prior to 1988, the SCAR Working Group on Logistics (WGL), have provided a forum for this exchange of information, both through their regular meetings and with further Symposiums.

“The national managers . . . strive for nearly identical objectives, confronting the same remote and extreme operating conditions . . . the same relentless cycle of annual operating seasons . . . bound by the same regime of international governance.”

– Alfred N. Fowler, *COMNAP: The National Managers in Antarctica*

The WGL organised a third Antarctic Logistics Symposium in 1980, and since the establishment of COMNAP in 1988, COMNAP–SCALOP have held Symposiums every two years at the same time and location as the COMNAP AGMs and the biennial SCAR meetings.

The first COMNAP meeting agenda in 1989 included a range of operational and logistics topics: air operations, waste disposal, contingency plans to combat oil pollution, telecommunications and Antarctic maps and charts.

A range of COMNAP and SCALOP Working Groups, Expert Groups and networks have addressed various operations and logistics topics. COMNAP meetings also provide opportunity for informal exchanges and side meetings that contribute to collaboration between national programmes. COMNAP meetings have regularly included updates from regional groupings such as the Reunión de Administradores de Programas Antárticos Latinoamericanos (RAPAL), and groupings with an Arctic as well as Antarctic focus, for example the Asian Forum for Polar Sciences (AFOPS) and the European Polar Board. There have been meetings of the Ross Sea, East Antarctica, and Antarctic Peninsula regional groupings on topics such as air operations, contingency planning and search and rescue.

COMNAP Information Paper ATCM XXII IP007 presented to the 1998 Treaty meeting summarised scientific and operational co-operation in Antarctica. It showed each Antarctic programme co-operated scientifically with an average of eight other programmes, with only one country

Table 5: Topics addressed in presentations at SCALOP–COMNAP Symposiums

	IV 1990	V 1992	VI 1994	VII 1996	VIII 1998	IX 2000	X 2002	XI 2004	XII 2006	XIII 2008	XIV 2010	XV 2012
Environmental issues and management												
Alternative energy												
Energy management												
Communication and satellite technologies												
Land, air, sea transportation												
Runways												
Stations												
Medical topics												
Construction and technology												
Logistics planning												
Hydrography, sea ice charting and mapping												
Waste management												
Site clean-up												
Field operations and field safety												
Scientific equipment												
Meteorology												
Overland traverses												
Best Available Technologies												
Personnel selection and management												
Oil spill prevention and response												
Data management												
Deep drilling technologies												
Emergency response and contingency planning												
Environmental monitoring												
Environmental impact assessment												
Antarctic tourism												
Safety												
Search and rescue												
Outreach												

not having any international scientific collaboration. A further survey in 2007 showed that 96 per cent of national Antarctic programmes hosted scientists from other nations, 96 per cent shared ships or aircraft with other nations, 78 per cent provided logistic facilities for other nations and 35 per cent operated or managed logistic facilities in partnership with other nations. The 2007 survey followed discussion on international collaboration at ATCM XXIX–CEP IX in 2006. The subsequent COMNAP meeting discussed this ATCM topic and recorded a concern as to a *lack of realisation [at the ATCM] that international*

*collaboration was already widespread and that operation of a station or vessel by one single nation did not mean that it was not offered for use, and used, by other nations.*³ Renewed discussion at ATCM XXXV on co-operation resulted in the Treaty parties agreeing to convene an Intersessional Contact Group on the matter, with ATCM Resolution 3 (2012) recommending that *the Parties and other Antarctic Treaty Consultative Meeting participants conduct a discussion on promoting broader Antarctic co-operation.*

³ COMNAP XVIII Minutes, 2006, p. 10

¹ *Symposium on Antarctic Logistics, held at Boulder, Colorado, August 13–17, 1962 [proceedings]* (Washington, DC, National Academy of Sciences–National Research Council, 1963), p. 11

² Ibid.

The SCALOP Chairs

In addition to the leadership provided by the COMNAP Chairs, leadership was also provided by the SCALOP Chairs. There were, in total, six elected SCALOP Chairs who each served three year terms, until the disbandment of SCALOP in 2008. Each brought to the role a significant understanding of Antarctic operations and logistics.



Dr Heinz Kohnen, AWI SCALOP Chair 1988-92

Dr Heinz Kohnen was the founding father of Alfred Wegener Institute-Logistics. A geophysicist educated at Münster University, he was active in polar research from the 1960s, first in Greenland and later in Antarctica. In 1979 he led the "Polar Circle" expedition to find a suitable location for the first (West) German Antarctic station. Dr Kohnen began his official service with Alfred Wegener Institute (AWI) on

1 September 1982. During his years leading AWI-Logistics, the *Polarstern* (1982) and the first Polar research aircraft (1983) were brought into service, and the second German Antarctic station, Neumayer and the Dallmann Laboratory at Carlini Base were constructed. The field station of the

EPICA project in Dronning Maud Land was named after him. He continued to attend and contribute to COMNAP meetings and activities until his untimely death in 1997.

After Kohnen's time as the SCALOP Chair, Jack Sayers (Australian Antarctic Division) took on the role for the period 1992 to 1995. Jack later became the COMNAP Executive Secretary, his years as SCALOP Chair making him well suited to the role. Erick Chiang (National Science Foundation/US Antarctic Program) was SCALOP Chair from 1995 to 1998, Patricio Eberhard (Instituto Antártico Chileno) from 1998 to 2001, Kim Pitt (Australian Antarctic Division) from 2001 to 2004 and John Pye (British Antarctic Survey) from 2005 to 2008. In 2008, when the structure of COMNAP changed and SCALOP was disbanded, Kazuyuki Shiraishi (Japan's National Institute of Polar Research) was elected to one of the newly established Vice-Chair positions and in this role he provided oversight on some of the initiatives that had been traditionally in the realm of SCALOP, including the newly renamed COMNAP Symposium 2010 and the Accident, Incident and Near-Miss Reporting (AINMR) system.

Air Operations

The first flights in Antarctica were carried out in 1902. Scott flew a tethered balloon to 180 metres on 4 February 1902, followed by Shackleton, who took the first Antarctica aerial photographs. There was then an untethered balloon flight to 490 metres by the Drygalski Expedition on 29 March 1902. Subsequently, fixed wing planes and helicopters were shipped for use in Antarctica. The first intercontinental flight was from New Zealand to Ross Island in 1955: by a ski equipped PV2-2N Neptune with the United States Operation Deep Freeze.

Air support for national Antarctic programmes has expanded since the 1950s. Now both fixed wing aircraft and helicopters are routinely used to transport field parties

within the continent, and personnel and equipment are flown from Argentina, Chile, South Africa, Australia and New Zealand to several hard-rock, blue-ice, and sea-ice runways in Antarctica. COMNAP currently has an Air Expert Group, which has succeeded an Air Operations Working Group (AIROPS), which in turn had succeeded an Air Safety Group.

The SCAR WGL put significant effort into consideration of co-operation in air transport in the 1970s, and a Sub-committee on Co-operative Air Transport (CATSA) was established, with membership from Argentina, Australia, France, USSR and USA. This followed ATCM Recommendation VII-8 (1972) that had encouraged



Panorama of the Basen Nunatak

Photo: P. Tisler, SCAR-COMNAP Photographic Exhibition, 2012

From SCALOP Symposium to COMNAP Symposium

Kazuyuki Shiraishi

Logistics and operations support are essential for any scientific activity in the Antarctic. The SCAR Working Group on Logistics convened the first logistics symposium in connection with the sixth SCAR meeting at Boulder, Colorado in 1962. It was organised for the national operators to exchange their experience and knowledge of operations in Antarctica, to discuss problems of providing buildings, food and clothing for polar conditions, and to study how best to carry out difficult and hazardous field operations.¹ The purpose of the symposium carried over to the SCALOP symposium after SCALOP was established as a standing committee of COMNAP in 1989.

The SCALOP symposium has been held every two years since 1989 in conjunction with the SCAR Meeting and COMNAP Annual General Meeting. The SCALOP Symposium Working Group (SYMP WG) for the next symposium was organised immediately after the latest event. My first commitment to the SYMP WG was for the ninth symposium at COMNAP XII in Tokyo (2000), as a SCALOP representative from the host national programme. The main topics at the ninth symposium were best available technology, human resources management, transportation management and environmental issues. Topics discussed in the SYMP WG were closely related to the issues of the day for the various Working Groups in COMNAP and SCALOP.

Transportation, building, food and clothing were the main topics in the 1960s, while energy, environment and safety have been highlighted in recent symposiums.

For me, international air operation is the most impressive achievement of the symposiums since the mid-1990s. At the sixth symposium in Rome (1994), a Russian presentation proposed reviving discussions on an air-link between South Africa and Dronning Maud Land. This idea was developed into the East Antarctic Air Network (EAAN) at the Air Transportation Workshop in Washington DC in April 1995. A proposed air-link from Cape Town was also presented by a group of European countries. These two concepts merged into the establishment in 2003 of the Dronning Maud Land Air Network (DROMLAN), conducted by 11 countries. This is one of the success stories from the SCALOP symposium.

The structure of COMNAP was changed at COMNAP XX in St Petersburg in 2008, and the SCALOP symposium was renamed the "COMNAP Symposium". The Symposium now has a more comprehensive coverage, as shown in the main theme at the 2012 symposium in Portland, Oregon: "Sustainable Solutions to Antarctic Challenges: Supporting Polar Research in the 21st Century".

Kazuyuki Shiraishi

Director-General, Japan National Institute of Polar Research 2011-present
Japanese SCALOP Representative 1992-2008
Japanese COMNAP Representative 2008-present
COMNAP Vice-Chair 2008-11

¹ *Symposium on Antarctic Logistics, held at Boulder, Colorado, August 13-17, 1962 [proceedings]* (Washington, DC, National Academy of Sciences-National Research Council, 1963), p. 11

co-operation in air- and sea-transportation in Antarctica, and Recommendation VIII-7 (1975) that had requested the administration of Antarctic expeditions to review the ways in which a co-operative air transport system might benefit their scientific programmes, and that the SCAR WGL review the available transport resources and the potential requirements with respect to a co-operative air transport system.

The CATSA group carried out preliminary work on an "Antarctic Airbus" concept. This work did not result in any continental networks at the time, maybe because the focus, driven by the logisticians of the SCAR WGL rather than the programme managers, was on logistics design, before any review of the demand for such a service. It is questionable whether the majority of programmes saw an operational need for such a network at a time when efficiency of science support was not as high a priority as it is today.

By the time COMNAP was established the focus had changed to the safety of air operations in Antarctica. With increasing air operations in the region, there was concern that better safety and communication mechanisms, able to work without the land-based air traffic control infrastructure available elsewhere in the world, were needed in Antarctic air space.

An ATME on Air Safety in Antarctica was held in Paris in May 1989, and ATCM Recommendation XV-20 in 1989 on Air Safety in Antarctica recommended the publication of a handbook of aeronautical information. Air operations were a substantive topic on the first COMNAP agenda in 1989, addressing 10 proposals adopted at the ATME: consistency with International Civil Aviation Organisation (ICAO) standards; advance exchange of annual air operating plans; preparation by members of national Antarctic programmes of a handbook on Antarctic air operations facilities, equipment and procedures; identification of primary and secondary air information stations in Antarctica; procedures for very high frequency (VHF) broadcasting of air traffic information; improvement of meteorological data; satellite communications and navigation systems; and points of contact for Antarctic area emergency location messages. These addressed the challenges of operating in a remote, extreme environment with little ground infrastructure, as well as the sensitivities of disputed sovereignty, particularly in the Antarctic Peninsula area. A combination of diplomatic skill and a pragmatic operational approach resulted in a solution that, with operational refinements as technology has improved, is still in use today.

COMNAP – The Guiding Force in Antarctic Co-operation

Rasik Ravindra

Operations in Antarctica, both scientific and logistic, can be tedious and time-bound. The isolation and inaccessibility of the continent make it essential for the nations to co-operate to make operations cost-effective and sustainable. COMNAP plays a crucial role towards achieving this goal.

The ice conditions in the area of Indian activities, off the Princess Astrid Coast in central Dronning Maud Land, prevent anchoring of ice-class ships in India Bay early in the season. This results in late positioning of scientists at Maitri station and, consequently, insufficient working days for scientific tasks.

The COMNAP–SCALOP Working Group on Air Operations (AIROPS) and the Working Group on Ship Operations (SHIPOPS) played a significant role in bringing together Antarctic Treaty Parties working in Dronning Maud Land to explore possibilities of national Antarctic programmes joining hands to support air services between the Antarctic gateway city of Cape Town and Antarctic sites with ice runways. This gave birth to the Dronning Maud Land Air Network (DROMLAN), which has been carrying expedition members and their scientific equipment to Antarctica as early as late December. A number of countries, including Belgium, Germany, India, Japan, Norway, South Africa and the United Kingdom, have directly benefited from this move.

COMNAP also played a significant role in assisting the Indian Antarctic programme in planning the First Indian Overland Scientific Expedition to the South Pole, facilitating the establishment of contacts with the Norwegian Antarctic Programme and the US Antarctic Program. Their practical advice and support, including the route map of the Norwegian traverse to the South Pole, were a great help in planning the Indian Traverse.

Rasik Ravindra

Director, Indian National Centre for Antarctic and Ocean Research and Indian COMNAP representative 2006–12
COMNAP EXCOM Member 2008–11
SCAR Vice-President 2008–12
Head of Indian Delegations to ATCM 2006–12
IASC Council Member representing India 2012

The Antarctic Flight Information Manual (AFIM)

Jack Sayers

Over the years since air operations began in the Antarctic region, the number of countries operating in Antarctica has grown, as has the proportion that operate aircraft, for both logistics and scientific purposes. Initially there were no formal aviation operating policies agreed for Antarctica. The universally accepted aviation regulations codified through the International Civil Aviation Organisation were not applicable to Antarctica because of its unique Treaty status. In addition, Antarctic aviation posed a particular challenge due to the lack of ground-based air traffic control; hence, a Traffic Information Broadcasts by Aircraft (TIBA) system was needed. With increasing air activities in Antarctica, at the XIVth Antarctic Treaty Consultative Meeting in 1987 it was agreed to convene a Meeting of Experts to consider matters that would enhance air safety in Antarctica.

The Meeting of Experts on Air Safety in Antarctica was held in Paris in May 1989 and a number of proposals were adopted. These included requirements for advance exchange of information on proposed air operations, in-flight radio communication procedures, enhanced meteorological data, use of locator beacons by aircraft in distress and the development of a handbook describing ground facilities, operating procedures, radio communication services and details of runways or other landing facilities.

The task of developing the proposed handbook (known as the "Antarctic Flight Information Manual") was enthusiastically embraced by COMNAP Executive Secretary, Al Fowler, who became Convenor/Secretary of the "AFIM" Working Group. Fowler was well qualified to lead this task, being an ex-US naval aviator and former Executive Officer with the Antarctic Program of the US National Science Foundation.

As described by Fowler in his book on the history of COMNAP, *The first edition was a rather homemade publication, assembled using standard computer printer paper with tab separators for each country in a two-inch, three-ring binder!* It included information provided by fifteen national Antarctic programmes and one private tourism operator. The proposed format was adopted by COMNAP, with agreement that Antarctic operators would exchange information on their planned air operations in a standardised format by 1 September each year.

In 1994 SCALOP established a small group, led by Fowler, to improve the format of *AFIM*. The other members comprised Patricio Eberhard and Juan Bastias (Chile), David Geddes (New Zealand), John Hall (UK), and Erick Chiang and Harry Mahar (USA). COMNAP agreed to have the new edition of *AFIM* professionally published by the specialist flight information company Jeppesen (headquartered in Denver, Colorado). Each COMNAP member organisation received three *AFIM* manuals free of charge, with the option of purchasing additional copies. It should be noted that the publication of the manual does not imply any right of use of the facilities, which are primarily established and maintained by national Antarctic programmes and other operators for their own use.

Jack Sayers

Chair of SCALOP 1993–95
Executive Secretary of COMNAP 1997–2001
Member of the SCAR Group of Specialists on Environmental Affairs and Conservation (GOSEAC) 1993–99
Operations Manager of the Australian Antarctic Division 1987–97

¹ A. F. Fowler, *COMNAP: The National Managers in Antarctica* (Baltimore, Md., American Literary Press, 2000), p. 89

An *Antarctic Flight Information Manual (AFIM)* was first published in 1991, and has continued to be updated annually. Copies of the manual are provided to each national Antarctic programme and are made available for purchase by others, including private air operators. Ongoing co-operation on safety issues between national programme and private operators has been facilitated by representation from International Association of Antarctica Tour Operators (IAATO) companies at COMNAP's Air Operations Working Group (AIROPS).

In 2011 COMNAP advised the ATCM that a project was underway to revise the format for the paper-based *AFIM*. The project is being led within COMNAP by the United States National Science Foundation (NSF) Office of Polar Programs and the Polar Geospatial Centre, with the goal to have a fully electronic version of *AFIM* ready for approval in late 2013.

Since the mid-1990s there has been revived interest in intercontinental networks. The Russian programme provided a paper at the 1994 Logistics Symposium on



COMNAP Map, Antarctica and the Southern Ocean, Edition 3, May 2006. Compiled for COMNAP by DataVision GIS Limited and Latitude Technologies Pty Ltd.

The Concept of the Cooperative Air Transport System in East Antarctica. Various combinations of national Antarctic programmes have worked on developing air links from Australia and South Africa in addition to the longer-established links from New Zealand and South America. COMNAP and the AIROPS Working Group have provided the forum for meetings of national programmes with an interest in these developments. Air operations, and runway construction and operation, have been consistent topics at the SCALOP–COMNAP Symposiums.

The air link from Christchurch has been a USA–New Zealand co-operation since the 1950s, with Italian participation since the late 1980s. The DROMLAN network for flights between South Africa and Eastern Antarctica now has 11 national programme members. Flights from Hobart to the Antarctic continent began in the 2007–08 season.

The AIROPS meetings have also been a forum for exchange of information, discussion and mutual learning on air incidents, which are reviewed at each meeting.

Table 6: COMNAP activities related to Air Operations

Year	Activity
1989	COMNAP–SCALOP input to the Antarctic Treaty Meeting of Experts on Air Safety in Antarctica A number of initiatives undertaken to respond to ATCM Recommendation XV-20, <i>Air Safety in Antarctica</i> : Development of a standard format for advance exchange of annual air operation plans Collation of existing national programme material on air operating facilities, equipment and procedures Identification of primary and secondary air information stations in Antarctica Development of procedures for broadcasting of air traffic information using a VHF frequency selected for the Antarctic area Identification of points of contact for Antarctic area emergency location messages
1990	Development of the <i>Antarctic Flight Information Manual (AFIM): An Aeronautical Information Handbook for Antarctica</i> , as requested by ATCM Recommendation XV-20 and using guidance from this Recommendation and ICAO Annex 15
1991	The 1 st edition of the <i>AFIM</i> published and distributed for use in 1991–92 Antarctic season; review of the procedure for the annual advance notice of planned air operations, and development of a format for flight plans involving the facilities of two or more national programmes
1992	Data provided for the <i>AFIM</i> by private operator Adventure Network International (ANI)
1993	New <i>AFIM</i> Annex 6 provides procedures for the use of the Antarctic Flight Plan and for prior approval and co-ordination for flight operations that use facilities of another operator
1995	Workshop on Air Transport Networks held in Washington DC and follow-up task group met in Santiago, Chile to study options and possibilities for co-operation in air transport to serve the East Antarctic plateau area; East Antarctica Air Network (EAAN) COMNAP subgroup established <i>AFIM</i> 2 nd edition published in standard flight information manual format by international aeronautical publishers, Jeppesen Ltd
1996	East Antarctic Air Network Working Group established to continue examination of the feasibility to establish an Australia–Antarctica air link, with membership from Australia, China, Italy, Japan and Russia
1997–98	National programme personnel flown from South Africa to Dronning Maud Land by a commercial operator, Adventure Network International (ANI) Preliminary investigations on the construction of a compacted snow airstrip in the Prydz Bay region of East Antarctica
2002	First Dronning Maud Land air network (DROMLAN) workshop hosted by the Alfred Wegener Institute in Bremerhaven
2004	COMNAP paper ATCM XXVII WP010: <i>Guidelines for the Operation of Aircraft near Concentrations of Birds in Antarctica</i> ; adopted as ATCM XXIX Resolution 2 (2004), Guidelines for Aircraft near Concentrations of Birds
2008	COMNAP report to ATCM XXXI advises of a review of the structure, management and use of the <i>AFIM</i>
2011	COMNAP report to ATCM XXXV and input into the ATCM Intersessional Contact Group on Review of Recommendations of an Operational Nature, advises of COMNAP's intention to develop an electronic format for the <i>AFIM</i>
2012	Proposed new online <i>AFIM</i> format presented to COMNAP AGM Online workshop on the revised <i>AFIM</i> format planned for 2013

The Dronning Maud Land Air Network (DROMLAN)

Ulf Hedman and Hartwig Gernandt

The DROMLAN operates intercontinental flights from Capetown, South Africa, to blue ice runways at Novolazarevskaya (Russia) and Troll (Norway) stations in Dronning Maud Land (DML), and intracontinental ski-plane flights between these and other stations in the region. It is a partnership between the national Antarctic programmes with research activities in DML. The initial five years of the network began with the signing of DROMLAN Terms of Reference in August 2003 by 11 countries operating in the DML region: Belgium, Finland, Germany, India, Japan, the Netherlands, Norway, Russia, South Africa, Sweden and the United Kingdom. A second Terms of Reference signed in 2009 ensures continued co-operation without stipulating a definite time period.

The objective of DROMLAN is to organise and rationalise the provision of air transportation to, from and within DML during each summer season.

The regular DROMLAN activities during an Antarctic season are:

- Intercontinental flights between Cape Town and Antarctica
 - Since the beginning of the DROMLAN co-operation the long-range Ilyushin cargo aircraft IL-76TD has performed more than 100 flights.
- Operation and maintenance, through the national operators Russia and Norway, of two blue ice runways at Novolazarevskaya and Troll stations
 - The blue ice runways are also used by other wheeled aircraft in support of individual national programmes.
- Intracontinental Antarctic flights with small ski-equipped aircraft for transport of personnel and cargo to the stations, and for scientific flight missions and other national activities

Two small Basler BT-67 aircraft cover the requirements of DROMLAN members. The Alfred Wegener Institute also operates a BT-67 research aircraft, Polar 6, which can be made available for DROMLAN operations. If needed, additional aircraft can be mobilised for scientific support.

- A flight weather forecast service for intercontinental and Antarctic flight operations, distributed from Neumayer Station III (Germany)

The co-operation has offered easier and more-frequent access to DML. Sharing of costs has made more-affordable both the transportation of personnel and scientific cargo, and the support for scientific activities at research stations and in the field, including airborne research missions in DML

and beyond. It has also resulted in increased co-operation in science activities and support.

The DROMLAN members have made joint investments to upgrade infrastructure for intercontinental flights and to establish the flight weather service. In addition to these basic elements, the national programmes provide various in-kind contributions beyond their national needs, such as fuel, ski-ways, weather information and accommodation for pilots.

A DROMLAN Steering Committee with membership from involved national programmes is the decision-making body, co-ordinating all air operations and activities. The Steering Committee meets annually as a regional break-out group at the COMNAP AGM. There are also regular pre- and post-season meetings hosted by one of the DROMLAN members. An operating agent – currently the Antarctic Logistics Centre International (ACLI), based in Capetown – provides the operational management of all flights.

The partnership has proved so successful that over the 10-year period of operation, in addition to a reliable and efficient network for flight management, other tools have developed, such as co-ordinated search and rescue and medical evacuation, shared maritime transport, centralised communication, and a common meteorological forecasting service using data collected to continuously improve forecasting models.

There are now 10 to 12 flights from Capetown to Novolazarevskaya or Troll each summer season, with up to 320 round-trip passenger movements of scientists and logistics staff, allowing for researchers to have greater freedom and cost effectiveness in choosing their period of stay on the continent. In each of the last five years sixty tonnes of cargo – scientific equipment, consumables and spare parts – have been carried between Capetown and DML.

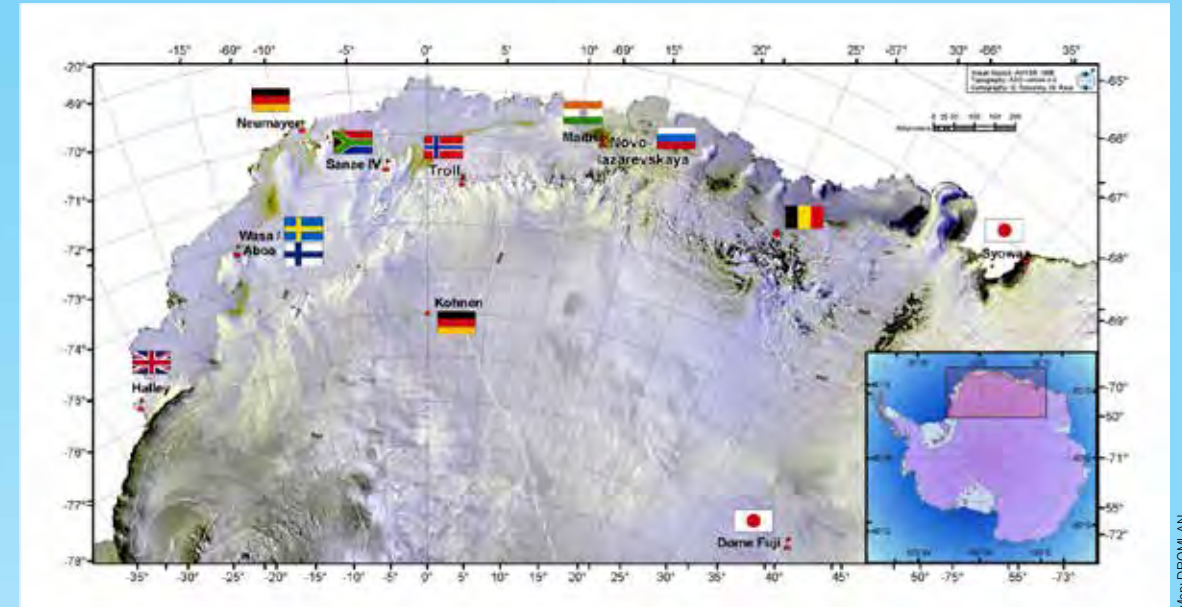
DROMLAN is a unique working example of international co-operation, sharing logistic infrastructure in the field of air operations. A great part of the national activities now carried out in Antarctica by the DROMLAN partners would not be possible without the regular intercontinental flights and the well-established air operations within the Antarctic.

Ulf Hedman

DROMLAN representative for Sweden 2003–11
DROMLAN Executive Directorate 2012–present
SCALOP–COMNAP representative for Sweden 1994–2013
Swedish Polar Research Secretariat 1993–present

Hartwig Gernandt

DROMLAN representative for Germany 2003–11
DROMLAN Executive Directorate 2012–present
SCALOP–COMNAP representative for Germany 1998–2009
Alfred Wegener Institute 1992–present



DROMLAN map showing national Antarctic programme stations in the Dronning Maud Land area



The Ilyushin 76 (IL-76) and Basler 67 (BT-67) aircraft at ice runway in the Dronning Maud Land area

Shipping Operations and Hydrography

Shipping has been the traditional way of accessing Antarctica since the first sealing and whaling activities in the region in the 1800s. Ship access is fundamental to transporting supplies, and, for many national programmes, personnel. Ships are used as platforms for a range of Southern Ocean research. The 2012 *Antarctic Telecommunications Operators Manual* lists 48 Antarctic vessels, including naval vessels, that are used to support Antarctic operations. Operating a ship for Antarctic work is expensive, and a number of national programmes have collaborative arrangements to share ship resources. COMNAP has a Shipping Expert Group, and prior to this had a Ship Operations Working Group (SHIPOPS).

The initial COMNAP focus in relation to shipping was the inadequacy, and in many cases lack of Antarctic hydrographic maps and charts. The topic was on the agenda of the first COMNAP meeting in 1989, and a discussion paper was presented. ATCM Recommendation XV-19 (1989) on hydrographic survey and charting recommended that governments *increase their mutual co-operation in the hydrographic survey and charting of Antarctic waters in order to contribute to the safety of navigation, the protection of the Antarctic environment and dependent and associated ecosystems, and for scientific purposes.*

The International Hydrographic Organisation (IHO) formed a Permanent Working Group on Co-operation in Antarctica in response to ATCM Recommendation XV-19 (1989). COMNAP is an invited observer to the annual HCA meetings and has had an ongoing relationship with this IHO Working Group, with representatives of COMNAP regularly attending its meetings.

The theme of the need for improved hydrographic data has been repeated at many ATCMs, including ATCMs XIX (1995), XXVI (2003) and XXXI (2005). Most recently ATCM Resolution 5 (2008) recommended governments take action directed at *Improving hydrographic surveying and charting to support safety of navigation and environmental protection in the Antarctic region*; and Resolution 2 (2010) noted the increase in shipping activity associated with the International Polar Year (IPY) in 2007–08 and requested parties to ensure hydrographic information gained through IPY activities be provided to their hydrographic organisations.

The slow progress and repeated ATCM resolutions are indicators of the challenges of obtaining the resources necessary to provide robust hydrographic information in Antarctic coastal areas. The region is still sparsely visited, national programme supply ships and tourist vessels tend to cover the same routes every season, and only a few research and naval vessels have sophisticated hydrographic equipment

or expertise on board. Dedicated hydrographic voyages have high costs relative to the level of demand for detailed charting information. COMNAP has recently worked with the HCA to develop a simple method and a recording sheet for ships engaged in logistics and scientific activity, which do not have dedicated hydrographic tasking, to collect hydrographic data.

In the mid-1990s the International Maritime Organization (IMO) gave attention to polar shipping and began work on a Mandatory Polar Shipping Code. The main polar focus of the IMO work was the Arctic, but the code was expected to also have implications for Antarctic shipping, and COMNAP tasked its SHIPOPS group to monitor these developments, to provide expert advice for COMNAP contribution to Antarctic Treaty deliberations, and to liaise with IAATO. A number of papers were developed for consideration by the ATCM and for input into the ATME on Guidelines for Antarctic Shipping and Related Activities in 2000. *Guidelines for Ships Operating in Arctic Ice-covered Waters* were approved by the IMO in 2002, and work continues on incorporating Antarctic requirements into broader IMO guidelines for ships operating in polar waters.

In 1999 the COMNAP Executive Secretary proposed that COMNAP develop a vessel positioning reporting system. An email-based Ship Position Reporting System (SPRS) was implemented in the 2001–02 season and has been upgraded and revised since then. Information is made available to national programmes and marine safety authorities with search and rescue co-ordination responsibilities in the waters below 60° south. IAATO and other third party vessels can enter information into the system. IAATO has since implemented its own vessel reporting system. The importance of both these systems as a tool in search and rescue situations has been recognised by the ATCM. The COMNAP report to ATCM XXXIII in 2010 notes that the SPRS was used as a tool during a search and rescue communications exercise carried out by the New Zealand Rescue Co-ordination Centre in January 2010 and received positive reviews.

More recently COMNAP has also addressed marine pollution topics that have been raised by the SCAR Group of Specialists on Environmental Affairs and Conservation (GOSEAC), and at the ATCM–CEP. Papers on the use of ballast water, anti-fouling biocide paints, marine acoustic systems and use of heavy fuel oil have been provided for ATCM consideration (refer to Chapter 3).

COMNAP has regularly worked with IAATO on shipping topics, holding joint workshops and preparing joint papers for Antarctic Treaty meetings.

Table 7: COMNAP activities related to Shipping Operations and Hydrography

Year	Activity
1989	Discussion paper on Antarctic maps and charts presented to the first COMNAP meeting
1992	Survey of national programmes on needs and priorities for Antarctic hydrographic surveying and charting COMNAP–SCALOP representation at the inaugural meeting of the IHO Permanent Working Group on Cooperation in Antarctica
1997	SCALOP Working Group on Ship Operations tasked to review the draft IMO Polar Shipping Code
1998	COMNAP paper ATCM XXII WP013: <i>Code of Safety for Ships Operating in Polar Waters</i> COMNAP members surveyed on qualifications of navigation officers and communications equipment requirements for Antarctic vessels, and information on current Antarctic resupply and marine science vessels
1999	COMNAP paper ATCM XXIII IP026: <i>Antarctic Shipping</i> COMNAP paper ATCM XXIII IP027: <i>The Training Requirements for Ships' Officers and on Navigation/Communication Equipment for Antarctic Vessels</i>
2000	Four COMNAP papers provided to the Antarctic Treaty Meeting of Experts on Guidelines for Antarctic Shipping and Related Activities: ATME WP004: <i>An Assessment of Environmental Emergencies Arising from Activities in Antarctica</i> ATME WP006: <i>Working Paper on the Polar Code</i> ATME WP007: <i>The Training Requirements for Ships' Officers and on Navigation/Communication Equipment for Antarctic Vessels</i> ATME IP001: <i>Information Paper on Antarctic Shipping</i>
2001	Web-based Ship Position Reporting System (SPRS) set up for use on a voluntary basis for the 2001–02 season
2002	COMNAP paper ATCM XXV IP040: <i>The Proposed Antarctic Shipping Guidelines</i>
2003	ATCM XXVI sought COMNAP technical advice on the applicability to the Antarctic of the recently adopted IMO <i>Arctic Shipping Guidelines</i>
2004	COMNAP paper ATCM XXVII WP009: <i>The Applicability to the Antarctic of the IMO "Guidelines for Ships Operating in Arctic Ice-Covered Waters"</i>
2005	COMNAP paper ATCM XXVIII IP067: <i>The Use of Heavy Fuel Oil in Antarctic Waters</i> COMNAP paper ATCM XXVIII IP121: <i>The Use of Ballast Water in Antarctica</i>
2006	COMNAP paper ATCM XXIX IP082: <i>The Use of Anti-fouling Biocide Paints by National Antarctic Program Vessels</i> COMNAP paper ATCM XXIX IP083: <i>The Use of Ballast Water in Antarctica</i>
2007	COMNAP paper ATCM XXX IP050: <i>International Coordination of Hydrography in Antarctica: Significance to Safety of Antarctic Ship Operators</i> ; prepared in conjunction with IHO HCA Working Group Consideration of energy use by ships added to the SHIPOPS terms of reference
2008	Update of SPRS to collect a wider variety of ship and voyage information
2009	Inclusion of automatically generated "KLM" file from the most recent reporting of positions in the SPRS
2011	COMNAP Shipping Expert Group recommendation to request observer or consultant status at the IMO Design and Equipment (DE) subcommittee consideration of the Polar Code, or to create a Working Group of representatives of COMNAP parties that are within the IMO DE subcommittee

Telecommunications



The cover of the COMNAP ATOM

Telecommunication has been on the Antarctic Treaty agenda since the first ATCM in 1961. Recommendation ATCM I-XI proposed a meeting of specialists to discuss telecommunications facilities needed for scientific, technical and other purposes in the Treaty area. ATMEs on telecommunications were held in 1963, 1969 and 1978.

COMNAP has maintained an *Antarctic Telecommunications Operators Manual (ATOM)* since 1993. The *ATOM* is an evolution of the *SCAR Antarctic Telecommunications Manual (SCARCOM)* that ATCM Recommendation X-3 (Washington, 1979) had invited SCAR to prepare. The information in the *ATOM* is updated annually by national Antarctic programmes, and is now maintained on the COMNAP website.

Over the time period of the *SCARCOM* and *ATOM*, Antarctic telecommunications technology has undergone a revolution: from HF radio communications to satellite communications integrated into the world-wide public switched telephone system and the Internet network. Of 83 stations listed in the 2013 *ATOM*, 55 list email addresses, and, of 48 ships, 28 have email addresses. The *ATOM* has



Photo: G. Wraat

Satellite phones now offer direct communication from the field in Antarctica to anywhere else in the world.

become an Antarctic communications directory of direct telephone, fax and email contacts. It is no longer limited to stations and ships, and includes contact details for national Antarctic programmes, search and rescue authorities and a number of other stakeholders.

There is now an increasing demand for high-bandwidth, low-cost satellite systems. A workshop on a co-operative approach to the provision of increased broadband capability into Antarctica was held with four commercial suppliers at COMNAP XXIV in 2012.

Table 8: COMNAP activities related to Telecommunications

Year	Activity
1991	SCALOP initiates review of the <i>SCAR Antarctic Telecommunications Manual (SCARCOM)</i>
1993	Revised <i>Antarctic Telecommunications Guidance Manual</i> format provided to managers for provision of their annual advance exchange of operational information; renamed <i>Antarctic Telecommunications Operators Manual (ATOM)</i> First printing and circulation of <i>ATOM</i> September 1993
2000	<i>ATOM</i> published on COMNAP website
2012	COMNAP workshop on provision of broadband capability into Antarctica

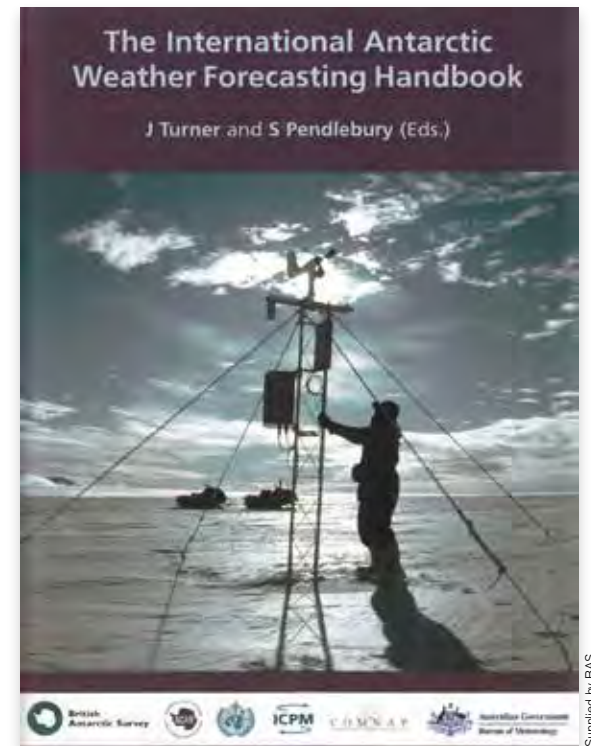
Meteorology

The IGY had demonstrated just how valuable Antarctic meteorological information was for forecasting, both within regions of Antarctica and for the wider purposes of national forecasting in the countries around Antarctica. Meteorology was thus given a high priority by SCAR from 1958 onwards, and SCAR WGL members were closely involved in ensuring the daily data were transmitted out of Antarctica to World Meteorological Organization (WMO) nodal centres.

COMNAP took on the practical connection with the WMO Working Group on Antarctic Meteorology (WGAM) from the first COMNAP meeting in 1989. SCAR continued to focus on the science. The ATME on Air Safety in Antarctica in May 1989 encouraged attention to the improvement of meteorological data and services. ATCM Recommendation XV-18 (1989) on meteorological and sea ice information services asked the WMO WGAM, COMNAP and SCAR to consider ways to develop and improve meteorological and sea ice information services for maritime and air navigation in Antarctica, and to make recommendations to the ATCM. The Chair of the WMO WGAM attended the 1989 COMNAP meeting and COMNAP further engaged with the WMO on this topic over the next two years. The COMNAP report to ATCM XVI in 1991 noted the need for continued active dialogue with the WMO WGAM, but concluded there were no specific requirements for further joint or individual action with respect to the network of observing stations, or the further development of analysis and forecast centres.

COMNAP has continued to work with the WMO WGAM, resulting in presentations at COMNAP meetings on various weather forecasting topics, which have contributed to enhancing weather forecasting capabilities at the Antarctic stations.

Following a workshop in Hobart in 1998 an *International Antarctic Weather Forecasting Handbook* was developed, with contributions from personnel from various national Antarctic programmes. This handbook has since been updated several times and is made available through the British Antarctic Survey (BAS) website. The current version (2004) was published by BAS in collaboration with SCAR, the WMO, the International Commission on Polar Meteorology, COMNAP and the Australian Bureau of



The cover of The International Antarctic Weather Forecasting Handbook

Meteorology. There have also been several workshops on Antarctic meteorology and forecasting in the last decade, organised by an international Antarctic Meteorological Observation, Modelling, and Forecasting Planning Committee. Reports on these workshops have been provided at COMNAP meetings.

With initiatives from the WMO Working Group, individual Antarctic programmes and groups of scientists, COMNAP's role in this area has been one of facilitating provision of information to members rather than of taking a proactive role. Presentations on meteorological topics at the Symposiums in 1994, 1996, 1998, 2004 and 2012 demonstrate the ongoing interest in improving and sharing information on meteorological technologies.

Table 9: COMNAP activities related to Meteorology

Year	Activity
1989	COMNAP meeting discussion of ATCM Recommendation XV-18 on meteorological and sea ice information services with WMO WGAM Chair
1998	First International Symposium on Operational Weather Forecasting in Antarctica held in Hobart
2000	CD of an <i>International Handbook on Antarctic Meteorology</i> provided to COMNAP members for review

Search and Rescue

The first explicit mention of search and rescue in COMNAP meeting records is in COMNAP XVII in 2005, in the context of increased national programme and tourism activity generally, and an anticipated increase in activity for the IPY in 2007–08. The AIROPS Working Group undertook to identify current national search and rescue (SAR) arrangements for aircraft operations and to develop principles for SAR co-operation between operators. A Safety Working Group was set up in 2006 and tasked with developing an ATCM paper on current approaches and relationships with Rescue Co-ordination Centres (RCCs) in Argentina, Australia, Chile, New Zealand and South Africa.

Since then, COMNAP and several national programmes have worked with the RCCs and IAATO, holding workshops, undertaking scenario exercises and developing advice for the ATCM.

A Special Working Group Meeting on Search and Rescue was held at ATCM XXVI in May 2013, and ATCM Resolution 8 (2012) invited COMNAP to provide an update to this meeting on actions resulting from the COMNAP SAR workshops. In response, COMNAP presented WP017, which provided the update.



Delegates at COMNAP SAR Workshop I, Valparaiso/Viña del Mar, Chile, August 2008

Photo: DIRECTEMAR



Delegates at COMNAP SAR Workshop II, Buenos Aires, Argentina, November 2009

Photo: Direccion Nacional del Antartico (DNA)

Search and Rescue – Towards a Safer Future

Antoine Guichard

Few emergency response assets are available in the Antarctic. This has engendered a strong tradition of international co-operation in Search and Rescue (SAR), which arguably dates back to 1916 and the legendary rescue of the Shackleton expedition. A succession of four ships was sent to attempt to rescue Shackleton's crew. The first three ships were all forced to turn back in adverse conditions. The fourth ship, the *Yelcho*, loaned by the Chilean government, eventually rescued the men on Elephant Island on 30 August 1916.

More Antarctic SAR events have followed since then. If few have become as famous, almost every event has reinforced the importance of international co-operation in saving lives in the remote Antarctic region.

National Antarctic programmes have generally adopted the principle of designing, alone or as a group, contingency plans to meet their own needs. Systems are in place to cover most emergencies likely to arise within planned operations. When there is a need for further help national programmes can call upon each other in the spirit of Recommendation I-X of the first ATCM (Canberra, 1961) that reaffirms . . . *the traditional Antarctic principle that expeditions render all assistance feasible in the event of an emergency request for help.*

There had for many years been little call upon the global, international SAR system organised under the auspices of the IMO and the ICAO, to the extent that some had mistakenly assumed that this system did not cover the Antarctic. Under this system the national SAR authorities of South Africa, Australia, New Zealand, Chile and Argentina share responsibility for co-ordinating Antarctic SAR. Each nation's maritime SAR region extends south to the Antarctic coast, and aeronautical SAR regions extend south to the Pole. Potential conflict between Antarctic sovereignty claims and national SAR responsibilities under IMO/ICAO is dealt with by it being up to each operator to decide when to call on a SAR authority for help.

At the beginning of the 21st century an increase in Antarctic activity was causing concern in relation both to the capability to respond to emergencies and to their possible impact on national Antarctic programmes. Of particular concern were large passenger vessels – their rescue would require considerable resources, with almost inevitable major disruption to nearby stations, vessels and the research programmes they support. Recognising these new challenges in 2006–07, COMNAP and SAR authorities held comprehensive discussions that confirmed a high level of complementarity and obvious potential for collaboration

between Antarctic operators and SAR authorities. SAR authorities have the co-ordination expertise and capabilities, the access to IMO and ICAO instruments to collect information, and the power to direct any best-placed government or private asset to respond to an emergency.

Antarctic operators have local assets, local knowledge and vital Antarctic expertise.

In 2007 COMNAP, with leadership from José Retamales (then COMNAP Chair), Manuel Catalan, John Hall, Kazuyuki Shiraishi and me, initiated a project with the relevant national SAR authorities: "Towards Improved SAR Coordination and Response in the Antarctic". It focussed on two actions:

- Providing the Antarctic community with a clearer picture of SAR issues. IP099 Search and Rescue in the Antarctic, was prepared by COMNAP in collaboration with SAR authorities and presented to ATCM XXXI in 2008. The paper formed the basis of a keynote presentation to a special ATCM plenary session.
- Improving links amongst Antarctic operators and national SAR authorities. Two international workshops were held: in August 2008 in Valparaiso, Chile, and in November 2009 in Buenos Aires, Argentina.

The workshops brought together all relevant national SAR authorities and many Antarctic operators. They allowed significant improvements in understanding, exchange of information and collaboration – both formal and informal – between all participants.

The Australian Regional Co-ordination Centre (Colin Barr and Chris Wright) and the Chilean navy (Ivan Valenzuela) were key supporters for these initiatives.

This project demonstrated the value of establishing strong, effective links with SAR authorities, provided a framework for developing such links, and started to establish them. The vision is for a safer future where SAR authorities are better placed, if and when called upon, to promptly and efficiently help co-ordinate SAR in the Antarctic in co-operation with national Antarctic programmes and other operators – increasing the chances of a successful rescue while keeping disruptions to research programmes to a minimum.

Shackleton could only have dreamed of such a future.

Antoine Guichard
COMNAP Executive Secretary 2003–09

Table 10: COMNAP activities related to Search and Rescue

Year	Activity
2006	COMNAP members surveyed on national SAR arrangements for aircraft operations SAFETY Working Group set up and tasked with developing an ATCM paper on current approaches and relationships with RCCs in Argentina, Australia, Chile, New Zealand and South Africa
2008	COMNAP paper ATCM XXXI IP099: <i>Search and Rescue in the Antarctic</i> COMNAP Antarctic SAR Workshop I hosted by the Chilean Directorate General of Maritime Territory (DIRECTEMAR) in Valparaiso – Toward Improved SAR Coordination and Response in the Antarctic – brought together operational staff from relevant RCCs, national programmes and IAATO
2009	COMNAP paper ATCM XXXII WP047: <i>Towards Improved Search and Rescue Coordination and Response in the Antarctic</i> COMNAP Antarctic SAR Workshop II hosted by Argentina's Dirección Nacional del Antártico (DNA) in Buenos Aires; representation from RCCs, IAATO, IMO, COMNAP and several national Antarctic programmes
2010	COMNAP paper ATCM XXXIII IP076: <i>Towards Improved Search and Rescue in the Antarctic</i> presented results from 2008 and 2009 COMNAP SAR workshops
2012	COMNAP agreed to provide an update on actions resulting from the COMNAP SAR workshops to a Special Working Group on Search and Rescue at ATCM XXXVI in May 2013
2013	COMNAP paper ATCM XXXVI WP017: Update on actions resulting from the two COMNAP SAR workshops, <i>Towards Improved Search and Rescue Coordination and Response in the Antarctic</i> COMNAP participated in IAATO SAR Workshop; presented SAR Response in Antarctica: An Update

Medicine

Both SCAR and COMNAP have addressed Antarctic medical issues. Papers on medical topics have been presented at COMNAP–SCALOP Symposiums, and in 2002 "Medical Support and Standards" was one of six key Symposium themes.

In 1994 the SCAR Working Group on Human Biology and Medicine met with COMNAP and proposed the development of standard medical screening criteria across all programmes. COMNAP decided that too much variation in the requirements for different countries and Antarctic activities precluded the development of standard criteria. In the last decade, with increasing exchange of personnel between national programmes, more attention has been given to medical topics within COMNAP, and in 2003 a COMNAP network of people responsible for medical screening (MEDINET) and a Medical Co-ordinating Group were established.

MEDINET has worked on a number of projects aimed at improving medical support and risk management across Antarctic programmes, including a minimum standard for medical screening, documentation for aero-medical evacuation and a database of medical capabilities and telemedicine.

Many of the members of the SCAR Working Group on Human Biology and Medicine (WGHB&M) were also members of MEDINET. In 2010, at the request of the members of both of these groups, SCAR and COMNAP combined their medical groups into a single medical Expert Group, the Joint Expert Group on Human Biology and Medicine, reporting on practical medical problems to COMNAP and on research to SCAR.

Table 11: COMNAP activities related to Medicine

Year	Activity
1991	Survival training and medical support an additional agenda item for the COMNAP AGM; noted value in learning from experience in the Arctic
1992	Contact points identified for exchange of information on personnel management topics and related health care practices; a COMNAP Human Resources Subgroup established to draw on the advice and experience of the SCAR Working Group on Human Biology and Medicine (WGHB&M), and to organise a workshop on practical guidelines for national programmes
1993	Discussion paper presented to COMNAP V covering standards and procedures for medical screening of programme travellers to Antarctica
1994	Joint session COMNAP Human Resources Subgroup and SCAR WGHB&M
1995	Survey of national programme standards and criteria for medical screening
2002	Antarctic medical support and standards a SCALOP Symposium topic Second survey of national programmes on medical standards
2003	Medical Network (MEDINET) of persons who had responsibility for medical screening established – focussing on operational medicine (compared with the SCAR WGHB&M focus on medical research); a COMNAP Medical Co-ordinating Group to guide the work of the network and to provide a link to COMNAP also established
2005	Two-day MEDINET workshop and joint meeting with SCAR EGHB&M, which initiated <ul style="list-style-type: none"> a draft common format for presentation of medical standards, to be circulated around all programmes, requesting information on their medical standards and comment on possible development of common standards on screening requirements and fitness a database of medical capabilities at stations, vessels and field camps consideration of a database of medical events a plan to develop treatment guidelines for acute altitude sickness
2007	Three-day MEDINET meeting <ul style="list-style-type: none"> developed a proposal for an "Antarctic Health Register Data Linkage Project", to develop readily accessible information for prevention, management and treatment of common medical problems in Antarctica developed an evacuation form, and invited IAATO participation initiated development of database on existing medical capabilities initiated preparation of document on common medical themes for a major-incident plan
2008	MEDINET action on <ul style="list-style-type: none"> minimum standards for medical screening database of medical capabilities aero-medical evacuation documentation on COMNAP portal medical major-incident planning standards guidelines on altitude sickness prevention and treatment guidance on management of potential infectious disease outbreak
2010	Medical Expert Group Infectious Disease Workshop Joint SCAR–COMNAP Expert Group on Human Biology and Medicine formed
2011	COMNAP website hosts joint Medical Expert Group discussion forum and document server

Personnel Recruitment and Training

Selection and training of personnel to staff Antarctic stations and support field operations are key factors in running a successful Antarctic programme. Training first arose on the COMNAP agenda in 1991. The 1992 Symposium had three papers related to human resource management; in 1994 “Selection and Management of Antarctic Personnel” was one of four Symposium themes, in 2000 “Human Resources Management” one of four themes, and in 2002 “Selection and Recruitment” one of six themes.

In 1997 ATCM XXI asked COMNAP and IAATO to collect information on education and training of expeditioners and other visitors to Antarctica. A survey of members identified that national programme training commonly covered health and safety, environmental management practices and field operations, as well as job- and location-specific training.

A forum on education and training was held in conjunction with the 1998 COMNAP meeting and a Training Network (TRAINET) and a COMNAP Co-ordinating Group on Education and Training (EDAT) were established. At the forum an IAATO representative noted that tourist operators took a lot of leads from the training regimes developed over the years by national Antarctic operators. In 2009 the two training groups were replaced by a Training Expert Group.

As a result of the TRAINET work, in 2007–08 a comprehensive library of training-related material in various languages was developed. It incorporated course syllabuses, standard operating procedures, and training regulations and policies.

Table 12: COMNAP activities related to Training

Year	Activity
1991	Survival training and medical support an additional agenda item for COMNAP annual meeting; noted value in learning from experience in the Arctic
1996	Italian survey of national programmes on training and information provided to field personnel tabled at COMNAP annual meeting
1997	ATCM XXI asked COMNAP and IAATO to collect information on the education and training of expeditioners and other visitors to Antarctica and report back to ATCM XXII
1998	COMNAP paper ATCM XXII IP005: <i>Education and Training</i> Forum on education and training Training Network (TRAINET) and an oversight COMNAP Co-ordinating Group on Education and Training (EDAT) established
1999	COMNAP paper ATCM XXIII IP027: <i>The Training Requirements for Ships' Officers and on Navigation/ Communication Equipment for Antarctic Vessels</i> COMNAP paper ATCM XXIII IP028: <i>Education and Training</i>
2001	TRAINET workshop: sharing of information on training activities Common training checklist completed
2002	Japan, China and Republic of Korea established a regional training network Section added to COMNAP website for training material to be posted
2003	AEON–TRAINET Workshop on Training in Environmental Management
2006	TRAINET workshop Further work on the COMNAP training portal, including: <ul style="list-style-type: none"> • access to oil spill prevention and clean-up training and to oil spill response equipment • training exchange of information • standard operating procedures
2008	Comprehensive library of training material developed, including course syllabuses, standard operating procedures and training regulations and policies, in various languages
2011	COMNAP website hosts Training Expert Group discussion forum and document server

Safety

Exchange of information and experience relating to safety of operations has been included in the work of many of the COMNAP and SCALOP subgroups over the years. The SCALOP meetings in particular have provided a forum where operators have learned from each other by sharing experience on incidents that have occurred in the previous Antarctic season. The Air Safety and AIROPS Working Groups, and the Air Expert Group have regularly reviewed Antarctic air incidents.

In 2006 COMNAP established a Safety Working Group to complement the approach where each group discusses safety issues relevant to its domain of competence. The terms of reference of the new group included sharing and reviewing contingency plans and planning, and emergency policies and practices used in Antarctica; improving and monitoring the Accident, Incident and Near Miss Reporting (AINMR) system; working with other COMNAP groups on common safety issues; and considering safety initiatives that would benefit national programmes.

The AINMR section on the COMNAP members' website enables members to summarise and share information on accidents and incidents in order to avoid similar events. When a new record is entered by any of the COMNAP members, all the other member national Antarctic programmes are automatically alerted to the new entry and are provided with a link to quickly review the incident. Circumstances that may be relevant to a programme's procedures can then be reviewed and changed as needed to enhance the safety of future operations.

In 2011 “safety” was added as a standing item to the COMNAP AGM agenda and there is a Safety Expert Group and website forum.



Photo: W. Orcheston, Antarctica New Zealand Pictorial Collection: 66/67
Mt Erebus expedition, 1966–67



Photo: G. L. Martin, Antarctica New Zealand Pictorial Collection: TAE 56/68
Dog team sets out to find route up Skelton Glacier to Polar Plateau, 1957–58

Field Operations

Field operations in polar regions face a combination of cold, remoteness, extreme weather, snow and ice conditions, and, for Antarctica, the requirements of the Antarctic Treaty System, especially with regards to the handling of waste. These create both planning and operational challenges.

There have been immense changes in field technology since the IGY: from dog sledges and converted farm tractors to skidoos and specialist amphibious snow track vehicles; from HF radio communications to satellite technology and Internet connectivity in field camps; from diesel generators to solar panels.

While there have been no dedicated COMNAP field operations groups, exchanges in SCALOP and various subgroups have related to field operations, for example medical practices, fuel handling, waste management and telecommunications technology. There have also been Symposium presentations on field operations and safety, and on overland traverses and technology.



An IGY field camp, 1957

Photo: Antarctica New Zealand Pictorial Collection



Modern field science support camp on Lake Vanda

Photo: G. Wyatt

Antarctic Station Construction and Operations

A broad range of COMNAP activities relate to the operation of stations: construction, engineering, fuel management, waste management, energy management, environmental impacts of station construction and operation, and emergency response and contingency planning. Work in several of these areas has focussed on managing environmental impacts of stations and operations, and is covered in Chapter 3 of this book. With financial pressure increasing in many national programmes in recent years, improved efficiency is increasingly becoming a driver for collaboration on Antarctic station construction and operation.

“Buildings” was one of the six themes of the First Symposium on Antarctic Logistics in 1962, with incinerator latrines (incinolets), lightweight portable field huts, water- and fuel-supply, fire security, and design and construction of new stations among the topics of the 24 presentations. Station construction and engineering have continued to be a topic both in the Symposiums and of informal exchanges within the SCALOP and COMNAP networks. A Best Available Technologies (BAT) COMNAP Working Group set up in the mid-1990s, along with the previous Energy Management Working Group (EWG) and Energy Management Network (ENMANET) and the current Energy and Technology Expert Group, has looked at a variety of aspects of station technology.

ATCM Recommendation XV-17 (1989): The Establishment of New Stations, urged Parties to the Antarctic Treaty to avoid excessive concentration of stations and facilities, and to consult with other national programmes with facilities in the vicinity in the planning of new stations and associated logistics operations. Station siting was on the agenda of COMNAP meetings II, III and IV from 1990 to 1992. At COMNAP II in 1990 it was suggested that a set of guidelines for siting of new stations be developed. There is no evidence that these eventuated.

Environmental effects of concentrations of stations and the benefits of collaboration and sharing of facilities were raised at ATCM XXIX–CEP IX in 2006. COMNAP surveyed members in 2007 to gather information on existing collaboration and to identify new opportunities to share logistics facilities and efficiencies and to exchange cost saving ideas.

In principle, sharing facilities is appealing, considering the capital and operating costs of Antarctic stations, and is consistent with the co-operative approach of the Antarctic Treaty. The reality is that political agendas, including the requirement for a country to operate an Antarctic research programme if it is to become Consultative Party to the Antarctic Treaty, along with the complexities of international operations and differences in national science priorities, discourage truly multinational facilities. The Netherlands is the only Antarctic Treaty Consultative Party without a station separate from any other national programme, and there are only a few facilities listed on the COMNAP website as operated by more than one country: Concordia (France–Italy), Law-Racovita-Negoita (Australia–Romania) and Dallmann Laboratory at Carlini Station (Argentina–Germany).

The pragmatic solution, demonstrated by the large degree of collaboration shown in the Information Papers presented to the ATCM in 1998 and 2008 (Appendix 3), is that while most stations are constructed and managed by one country, they host scientists from other countries, particularly in support of multinational projects. There is also extensive collaboration by national programmes in the operation of ships and aircraft.

Recent decisions on construction – of, for example, stations being built or planned by India, China and Republic of Korea – have all been preceded by consultation and advice from countries with adjacent stations or stations in similar locations.

Table 13: COMNAP activities related to Antarctic Station Construction and Operations

Year	Activity
1990	Discussion paper circulated to members on siting of stations
1991	Subgroup on Siting of Stations established, chaired by Chile, with membership from China, Netherlands, Norway, Argentina, USSR and Brazil
1998	COMNAP paper ATCM XXII IP007: <i>Overview of Scientific and Operational Co-operation in Antarctica</i>
2005–06	Discussion at annual meetings of the environmental impact of excessive concentrations of stations and the benefits of collaboration and sharing of facilities
2007	Survey of national programmes to identify new opportunities to share logistics facilities, and to establish a mechanism to share efficiency and cost-saving ideas
2008	COMNAP paper ATCM XXXI IP092: <i>International Scientific and Logistic Collaboration in Antarctica</i>

Concordia: A French–Italian Research Station on the Antarctic Plateau

Yves Frenot and Massimo Frezzotti

Recognising the unique research opportunities offered by the Antarctic Plateau, the French and Italian Antarctic programmes agreed in 1993 to co-operate in developing a permanent research support facility at Dome C, high on the ice sheet: “Concordia Station” (75° 06’ S, 123° 23’ E; 3,220 metres above sea level). This station became in 2005 the third permanent station inland on the 14-million-square-kilometre Antarctic continent, beside Amundsen–Scott and Vostok stations. Facilities are designed for a maximum winter population of sixteen expeditioners: up to nine persons conducting scientific experiments and seven support staff.

The site of Dome C was originally selected for glaciological research: the EPICA programme, a European ice drilling project involving 10 countries, allowed reconstructing more than 800,000 years of palaeoclimate from the ice core collected at this site. Dome C has numerous other valuable scientific characteristics allowing research in several scientific fields: physics and chemistry of the atmosphere, earth geophysics, astronomy, astrophysics, satellite calibration/validation, human biology etc. Moreover, the station is considered by space agencies as a perfect space analogue. Currently about 40 projects are annually implemented at Concordia.

In a very harsh environment, access to Dome C, construction of the buildings, and annual resupply of

food, fuel and other goods remain challenges that benefit from the expertise and skill of the two associated countries, France and Italy. Special governance was established between the French Polar Institute (IPEV) and the Italian Antarctic Research Programme (PNRA), and the main responsibility for logistics activities was divided between the two groups: eg, Italy is in charge of medicine, air transport and telecommunications, and France implements the ground traverses between Dumont d’Urville and Concordia stations, as well as the main construction work and building maintenance. Italian and French technicians co-operate in all sectors.

This multinational expertise also benefits from the long history of the Antarctic community spirit. In particular, the numerous discussions we had with other colleagues in charge of Antarctic stations, especially through the COMNAP meetings, contributed to making the best choices of technology or practices. It is especially the case for the conception of the surface transport mode or for the building design concept that combines comfort and safety for the staff, protection of the environment and easy use for the science.

Yves Frenot
Director, French Polar Institute
and French COMNAP
representative 2005–13
Chair, CEP 2010–present

Massimo Frezzotti
Head, Antarctic Technical Unit
(ENEA-PNRA) and Italian
COMNAP representative
2011–13



Photo: K. Pierre, IPEV

Concordia Station

The Dirck Gerritsz Laboratory at Rothera Research Station: UK–Netherlands Collaboration

Dick van der Kroef and John Shears

The Dirck Gerritsz Laboratory at the UK Rothera Research Station opened in January 2013, as a result of an international collaboration between the British Antarctic Survey (BAS) and the Netherlands Organisation for Scientific Research (NWO).

The Netherlands is a signatory of the Antarctic Treaty, but does not have a research station of its own in Antarctica. For over 20 years the NWO has collaborated very successfully with BAS, and Dutch scientists have often used Rothera Research Station as a base for their polar research. In order to extend and enhance this existing collaboration the NWO and the Netherlands Ministry of Education, Culture and Science invested in building the Dirck Gerritsz Laboratory, which was built in partnership with BAS and the Royal Netherlands Institute of Sea Research (NIOZ). It is designed as a flexible docking station that provides space for four mobile laboratories, each built in a standard shipping container.

The laboratory allows the NWO to run a research facility in the Antarctic and to continue to use the existing facilities at Rothera Research Station. Scientists from the Netherlands will use the laboratory to continue their important studies into climate change, glaciology, marine biology and oceanography.

The laboratory was named after a Dutch explorer, Captain Dirck Gerritsz, who was part of a fleet of five ships to find a trade route via South America to Asia. Whilst sailing round the southern tip of South America in 1599 his ship *Annunciation* was blown southwards, and he may have been the first person to gain sight of Antarctica.

Dick van der Kroef
COMNAP Netherlands
representative 2008–present
Deputy Director NWO Division
for Earth and Life sciences
2004–present
Netherlands delegate to the ATCM
2009–present

John Shears
COMNAP UK representative
2012–present
Board Member for Operations and
Engineering, British Antarctic
Survey 2010–present
Head, Environment and
Information Division, British
Antarctic Survey 2006–10
UK Delegate to the ATCM
1991–present

Chinese Kunlun Station

Qu Tanzhou

Dome A has often been referred to as the “inaccessible pole”, owing to its harsh natural environment. It is also an ideal site for study of global climate and environmental change, and for astronomical observation, thus attracting much scientific attention.

Since 1996 the Chinese National Antarctic Research Expedition (CHINARE) has carried out 10 traverses from the Chinese Antarctic Zhongshan Station in East Antarctica to Dome A. Kunlun Station was established at Dome A in January 2009. CHINARE has conducted comprehensive study in this area in glaciology, astronomy, mapping, meteorology, geology and biology. It has also carried out observation and research programmes in co-operation with Australia, the United States, Republic of Korea, and Japan, and has participated in the IPY flagship programme, Antarctic Gamburtsev Province (AGAP).

In the process of constructing the Kunlun Station we learned from the experiences of inland transportation and station building from other COMNAP members. Management rules were formulated for oil spill contingency planning, waste management, and environmental monitoring, based on COMNAP guidelines. Further construction work on the station, a deep ice-core drilling facility, an astronomical observatory and other facilities is proceeding as planned, and scientific research in different disciplines is also in steady progress.

With the station’s location 1,200 kilometres inland and at an elevation of 4,090 metres above sea level, the low oxygen levels, extreme cold and remoteness create construction and operational challenges for logistics support, personnel safety and emergency rescue. For example, when deep ice-core drilling, the expeditioners climb up to the surface to warm themselves at -32°C, after only 30 minutes in the ice pit, where the temperature 3 metres below the snow surface is -51°C.

Kunlun Station facilities have been constructed drawing on the expertise of a number of other COMNAP members, as well as previous Chinese experience. As an important heritage of the 2007–08 IPY, we hope it will become a valuable support base for field study in the Antarctic inland area, for both Chinese scientists and for scientists from all over the world.

Qu Tanzhou
Director General, Chinese Arctic and Antarctic Administration 2001–13
Chinese COMNAP representative 2010–13



Differs in a warming ocean Photo: G. K. Saba, SCAR-COMNAP Photographic Exhibition, 2012

Developing Effective Environmental Practices

Improving practices to minimise the environmental impact of human activities in Antarctica has been on the COMNAP agenda from its establishment. COMNAP has run a number of forums and developed operational guidelines for its members, working closely in appropriate areas with the Scientific Committee on Antarctic Research (SCAR). Working Groups and networks, and more recently Expert Groups, have provided opportunity for staff from different programmes to exchange information on technologies and procedures, and to learn from each other.

COMNAP members' practical knowledge has been repeatedly called upon by the Antarctic Treaty Consultative Meeting (ATCM), and COMNAP has consistently contributed to the deliberations of the ATCM and its Committee on Environmental Protection (CEP). Working Papers and Information Papers have been provided on a range of topics, and COMNAP has participated in intersessional consultation and Working Groups.

All human activities in Antarctica inevitably generate environmental impacts. There was little overt concern over these during the International Geophysical Year (IGY) and the negotiation of the Antarctic Treaty. With time, however, the development of conservation initiatives and a growing recognition of the impacts of waste dumping, station building and oil spills made it essential that sound environmental management became the new norm for all Antarctic operations. The Treaty gradually accumulated a variety of recommendations in this field. In 1991 the Protocol on Environmental Protection to the Antarctic Treaty laid out a new environmental framework.

The Antarctic environment was receiving significant international attention when COMNAP was established in 1988. The negotiation of the Convention on the Regulation of Antarctic Mineral Resource Activities (CRAMRA) had been successfully completed by the Antarctic Treaty Consultative Parties in June of that year, but it was never ratified, as international resistance to the exploration and exploitation of minerals in Antarctica increased. In response to these environmental concerns, efforts to implement CRAMRA ceased and negotiation of the Environmental Protocol began in November 1990. It was adopted by signature of all the Treaty Parties at the Eleventh Special ATCM (SATCM XI-2) in Madrid in October 1991. The Environmental Protocol designates Antarctica as a *natural*

“Environmental matters in Antarctica are subject to public concern and operators should not only be taking appropriate action but also should be seen to be doing so.”

– Mario Zucchelli, in COMNAP I Minutes, 1989

reserve, devoted to peace and science, and sets out legally binding environmental protection principles applicable to human activities in Antarctica. At the time of its adoption, it included annexes on environmental impact assessment, conservation of Antarctic fauna and flora, waste disposal and waste management and the prevention of marine pollution. A fifth and a sixth annex on area protection and management, and on liability due to environmental emergencies, respectively, have since been negotiated.

While the Protocol would not become legally binding until ratified by being passed into national law by all Consultative State Parties in 1998, its adoption in 1991 was a significant Antarctic Treaty development for the COMNAP members, who at the time were managing the majority of human activities in the Antarctic Treaty area. COMNAP, SCAR, and the International Association of Antarctica Tour Operators (IAATO) have taken a proactive approach to Antarctic environmental management. Often working together, the operational managers in COMNAP and IAATO, and the scientists in SCAR, have developed a range of effective, practical approaches to environmental management, and have provided related advice to ATCMs and the CEP. It has been a challenge for some of the Treaty Parties to accept the independent role of COMNAP, and to understand that effective management of impacts of human activities in Antarctica requires a proactive approach by those involved in managing operations in Antarctica. COMNAP has at times been criticised by Treaty Parties for moving ahead of the ATCM.

Environmental issues were not new to Antarctic programme managers prior to CRAMRA and the Environmental Protocol negotiations. In 1964, three years after the Antarctic Treaty was signed, the ATCM had adopted the

COMNAP and the SCAR Group of Specialists on Environmental Affairs and Conservation (GOSEAC)

David Walton

One of the key areas of concern in the 1990s to both SCAR and COMNAP was the implementation of the Protocol on Environmental Protection to the Antarctic Treaty. SCAR had been providing data on conservation and environmental management to the Treaty since its inception in 1959, but the development of the Committee for Environmental Protection changed the dynamics of how best to do this. Recognising that national programmes would need to take the environment more seriously, most national Antarctic programmes began by appointing Environment Officers, whose remit often covered areas originally dealt with by SCAR scientists. Recognising the need for sound interdisciplinary advice on the environment, SCAR had decided in 1988 to upgrade its Subcommittee on Conservation to a full Group of Specialists on Environmental Affairs and Conservation (GOSEAC), chaired by Nigel Bonner (British Antarctic Survey). Amongst the first members appointed was Hugh Logan, then the Executive Officer for the New Zealand Antarctic Programme. This appointment established an important link between science and programme managers for this whole field of advice.

By 1992 José “Tito” Acero (from Argentina’s Dirección Nacional del Antártico) was invited to join GOSEAC as a representative of the environmental officers group, whilst Jack Sayers, the Operations Manager for the Australian Antarctic Division, represented the SCALOP group. This active linkage in GOSEAC provided for the injection of practical concerns from the COMNAP side into scientific discussions on conservation issues, in addition to ensuring that new scientific ideas and evidence based on SCAR expertise had a thorough

airing. There were many shared concerns, especially over areas such as environmental monitoring, environmental impact assessment and the development of a network of protected areas with sensible management plans. It was from these discussions that the handbook on environmental monitoring came, as well as proposals on incinerators, de-icing fluids, Antarctic reference materials, codes of conduct on field operations and the use of aircraft, cumulative impacts, State of the Antarctic Environment reporting, bioprospecting etc.

Joint publications for environmental management and joint papers to the Antarctic Treaty Meetings were a clear indication of how successful this format was in harnessing the expertise and enthusiasm of the two organisations. With the re-organisation of SCAR, GOSEAC became the SCAR Standing Committee on the Antarctic Treaty in 2002, and the formal membership link with COMNAP on environmental matters was broken. The subsequent re-organisation of COMNAP has also changed its internal structure. The present system is one in which joint projects between SCAR and COMNAP – such as the new strategy for Antarctic conservation – are developed as necessary, but all formal discussions between the two organisations are conducted through the joint Executive Meetings. Different strategies are needed for different times but the need to work closely together has not changed.

David Walton

Convenor of GOSEAC 1992–2002

Chair of SCAR Antarctic Treaty Standing Committee 2002–06
Research scientist and Head of Division, British Antarctic Survey
1967–2006

Agreed Measures for the Conservation of Antarctic Fauna and Flora (“Agreed Measures”), proposed by SCAR to cover the absence of conservation in the original Treaty Articles. The first COMNAP Executive Secretary, Al Fowler, notes that *Environmental protection, by the end of the 1970s, was becoming a paramount concern for the people responsible for the national programs . . .*¹ In 1975 the ATCM had adopted a code of conduct that added waste disposal and

impact assessment to the topics covered by the Agreed Measures. The COMNAP predecessor, the Working Group on Logistics (WGL) of SCAR had engaged with the SCAR Biology Working Group on proposals for Antarctic Protected Areas and on the topic of environmental impacts of human activities in Antarctica. In the mid 1980s, in the context of environmental protection, SCAR and its WGL had developed a Code of Conduct for Antarctic Expeditions and Station Activities.

¹ A. F. Fowler, *COMNAP: The National Managers in Antarctica* (Baltimore, Md., American Literary Press, 2000), p. 70

Environmental protection and management was one of five operational topics on the agenda for the first COMNAP meeting at Cambridge, UK in October 1989. Under this heading were initial and comprehensive environmental evaluations, a code of conduct for waste disposal, and contingency plans to combat oil pollution. A discussion paper was presented by the head of the Italian national programme, Mario Zucchelli. In introducing the paper Zucchelli emphasised that *Environmental matters in Antarctica are subject to public concern and operators should not only be taking appropriate action but also should be seen to be doing so.*²

At that first meeting of COMNAP it was agreed to hold a workshop on environmental impact assessment. Informal exchanges of information on policies, procedures and methodologies, environmental protection plans, and environmental impact assessments through the Executive Secretary were encouraged. An Environmental Monitoring and Assessment Subgroup was established. It was agreed that an exhibition focussed on environmental technology would be included in the 1990 symposium of COMNAP's Standing Committee on Antarctic Logistics and Operations (SCALOP).

The report of the first COMNAP meeting shows the intention to work with SCAR on environmental issues. The SCAR Group of Specialists on Environmental Affairs and Conservation (GOSEAC) already included an Antarctic programme manager, and an Environmental Officer was subsequently added to the GOSEAC membership, to keep science and practice firmly linked. The meeting noted the importance of not duplicating the work of GOSEAC. A SCAR report on waste disposal was identified as the start point for SCALOP work on a code of conduct for waste disposal.

Discussion on contingency plans to combat oil pollution at the first COMNAP meeting established the priority of preventative measures as opposed to the stocking of contingency equipment – it was identified that preventative measures were more cost effective than clean-up operations, although equipment and contingency plans were seen as essential for rapid response in the event of a fuel spill. The relatively small scale of potential oil spills from Antarctic operations was also noted. It was agreed to prepare two papers for future discussion: one on prevention of oil spills, and the other on contingency response. These, plus a number of other environment-related topics, have been consistently on the agenda of COMNAP meetings, addressed in an operational context in Antarctica, and the subject of COMNAP papers to the ATCM (Appendix 3) since COMNAP was established. Of 81 COMNAP papers

(excluding the COMNAP Report) to the ATCM from 1991 to 2013, 59 per cent have been on environment-related topics.

To varying degrees, depending on their operational relevance, most topics relating to the environmental impacts of human activities in Antarctica that are covered by the ATCM and the CEP have been addressed by COMNAP.

A list of contact points for environmental matters in each national Antarctic programme was appended to the minutes of the second COMNAP meeting in 1990. In 1996 an Antarctic Environmental Officers Network (AEON) was set up, with oversight from a COMNAP Environmental Co-ordinating Group of managers. Since the adoption by the ATCM of the Environmental Protocol, national programmes had increasingly appointed specialist environmental personnel. AEON provided opportunity for them to learn from each other and to contribute to COMNAP work for the ATCM–CEP on environment-related issues.

There were also SCALOP Waste Management and Oil Spill Contingency subgroups in the 1990s, and SCALOP was tasked with reviewing alternative energy sources and an Energy Management Working Group was established. In 2001 an Energy Management Network (ENMANET) was created to involve engineering personnel directly working with energy management. In 2009 ENMANET was replaced by the Energy and Technology Expert Group, which continues to consider energy management issues.

In 1996 a Working Group to Monitor the Liability Annex negotiations (MoLiBA) was established. This group provided advice to COMNAP members on potential operational implications of the Antarctic Treaty negotiations on liability resulting from environmental emergencies, and, with the Executive Secretary, provided operational advice into the Treaty liability discussions. In conjunction with SCAR, it carried out a substantive piece of work for the ATCM Liability Working Group, on worst-case and less-than-worst-case scenarios for environmental incidents.

The COMNAP report to ATCM XXIII in 1999 recorded that the ratification of the Environmental Protocol in January 1998 (with its national legislative adoption by all the Treaty Parties) had shifted environmental compliance from responsible management to legal imperative, and that AEON, under the umbrella of COMNAP, was addressing environmental monitoring and environmental impact assessment to provide support for individual members' activities in these areas.

The Antarctic Environmental Officers Network: A New Way of Working?

Emma Waterhouse

There was a mixed response from COMNAP Managers of National Antarctic Programs (MNAPs) to the proposal to establish a network of Antarctic environmental officers. It was 1996, in Cambridge, UK, and the forum was the annual COMNAP meeting. About 10 environmental officers had travelled to the meeting; environmental monitoring was on the agenda and an "informal" environmental officers workshop was organised by John Shears, the BAS environmental officer. During the week we drafted up terms of reference and identified priorities for a network.

A couple of years earlier John had floated the idea of the network to some of us. We had met each year in the margins of the ATCM, but it always seemed to be the same small group, and little could be achieved outside the main business of those meetings! We were keen to expand, and to reach out to as many of our colleagues in other national Antarctic programmes as possible. And there was wider interest: earlier that year, the ATCM had requested that New Zealand report to the next ATCM on the establishment of an Antarctic environmental officers network.

In 1996 it was a short five years since the Environmental Protocol had been signed and an increasing number of national Antarctic programmes were appointing staff with specific environmental responsibilities. More often than not, they were the only person within the organisation with environmental expertise, trying to understand and then implement the new requirements of the Protocol. In some cases, the environmental role was added to an already full workload. Different Antarctic programmes were at different stages of developing their environmental procedures and practices. Given we were all trying to achieve the same things, it made good sense to be actively sharing information and ideas.

Some of the MNAPs were concerned at the risks of extending the national programme linkages outside of the programme- and logistics-managers. Would these young upstart environmental officers have the knowledge to effectively manage the tensions between the politics of Antarctic environmental issues and the practical operational focus of COMNAP? The discussions in Cambridge centred on how COMNAP could direct and manage the work of the network and the link with the CEP. Clearly there was resistance to the idea. The COMNAP agenda was rearranged as the debate continued intermittently over two days. Anders Karlqvist later described it as *intensive debate ... over ... the proposed mechanism for this group to report to the Council.*

The minutes of the meeting noted that the network should operate in the realm of information sharing and could extend to other aspects, but that the ultimate responsibility would rest with the MNAPs. Eventually, the meeting agreed to establish an Environmental Co-ordinating Group (ECG) to oversee and guide the work of AEON, and to report on its activities to COMNAP. Gillian Wratt, New Zealand MNAP and COMNAP Executive Committee member, was appointed as the first ECG Chair and was joined by Max Tilzer, German MNAP, and Patricio Eberhard, the Chilean SCALOP representative.

So AEON was born. The objectives were to exchange information and ideas about practical and technical environmental issues in Antarctica, to promote the mutual understanding and practical application of the Environmental Protocol, and to respond to requests from COMNAP for advice on environmental issues. The AEON co-ordinator was to liaise directly with the ECG Chair.

I was appointed as the first co-ordinator, supported by a steering committee comprising Birgit Njaastad from Norway, José "Tito" Acero from Argentina and Joyce Jatko from the USA. They were a motivated, dedicated and technically impressive group to work with. We got on with our work, setting up an email group and developing an AEON page on the COMNAP website. We started exchanging information, sharing our issues and problems, and planning exchanges of environmental officers between Antarctic programmes.

Two years later, the Chair of the ECG, Gillian Wratt, reported at the 1998 Cape Town COMNAP meeting that the network was working well. In 1999 AEON held its first formal workshop, in Goa, in conjunction with the annual COMNAP meeting. We tackled two of the hardest aspects of environmental management to do well: monitoring and impact assessment. Those discussions were the beginning of some pivotal work that eventually led to a CEP intersessional Working Group on environmental impact assessment and contributed to finalising a comprehensive set of Antarctic environmental monitoring guidelines. Along the way, AEON worked collaboratively with SCAR's Working Groups, most notably the Group of Specialists on Environmental Affairs and Conservation (GOSEAC), forging important informal links between science and environmental management.

Emma Waterhouse

AEON Coordinator 1996–2000

New Zealand CEP delegate 2002–04

Antarctica New Zealand Environmental Manager 1993–2002

² M. Zucchelli, in COMNAP I Minutes, 1989

AEON in Action: 2006–09

Rodolfo Sánchez

From 2006-09, ten years on from its establishment, AEON continued to provide a valuable forum for those responsible for environmental aspects of national Antarctic programme operations, facilitating the sharing of practical and technical environmental information. Guidelines and procedures were reviewed, workshops were organised, and environmental information was actively exchanged among members on a wide range of thematic issues. Topics addressed included non-native species, management of waste and fuel, and environmental monitoring. This work resulted in the presentation of three COMNAP ATCM Information Papers and information in COMNAP ATCM reports.

Among these activities I particularly recall the Workshop on Waste Management in Antarctica (Hobart, 2006), which aimed to share practical information on current waste management practices and clean-up of old waste sites, between people responsible for these activities in Antarctica. Although COMNAP and SCALOP had previously addressed waste management, including presenting a Waste Management Reporting Format to ATCM XVII in 1992, this was the first workshop on waste management in Antarctica since the signing in 1991 of the Environmental Protocol with its Waste Disposal and Waste Management annex.

The AEON survey on existing procedures for minimising the risk of introduction of non-native species in 2007 was another AEON contribution in this period. Information was collected from a wide range of national Antarctic programmes on awareness programmes, operational

procedures and monitoring/surveillance programmes. The survey results provided a realistic picture of the efforts made by the Treaty Parties as a whole to minimise the risk of alien introductions, contributed to analysing what procedures national Antarctic programmes already had in place, and laid the ground for the organisation of a COMNAP Workshop on Alien Species in 2010 held jointly with SCAR.

AEON also updated practical COMNAP documents such as the *Fuel Manual* and the Environmental Incident Reporting System; and it collected information on basic operational monitoring parameters, with the view to reshaping existing procedures. Finally, AEON kept close liaison with SCAR in the process of elaboration of the SCAR Environmental Code of Conduct for field scientists.

It was a fruitful period for AEON, with invaluable input from all the AEON members, the COMNAP Chairs José Retamales and Gérard Jugie, the Executive Secretary Antoine Guichard, the COMNAP Environmental Co-ordinating Group of Maaïke Vancauwenberghe (Belgium), Lou Sanson (New Zealand) and Yves Frenot (France), and my own Argentinian Antarctic programme, in the COMNAP spirit of co-operation and hand-in-hand work.

Rodolfo Sánchez

AEON Co-ordinator 2006–09
Head of the Antarctic Environmental and Tourism Program
Dirección Nacional del Antártico (Argentina) 2005–12
Argentine CEP delegate 1999–2011

Into the first decade of the 21st century, COMNAP has continued to refine guidelines, to survey and to review, and to provide information and advice to the CEP and ATCM across a range of environmental topics, with a focus on putting in place elements of good environmental management. Environmental impact assessment, environmental monitoring, waste management, emergency response and contingency planning, fuel handling and energy management have been areas of continuing focus since COMNAP's establishment. More recently, the focus has broadened to respond to new challenges and issues. Newer topics have included environmental training, prevention of unintentional introduction of non-native species, aircraft operations near bird colonies, and marine

environmental issues such as ballast water disposal, marine acoustics and antifouling paints. Since 2008 these discussions have taken place by way of the Environmental Expert Group, which replaced AEON.

Other environmental focus areas for the ATCM and CEP, such as state of the environment reporting, bioprospecting, protected area management plans, environmental domains, and ecological and scientific implications of climate change, have received less attention from COMNAP. While they are areas of relevance to individual national programmes, and COMNAP keeps a watching brief, they sit more in the collective expertise of SCAR than in COMNAP.

Environmental Impact Assessment

Environmental Impact Assessment (EIA) was identified as a priority at the first COMNAP meeting. It is a fundamental environmental management tool, and since the adoption of the Environmental Protocol in 1991, under Article 8 and Annex I of the Protocol environmental assessment procedures have been required to be *applied in the planning processes leading to decisions about any activities undertaken in the Antarctic Treaty area*. New infrastructure or new science programmes are typically the responsibility of the national programme managers, so development of common practical guidelines was seen as a priority by COMNAP.

The draft guidelines produced by COMNAP in the early 1990s drew criticism from some Treaty parties as being ahead of the ATCM deliberations, but it provided guidance for the national programmes in what would become a legal requirement once the Environmental Protocol was ratified. The COMNAP guidelines, and subsequent COMNAP reviews of actual practice, provided input to the development by the CEP of the *Guidelines for Environmental Impact Assessment in Antarctica* in 1998–99.



Sampling in coastal area of the Guayaquil Cove

The analysis of Initial Environmental Evaluations (IEEs) carried out by AEON and reported to the ATCM in 2002 recorded that from 1999 onwards all IEEs reviewed reached an acceptable average ranking, suggesting that a more consistent quality of document was emerging with the EIA guidelines and an increasing body of experience.

Table 14: COMNAP activities related to Environmental Impact Assessment

Year	Activity
1989–90	Survey/review of national programme material on environmental impact assessment and waste management
1991	COMNAP Environmental Impact Assessment workshop <i>Practical Guidelines for Environmental Assessment and Monitoring</i> presented to ATCM XVI
1998–99	Input to CEP intersessional work on EIA guidelines
1999	ATCM <i>Guidelines for Environmental Impact Assessment in Antarctica</i> published by COMNAP
2000	COMNAP–SCAR paper SATCM XII WP022: <i>Recent Monitoring and EIA Initiatives</i>
2001	AEON review of Initial Environmental Evaluations COMNAP paper ATCM XXIV WP020: <i>Working Paper on an Analysis of IEEs Prepared for Antarctic Operations: An Update on Progress</i>
2002	COMNAP paper ATCM XXV IP026: <i>An Analysis of Initial Environmental Evaluations</i>
2004	COMNAP paper ATCM XXVII IP015: <i>An Analysis of Initial Environmental Evaluations (IEEs)</i>

Environmental Monitoring

COMNAP and SCAR have worked closely together on environmental monitoring initiatives, from the early 1990s, combining their scientific and operational management expertise. Monitoring had been identified as a key topic by the ATCM in 1989, and an ATME on Environmental Monitoring was held in 1992 in Buenos Aires. A joint COMNAP–SCAR paper presented to this Experts Meeting provided most of the substance of the final report, and ATCM XVII tasked SCAR and COMNAP with convening technical workshops on Antarctic environmental monitoring. Two workshops were held, and guidelines were developed, with reports provided to the ATCM and CEP. Joint work

on this topic has continued over subsequent years, and the COMNAP–SCAR *Practical Guidelines for Developing and Designing Environmental Monitoring Programmes in Antarctica* were adopted by ATCM Resolution 2 (2005). The lengthy timeframe for this work reflects the lack of experience there was to draw on in the application to Antarctica of standard monitoring practice.

Antarctic programme managers now have a range of scientifically and practically based guidance material available to help them develop and implement environmental monitoring programmes.

Table 15: COMNAP activities related to Environmental Monitoring

Year	Activity
1992	COMNAP–SCAR Information Paper to ATCM XVII: <i>Environmental Monitoring in Antarctica: A Discussion Document</i>
1994	COMNAP–SCAR paper ATCM XVIII WP021: <i>Environmental Monitoring in Antarctica: Recommendations for Next Steps</i>
1995	COMNAP–SCAR paper ATCM XIX WP024: <i>Environmental Monitoring Initiatives</i> COMNAP–SCAR workshop: Prioritisation of Impacts and the Development of Monitoring Options (Oslo, Norway)
1996	COMNAP–SCAR workshop: Practical Design and Implementation of Environmental Monitoring Programs (College Station, Texas, USA) COMNAP–SCAR paper ATCM XX IP114: <i>Environmental Monitoring Workshop</i>
1997	COMNAP paper ATCM XXI WP020: <i>Monitoring of Environmental Impacts of Scientific Activities and Operations in Antarctica</i> COMNAP paper ATCM XXI IP067: <i>Existing Environmental Monitoring Activities</i>
1999	AEON workshop: Environmental Monitoring and Environmental Impact Assessment COMNAP–SCAR paper ATCM XXIII WP004: <i>The Monitoring of Environmental Impacts of Scientific Activities and Operations in Antarctica</i>
2000	COMNAP–SCAR <i>Antarctic Environmental Monitoring Handbook</i> published COMNAP–SCAR paper SATCM XII WP022: <i>Recent Monitoring and EIA Initiatives</i>
2005	COMNAP paper ATCM XXVIII WP026: <i>Practical Guidelines for Developing and Designing Environmental Monitoring Programmes in Antarctica</i> ; guidelines endorsed by CEP–ATCM and published on COMNAP website SCAR–COMNAP Workshop on Biological Monitoring
2006	COMNAP–SCAR paper ATCM XXIX IP088: <i>Practical Biological Indicators of Human Impacts in Antarctica</i>
2008	Reporting format developed by COMNAP for voluntary exchange of information on monitoring activities in the Antarctic region

Waste Management and Remediation

The Waste Management Annex to the Environmental Protocol requires that *Waste storage, disposal and removal from the Antarctic Treaty area, as well as recycling and resource reduction, shall be essential considerations in the planning and conduct of activities in the Antarctic Treaty Area*. Waste management was on the agenda from the first COMNAP meeting in 1989, carried over from the SCAR Working Group on Logistics (WGL). It has continued to be addressed by COMNAP and its Expert Groups, initially by SCALOP and subsequently by AEON and the Environmental Expert Group, in the form of workshops and guidelines, and by the sharing of best practice through the COMNAP website discussion forums.

In the early days of Antarctic activity, waste generated at scientific stations and by associated activities was simply left behind, buried or tipped into the sea. As awareness of the unacceptability of these practices grew, the focus was predominantly around waste handling and disposal. The Waste Management Annex to the Environmental Protocol also requires that *Past and present waste disposal sites on land and abandoned work sites of Antarctic activities shall be cleaned up by the generator of such wastes and the user of such sites*. Some waste removal initiatives were undertaken in the late 1980s and 1990s; for example, in 1991–92 the United States Antarctic Program recorded recovering 1044 cubic yards of recyclable metal, 570 cubic yards of bulk metal, 400 cubic yards of cardboard, 53 cubic yards of asbestos, 53 cubic yards of construction debris



and 26 cubic yards of recyclable aluminium from their dump site at McMurdo Station.³ More recently, attention has been given to clean-up and remediation of old waste sites by a number of national programmes, and in 2006 AEON ran a workshop on waste management practices and site clean-up. The COMNAP Information Paper to the 2012 ATCM⁴ lists 31 papers to

the ATCM since 1999 that report on clean-up activities, by 16 national Antarctic programmes.

In 2012 the CEP requested COMNAP review the outcomes from the 2006 workshop and provide a report to CEP XVI for an agenda item on remediation of environmental damage. The development of a Clean-up Manual has been proposed by the CEP.

³ Summary of US Antarctic Program Activities 1991–1992, COMNAP IV Minutes, 1992
⁴ ATCM XXXV, IP062: *Repair or Remediation of Environmental Damage: COMNAP Report on its Experience*

Table 16: COMNAP activities related to Waste Management and Remediation

Year	Activity
1989	Code of Conduct for Waste Disposal: carried over from SCAR WLG to SCALOP on the first COMNAP meeting agenda and allocated to SCALOP for action
1989–90	Survey/review of national programme material on environmental impact assessment and waste management
1992	Waste Management Reporting Format in the COMNAP report to the ATCM
1993	Survey of members on the use of incinerators, for provision to the SCAR Group of Specialists on Environmental Affairs and Conservation (GOSEAC) for work on emission standards
2001	Survey of COMNAP members on waste water disposal practices
2002	COMNAP paper ATCM XXV IP051: <i>Best Practice to Avoid Waste Water Disposal onto Ice-free Ground at Inland Stations</i>
2006	AEON workshop on Current Waste Management Practices and Efforts to Clean Up Old Sites
2007	COMNAP paper ATCM XXX IP098: <i>COMNAP's 2006 Workshop on Waste Management in Antarctica</i> ; copy of workshop proceedings provided to each CEP delegate
2012	COMNAP paper ATCM XXXV IP062: <i>Repair or Remediation of Environmental Damage: COMNAP Report on its Experience</i> Proposal for a Waste Management Workshop to review the 2006 workshop outcomes

A 20 Year COMNAP and SCAR Partnership: Environmental Monitoring in Antarctica

Mahlon C. Kennicutt II

Environmental monitoring can be defined as the processes and activities that characterise and establish the current status of an environment or the trends in environmental parameters. Monitoring is an important element of actions taken to minimise environmental impacts due to humans, by detecting deterioration of the environment and/or by documenting the success or failure of mitigation or remediation activities. Monitoring of the impacts of human activities in Antarctica has a several-decade history. The development and adoption of effective monitoring protocols and procedures are in large part due to the early and sustained co-operation and partnership of SCAR and COMNAP.

At ATCM XV (1989) environmental monitoring of human impact was discussed and the meeting set out a series of activities to be monitored, including waste disposal, contamination by oil and hazardous or toxic chemicals, construction and operation of logistic support facilities, conduct of scientific programmes, and recreational activities. It was recognised that for monitoring programmes to be implemented they must be compatible with the realities of Antarctica. It was recommended that a Group of Experts be convened to provide advice. For Antarctica, monitoring became a formal part of the conservation and protection framework of the Antarctic Treaty with the adoption (1991) and coming into force (1998) of the Protocol on Environmental Protection to the Antarctic Treaty. The two-fold objectives of monitoring were recognised in the Protocol:

Article 3: Environmental Principles

Section 2

(d) regular and effective monitoring shall take place to allow assessment of the impacts of ongoing activities, including the verification of predicted impacts;

(e) regular and effective monitoring shall take place to facilitate early detection of the possible unforeseen effects of activities carried on both within and outside the Antarctic Treaty area on the Antarctic environment and dependent and associated ecosystems.

ATCM XVI (1991) continued discussions on environmental monitoring, with SCAR and COMNAP being the principal sources of information. The implications of impacts related to the presence of humans and the lack of agreed principles for monitoring were discussed. It was decided that a

specialised meeting was required to advance these issues. The First Meeting of Experts was convened in June 1992 in Buenos Aires and the group provided a report to ATCM XVII (1992). The report contained numerous recommendations, including the selection of representative facilities for monitoring, development of formats for long-term monitoring programmes, establishment of a base-line surveillance programme for the Southern Ocean, and ensuring the co-ordination of complementary ecosystem-related research and monitoring activities. The final recommendation proposed that a meeting of technical experts be convened to consider the design of monitoring programmes, scientific protocols for monitoring, standardisation and quality assurance, applicable technologies, and data management. The need for environmental monitoring in Antarctica was succinctly stated in a SCAR–COMNAP discussion document (1992):

Environmental monitoring is a fundamental element of basic research, environmental management, and conservation. The organized and systematic measurement of selected variables provides for the establishment of baseline data and the identification of both natural and human-induced change in the environment. Monitoring data are important in the development of models of environmental processes, which in turn facilitate progress towards a predictive capability to detect environmental impact or change. The collection and evaluation of monitoring data is essential for the detection of human perturbation within the natural variability of ecosystem processes. Since all environmental monitoring must be based on testable hypotheses it can also contribute to advancement in both basic and applied research.¹

While the concept and intent of monitoring as an essential part of environmental protection in Antarctica were straightforward, the definition of the processes and procedures involved, and implementation of cost-effective monitoring programmes in the unique and harsh conditions of Antarctica, were not. At ATCM XVIII (1994), SCAR and COMNAP offered to convene and sponsor a series of workshops. Based on initial co-operation in providing expert advice to the ATCM, COMNAP and SCAR joined forces to methodically develop the basic concepts regarding monitoring based on best practice and experience. These activities were mostly co-funded by COMNAP and SCAR, with substantial additional funds from various hosts. The

¹ COMMAP–SCAR, *Environmental Monitoring in Antarctic: A Discussion Document* (COMMAP–SCAR Information Paper to ATCM XVII, 1992)

objective was to build international consensus and to make optimum use of monitoring expertise outside of the Antarctic community. This co-operation led to a series of workshops in the 1990s, development of a manual, and assessment of the outcomes of environmental impact assessments. These documents provided a blueprint and a resource for Treaty Parties to inform how best to meet their Treaty obligations to monitor the impact of their operations and science activities.

SCAR and COMNAP convened a first workshop in Oslo, Norway (1995) and a second one in College Station, Texas (1996), which resulted in publication of a set of guidelines for environmental monitoring of impacts from science and operations.² This in turn led to COMNAP and SCAR developing an environmental monitoring handbook that provided recommended best practice for monitoring physical and chemical disturbances.³ In 2005 a set of practical guidelines for developing and designing environmental monitoring programmes in Antarctic was produced by COMNAP.⁴ The final document in this series was a two-volume workshop report on practical biological indicators of human impacts in Antarctica.⁵ In 2005 the Chair of COMNAP concluded that

... this co-ordinated effort to provide practical monitoring guidelines should assist all national programs, but particularly those with more limited resources and who do not currently have a systematic monitoring program in place. Ultimately, a unified approach to environmental monitoring will assist the continued protection of resources and values, and in minimizing human impacts on the Antarctic continent ...⁶

An example of the impact of these documents and the success of the SCAR–COMNAP partnership is the implementation by the US Antarctic Program of a long-term monitoring programme beginning in 2003.

The guidelines and workshop recommendations were refined by a series of reports that addressed issues of spatial and temporal scales of monitoring, identification of parameters amenable to monitoring, and a proposed long-term monitoring programme design.⁷ These documents and the subsequent implementation of a long-term monitoring programme at McMurdo Station, Antarctica drew extensively on the SCAR and COMNAP reports. This monitoring programme has now been in place for more than a decade and is often referred to as an example for all nations to emulate in meeting their obligations for environmental monitoring under the Antarctic Treaty and the Environmental Protocol.⁸

Mahlon C. Kennicutt II

Vice-President of SCAR 2004–08; President of SCAR 2008–12
US delegate to SCAR 2003–12
Member of the SCAR Group of Specialists on Environmental Affairs and Conservation (GOSEAC) 1996–2002
Member of the SCAR Standing Committee on the Antarctic Treaty System 2004–present

- M. C. Kennicutt II, J. A. Sayers, D. W. Walton & G. Wratt, *Monitoring of Environmental Impacts from Science and Operations in Antarctica* (SCAR, COMNAP, 1996)
- Geochemical and Environmental Research Group, Texas A & M University, *COMNAP and SCAR Antarctic Environmental Monitoring Handbook* (2000)
- COMNAP, *Practical Guidelines for Developing and Designing Environmental Monitoring Programmes in Antarctica* (WPO26 to ATCM XXVIII, 2005)
- Texas A & M University, British Antarctic Survey, *Practical Biological Indicators of Human Impacts in Antarctica: 16–18 March 2005, Bryan/College Station, Texas, USA* (Houston, Tex., [2005])
- COMNAP, *Practical Guidelines for Developing and Designing Environmental Monitoring Programmes in Antarctica* (WPO26 to ATCM XXVIII, 2005), p. ii

- M. C. Kennicutt II, D. J. Wylie & G. A. Wolff, *Summary of Existing Environmental Data McMurdo Station, Antarctica. A Report for the National Science Foundation* (NSF) (1999)
M. C. Kennicutt II & G. A. Wolff, *Spatial and Temporal Scales of Monitoring. A Report for the National Science Foundation* (NSF) (1999)
M. C. Kennicutt II, G. A. Wolff & D. Alsup, *System Attributes Amenable to Long Term Monitoring. A Report for the National Science Foundation* (NSF) (1999)
M. C. Kennicutt II, G. A. Wolff, D. Alsup & A. Klein, *Long Term Monitoring McMurdo Station, Antarctica: Pilot Project Design. A Report for the National Science Foundation* (NSF) (1999)
- K. A. Hughes, "Perspective: How committed are we to monitoring human impacts in Antarctica?", *Environmental Research Letters*, 5, 4 (2010), doi:10.1088/1748-9326/5/4/041001

Cape Hallett Site Remediation: Lessons Learned and Future Considerations

Antarctica New Zealand and US Antarctic Program (National Science Foundation)

Introduction

The Protocol on Environmental Protection to the Antarctic Treaty requires abandoned work sites to be cleaned up unless the site has been designated as an historic site or monument, or removal would cause greater environmental impact than leaving materials in place (Article 1 of Annex III).

New Zealand and the United States have undertaken a clean up programme of an abandoned research station at Cape Hallett, northern Victoria Land, Antarctica.

Station History

New Zealand and the United States established Cape Hallett research station in 1956/57 (Figure 1). The station was occupied year round until 1964 when a fire destroyed the main laboratory. The station was then used as a summer-only facility until it was abandoned in 1973.



Clean up activities

Clean up operations at Cape Hallett have been ongoing since the early 1980s (Table 1).

Date	Clean up activity
1984 - 1996	Several visits over this time concentrated on recovery of debris, removal of most buildings, recovery of contaminated soils, and removal of drummed waste fuels.
January 2001	A joint NZ/US site assessment was undertaken. Soil sampling was carried out to assess contaminant levels.
January / February 2003	A further site characterization was undertaken to assess the extent of hydrocarbon contamination in the soils and ground water.
2003/04	All remaining buildings and contents were dismantled and staged for removal. Further sampling of the ponds across the site for hydrocarbon contamination was undertaken.
2004/05	Visible debris was collected across the whole of the site. Remaining fuel in the bulk fuel tank was removed and drummed. 28 tonnes of waste materials retrograded to New Zealand by the MV Itasca. (Figure 2)
2005	IEE prepared for dismantling of the fuel tanks.
2005/06	All remaining fuel tanks were dismantled including the 100,000-gallon bulk fuel tank (Figure 3). 70 tonnes of materials were retrograded to New Zealand by the MV Itasca. (Figure 4)

Table 1. History of clean up activities at Cape Hallett.

Future monitoring

A monitoring programme will now be conducted to assess the effectiveness of the clean up (Table 2).

Concern	Monitoring Objective	Methodologies
Visible impacts	Assess changes in the visual appearance of the site over time to determine whether clean up has reduced the disturbed area.	Assessment of randomly selected 5m ² areas using terrestrial disturbance criteria. Continuity of assessments to be verified with 35mm photography of selected plots.
Adelie penguins	Determine whether the clean up has any influence on the Cape Hallett Adelie penguin population.	Analysis of annual aerial photography census, supported by opportunistic ground counts, to identify re-colonisation of former station areas and any trends in total population (breeding pairs).
Ground water contamination	Assess whether hydrocarbon contamination in the ground water is reducing over time.	Analysis of ground water sampling from existing piezometers for TPH, BTEX and PAHs as appropriate, whenever logistical opportunities allow.

Table 2. Proposed future monitoring programs.

Lessons learned

Site characterization was critical to inform the work plan.

- Location and amount of contaminants (Figure 5)
- Location of wildlife

Adequate planning over time was essential.

- Long meetings and phased approach.
- Thorough assessment of personnel and equipment needed.
- Risk analysis for removal of bulk fuel tank.

Cooperation and support led to success.

- Assistance of Latitudinal Gradient Project camp and personnel.
- Retrograde via Italian Antarctic Program MV Itasca.

Summary

Cape Hallett is remote from current areas of New Zealand and US activities and presented a logistical challenge to clean up the abandoned station. A dedicated clean up programme over the last three years has resulted in the successful removal of all remaining buildings and contents and the dismantling and removal of the fuel tanks. Ongoing monitoring will be undertaken to assess the effectiveness of the clean up effort.



Supplied by Antarctica New Zealand and the US National Science Foundation

Poster presenting the lessons learned from the joint site remediation at Cape Hallett

Contingency Planning and Fuel Management

Fuel oil spills have been on the COMNAP agenda since its establishment, initially addressed by SCALOP and subsequently also by AEON. The spill from the *Bahia Paraiso* grounding on the west coast of the Antarctic Peninsula in January 1989 put this issue at the forefront at the first COMNAP meeting in October 1989. Several papers on the *Bahia Paraiso* incident and oil spill strategies were discussed at the meeting, and it was agreed that papers on the prevention of oil spills and contingency response to oil spills be prepared for further consideration by members.

A Discussion Paper for a Contingency Plan for "25 de Mayo" (King George Island) was presented by the Argentinian MNAP to COMNAP III in 1991. It was noted that a regional plan was needed, incorporating tourism activities, and it was decided to hold a meeting of all national programme managers with stations in the South Shetland Islands. Subsequently, three other regional contingency planning regions were identified as Northern Marguerite Bay, Prydz Bay and Western Ross Sea.

Article 15 of the Environmental Protocol, Emergency Response Action, requires that each Party to the Treaty establish contingency plans for response to incidents with potential adverse effects on the Antarctic environment or dependent and associated ecosystems. Guidelines for storage and handling of fuel, and for spill management, were produced by COMNAP in the early 1990s. In the mid-1990s, attention was broadened to include other emergencies with potential environmental impacts, such as the release of toxic substances. Guidelines have been revised and expanded, surveys of member practices carried out, and recommendations made to the ATCM. The adoption by the Treaty Parties in 2005 of the Liability Annex to the Environmental Protocol put further emphasis on managing environmental risks and contingency planning.

The number of papers and volume of activity outlined in Table 17 demonstrate that this is an area that COMNAP has given significant focus to through its history. The COMNAP paper to ATCM XXXV in 2012 recorded that 89 per cent of national Antarctic programmes had contingency

plans in place at their stations. This compared with 60 per cent with such plans by 1996. At the 2012 ATCM, COMNAP agreed to collect information on contingency equipment available at the "Antarctic gateway" cities and

to develop a database of equipment at stations. The 2012 CEP meeting encouraged those Treaty Parties with stations whose contingency plans did not follow the COMNAP guidelines, to update their plans in order for them to do so.

Oil Spill Prevention and Response

Jack Sayers

In 1990 COMNAP requested its Standing Committee on Antarctic Logistics and Operations (SCALOP) to develop policies and procedures on oil spill prevention and response in the Antarctic. A Working Group was established to undertake the task, comprising Chair Jack Sayers (Australia) and members Dennis Stossel (Canada), Heinz Kohlen (Germany), Jan Haugland (Norway), Bernard Guam (South Africa), John Hall (UK) and Erick Chiang (USA). The Working Group brought together many decades of Antarctic operational experience and knowledge and applied considerable enthusiasm to the task.

Large quantities of fuel oil are transported and consumed in the Antarctic in the provision of logistical and operational support for national Antarctic programmes. The 20 years before COMNAP's establishment had seen significant growth in the number of nations conducting science in Antarctica, and, as a result, the deployment of many more ships, aircraft, surface vehicles and personnel. Furthermore, there had been a major surge in tourist activity involving ships, and, to a lesser extent, aircraft. The Protocol on Environmental Protection to the Antarctic Treaty, adopted in 1991, required that contingency plans be developed for incidents having potential adverse effects on the Antarctic environment.

The SCALOP Working Group identified the principal potential sources of oil spills in Antarctica as being

- the grounding or sinking of ships, which could cause the release of up to 250,000 litres of fuel from a single ruptured tank, or, in a worst case scenario, upwards of 2,000,000 litres;
- the failure of containers, barges or pipelines used for transfer between ship to shore, resulting in an oil spill of 25,000 litres or more; and

- the failure, incorrect operation of, or accidental damage to fuel storage facilities at stations, resulting in the loss of between a few thousand litres and 1,000,000 litres of fuel.

It was clear to the Working Group that particular emphasis had to be directed towards prevention, as prompt response in adverse weather conditions in the Antarctic can be challenging, and sometimes impossible. Even in summer, weather and pack-ice conditions are often not conducive to the safe and effective deployment of response equipment. There are also practical and economic limits, along with training constraints, that restrict the size and quantity of response equipment that can be held and deployed at Antarctic bases.

The Working Group benefited from the participation of experts on marine pollution who attended one or more meetings, and from advice from members' national maritime safety and environmental safety authorities.

The key recommendations of the Working Group were wide ranging, covering

- minimum navigation experience of ships' Deck Officers;
- the preferred use of non-persistent fuels;
- shipboard contingency plans;
- producing up-to-date-hydrographical charts for frequently visited areas;
- guidelines for oil storage at stations and bases; and
- oil spill contingency plans for stations and bases.

Jack Sayers

Chair of SCALOP 1993–95
 Executive Secretary of COMNAP 1997–2001
 Member of the SCAR Group of Specialists on Environmental Affairs and Conservation 1993–95
 Operations Manager of the Australian Antarctic Division 1987–97

Table 17: COMNAP activities related to Contingency Planning and Fuel Management

Year	Activity
1990	Inventory undertaken of fuel products taken to Antarctica
1991	Meeting of the SCALOP Oil Spill Working Group in Washington DC Draft <i>Practical Guidelines for Design and Operation of Fuel Storage and Transfer Facilities</i> , and adoption of eight recommendations from SCALOP to the COMNAP meeting on measures for prevention and control of oil spills and contingency planning for oil spill response; draft oil spill contingency planning formats and procedures made available for national programmes; discussion of need for regional oil spill contingency plans
1992	Recommended procedures for oil transfer at stations and bases, recommendations for oil spill prevention and containment of fuel oil at stations and bases, and guidelines for oil spill contingency planning distributed to national Antarctic programmes and included in COMNAP report to ATCM
1993	COMNAP member survey of fuels and oils carried into the Antarctic Treaty area Development of emergency contacts directory in relation to oil spill prevention and response
1995	Extension of COMNAP contingency planning work to cover environmental risks beyond oil spills
1997	COMNAP Working Group on Emergency Response and Contingency Planning Ross Sea, Peninsula and Prydz Bay subgroups established
1998	Survey of national programme contingency planning COMNAP paper ATCM XXII IP006: <i>Survey Carried out by COMNAP as Requested in ATCM XXI (Emergency Response and Contingency Planning)</i> COMNAP paper ATCM XXII IP062: <i>Guidelines for Reporting Oil Spill Incidents which Occur in Antarctica</i> ATCM XXII Resolution 6, 1998, adopted the COMNAP–SCALOP recommended procedures for fuel oil handling at stations and bases, recommendations for spill prevention and containment of fuel oil at stations and bases, guidelines for oil spill contingency planning, and guidelines for reporting of oil spill incidents ATCM XXII Resolution 6, 1998 requested COMNAP/SCALOP to identify and formulate additional steps in relation to emergency response action and contingency planning for incidents other than oil spills
1999	COMNAP paper ATCM XXIII WP003: <i>Contingency Planning and Emergency Response</i>
2000	Guidelines for oil handling and storage, and for oil spill response reviewed; contingency planning guidelines for oil spills also reviewed Guidelines developed for contingency planning for general incidents and disasters
2001	Survey on actions taken by national programmes to implement COMNAP guidelines on oil storage and transfer, and on oil spill contingency planning
2004	COMNAP paper ATCM XXVII IP012: <i>COMNAP's Framework and Guidelines for Emergency Response and Contingency Planning in Antarctica</i>
2005	Inspection reports to the ATCM identified issues with storage and handling of fuel; ATCM XXVIII Resolution 3, 2005 recommended replacing bulk fuel facilities currently lacking secondary containment with double-skinned tanks, and that COMNAP undertake further work in this area COMNAP–IAATO paper ATCM XXVIII IP067: <i>The Use of Heavy Fuel Oil in Antarctic Waters</i> The ATCM proposed a ban on use of heavy fuels in Antarctica and asked IMO to look at mechanisms
2006	AEON–SCALOP workshop reviewed fuel storage, handling and contingency planning guidelines and developed recommendations for COMNAP; found guidelines to be essentially adequate
2007	COMNAP paper ATCM XXX IP099: <i>Contingency Planning and Emergency Response</i> : in response to discussion at ATCM XXIX (2006) that the Antarctic Treaty may want to develop a formal regulatory approach
2008	COMNAP paper ATCM XXXI IP091: <i>The COMNAP Fuel Manual, Incorporating Revised Guidelines for Fuel Storage and Handling in Antarctica</i>
2012	COMNAP paper ATCM XXXV IP032: <i>COMNAP Survey of National Antarctic Programs on Oil Spill Contingency Planning</i>

Alternative Energy and Energy Management

COMNAP's interest in alternative energy and energy management has been driven by the concern to reduce environmental risks of spills from fuel transport and storage, by the high costs of fuel purchase and transport to Antarctic locations and more recently by a desire to reduce emissions. A SCALOP Alternative Energy and New Technology subgroup was formed in 1992, with an initial focus on solar, wind and fuel cell sources of energy and their application in Antarctica. In 1999 the subgroup was renamed the Energy Management Working Group. In 2001, ENMANET, the Energy Management Network, was established, to involve engineering personnel directly responsible for energy management. There have been presentations on energy management and alternative energy at 13 of the 15 SCALOP–COMNAP Symposiums since 1990. COMNAP *Best Practice Energy Management Guidelines* were developed in 2006 and presented to ATCM XXX in 2007, and an Energy Management Workshop was held at the 2010 COMNAP meeting in Buenos Aires. The COMNAP website hosts an Energy and Technology discussion forum and document server, where national Antarctic programme managers and staff can ask questions and share ideas. A preferred supplier database is under development so that national Antarctic programmes can share information on the availability of energy management equipment and their suppliers.

In recent years, climate change and high fuel costs have resulted in further attention to energy management, now through the COMNAP Energy and Technology Expert Group. The ATME on Implications of Climate Change for Antarctic Management and Governance in 2010 made several energy related recommendations, including acknowledging and encouraging the development and exchange of experience in energy efficiency and alternative energy practices, and soliciting from COMNAP a report on progress on the implementation of its *Best Practice for Energy Management – Guidance and Recommendations* that had been presented to ATCM XXX in 2007. The report to ATCM XXXV in 2012 identified a range of energy related initiatives, including automated fuel use recording systems, education of staff on



Wind turbines at Crater Hill wind farm, Ross Island

energy saving practices, improved insulation, energy efficient equipment, building management systems, generator heat recovery systems, wind turbines and solar energy collector systems, and fuel savings through a strengthening of focus on fuel logistics collaboration, particularly around air and ship operations, which are the highest users of fuel.

Box 3: COMNAP Best Practice Energy Management Guidelines (ATCM XXX WP035)

- Measure and clearly identify where energy and power is being used.
- Introduce an education programme to recognise the need for energy saving and encourage personnel to implement and maintain energy saving measures.
- Replace inefficient buildings or install enhanced insulation to ensure that heat loss is reduced.
- Replace power and lighting systems with energy efficient equipment and controllers that ensure that equipment is only using power when there is an operational need.
- Install energy efficient generator systems and make use of heat recovery systems where feasible.
- Investigate and where feasible install renewable energy systems to reduce the dependence on fossil based fuel.
- Reduce where possible operational activities. Particular attention to be paid to the routing of ships and the operation of engines to ensure lower fuel burn.

Table 18: COMNAP activities related to Alternative Energy and Energy Management

Year	Activity
1991	Paper presented to the COMNAP meeting: <i>The Use of Alternate Energies to Reduce Environmental Impact on Antarctica</i> ; SCALOP reviewed alternative energy sources to have as a topic for the next SCALOP Symposium
1992	SCALOP Alternative Energy and New Technology subgroup formed
1994	COMNAP report to ATCM XVIII includes a section on alternative energy
1999	Alternative Energy Working Group focus broadened to include energy management; Group renamed Energy Management WG (ENMAN)
2000	Results of a survey of energy management practices posted on COMNAP website
2001	Energy management network (ENMANET) established to involve engineering personnel directly responsible for energy management
2004	ENMANET grown to 42 members, with active and useful discussion on topics ranging from energy use to wider technical issues, eg use of solar panels Energy survey carried out and results distributed by CD and on COMNAP website Sustainable Energy Forum held during the COMNAP meeting; noted that the largest energy use in many national programmes is ship operations, and agreed fuel use by ships, aircraft and traverse vehicles should be included in fuel use surveys
2005	Energy utilisation survey completed
2007	COMNAP paper ATCM XXX WP035: <i>Best Practice for Energy Management – Guidelines and Recommendations</i> Energy use added to the terms of reference for the COMNAP Ship Operations Working Group COMNAP AGM comment that increasing fuel costs are driving more national programmes to consider energy management programmes, and that better co-ordination/international collaboration is of the "utmost importance" in making energy savings
2010	COMNAP Energy Management Workshop
2011	COMNAP paper ATCM XXXIV IP008 <i>COMNAP Energy Management Workshop</i>
2012	COMNAP paper ATCM XXXV IP031: <i>Best Practice for Energy Management – Guidance and Recommendations</i>
2013	COMNAP PAPER ATCM XXXVI IP034: <i>Best Practice for Energy Management – Guidance and Recommendations: Update on Progress and Implementation</i>

Ross Island Wind Energy Project: Sustainability Through Collaboration

Lou Sanson and Brian Stone

The Ross Island wind energy project was commissioned in January 2010. The project consisted of one megawatt of installed wind generation capacity to provide renewable energy to New Zealand's Scott Base and to the United States' McMurdo Station, both located on Ross Island. The project was the first of its kind in Antarctica, linking Antarctic stations from two different countries into a common electrical network.

That commissioning in January 2010 represented the culmination of five years of commitment from Antarctica New Zealand and the US National Science Foundation, lots of hard work, and plenty of telephone conversations, email exchanges and face-to-face meetings. Many such meetings took place at the margins of the COMNAP AGMs. The success of the project is a testament to the power of collaboration and co-operation that is the hallmark of COMNAP.

The project was a serious investment in renewable energy technology and energy management equipment. At first, it was designed as a "proof of concept", both for the installation of wind power generators in the Ross Sea Region and for the tying together of two separate power-production and power-consumption systems. A three-turbine wind farm was constructed during the Antarctic summer seasons of 2008–09 and 2009–10.

The project had three main purposes:

1. To reduce diesel fuel consumption on Ross Island, thereby reducing both programmes' environmental impact in Antarctica;
2. To develop and test a fully integrated wind farm "proof of concept" on Ross Island; and

3. To increase New Zealand's contribution to the shared joint logistics pool with the United States.

The project was delivered on time over a very tight two-season programme. This would not have been possible without significant collaboration and co-operation between the national Antarctic programmes. Antarctica New Zealand, as the project manager, worked with a New Zealand energy company to plan the project and manage the construction. The United States Antarctic Program was involved in design consultation and approval, as the wind farm controllers fundamentally changed the way the McMurdo Station power house was controlled and operated. Support was also provided by United States Antarctic Program personnel in site preparation, electrical engineering and cargo and logistics activities.

To date, the wind farm is exceeding expectations for supplying power to the two bases. Its three 330-kilowatt turbines are delivering 111 per cent of their production target, and up to 50 per cent of the power requirements of McMurdo and Scott Bases. This power, which was previously all provided by diesel generators, represents an annual saving of one million litres of fuel.

Lou Sanson
Chief Executive of Antarctica
New Zealand, 2002–present
New Zealand COMNAP
representative, 2002–
present
COMNAP Vice-Chair, 2007–10

Brian Stone
Section Head Antarctic
Infrastructure and Logistics,
US NSF Division of Polar
Programs, 2011–present
USA COMNAP representative,
2011–present
COMNAP Vice-Chair, 2011–
present



Princess Elisabeth Station and wind turbines

Environmental Risks, Incidents and Reporting

Risk assessment and management is a day to day matter for Antarctic programme managers, and COMNAP meetings have provided a forum for sharing and learning. In addition to sharing of experience at meetings and by informal emails, an accident, incident and near miss reporting (AINMR) system has been established on the members-only section of the COMNAP website. The aim of this system is to capture information about events that had, or could have had, serious environmental, operational or safety consequences. Sharing of lessons learned reduces the risk to each national Antarctic programme of repeating the same mistakes with the same resulting impacts.

Understanding environmental risks from Antarctic operations was important for the Antarctic Treaty negotiations on the Liability Annex to the Environmental Protocol. The negotiations drew on expertise within COMNAP, alongside scientific advice from SCAR. COMNAP also had an interest on behalf of its members in ensuring the negotiations were informed by practical advice on operations in Antarctica. To this end, in 1996 COMNAP established a Working Group to Monitor the Liability Annex negotiations (MoLIBA). As in many Treaty-level negotiations, the countries represented around the COMNAP table had differing positions on the liability negotiations. COMNAP had to be very careful that its representation and presentations on the Liability Annex were limited to provision of operational advice, and that it was not seen to be taking a position.

COMNAP's contribution to the Liability Annex negotiations is illustrated in ATCM Resolution 5 (1999), with appreciation recorded for the *valuable information regarding Antarctic environmental risks contained in XXIII ATCM/WP016 presented by COMNAP*, the request that *COMNAP and SCAR continue to provide representatives throughout all meetings of the Consultative Parties at which the question of liability is discussed*, and the request for a joint Working Paper to the XXIV ATCM on *operational and scientific aspects of preventative measures and response action, with a view to aiding the ATCM in its understanding of these practical aspects in order to facilitate work on liability issues*.

Annex VI to the Protocol, *Liability Arising from Environmental Emergencies*, was adopted by the ATCM in 2005 and is not yet in force.

“The input to the negotiation meetings on the Environmental Protocol Liability Annex from COMNAP (and SCAR) was crucial in filling the knowledge gaps in the room, and in providing the necessary reality checks. Their contribution was quite essential.”

– Don MacKay
Chair, Liability Negotiations (1999–2005)



Nacreous clouds and Crater Hill wind farm

Table 19: COMNAP activities related to Environmental Risks, Incidents and Reporting

Year	Activity
1996	COMNAP Working Group (MoLIBA) established to monitor the Liability Annex negotiations and provide practical operational information as required
1999	COMNAP paper ATCM XXIII WP016: <i>An Assessment of Environmental Emergencies Arising from Activities in Antarctica</i> ATCM XXIII Resolution 5 asked for input from SCAR and COMNAP on a range of environmental risk issues in relation to the Liability Annex negotiations; joint SCAR–COMNAP ad hoc group formed to respond to Resolution 5
2000	COMNAP paper SATCM XII WP005: <i>Revised Working Paper on an Assessment of Environmental Emergencies Arising from Activities in Antarctica</i> Workshop on risk assessment held, and a proposed structure developed for a Risk Assessment page on the COMNAP website – to cover field, station, maritime and air situations; to include risk assessment procedures; to publish reports on significant accidents, incidents and near misses; and to provide examples of national programme reporting forms
2002	COMNAP paper ATCM XXV WP025: <i>Worst Case and Less Than Worst Case Environmental Scenarios</i> COMNAP paper ATCM XXV WP027: <i>An Assessment of Environmental Incidents Arising from Activities in Antarctica</i>
2003	COMNAP paper ATCM XXVI WP009: <i>Worst Case and Less Than Worst Case Environmental Scenarios: Revision of ATCM XXV WP025</i>
2004	COMNAP funding approved for development of a Web-based template for Accident, Incident and Near Miss Reports (AINMR)
2010	AINMR template listed as COMNAP strategic project, corresponding directly with the Antarctic Treaty Electronic Information Exchange System
2012	AINMR system launched on COMNAP website

COMNAP and the Environmental Liability Annex

Erick Chiang

How does the Antarctic Treaty System (ATS) work to produce the framework for the governance of the Antarctic continent? To the outside observer it seems obscure, as it did to me until my work with the US Antarctic Program provided the opportunity to be a part of the work. I mark my start in Hobart, Australia, where the efficacy of creating an independent Council of Managers of National Antarctic Programs was first debated (in 1988). It continued through the next 17 years, with my participation as a US delegate to the ATCM as the Director for US Antarctic Infrastructure and Research Support.

From my perspective the ATS is a triad composed of the members of the COMNAP, the scientists of the Scientific Committee for Antarctic Research (SCAR), and the diplomats who negotiate the contents of the resolutions. Each component provides unique expertise to deliberations: COMNAP, the "on the ground" operating experience; SCAR, the scientific data to support proposed governing principals; and the diplomats, their negotiating skills, backed by the advice of COMNAP and SCAR.

It was critical that the three play their parts in the negotiations that resulted in the Annex on Environmental Liability. Many issues needed to be addressed. For example: Would any of the activities undertaken to support the scientific research lead to environmental catastrophe? In the absence of economic interests how would the cost of liability be assessed? Did doing science in and of itself create environmental degradation? What constituted minor or transitory impact? The answers were integral to achieve a resolution that in and of itself did not constrain the research that needed to be done.

Early drafts of the Annex made clear that vital information regarding necessary operational requirements to sustain existing activities was missing. These drafts defined and assigned liability in a way that would result in excessive operational caution that would overly constrain the ability to support ongoing operations and field research. In addition, the concept of strict liability would unintentionally discourage future collaborations in logistics and science.

COMNAP needed to contribute to the debate, and it formed the MoLIBA Working Group in 1996 to monitor the liability negotiations for its members and to provide practical

operational advice to the negotiations, based on the collective expertise of COMNAP. This Working Group was initially chaired by Barry Heywood (British Antarctic Survey), with Heinz Kohlen (Alfred Wegener Institute) and me as members. The group remained a small, focussed team, but, as with most COMNAP and SCALOP Working Groups, leadership and membership of this group changed over the years. Pentti Mälkki (Finnish Institute of Marine Research) took over the chair from Barry Heywood, followed by Gérard Jugie (French Institute for Polar Research and Technology) and finally John Dudeney (British Antarctic Survey). The MoLIBA Working Group was wound up in 2005 when the Liability Annex was adopted by the ATCM.

"On the ground" expertise identified the aspects of operations that posed the greatest danger to the environment. This knowledge led to the development of preventive measures, which allowed programmes to adopt best practices to protect the environment. Among these practices were the handling of fuels and the prevention of spills, developing environmental impact assessments for all activities, and providing risk assessment procedures for field, air, and maritime operations. COMNAP identified high-risk environmental impact activities, helped develop the protocols to rectify poor practices, and created a proactive best-practices approach, focussed on prevention rather than reaction and response to environmental hazards. Among the benefits of this approach was that liability could then be assessed based on environmental impacts that resulted from negligent practices, and national programmes could introduce environmentally responsible approaches to station- and field-operations in the conduct of the science. COMNAP, SCAR and the ATS succeeded in producing a practical and realistic approach to implementing programmes' environmental responsibilities. It was indeed rewarding to have been part of those Working Groups.

Erick Chiang
 Chair of SCALOP 1995–98
 Member of the COMNAP Working Group to Monitor the Liability Annex negotiations (MoLIBA) 1996–2005
 Division Director Antarctic Infrastructure and Operations, National Science Foundation Office of Polar Programs and US SCALOP representative 1991–2008

Unintentional Introduction of Non-native Species

Marine biodiversity in Antarctica has evolved differently to that in the rest of the world; Antarctic terrestrial and freshwater communities are species-poor and Antarctic marine communities species-rich. On land and in the sea the communities are open to attack and change if non-native species are inadvertently introduced. The sub-Antarctic islands provide clear examples of how damaging non-native species can be to ecosystems.

Regulations in relation to the introduction of non-native species into Antarctica were first agreed in 1964 as part of the Agreed Measures for the Conservation of Antarctic Fauna and Flora, and Annex II, Article 4 of the Environmental Protocol prohibits the introduction of any species of plant or animal not native to the Antarctic Treaty area except in accordance with a permit. In the 1990s awareness began to grow of the risks of accidental introductions, in particular of seeds and micro-organisms. The COMNAP AGM minutes in 1999 record discussion at a workshop held in Hobart on the introduction and spread of diseases in Antarctic wildlife, and ATCM consideration of

this topic. As awareness of the potential impacts of climate change in Antarctica has grown, it has become evident that there will be increased likelihood of non-indigenous species surviving in the warmer parts of Antarctica. This topic, along with the risks of intra-Antarctic transfer of species between areas, is now attracting increasing attention from the CEP, SCAR and COMNAP.

Transfer of non-indigenous species to Antarctica and transfer of organisms between biogeographically distinct regions were listed among the Antarctic conservation challenges in a 2012 paper, *Challenges to the Future Conservation of the Antarctic*,⁵ which included several Antarctic scientists and managers as its co-authors. The CEP has developed a non-native species manual and COMNAP, in consultation with SCAR, has initiated practical work on the topic, including surveying members on their practices and the development of a checklist for supply managers.

5 S. L. Chown et al., *Science*, 337, 6091 (2012), pp. 158–159

Table 20: COMNAP activities related to Unintentional Introduction of Non-native Species

Year	Activity
2006	CEP IX recommended a set of comprehensive and standardised guidance and/or procedures should be developed, aimed at all operators in Antarctica, based on the "Prevention, Surveillance, Response" approach AEON tasked to carry out a survey of current procedures to prevent introduction of non-native species to Antarctica
2007	Survey of current procedures on introduction of non-native species to Antarctica completed, seeking information on awareness, operational procedures and monitoring/surveillance programmes; found only 38 per cent of members with operational procedures in place
2008	COMNAP paper ATCM XXXI IP098: <i>Survey on Existing Procedures Concerning Introduction of Non-Native Species in Antarctica</i> AEON and the COMNAP training network (TRAINET) tasked to look at material on and for a COMNAP on-line library
2009	Reviewing the issue of the introduction of non-native species to Antarctica, and determining practical remedial actions, identified as one of 11 COMNAP strategic projects
2010	Joint COMNAP–SCAR non-native species workshop presenting and reviewing the results of the IPY Aliens in Antarctica project COMNAP–SCAR Checklists for Supply Chain Managers produced and distributed as a tool to reduce non-native species introductions
2011	COMNAP–SCAR paper ATCM XXXIV WP012: <i>Raising Awareness of Non-Native Species Introductions: Workshop Results and Checklists for Supply Chain Managers</i> Checklists translated into Spanish, Korean and Dutch and made publicly available on the COMNAP website

Checklists

for supply chain managers of National Antarctic Programmes for the reduction in risk of transfer of non-native species

for ships traveling to Antarctica

Action	Importance	✓
Rat guards in place on mooring lines	★★	
Garage grates fitted at night or, if lowered, lit with flood lights	★★	
External doors and windows closed whenever possible	★★★	
Insect traps in place in food storage areas	★★	
Old food removed from food storage areas at the end of each voyage	★★	
Hold fumigated	★	
Inside watercraft cleaned	★★	
Hulls of watercraft cleaned before loading	★	

for aircraft traveling to Antarctica

Action	Importance	✓
Inside aircraft clean	★★★	
Landing wheels or skids clean	★★★	
Doors closed whenever possible	★★	
Lighting minimised during night-time loading	★★★	
Insecticide available in case insects etc. are discovered in flight	★★	

for stores supplying cargo to Antarctic destinations

Action	Importance	✓
Area surrounding stores free from weeds/plants	★★★	
Shipping containers washed inside and out	★★	
Loose and palletised cargo minimised	★★★	
Wooden crates and pallets meet International Plant Protection Commission standards	★★★	
Tracks and wheels of all vehicles clean	★★★	
Warehouse doors closed where possible	★★	
Cargo stored inside where possible	★★	

for stores supplying food to Antarctic destinations

Action	Importance	✓
Designated clean area for packing food	★★	
Packing area is rodent-free, packaging is rodent-proof	★★★	
Prying and crawling insect traps in place	★★	
Produce is free of soil	★★★	
Quality checks on food to ensure no insect or fungal infestation before loading	★★★	
Refrigerate fresh produce	★★	
Avoid spilling out of season produce	★	

for expeditioners' gear sent to Antarctic destinations

Action	Importance	✓
Supply new clothing where possible	★★★	
Supply clothing and footwear not previously used in polar or alpine climates	★★	
Ensure all clothing and footwear is washed to remove organic material	★★	
Visually check all bags, footwear and clothing (particularly socks and over trousers) and remove entrapped seeds	★★	
Pay particular attention to items with Velcro®	★	

An information video outlining cleaning procedures can be found at: http://academic.sun.ac.za/ice/video/Aliens_cleaning_video%202010.wmv

Background

Non-native species are one of several major threats to biodiversity globally. They have already profoundly transformed the biodiversity of many sub-Antarctic islands, and are increasing in their prevalence in the Antarctic. Indeed, the threat of non-native species introductions has been identified as a priority Antarctic conservation concern by the Committee for Environmental Protection (CEP) within the Antarctic Treaty System. The Scientific Committee on Antarctic Research (SCAR) and the Council of Managers of National Antarctic Programmes (COMNAP) are working with the CEP to reduce the threats posed by non-native introductions to the Antarctic region.

Gradually, experience has shown that prevention of the introduction of non-native species is the most appropriate means of reducing the risks posed by them. If the species are not introduced they cannot go on to colonise an area and have an impact. Recent work, including that of the Aliens in Antarctica project undertaken during the International Polar Year, has identified the key pathways and vectors of non-native species introduction into the region.

Based on this research, and operator experience and consideration of what immediate actions can be taken by operators to reduce the risk of transfer of non-native species to the Antarctic, the checklists set out here have been developed. This document suggests actions that for many operators, can readily be taken, outlines why the actions are recommended, and provides guidance on the relative importance of each action in terms of practicability and reduction of risk of non-native species transfer. The importance ranking, from one star being the lowest to three stars being the highest, is a general guide. Given the range of environments that exist in the Antarctic region, the high importance of an action may not necessarily apply to all areas of the Antarctic.

It does not address however, the specific reduction of risk of introduction of micro-organisms, nor the reduction in risk of transfer of diseases. As further information becomes available and as the practicability of procedures to reduce the risks of introduction of non-native species improves, so these checklists will evolve.

COMNAP/SCAR Checklists for supply chain managers, poster version, 2010

Environmental Training

Much of the environment-related work of COMNAP since the mid-1990s has focussed on encouraging the sharing of expertise between the environmental officers of COMNAP member organisations through AEON, and, more recently, through the Environmental Expert Group. AEON also connected with other operational COMNAP groups, such as SCALOP, the Energy Management Working Group and ENMANET (later the Energy and Technology Expert Group). The effectiveness of environmental management

in Antarctica relies not only on these staff, but also on engagement with other base- and field-personnel working in Antarctica. Effective training of these personnel and visitors to Antarctica has taken on increasing importance as environmental protection requirements have increased with implementation of the Environmental Protocol. Staff exchanges between different programmes have provided environmental as well as operational learning opportunities.

Table 21: COMNAP activities related to Environmental Training

Year	Activity
2003	AEON-TRAINET Workshop on Training in Environmental Management
2004	ATCM XXVII IPO13: <i>Environmental Training in National Antarctic Programs: A Workshop Between the COMNAP Networks AEON and TRAINET</i>

Operation of Aircraft Near Concentrations of Birds

Consideration of the impact of aircraft operations on Antarctic birds was first mentioned in COMNAP AGM minutes in 2003, following the presentation by the UK in 2002 of ATCM XXV WP026: *Proposed Guidelines for*

the Operation of Aircraft Near Concentrations of Birds. Guidelines for the operation of aircraft in such situations have since been finalised, and are incorporated in the *Antarctic Flight Information Manual (AFIM)*.

Table 22: COMNAP activities related to Operation of Aircraft Near Concentrations of Birds

Year	Activity
2002	AEON and the Air Operations (AIROPS) Working Group review UK paper ATCM XXV WP026: <i>Proposed Guidelines for the Operation of Aircraft Near Concentrations of Birds</i> , and refer to SCAR for advice on distances
2004	COMNAP paper ATCM XXVII WP010: <i>Guidelines for the Operation of Aircraft Near Concentrations of Birds in Antarctica</i> ATCM XXVII adopts Resolution 2 (2004) Guidelines for "Aircraft Near Concentrations of Birds"; guidelines incorporated in <i>Antarctic Flight Information Manual</i>
2006	CEP IX requested COMNAP to consider provision of readily available information about wildlife concentrations where aircraft operations are taking place, how such information would be best presented and how such a product might be best developed and updated AEON and the Environmental Co-ordinating Group (ECG) undertook to ascertain current coverage of aircraft wildlife guidelines by national programmes



The use of aircraft in Antarctica requires consideration of their impact on birds.

Photo: Antarctica New Zealand Pictorial Collection

Marine Pollution

The COMNAP AGM minutes in 2004 noted a request from ATCM XXVII, to SCAR and other appropriate organisations, to investigate environmental and technical issues related to ballast water in Antarctic waters, with the concern that release of ballast water is a potential source of alien species. The use of marine acoustic equipment, such as in seismic surveys and echo sounding, was identified by SCAR through the early 2000s as a potential concern. In

2005 the ATCM–CEP specified marine acoustics and the use of antifouling biocide paints as topics of concern in relation to marine pollution. More recently, the use of heavy-fuel in Antarctic waters has received attention from the ATCM, and from COMNAP in the context of International Maritime Organization work on the Polar Shipping Code. COMNAP has surveyed its members to provide information for informed discussion by the ATCM and CEP.

Table 23: COMNAP activities related to Marine Pollution

Year	Activity
2004	Member survey covering ballast water practices, acoustic equipment and use of antifouling paints
2005	COMNAP paper ATCM XXVIII IP067: <i>The Use of Heavy Fuel Oil in Antarctic Waters</i> (joint COMNAP–IAATO paper) COMNAP paper ATCM XXVIII IP121: <i>The Use of Ballast Water in Antarctica</i> (joint COMNAP–IAATO paper)
2006	COMNAP paper ATCM XXXIX IP083: <i>The Use of Ballast Water in Antarctica: an update of ATCM XXVIII IP121</i> (COMNAP–IAATO); the paper noted that few, if any, of the ships operated by either COMNAP or IAATO members had an operational requirement for discharging ballast water in the area under normal circumstances COMNAP paper ATCM XXIX IP082: <i>The Use of Anti-fouling Biocide Paints by National Antarctic Program Vessels</i> COMNAP paper ATCM XXIX IP084: <i>Marine Acoustic Systems used by National Antarctic Program Vessels</i> ; Workshop on Marine Acoustics in Antarctic Waters, September 2006

Facing the Next Environmental Challenge

In 2012 SCAR, with New Zealand and the International Union for the Conservation of Nature (IUCN), presented an Information Paper to the ATCM titled *Antarctic Conservation for the 21st Century: Background, Progress, and Future Directions*.⁶ This paper traverses similar ground to the Chown et al. *Science* paper mentioned above.⁷ It highlights that *Antarctic and associated and dependent ecosystems are facing significant environmental pressures . . . Some of the most significant environmental pressures include: growing and diversifying human activities, accelerating climate change and the associated effects, ocean acidification, introductions of non-native species, and changes in food web dynamics as a consequence of interactions among these drivers*.⁸ Implicit in these papers is the challenge to the Antarctic Treaty System to take action to address these issues. Chown specifically issued this challenge to the 2012 COMNAP meeting, commenting that

COMNAP members, as the managers of human activities in Antarctica, will be held accountable by the rest of the world for good stewardship of Antarctica. COMNAP members agreed to take up this challenge and two workshops are currently being planned, one for September 2013 and a joint SCAR–COMNAP workshop for August 2014 to coincide with the joint meetings of SCAR and COMNAP and the Open Science Conference 2014.

COMNAP discussions have begun on the management implications of a changing Antarctica and its conservation challenges. COMNAP will need to identify to what extent the scope of its environmental work should go beyond its traditional focus on operational environmental management, to also engage in the broader issues of Antarctica and its place in a changing global environment.

⁶ ATCM XXXV IP035

⁷ S. L. Chown et al., Challenges to the future conservation of the Antarctic, *Science*, 337, 6091 (2012), pp. 158–159

⁸ p. 3





Supporting Scientific Co-operation – As Envisioned by the Antarctic Treaty

Supporting international collaboration in science has always been one of COMNAP's core principles. In this arena COMNAP links very closely with the Scientific Committee on Antarctic Research (SCAR), as well as providing a forum for bilateral and multilateral connections on international science projects and logistics support. COMNAP meetings have provided opportunity for the national programme managers to be updated on international science programmes and priorities. COMNAP has supported key SCAR initiatives that reach across all Antarctic science, such as systems for management of Antarctic scientific data and the International Polar Year (IPY). COMNAP forums enable national Antarctic programmes operating in geographical proximity and/or with bilateral or multilateral research projects to connect and plan co-operative logistics support. The COMNAP Information Officers Network (INFONET) and now the Outreach Expert Group have worked collaboratively on science outreach projects. These are additional to the range of activities described in other chapters that, through collaboration under the COMNAP umbrella, improve the effectiveness and efficiency of support for Antarctic science and the Antarctic Treaty System.

Close international and science–logistics connections have become increasingly important in recent years, with tight government and science budgets and the need for Antarctic science to provide answers to global issues. Research to answer complex global issues often requires the geographic coverage, expertise and logistics support of more than one country, which is facilitated by SCAR and COMNAP. The COMNAP forum, and the relationships that develop through meetings, workshops and linkages with SCAR, provide this foundation.

Forthcoming large-scale international science programmes were on the agenda for the first COMNAP meeting in 1989, with discussion as to how international science programmes should be brought to the attention of COMNAP. It was agreed that the SCAR Executive Secretary be asked to submit to COMNAP, on an annual basis, information on forthcoming large-scale international Antarctic science programmes.

“With more focus on global environmental issues and the Southern Ocean in Antarctic research, international and multi-disciplinary science are essential.”

– COMNAP Chair Anders Karlqvist, COMNAP report to ATCM XXII, 1998

Presenting the COMNAP report to the 1998 Antarctic Treaty Consultative Meeting (ATCM XXII), the COMNAP Chair Anders Karlqvist noted that . . . *with more focus on global environmental issues and the southern ocean in Antarctic research, international and multi-disciplinary science are essential.* COMNAP Information Paper ATCM XXII IP007 presented to the same meeting summarised scientific and operational co-operation in Antarctica. It showed each Antarctic programme co-operated scientifically with an average of eight other programmes, with only one country not having any international scientific collaboration.

In 2009 COMNAP adopted a new constitution, including a restatement of the importance of support of science: *COMNAP's primary mission is to develop and promote best practice in managing the support of scientific research in the Antarctic.* In a presentation to the 2009 COMNAP meeting the SCAR President, Mahlon “Chuck” Kennicutt II, emphasised the point that *research will become more complex, holistic, interdisciplinary, international, technology intensive, and often require continent-wide solutions.*¹

One of the factors recognised in adopting the new COMNAP constitution was that more-sophisticated science is driving an even greater need for international collaboration.

¹ COMNAP XXI Meeting Report (2009), p. 53

The EPICA Project

Heinrich “Heinz” Miller

The European Project for Ice Coring in Antarctica (EPICA) represented a landmark science project in many respects. It was a multinational project involving scientists and technicians from 10 European nations, not all of which had national Antarctic programmes, over a period of 11 years. It was successful in retrieving two deep ice cores, one at Concordia Station at Dome C, and the other at Kohnen Station in Dronning Maud Land. The two main goals were to get very old ice, and to get a high-resolution core covering the last glacial cycle for comparing the Antarctic record with the Greenland record. These main scientific goals were reached, and over 200 publications in high-profile journals are testimony to that.

With hindsight it is easy to write that this project was successful; however, getting there needed dedicated effort by many. Funding was secured partially through three European Union projects, and partially through so-called “national contributions”, where money from different national sources was paid into a common pot, out of which the cost of field operations was then covered.

The national Antarctic programmes of France and Italy took responsibility for the logistics for the Dome C drilling, and the German Alfred Wegener Institute was responsible for the Dronning Maud Land drilling. Given the rather awkward structure of such a multinational project it was essential that the leading people from

the science and logistics side had an excellent working relationship, and that the logistics problems were solved in the well established COMNAP way. Without COMNAP managers from the national Antarctic programmes – for example, David Drewry (UK), Mario Zucchelli (Italy), Gérard Jugie (France), Olav Orheim (Norway) and Heinz Kohnen and me (Germany) – EPICA would not have become a reality.

The EPICA project showed that it is possible to tackle expensive and long-term science projects in Antarctica, in a concerted manner, between many different national programmes. It also proved that COMNAP is a major and able player in such undertakings.

The future for Antarctic ice core science is already sketched out by the International Partnerships in Ice Core Sciences (IPICS) consortium. While some of the planned projects can be managed by a single national Antarctic programme, others, such as finding and drilling the “oldest ice” (the search for which is already underway), can again be managed only by multinational efforts, and here COMNAP can once again play a key role.

Heinrich “Heinz” Miller

Chair of the Scientific Steering Committee for EPICA 2000–10
Chair of COMNAP 2011–present
Deputy Director of the Alfred Wegener Institute for Polar and Marine Sciences 2000–12
COMNAP German representative 1998–present
Chair of the SCAR Working Group on Glaciology 1992–2000

Despite this consistent recognition through COMNAP history of the importance of supporting international science collaboration, defining COMNAP's role has proved challenging. At the first COMNAP meeting it was acknowledged that there are considerable differences in the way COMNAP members relate to the community of scientists in their respective national systems. In 1989 the then head of the German Antarctic programme, Gotthilf Hempel, specifically emphasised that *the MNAP [Managers of National Antarctic Programs] group should not attempt to replace SCAR in the planning of large programmes. Nor can the MNAP group be a substitute for the direct links between national SCAR representatives and their MNAPs.*² Yet, one of the strengths of COMNAP has been that many of its national representatives have had science backgrounds before being promoted to leading

management roles, ensuring that there has been a high level of appreciation of the science to be supported as well as an understanding of the operations and logistics management necessary.

Neither COMNAP nor SCAR has funding for large scale international projects; these predominantly rely on national research funding priorities and agencies. COMNAP members, to varying degrees and alongside SCAR national committees, provide a feedback loop on international Antarctic science priorities into national science funding processes. Some COMNAP member organisations set Antarctic science priorities and fund the science; others operate within other national funding systems and have direct responsibility only for logistics support. When these variations are overlaid with SCAR research priorities and large scale international programmes, and another range of relationships at the national level between SCAR

² COMNAP I Meeting Report (1989), p. 4



Ice measurements near Progress Station

Photo: AARI/RAE

First Meeting with Antarctica as a Symbol of Future Co-operation

Valery Lukin

My experience of working in COMNAP is now more than twenty years. During this period of time I have been fortunate to take part in many big international logistical projects in Antarctica. These have included the Russian–German environmental protection operation in the area of the Schirmacher Oasis, the search for a site for the new Antarctic station of the Republic of Korea, provision of ice information for polar cruises of the Korean research icebreaker the *Araon*, the DROMLAN collaborative air programme and many others. In these projects we have got to know our foreign colleagues, and together have overcome various difficulties and achieved successful results.

I remember especially well my first Russian–US Antarctic Project in the Weddell Sea, when the Russian Antarctic Expedition (RAE) and the United States Antarctic Program (USAP) organised jointly the first drifting research station on sea ice. During preparation of this project in 1991 I visited the Antarctic for the first time, on board the German research icebreaker the *Polarstern*, to carry out reconnaissance surveys of sea ice in the south-western area of the Weddell Sea. In January 1992, with American colleagues on board the Russian vessel the *Akademik Fedorov*, we found a suitable ice floe and deployed a temporary scientific ice camp for 33 people. More than 20 years have passed from this memorable date when on 12 February 1992 we hoisted our national flags and began an independent drift. We got closely acquainted with each other and became familiar with the methods of our studies and organisation of life on the drifting ice. In spite of our differences we began very quickly to understand each other and find solutions to the most unexpected situations. The drift of the “Weddell-1” station created a sound basis for subsequent contacts with the USAP in the Antarctic, in particular leading to joint studies of the ice core at the Russian Antarctic Vostok station from 1993 to 2003.

Valery Lukin

Head, Russian Antarctic Expedition 1991–present
 Russian COMNAP representative 1993–present
 Deputy Director of the Arctic and Antarctic Research Institute
 2002–present

national committees and delegates on the one hand, and government science management and funding mechanisms on the other hand, the result is a complex national and international matrix. At times there have been expectations from SCAR science groups that, because SCAR is backing a particular programme, COMNAP should collectively arrange support. The reality is more complicated and more difficult.

Close connections with SCAR have been maintained through both organisations meeting at the same location every second year, through annual meetings between the Executive Committees of the two organisations, and via a standing invitation to the SCAR President to participate in COMNAP AGMs. There have been presentations to COMNAP meetings on key international science projects from SCAR Chief Scientists, and joint science workshops at some COMNAP–SCAR meetings. COMNAP and SCAR have often co-authored joint Working and Information Papers to the ATCM–CEP, on topics of mutual interest, and particularly on environmental topics. The annual meetings of COMNAP also provide opportunity for side meetings of national programmes on specific bilateral or multilateral science programmes. Some COMNAP representatives are also their country’s SCAR delegate and attend both meetings.

Since 2004 SCAR has run an Open Science Conference in association with its biennial meetings of delegates. The first day of this conference and the plenary sessions have generally been incorporated into the COMNAP agenda, to enable COMNAP members to attend sessions at both the Open Science Conference and the COMNAP AGM.

Table 24: Science presentations and workshops associated with COMNAP AGMs

COMNAP meeting	Topic
COMNAP II (1990)	International Geosphere Biosphere Programme (IGBP) Antarctic Lithosphere Project Cenozoic Paleoenvironments
COMNAP III (1991)	BIOMASS Southern Ocean Ecology International Geosphere Biosphere Programme (IGBP) Antarctic connections
COMNAP V (1993)	Global Change Antarctic (GLOCHANT)
COMNAP VI (1994)	SCAR Working Groups and Groups of Specialists
COMNAP VIII (1996)	SCAR Working Groups and Groups of Specialists
COMNAP IX (1997)	Antarctic Offshore Stratigraphy project (ANTOSTRAT)
COMNAP X (1998)	COMNAP–SCAR joint session on facilitation of international science European Project for Ice Coring in Antarctica (EPICA) Lake Vostok sub-glacial lake research Global Change Antarctica (GLOCHANT) Antarctic Pack Ice Seals (APIS) Cape Roberts Project sedimentary drilling
COMNAP XIII (2001)	Sub-Glacial Lakes Exploration
COMNAP XIV (2002)	SCAR–COMNAP Science Workshop Sub-Glacial Lakes Exploration Antarctic Neotectonics Cybercartographic Atlas Southern Ocean
COMNAP XVI (2004)	First SCAR Open Science Conference
COMNAP XVIII (2006)	SCAR Open Science Conference II
COMNAP XX (2008)	SCAR Open Science Conference III
COMNAP XXI (2009)	Future Directions of Antarctic Science: Implications for National Programs
COMNAP XXII (2010)	SCAR Open Science Conference IV COMNAP–SCAR Workshop on the risk of introduction of non-native species into Antarctica Joint plenary with SCAR national delegates Southern Ocean Observing Systems (SOOS) Data and Information Management Strategy (DIMS)
COMNAP XXIII (2011)	International Partnerships in Ice Core Science (IPICS)
COMNAP XXIV (2012)	SCAR Open Science Conference V Integrating Climate and Ecosystems Dynamics (ICED): Southern Ocean Sentinel Blue Whale Research Project International Polar Initiative
COMNAP XXV (2013)	SOOS Workshop

There have also been some specific science-related initiatives, generally in conjunction with SCAR, such as the development of an Antarctic science metadata directory (the Antarctic Master Directory, AMD) on NASA's Global Change Master Directory (GCMD), the establishment of a COMNAP International Polar Year Co-ordinating Group to provide a link between COMNAP and IPY science programmes, and outreach initiatives telling the story of international science collaboration.

The COMNAP and SCAR Executives agreed at their joint meeting in August 2009 that they would form a Joint Action Group that would focus on developing a strategy for a sustainable partnership for the two organisations. Terms of reference for the group were agreed and the Joint Action Group first met in Baltimore, USA, in March 2010.

The initial outcomes from the Joint Action Group have included agreement on a more co-ordinated approach to topics presented at ATCM–CEP meetings, agreement to prioritise continued joint work on prevention of the introduction of non-native species into Antarctica, the annual award of a COMNAP Antarctic Research Fellowship, and combining the SCAR Working Group on Human Biology and Medicine and the COMNAP Medical Expert Group into a joint COMNAP–SCAR Expert Group on Human Biology and Medicine.

The Action Group has also supported the need to develop tools to assist improved co-operation on science projects. One such tool, the Antarctic Peninsula Advanced Scientific Information system (APASI), was already under development within COMNAP, driven by the significant level of national Antarctic programme activity taking place on King George Island. SCAR agreed that such a tool could be useful alongside the SCAR Action Group on King George Island Co-ordination and a King George Island Global Information Systems (GIS) Group.

In 2010 COMNAP established a Science Expert Group. The terms of reference for this group were to

- Screen SCAR processes for “big collaborative” science programs (eg SOOS, IPICS etc.)
- Identify areas of logistic support, which can be facilitated jointly by national Antarctic programmes
- Look out and identify projects on the horizon
- Identify logistic capabilities, which may be used jointly in the future
- Organize one “science” lecture at each AGM with a focus on supporting that science
- Collect examples of past and present collaborative projects including lessons learned.

Joint Committee on Antarctic Data Management

One of the fundamental principles of the Antarctic Treaty is Article III 1 (c): *scientific observations and results from Antarctica shall be exchanged and made freely available*. SCAR and COMNAP have run paper-based exchange-of-information systems to meet the requirements of the Treaty. These are cumbersome to operate, and are very high-level and not amenable to populating with current science information. In 1985, prior to the establishment of COMNAP, the Antarctic Treaty Consultative Meeting (ATCM) requested advice from SCAR on improving the comparability and accessibility of Antarctic data.

SCAR created an ad hoc Committee on the Co-ordination of Antarctic Data (CCAD) in 1989. This subsequently became a joint COMNAP–SCAR group, and proposed the development of an Antarctic Data Directory System (ADDS) with National Antarctic Data Centres (NADCs) in each country linked to an AMD. In 1996 COMNAP was advised that the planning work of this group was complete and that a COMNAP–SCAR Joint Committee on Antarctic Data Management (JCADM) should be set up to oversee the continued development of the AMD and the network of NADCs. This was established, and by 1998 the AMD was operating at the International Centre for Antarctic Information and Research (ICAIR), Christchurch, New Zealand, funded by a consortium of the USA, Italy, France and New Zealand. The AMD is a metadata directory: it provides information on datasets and pointers to other databases and institutes that hold the data.

In 1999–2000 there was considerable discussion within and between SCAR and COMNAP on the value and future of the AMD. The challenges of developing systems to support international Antarctic science include the very different levels of resourcing and mechanisms for doing and supporting Antarctic research in different countries, and the varying needs and existing data infrastructure of different science disciplines. Successful establishment of the AMD was dependent on individual countries setting up NADCs to feed information into the AMD, and in 1999 only seven countries had operational NADCs.

By 2000 the Antarctic directory had become a sub-directory of the NASA GCMD, and a SCAR survey of its members indicated support for further development of the AMD. COMNAP agreed with SCAR to share the costs of the GCMD hosting for an initial two-year period. The GCMD continues to host the AMD, and COMNAP financial support continued until 2009. SCAR now provides oversight for the AMD and the IPY data system through its Standing Committee on Antarctic Data Management.

The JCADM report to COMNAP and SCAR in July 1998 identified that there were 7 NADCs and 504 metadata records held on the AMD. By November 2012 the GCMD showed links to 21 NADCs and over 6400 data set descriptions or metadata records. A portal for the IPY is also hosted by the GCMD.

While COMNAP is now no longer directly involved in the Antarctic Data Management System, the COMNAP input into the strategy and funding of the AMD in the mid-to-late 1990s had a significant influence on its development.

Table 25: COMNAP activities related to Joint Committee on Antarctic Data Management

Year	Activity
1985	ATCM Recommendation XIII-5 asked SCAR for advice to improve the comparability and accessibility of Antarctic data
1989	SCAR ad hoc Committee on the Co-ordination of Antarctic Data established
1992	COMNAP–SCAR ad hoc Planning Group on Antarctic Data Management established COMNAP–SCAR Paper ATCM XVII WP005: <i>International Directory Network/Antarctic Data Directory System</i>
1995	COMNAP–SCAR call for proposals to operate an Antarctic Master Directory (AMD) COMNAP–SCAR Paper ATCM XIX IP061: <i>Antarctic Master Directory: Progress</i>
1996	COMNAP–SCAR Joint Committee on Antarctic Data Management (JCADM) established AMD/Antarctic Data Directory System (ADDS) support service to be developed at ICAIR, Christchurch, New Zealand
1997	National Antarctic Data Centre (NADC) Managers Workshop COMNAP–SCAR Paper ATCM XXI IP031: <i>Management of Antarctic Data (Implementation of the Antarctic Master Directory (AMD))</i>
1998	COMNAP–SCAR Paper ATCM XXII IP085: <i>Antarctic Data Management</i> ATCM XXII Resolution 4 (1998) recommended that Antarctic Treaty parties establish NADCs and link these to the ADDS managed by JCADM; and that they encourage their scientists to provide timely information into the NADCs JCADM four-day workshop, Concepción, Chile European regional NADC workshop, Bremerhaven, Germany
1999	COMNAP–SCAR Paper ATCM XXIII IP008: <i>Antarctic Data Management</i> South American regional NADC workshop, Santiago, Chile
2000	AMD transferred to NASA's Global Change Master Directory (GCMD) COMNAP and SCAR jointly provide funding to the GCMD
2009	COMNAP handed over management to SCAR with establishment of SCAR Standing Committee on Antarctic Data Management (SC-ADM)

Box 4: Comments on the Antarctic Data Management System from SCAR Data and Information Management Strategy 2009 (from SCAR Report 34)

Testimonial from a young researcher:

The SCAR Antarctic Data Management System has significantly reduced the amount of time I have had to spend familiarising myself with research relevant to the project that I'm currently undertaking. The SCAR metadata system, and its affiliated, inter-linked core web-based systems permit me to readily discover, and in most cases access almost immediately: raw data; derived data; publications; products; and model output, regardless of when, where and how those data were originally collected . . . I don't know if I could ever move into another research field that wasn't supported by such a fantastic data management system.

Testimonial from a seasoned research scientist:

I must admit that when development of the SCAR Antarctic Data Management System began in earnest I was very sceptical about using it, or making any sort of contribution . . . The new SCAR dataset citation system is now widely accepted as a legitimate research performance indicator by SCAR participants, and has made a big difference to how my work is being received in my home agency.

The International Polar Year (2007–08)

The International Polar Year (IPY) 2007–08 (and extending into 2009) was a major initiative to put the polar regions into focus and to mobilise resources for research and international co-operation. It followed a tradition: the first Polar Year had been in 1882–83, followed by a second Polar Year 1932–33, and the International Geophysical Year (IGY) 1957–58. IGY was a milestone for Antarctica; it was the origin for SCAR and the Antarctic Treaty. The international co-operation during IGY demonstrated that, with science as a focus, it was possible to reach a peaceful consensus approach to managing human activity. The international co-operation in support of science that COMNAP facilitates provides the operational foundation for the Antarctic Treaty.

The planning of IPY was initiated and overseen by a joint committee of the International Council for Science (ICSU) and the World Meteorological Organization (WMO). An IPY Programme Office (IPO) was hosted by the British Antarctic Survey (BAS) in Cambridge, UK. The Director of BAS and Chair of the ICSU IPY planning group, Chris Rapley, updated the 2003 COMNAP meeting on plans for the IPY, and in 2004 COMNAP set up an IPY co-ordinating group (IPYCG) led by previous COMNAP Chair and head of the Swedish Polar Secretariat, Anders Karlqvist. This group provided a connection point with SCAR and other international organisations involved with IPY, and organised COMNAP meeting sessions for presentation and exchange of information on IPY initiatives and logistics needs.

Following the IPY there has been discussion in COMNAP and SCAR forums of how to maintain IPY initiatives and legacies, in particular long term observatory and monitoring activities. An ongoing International Polar Initiative (IPI) has conceptual support from a range of international scientific and environmental organisations, including SCAR, ICSU, WMO and the United Nations Environment Programme (UNEP). The IPI focus is on addressing the global challenges of ongoing dramatic changes in polar regions, with a plan of sustained observations, research, outreach and services.

A presentation on IPI was provided to the 2012 COMNAP meeting by the head of the Norwegian Polar Institute and member of the IPI steering group, Jan Gunnar-Winther. The meeting agreed to consider a COMNAP workshop on IPI. The minutes note that . . . *large initiatives such as the proposed IPI require co-operation that only the COMNAP National Antarctic Programs can organise, manage and provide, so the workshops are critical to understanding what capability exists and therefore to determine what science can successfully be delivered.*

COMNAP and the International Polar Year

Anders Karlqvist

The role of COMNAP in the IPY context was very much in line with COMNAP's basic mission: to support science and multinational logistical partnership. Many of the scientific activities were formulated within a framework set up by the IPY Programme Office (IPO). In addition many nations had national IPY committees and even special resources for IPY research. The general increase of activities during IPY was a major challenge for COMNAP. Important decisions about science priorities and funding were taken by national organisations under the general guidance of IPO. Hence partnership and information exchange became important factors. For COMNAP the relationship with SCAR had high priority throughout the whole IPY planning process.

In 2004 COMNAP established an IPY co-ordinating group (IPYCG) chaired by me (Sweden), with other members from Chile (Patricio Eberhard), Republic of Korea (Yeadong Kim), Russia (Valery Lukin) and South Africa (Henry Valentine).

The IPY was officially launched on 1 March 2007. It was to engage around 70 nations, involving more than 50,000 scientists and personnel across the Arctic and Antarctica, with an estimated total budget of approximately USD 1.2 billion, one third of which was special IPY funding. Whereas the IGY in 1957–58 had had a special emphasis on Antarctica (and space research), for the IPY the development in the Arctic region was given special attention, also implying a greater emphasis on social and economic aspects. From COMNAP's perspective this also gave an opportunity to interact more closely with its Arctic counterparts, the International Arctic Science Committee (IASC) and the Forum of Arctic Research Operators (FARO).

The discussions on IPY in COMNAP and its IPYCG were typically focussed on exchange of operational information on ship, aircraft and traverse capabilities and the exchange of more-general information to provide material for outreach.

The importance of keeping each other informed about ship operations was stressed by the IPO as well as by SCAR. COMNAP provided an updated ship survey in December 2006. It seemed as if the availability of vessels and the capacity for executing large scale marine programmes would be critical factors and bottlenecks for co-ordinated planning of IPY logistics. Still, the responsibility for

the operations was in the hands of national operators. COMNAP's role was to encourage exchange of information between operators and from the science community. In that context it was stressed that COMNAP's resource in terms of information officers and their network (INFONET) was a valuable asset. Outreach and the encouraging of young scientists was an important part of IPY, although the main responsibility for those activities rested with the IPO.

It is difficult to trace the specific impact of COMNAP in the IPY process. The general level of activities during these years did successfully contribute to a great deal of important polar research and a stimulated interest in the polar regions among politicians and members of society, also in countries with less close relations geographically to these extreme parts of the world. COMNAP was one of many players. It had the advantage of direct access to "ground truth" and played a useful role in the information flow among actors, especially in the science community. One important initiative that was discussed by COMNAP was the co-ordination of a comprehensive glaciological project based on traverses. Several nations implemented such traverse programmes. Another initiative in the spirit of IPY, proposed by the US Antarctic Program, was to organise a workshop on weather forecasting. The ability to provide effective forecasting would be a useful tool to the IPY legacy. COMNAP welcomed and supported this proposal.

New infrastructure and stations were put into place as national contributions to IPY, and the information exchange provided by COMNAP was an important means for discussion of technical solutions and benchmarking. By and large IPY highlighted the very essence of international science co-operation. For COMNAP it was a challenge to meet the enhanced expectations of the science community and to build on this experience for the future operations of COMNAP.

Anders Karlqvist

Chair of COMNAP 1994–97

Chair of COMNAP IPYCG 2005–08

Head of Swedish Polar Secretariat 1985–2010

COMNAP Swedish representative 1988–2010

Managing International Science Projects – The Cape Roberts Project and ANDRILL

Gillian Wratt

The Cape Roberts Project (CRP) was a multi-year international collaborative scientific drilling and research programme with seven partner countries: Australia, Italy, Germany, the Netherlands, New Zealand, the UK and the USA. Its aim was to recover sedimentary core from beneath the sea floor off Cape Roberts on the eastern coast of Victoria Land in the Ross Sea Region of Antarctica, enabling better understanding of the climate and tectonic history of the region. The formal beginning of the project was a preliminary planning workshop held at Victoria University of Wellington, New Zealand in May 1992. The drilling work and initial core analysis were carried out from 1997 to 2000 on the sea ice at Cape Roberts and in the Cray Laboratory at McMurdo Station.

CRP was a technically, logistically and financially complex project, requiring close collaboration and trust between the players: scientists, logisticians, drilling technologists and national programme managers from different countries. Also critical for success was a strong project leadership group of Peter Barrett (science), Alex Pyne (drilling technology) and Jim Cowie (logistics), supported by science, operations and national Antarctic programme managers from all seven partner countries who were prepared to back a high risk project. The scientific and logistics success of CRP led to the still more technically challenging ANDRILL project, which included drilling off and through the Ross Ice Shelf in 2006–08. The partners in ANDRILL are Brazil, Germany, Italy, New Zealand, the Republic of Korea, the UK and the USA. Table 26 shows the international and science–drilling–logistics collaboration that resulted in success for CRP and establishment of the ANDRILL consortium.

CRP and ANDRILL were preceded by a number of smaller projects that provided the scientific, technical and logistics experience on which CRP and ANDRILL built.

A key challenge from the beginning of CRP was how to balance the scientific participation and logistical contributions of the interested countries. The project was carried out in the Ross Sea Region of Antarctica, where Italy, New Zealand and the USA all had significant infrastructure, allowing them to contribute “in kind” resources. Italy provided shipping support; New Zealand

provided logistics and drilling management and support, and accommodation; and the USA provided the Cray Laboratory facilities, logistics support and accommodation. Additional to these in-kind contributions the project needed cash for drilling equipment, dedicated CRP infrastructure, and drilling and logistics staff. New Zealand, as the logistics and drilling manager, prepared a project budget, including costing the in-kind support from Italy, New Zealand and the USA. A balancing of cash and in-kind contributions, in proportion to scientific participation in the project, was agreed – a simple principle, but challenging to implement given seven different cultures and currencies, fluctuating exchange rates, different management and funding systems for Antarctic science and logistics in each country, and variations in cost against the initial budget due to operating and technical delays, with a logistically and technically challenging project operating off seasonal Antarctic sea ice.

There were inevitable tensions. The Italy–New Zealand–USA relationship, developed over many years of collaborative science and logistics support out of Christchurch into the Ross Sea Region, and the relationships across all seven programmes built through COMNAP and SCAR, provided a sound basis for the success of the project. Face to face meetings between managers, logisticians, drilling experts and science leaders at a number of international meetings, including in the margins of COMNAP and SCAR meetings, were essential to resolving issues.

While COMNAP did not formally support either CRP or ANDRILL, these projects are an example of how COMNAP provides the forum and the relationships based on trust that help build successful collaboration. They also illustrate that supporting international projects is not simply a matter of COMNAP collectively signing off on a project or programme supported by SCAR.

Gillian Wratt

Chair of CRP Operations Management Group 1993–2000
 Chair of COMNAP 1997–2001
 Director, New Zealand Antarctic Programme, CEO, Antarctica New Zealand 1992–2002
 New Zealand COMNAP representative 1992–2002

Table 26: CRP Planning and Operations Chart

PRIOR PROJECTS			
Deep Sea Drilling Project (DSDP) Leg 28: Ross Sea Continental Shelf – USA, NZ – 1973			
Dry Valley Drilling Project (DVDP) – NZ, Japan, USA – 1972–75			
McMurdo Sound Sediment and Tectonic Studies (MSSTS) – NZ – 1979			
Benjamin Bowring seismic survey – NZ – 1980			
Sea ice surveys off Cape Roberts – NZ – 1983–85			
Cenozoic Investigations in the Western Ross Sea (CIROS) – NZ – 1984–86			
US Geological Survey multichannel seismic survey Western Ross Sea off <i>S. P. Lee</i> – USA, NZ – 1984			
Year	SCIENCE	DRILLING SUPPORT	LOGISTICS
1992	Preliminary CRP planning workshop, Victoria University (VUW), NZ; Australia, Germany, Italy, Japan, NZ, USA		
	International Steering Committee (ISC) established		Draft Comprehensive Environmental Evaluation (CEE) prepared – NZ
1993	Sea floor bathymetric survey of potential drill sites off Cape Roberts – USA		CRP presentation to interested countries at COMNAP meeting in NZ – indicative budget and draft Record of Understanding (ROU)
	CRP meeting Washington DC, USA – UK, Germany, Italy, NZ, USA; Operations Management Group (OMG) established and NZ appointed as Project Operator; budget and proportional contribution from each country agreed		
1994	Joint ISC–OMG meeting at COMNAP–SCAR meetings in Rome; ROU reviewed		CRP Project Manager appointed – NZ
	Aeromagnetic survey flown over proposed drill sites – Italy		Cape Roberts camp construction begun in NZ
1995		CRP Drilling Manager appointed	1 st ship offload at Cape Roberts – Italy
		Drill rig design and build completed in NZ	OMG meeting at COMNAP meeting Santiago
1996	ISC meeting Wellington, NZ		2 nd ship offload at Cape Roberts – Italy
	Combined ISC–OMG meeting at COMNAP–SCAR meetings in Cambridge, UK; decision to delay project start one year due to poor sea ice conditions		
1997	ISC meeting, Hanover, Germany	Drill rig test, Cape Roberts	Camp assembly and test, Cape Roberts OMG meeting at COMNAP meeting Capetown, South Africa
	CRP-1 drilling season and core analysis at Cray Lab; drilling terminated early (Oct) due to unseasonal violent storm causing sea ice break up adjacent to drill rig		
1998	ISC meet at Scott Base to review CRP-1	Sea riser refurbishment in NZ	OMG agree to fund sea riser refurbishment
	ISC meeting Washington DC, USA; recommend sea riser refurbishment and project extension into 3 rd drilling season		OMG meeting at COMNAP meeting Concepción, Chile; discuss 3 rd drill year proposal from ISC
	ISC meeting and CRP-1 workshop University College London, UK		
	CRP-2 drilling season and core analysis at Cray Lab		
	Joint ISC–OMG meeting at Scott Base; agreement to fund 3 rd drilling year		
1999	ISC meeting and CRP-2 workshop VUW, NZ		
	CRP-3 drilling season and core analysis at Cray Lab		
2000			OMG meeting at COMNAP meeting Goa, India; discussion of clean-up, future of CRP assets and a new Antarctic drilling consortium
	ISC meeting in Brisbane and discussion of successor project		OMG meeting at COMNAP–SCAR meeting Tokyo, Japan; presentation from ISC reps on new Antarctic Stratigraphic Drilling Office
	ISC meeting and CRP-3 workshop Ohio State University, USA; ANDRILL consortium established		CRP clean-up
2001	ANDRILL parties meet at Oxford University, UK; development of ANDRILL science and drilling strategy		

Outreach

Most COMNAP members have a commitment to telling the Antarctic science story at a national level. This is done through websites, publications, exhibitions, media stories, presentations at schools, participations in festivals, and in some cases visits by media representatives, artists and students to Antarctica. In 1998 a forum on education and training was held at the COMNAP annual meeting in Concepción, Chile. This included discussion of both education and training of personnel going to Antarctica, and education of the public on Antarctica and Antarctic science. As a result of this forum, an Information Officers Network (INFONET), of people responsible for the public information and education functions in COMNAP agencies and in the offices of SCAR and IAATO, was established to exchange information and experience about public information and public education initiatives. One of the tasks that were set for INFONET was the assessment of the potential of a collaborative millennium project.

INFONET struggled to gain any traction until the lead-up to IPY when several INFONET workshops were organised. The first was held prior to the COMNAP meeting in Sofia, Bulgaria in 2005. While there was concern expressed by some members during the subsequent COMNAP meeting as to whether outreach was the business of COMNAP as an organisation, it was recognised that national Antarctic programmes had an invaluable resource, in their information officers, for Antarctic education and outreach. The meeting agreed to support INFONET and bring together the national programme information officers with the objective of facilitating and promoting the development of partnerships in education and outreach between national programmes and with other stakeholders.

Table 27: COMNAP activities related to Outreach

Year	Activity
1998	COMNAP X, Forum on Education and Training, Concepción Establishment of the COMNAP Information Officers Network (INFONET)
2005	INFONET Workshop in Sofia prior to COMNAP XVII
2006	INFONET Workshop in Washington DC with participation from the Antarctic Treaty Secretariat, SCAR, ICSU and the IPY Programme Office
2008	INFONET Workshop, St Petersburg associated with COMNAP XX and SCAR XXX
2010	COMNAP Outreach Workshop at IPY Oslo Science Conference
2012	COMNAP representative on the International Steering Committee for IPY Montreal Conference

The 2007 COMNAP meeting record notes national programme collaborative outreach activities facilitated through INFONET during 2006–07 included an *Oden* Cruise Outreach (Sweden, USA, Chile), ANDRILL Outreach (Italy, Germany, New Zealand, USA), 50 Year Partnership (USA, New Zealand) and Ice Station Antarctica (UK, Republic of Korea, Spain, USA).

INFONET members were actively involved in the IPY International Steering committee and subcommittees. Although INFONET did not play a direct role it facilitated the connections that were instrumental in IPY outreach activities. These INFONET connections have continued post-IPY. For example a COMNAP Outreach Workshop was held at the IPY Oslo Science Conference in 2010, to provide an opportunity for INFONET members to meet with others in the wider IPY Education, Outreach and Communications (EOC) community, and to take forward the legacy of IPY EOC. The COMNAP Outreach Expert Group (the successor to INFONET) leader was a member of the Conference Steering Committee for the Montreal IPY Conference in 2012, and the COMNAP Executive Secretary participated in the conference as an Association of Polar Early Career Scientists (APECS) mentor and was the COMNAP representative on the International Steering Committee.

Making an Impact – Communications, Public Engagement and Outreach

Linda Capper

During the 25 years of COMNAP's existence the digital revolution catapulted all of us into the fast-paced and complex "Information Age". The widespread introduction of email and the World Wide Web gave our communities new opportunities to communicate with one another and share a wealth of experience, expertise, information and online resources.

In 1998 Tim Higham, outreach manager for Antarctica New Zealand, made contact with his counterparts in other national programmes to establish INFONET. For the few of us who were working in the relatively new discipline of "science communication" this was a wonderful opportunity to discover what other national programmes were doing to communicate and engage people in their science and operational activities. We shared our policies and procedures for Antarctic media visits, artists' and writers' programmes, educational activities and public engagement programmes – and found a remarkable similarity of approaches.

For several years the COMNAP Executive wondered what to do with INFONET. Delivering communication and public engagement is fast-paced and demanding, and whilst all of us were keen to stay connected to share information and best practice, we were reluctant to take on additional project work!

The initiation of International Polar Year (2007–08) drove the fields of polar education, outreach and communications (EOC) to the forefront in a way that had never before been attempted. IPY brought together communications and outreach professionals from leading polar institutions from all over the world and provided the impetus for COMNAP EOC members to strengthen their network and play a leading role in this remarkable polar achievement.

Face-to-face planning workshops in Sofia, Bulgaria in 2005, at the US National Science Foundation in Washington in 2006 and at the COMNAP meeting in St Petersburg in 2008 involved INFONET and stakeholders from the International Council for Science, the Antarctic Treaty Secretariat, the IPY Programme Office and Scientific Committee on Antarctic Research.

As planning for IPY developed, the huge burst of activity to develop EOC activities intensified. An IPY International EOC group and a European Polar Board EOC task force were established and INFONET members were invited to take leading roles. IPY provided the "glue" that brought our network closer together.

In the last few years some of us have enjoyed exchange visits to the Norwegian Polar Research Institute, the British Antarctic Survey, US National Science Foundation, and the Instituto Antártico Chileno. We've been mentors and have given communications training to the Association of Early Career Scientists (APECS); we've worked jointly on a press and media campaign at the IPY meeting in Oslo; and we've worked in partnership to develop the Public Engagement Programme for the IPY From Knowledge to Action conference in Montreal.

As we all know, working in partnership within COMNAP can help optimise polar science and infrastructure – a goal that is particularly important during periods of global economic constraint. The continued efforts by our networks to promote, explain and engage people in polar science and operations will demonstrate, one hopes, the value of this extraordinary international partnership for societal and economic well-being.

Linda Capper

Co-ordinator/Chair INFONET/Outreach Expert Group for 2007–11
IPY Education, Outreach and Communications Steering Groups (UK, International, European groups) 2005–09
IPY 2012 Conference, "From Knowledge to Action", Montreal:
Programme Chair – Public Engagement 2011–12
Information Manager, British Antarctic Survey 1990–2000
Head of Communications, British Antarctic Survey 2000–present



The Swedish icebreaker Oden and the US RVIB Nathaniel B. Palmer meet in the Antarctic Peninsula region

Photo: K. Ndungu, Swedish Polar Research Secretariat

Antarctic Peninsula Advanced Scientific Information system (APASI)

Reviewing the mechanisms used for collaborative support to science and exploring possible new options was identified as a strategic COMNAP project in 2008. As a start point, the Antarctic Peninsula Advanced Scientific Information system (APASI) was initiated in 2009, with leadership from the head of the Chilean programme and COMNAP Chair José Retamales.

Initially focusing on King George Island, the project involves the collection and analysis of information on the activities of 10 countries with stations and research programmes on the island, enabling sharing of information on science projects for upcoming seasons. The goal of the project was to better co-ordinate science and logistic activities in order to reduce duplication. It established a Web-based database that included information on proposed research projects,

location, principle investigator and contact details. To date, only one national Antarctic programme has entered its data into the system. Members' comments on the APASI tool from the 2011 COMNAP AGM are being considered so as to improve the usefulness of the system and therefore encourage greater participation.

While attempts to better co-ordinate King George Island science have been made through SCAR King George Island Action and GIS groups, this is the first COMNAP initiative. Whether involvement of the programme managers, and liaison with SCAR through the COMNAP–SCAR Joint Action Group will make a difference to the success of these initiatives, time will tell. The APASI approach is very similar to that used successfully by the Norwegian Polar Institute for research on Svalbard.

The Antarctic Peninsula Advanced Science Information System

José Retamales

For many years there have been discussions at the ATCMs, at COMNAP and SCAR meetings, at regional gatherings such as the RAPAL (Reunión de Administradores de Programas Antárticos Latinoamericanos) meeting, and in various other forums, on how we can improve international co-operation in delivering Antarctic science. After listening to these discussions for many years, in particular as Chair of the ATCM Working Group on Operational Matters and as Chair of COMNAP, I observed that such discussion is often focussed on national Antarctic programme activity in the Antarctic Peninsula area. This is hardly a surprise when you stop to consider that national Antarctic programmes from sixteen COMNAP member countries and from three non-Consultative States, plus other organisations, carry out activity in that region, with a cluster of activity and facilities on King George Island.

At the SCAR XXVI meeting held in Tokyo in July 2000, a recommendation was adopted that called for efforts to integrate scientific objectives and for collaboration among the nations working on the island. The King George Island GIS project was established to better support scientific activities among the national Antarctic programmes operating there. The ultimate goal was to reduce duplication of science and make best use of the research facilities and related infrastructure in order to increase efficiency and reduce environmental impact in the region.

In 2009, during my time as COMNAP Chair, COMNAP and SCAR convened a joint Action Group. The goal of the group was to strengthen the relationship between the two organisations, and, after a critical meeting in the USA, facilitated by Berry Lyons of Ohio State University, the primary outcome of the Action Group meeting was a list of 11 items of mutual interest that COMNAP and SCAR agreed to work on together.

One of those items was development of the Antarctic Peninsula Advanced Science Information system. The vision for the APASI was for it to become a tool for SCAR and for national Antarctic programmes to have information in advance of each Antarctic research season on what science was planned and where it would be carried out, to enable collaboration in the field or after the field research component, on such things as sharing of samples collected or exchange of datasets. APASI was created in 2009 as a

COMNAP project, with the project work being undertaken and managed by INACH.

While APASI seemed like a good idea at the time and COMNAP the most appropriate place to develop and host such information, only INACH has to date submitted its programme information into the APASI system, even though every national Antarctic programme operating in that area was asked to provide their information. The reason for the lack of take-up on the project is unclear. It is not likely to be lack of awareness of the project or lack of awareness of research efforts being duplicated. The real reason requires continuing investigation.

Personally, APASI has taught me several lessons about true international collaboration. First lesson: all national Antarctic programmes are different. Each has varying levels of involvement in science planning and so some are simply not interested in an APASI concept. Second lesson: science proposal selection processes are not perfect, with many knowing what is being published in their area of expertise, but with perhaps none understanding what exactly is going on outside their own country, or within COMNAP, to deliver the science results. Third lesson: politics – or maybe it is better stated as “national pride” – are against the grain of APASI, since each national Antarctic programme is charged with delivering its country's Antarctic science strategy, not with suggesting less science take place since others are doing the same or similar already.

APASI was not developed in vain, and the lessons learned were shared at the COMNAP XXV AGM. Information from this discussion will also be fed into ATCM considerations on international co-operation that are taking place intersessionally and are likely to be a topic at many future ATCMs. Lessons learned within COMNAP on barriers to international co-operation at a national Antarctic programme level may assist our diplomatic colleagues to understand the challenges at a political level.

José Retamales

INACH (Chilean Antarctic Institute) Director, 2003–present
 INACH COMNAP representative, 2003–present
 COMNAP Chair, 2007–11
 Chair of the ATCM Working Group on Operations, 2005–13



Snow from a sustained fall with no wind covers these vehicles at Casey Station Photo: I. Phillips, AAD

Looking to the Future

When the then Managers of the National Antarctic Programs (MNAPs) decided to establish COMNAP in 1988, there were a number of pressing issues. In particular, the number of nations involved in Antarctica had grown significantly from the original 12 signatories to the Antarctic Treaty, and close to 30 years of Antarctic Treaty Consultative Meetings (ATCMs) had resulted in a range of requirements on those managing activities in Antarctica. This was reflected in the original objectives of COMNAP (Table 1). Twenty-five years later, the complexity of issues and global focus on Antarctica pose new challenges for the MNAPs and for COMNAP as an organisation.

There has always been forward-looking leadership in the COMNAP Executive Committee, and COMNAP has made significant advances since its beginnings, as outlined in the pages of this book. As a result of a review of COMNAP initiated in 2008, a new way of working was implemented in 2009 and COMNAP's first formal five-year plan was adopted in 2010. The current five-year plan (Table 3) indicates that the core topics for COMNAP continue to be environmental considerations, safety, air and ship operations, medical matters, management of science, energy and technology issues, outreach, communications and training. Within those topics there are new discussion areas emerging; for example, new international science programmes, the management implications of climate change, the risk to Antarctic infrastructure and personnel from natural hazards such as volcanic ash and tsunami, and conservation challenges.

Thinking about as yet unencountered national Antarctic programme issues requires contemplation of how COMNAP as an organisation will effectively address these issues. How can and should COMNAP use its strengths to support the principles of the Antarctic Treaty? This chapter takes a closer look at COMNAP's strengths and possible goals for the future.

Facilitating Delivery of Antarctic Science

The COMNAP Rules of Procedure define a national Antarctic programme as *the entity with national responsibility for managing the support of scientific research in the Antarctic Treaty Area on behalf of its government and in the spirit of the Antarctic Treaty.*

The challenge to COMNAP is to build on the relationship between MNAPs, based on trust built over several decades, which provides a basis for effective collaboration and provision of practical, technical, non-political advice to the ATCM and CEP.

There is often a view that COMNAP is "only about logistics". The area of logistics and operations is a primary focus, but not an end in itself; COMNAP is about "managing support to science". Antarctic science could not be delivered without the national Antarctic programmes and the expertise of the managers of those programmes, who are often people with science backgrounds themselves: people who understand logistics and operations, and also science.

Science is continually changing. As science priorities change, so do the science support requirements. It is challenging to be proactive, to recognise that change is on the horizon, and to identify the trends. This is a key part of the role of the MNAPs. One of COMNAP's key challenges is to continue to provide value to the managers as they in turn deliver the changing support needs for Antarctic science.

Most of the matters of common concern listed 25 years ago are likely to remain key items on future agendas; however, the diversity in science and its complexity and sophistication are steadily increasing. As scientists have demonstrated the need for research to go wider, higher, deeper and longer, this has required commensurate diversification of national Antarctic programme activity and management of support to that science. National Antarctic programmes have grown to include logisticians, engineers, information and communication technology specialists, lab technicians, human resources specialists, accountants and media experts and, of course, many scientists. Some MNAPs are involved in their government budget discussions, in policy formation, in setting science strategies and in assisting with vetting project proposals



A "frozen Rose" after fueling aeroplanes at Amundsen–Scott South Pole Station

Photo: K. Scheerer, US National Science Foundation

within their peer-review processes. The MNAPs are often invited members on review panels for other national Antarctic programmes. The role of the manager is now, and will remain, often one of finding a way to do more science with fewer resources.

For COMNAP to assist, COMNAP itself must diversify. It must provide a forum for robust discussion and exchange of ideas on topics that are broader than ever before. It must also provide enough opportunities at AGMs and other meetings for managers to discuss the collaborative projects and proposals that are increasingly the way of modern Antarctic science. This requires good lines of communication between COMNAP members and a willingness to co-operate. It also requires effective and clear lines of communication between COMNAP and other members of the Antarctic community, in particular SCAR.

Doing more science with less funding often necessitates greater international co-operation. There are already some fine examples of international co-operation in support of Antarctic science. The Cape Roberts Project, ANDRILL, EPICA (European Programme for Ice Coring in Antarctica) and the CAML (Census of Antarctic Marine Life) spring to mind immediately. There are outstanding examples of international co-operation in regards to sharing of

infrastructure and operations and logistics. The joint French and Italian Concordia Research Station, the joint German and Argentine Dallmann laboratory at Carlini Station, the Netherlands' Dirck Gerritsz laboratory at the UK's Rothera Research Station, the 11-member-strong DROMLAN consortium, and the shared logistics pool of the US Antarctic Program, Antarctica New Zealand and Italy's ENEA are a few examples. Environmental projects provide further examples, such as the work carried out by Germany's Alfred Wegener Institute and Russia's Arctic and Antarctic Research Institute on Novolazarevskaya, and by the US Antarctic Program and Antarctica New Zealand on Cape Hallett.

Looking forward, there are several large-scale science projects on the horizon that will need international collaboration in science support for the science outcomes to be delivered. The Southern Ocean Observing System (SOOS) is the newest international effort for co-ordinated collection of data. Its mission is to co-ordinate and expand the efforts of all nations and programmes that gather data from the Southern Ocean, with the specific aim of developing a coherent and efficient observing system that will deliver the observations required to address key scientific and societal challenges. Ships operated by national Antarctic programmes and already working

in support of Antarctic science make regular Antarctic journeys. This vessel infrastructure can make a valuable contribution to the success of SOOS. National Antarctic programmes plan their Antarctic seasons several years in advance and their priorities are determined by national science funding priorities. For SOOS to succeed in the way its creators hope, national Antarctic programmes must engage in the planning processes – nationally and internationally – and must agree to devote significant vessel time, vessel personnel time and science support to the collection of the required data. They must also agree to lodge their data into appropriate archival systems that will require a long-term funding commitment. COMNAP will convene several workshops on SOOS in order to facilitate discussion on and support for the project.

Discussion is already well advanced for the International Partnerships in Ice Core Sciences (IPICS), which will see at least 18 national Antarctic programmes involved in geophysical investigation for, retrieval of and then research on the oldest ice in Antarctica – probably the oldest ice on our planet. Again, COMNAP can contribute to the successful delivery of this science by facilitating communication with the science leaders and across the national programmes involved.

Taking the international collaboration frame still broader is the next platform for a sustained international research campaign that picks up the legacy of the International Polar Year (IPY) of 2007–08: the proposed International Polar Initiative (IPI). If agreed to, the IPI will be a concentrated effort to address Polar issues, beginning in 2016 and lasting for at least a decade. COMNAP needs to consider in the near future whether it might support such an initiative, and, if so, how.

A fifth IPY in 2057–58 could provide opportunity for a further major step in the evolution of international collaboration. The third IPY (the International Geophysical Year: IGY) in 1957–58, which saw 52 IGY winter stations operated by 12 countries, was a collection of national Antarctic science projects within individual disciplines. While there was some co-ordination of projects, there was no far-reaching co-ordination of research efforts; countries were sometimes informed of the proposed activities of the other IPY countries and sometimes were not. During the next (2007–08) IPY, national Antarctic programmes contributed to close to 100 science projects and operated 47 IPY winter stations.¹ This IPY was better co-ordinated, with both Arctic and Antarctic projects being drawn together in an IPY Planning Chart, an IPY Secretariat established,

and a co-ordinated education and outreach programme developed. For 2057 the next logical step in this evolution might see the creation of an international Antarctic research platform or a proposal for an international Antarctic research station. Imagine a science plan where all national Antarctic programmes can use their individual strengths to fully participate in an international programme of research. COMNAP is well-placed to be the forum for national Antarctic programmes to begin discussions on the practicality of such an idea.

Contributing to the Antarctic Treaty System

Over the past 25 years COMNAP has made a wide range of practical, technical and non-political contributions to the Antarctic Treaty System, many of which underpin important decisions of the Treaty Parties. This has occurred through the authoring of a considerable number of Working Papers and Information Papers to ATCMs, Antarctic Treaty Meetings of Experts (ATME), and meetings of the Committee on Environmental Protection (CEP) (Appendix 3), and through the quality and depth of discussion at numerous symposiums, workshops, Working Group sessions and AGMs that have been convened by COMNAP and hosted principally by national Antarctic programmes (Appendix 2). The recent move by the ATCM to a shortened meeting schedule raises the issue for COMNAP and the ATCM of how operational and science support topics are considered in a shortened Operations Working Group session.

COMNAP values its status as an Observer in the ATCM and CEP and considers that its voice is critical in supplying a reality check on what can be practically achieved in the demanding Antarctic environment.

The analysis of Antarctic Treaty papers submitted by Parties, Observers and Experts over an 18-year period published by Dudeney and Walton in 2012² shows that COMNAP has been a “consistent contributor”. In terms of the number of Working Papers submitted, COMNAP ranks 13th out of a total of 33 countries and organisations that were entitled to submit papers to the System for the period 1992–2010. These papers will be one of the continuing strengths of the COMNAP of the future, based on the extensive pool of knowledge held by the national Antarctic programme managers. An objective for COMNAP must be to further improve the consultation processes for the production of these papers in order to ensure that

they remain authoritative and well supported and deliver information of value to the System.

An example of what has worked well in the past is COMNAP's information on Search and Rescue (SAR) in the Antarctic, first presented as COMNAP IP099 at ATCM XXXI, which explained the SAR arrangements in place, made suggestions for how such arrangements might be improved and led to COMNAP convening two workshops on the topic. The workshops brought together representatives from all five of the Search and Rescue Regions covering portions of the Antarctic Treaty area, representatives from the International Association of Antarctica Tour Operators (IAATO) and many of the COMNAP member national Antarctic programmes. SAR continues to be a topic of discussion at ATMEs and ATCMs: a special ATCM Working Group on SAR met at ATCM XXXVI in Brussels. COMNAP continues to focus on the topic in order to assist with the practicalities of protection of human life in the Antarctic Treaty area, and safety will continue to be one of the key topic areas for COMNAP.

COMNAP has already provided input on a number of the 22 issues listed in the CEP five-year plan.³ Introduction of non-native species, tourism and NGO activities, repair and remediation of environmental damage, monitoring and state of the environment reporting, exchange of information, emergency response and contingency planning, waste, energy management, and outreach and education have all been subjects of COMNAP ATCM papers, workshops and Expert Group discussion. Continued COMNAP input will provide CEP, in its decision making, with the benefit of the collective experience of the national Antarctic programmes.

In the CEP five-year plan there are specific references to COMNAP in only two places. The first is on the issue of monitoring and state of the environment reporting, with reference to COMNAP reviewing its information from the 2006 Waste Management Workshop as a first step. In the second, on the issue of waste, CEP again notes a COMNAP review of information from the 2006 Waste Management Workshop to assist with developing guidelines for best practice disposal of waste, including human waste. The majority of the national Antarctic programmes have already implemented the 2006 waste management guidelines. Many have gone beyond those guidelines and have systems in place to recover and return a high proportion of waste back to their countries. Any review would benefit from discussion of new technologies and techniques to reduce the waste stream from the point of origin, and for energy efficiencies around transportation of waste out of Antarctica. COMNAP is developing a “preferred supplier database”, which will

list information on companies that are able to provide sustainable products and technologies for waste processes and a range of energy efficiency outcomes. National Antarctic programmes realise that reducing non-sustainable energy use is good environmental practice and reduces operational costs, but implementation remains a significant challenge to some.

Other areas in the CEP five-year plan, while not specifically mentioning COMNAP, refer to national Antarctic programmes. These topics include unintentional introduction of non-native species, which COMNAP and SCAR have done significant amounts of work on, and repair or remediation of environmental damage – also a topic in which COMNAP and SCAR have made considerable contributions. Input to the clean-up manual, to the non-native species manual and to the inventory of sites of past activity are all areas that COMNAP can assist with in the future. COMNAP and SCAR have already informally agreed to work on the issue of unintentional transfer of species between Antarctic sites. COMNAP prepared an Information Paper on hydroponics use, which was presented at the CEP XVI meeting.

Beyond papers, there are other, non-quantifiable, contributions from COMNAP to an effective Antarctic Treaty System. These include national Antarctic programmes assisting each other to implement practices and approaches found in guidelines and manuals. Shared problems, shared experience and shared solutions have brought a high level of trust and a genuine desire to help each other. This has been a core foundation for COMNAP in the past and will be a key to continued effectiveness in supporting the national Antarctic programmes, and the Antarctic Treaty System.

COMNAP can support the Treaty System by engaging with national Antarctic programmes from those countries that have signed the Antarctic Treaty and Environmental Protocol but are non-Consultative Party countries pursuing Consultative Party status. Several Antarctic programmes from countries without Consultative Party status have indicated a desire to become COMNAP members, and they currently observe at COMNAP meetings. Such programmes could learn a tremendous amount about managing support to science in Antarctica and best practice on various environmental issues if they were given the opportunity to work side-by-side with another national programme, either in the Antarctic or at the home institution. This often happens bilaterally between countries that have historical connections, but COMNAP can accelerate the process by providing exposure to many national programmes, some of which have operated in the Antarctic since the IGY.

1 D. W. H. Walton and P. D. Clarkson, *Science in the Snow* (Cambridge, SCAR, 2011)

2 J. R. Dudeney & D. W. H. Walton, “Leadership in politics and science within the Antarctic Treaty”, *Polar Research*, 31 (2012), doi: 10.3402/polar.v31i0.11075

3 Committee on Environmental Protection, *CEP Five Year Work Plan* (2013)

Engaging Future Generations

Engaging today's bright early-career personnel to choose Antarctic-related careers should be one of COMNAP's primary focal areas in the near future. COMNAP has joined SCAR in providing fellowship opportunities to early-career-level researchers to undertake exchanges at facilities located in other COMNAP countries. COMNAP fellowships open up applications to those from non-science disciplines, including social science, humanities and law.

The IPY outreach meant that many students became interested in Antarctica. But, five years beyond IPY, how does COMNAP support keeping these bright people engaged and adequately funded, and ensuring that they remain valued for their Antarctic work?

There are several international research institutions that hold significant polar collections. Creating opportunities for early-career scholars to have access to these institutions should be one of COMNAP's goals. Exchanges for scholars and professionals often require little funding: simply the opportunity and an agreement to provide a working space. Such exchange of expertise often creates collaborations that were not envisioned but that become of significant value.

The Association of Polar Early Career Scientists (APECS) is an organisation that encourages and supports early-career scientists to pursue a polar career path. COMNAP and its member national programmes are the principle entities able to assist the organisation, yet there is little interaction between COMNAP and the APECS. COMNAP should consider how it can improve this relationship.

COMNAP should also celebrate the work of the numerous writers' and artists' programmes that many of the national Antarctic programmes have supported throughout the years to engage the wider population in Antarctica.

Standards Based on Best Practice

Sharing best practice and expertise on the best way to deliver science, supporting each other during times as varied as business-as-usual, restructure or emergency, and providing assistance when available and when requested will always be at the forefront of what COMNAP stands for. COMNAP has assisted in developing a range of guidelines, including on Antarctic environmental assessment (1991), oil spill contingency planning (*Fuel Manual*, 2008), waste management (Workshop on Waste Management 2006) and for the operation of aircraft near birds (2004). Checklists for supply chain managers for the reduction of risk of transfer of non-native species (2011), and best practice guidelines for energy management (2007) have been developed. COMNAP maintains a range of products that

support exchange of information, including the *Antarctic Flight Information Manual*, the *Antarctic Telecommunications Manual*, the Ship Position Reporting System, and the Accidents, Incidents, and Near Miss Reporting system.

It is not clear what new sets of guidelines or best practice will be needed in the near future. What is clear is that guidelines can often be quickly developed and agreed to within COMNAP, based on the best practices of the national Antarctic programmes. Such guidelines, endorsed by the COMNAP membership, are likely to encounter less resistance in their implementation than those from other sources.

Facilitating exchange opportunities for engineers, environmental managers, outreach co-ordinators, and other national programme staff, either at host institutions or in Antarctica, is another way of enabling the development and spread of best practice.

Having access to advanced planning and knowing when space is available on vessels, planes or on research stations means that the best use of limited resources can be made. The knowledge that your Antarctic neighbour has already tried a particular piece of equipment, and whether and in what conditions it worked or failed, is priceless. COMNAP must build robust information-exchange tools and encourage and support its membership to maintain those systems with up-to-date information on their programmes. This has proved challenging in the past.

Conclusion

To look to the future we have to look back to the founding document of the Antarctic Treaty System: the Antarctic Treaty of 1959. In that document there is a strong sense of the importance of the scientific co-operation that took place in the IGY of 1957–58. There is still a strong and proud sense of the achievements from this pulse of international co-operative activity. How does COMNAP best continue to support international co-operation in scientific investigation as demonstrated in the IGY, and the broader principles of the Antarctic Treaty?

COMNAP has long recognised that while there is strength in diversity, there are also challenges in agreeing the compromises that make collaboration possible. Cultural and language differences, variations in funding and scale between national Antarctic programmes, widely spaced locations and varying capacity of facilities in the Antarctic, and the widely dispersed and trans-global locations of the organisations that support Antarctic operations are only a few of the barriers to true international collaboration in Antarctica.



A long way home: an impression (near Mirny Station, October 2009)

Photo: A. Listopadov

COMNAP provides a forum to break through those barriers – to facilitate international co-operation in major science programmes, joint funding of equipment and field work, pooling of logistics capabilities and co-ordination of support to science.

The look to COMNAP's future in this chapter identifies a range of potential initiatives to facilitate management of Antarctic science, to support the ATCM and CEP, to build and implement standards based on best practice, to engage future generations in Antarctica, and to continue to provide a forum to enable the development of trusted collaborative relationships between MNAPs; all based on the unparalleled first-hand knowledge of Antarctica of the national Antarctic programmes. Such initiatives include:

- Continued development of best practice guidelines and information exchange systems
- Continued symposiums, workshops and AGMs to inform members and exchange information on topical issues
- Workshops on large international projects such as SOOS and IPICs, to facilitate communication of the science plans and objectives, and support needs, across the national programme managers
- Consideration of Antarctic conservation challenges and COMNAP's role in addressing and responding to them

- Consideration of the collective national Antarctic programme potential for the next IPY in 2057–58
- Consideration of how best to engage with a shortened Operations Working Group session at the ATCM
- Continued contribution of papers to inform the work of the ATCM and CEP, including the CEP five-year plan topics on waste management, energy efficiency, site remediation, and prevention of the introduction of non-native species, and ATCM consideration of search and rescue in Antarctica
- Improvement of engagement with other Antarctic organisations
- Celebrating the work of national programme artists' and writers' programmes.

The international environment in which COMNAP operates has changed over its 25 years of existence, and will continue to do so. The demands will grow for increasingly complex Antarctic science and for operations that are more cost effective, as will the pressures on the Antarctic Treaty System. The challenge to COMNAP is to build on the relationship between MNAPs, based on trust built over several decades, which provides a basis for effective collaboration and provision of practical, technical, non-political advice to the ATCM and CEP.

The National Antarctic Programs from 29 nations party to the Antarctic Treaty



together in
COMNAP

supporting
science in Antarctica
and the
Antarctic Treaty System

The Council of Managers of National Antarctic Programs
www.comnap.aq



COMNAP

PART II

COMNAP Member National Antarctic Programmes

In 2013, COMNAP includes 29 member national Antarctic programmes. This section of the book comprises a "snapshot" of each, contributed by the programmes. More information can be found on the COMNAP website (www.comnap.aq) and from the individual national Antarctic programme websites.

The national Antarctic programme of Argentina

Activities of Argentina in Antarctica began in the early 19th century, and have continued through the years until today. In 1903 Argentina made the historic rescue in Antarctic waters of the Nordenskjöld scientific expedition with the corvette *Uruguay*. In 1904 Argentina affirmed its presence on the White Continent with the opening of the Orcadas Station, the first year-round station installed by a country south of 60° south latitude. That station has been active ever since and marks the beginning of Argentinean scientific work in the region. Argentina actively participated in the International Geophysical Year (1957–58) through the Instituto Antártico Argentino (IAA) and is an original signatory to the Antarctic Treaty of 1959. Today, Argentina's national Antarctic programme has six year-round Antarctic stations: Orcadas, Belgrano II, San Martín, Carlini, Esperanza and Marambio; seven summer stations: Melchior, Brown, Matienzo, Cámara, Decepción, Primavera and Petrel; and refuges, ships and aircraft. It also operates field camps in Antarctica in support of its scientific programme.

The organisational structure of Argentina's national Antarctic programme

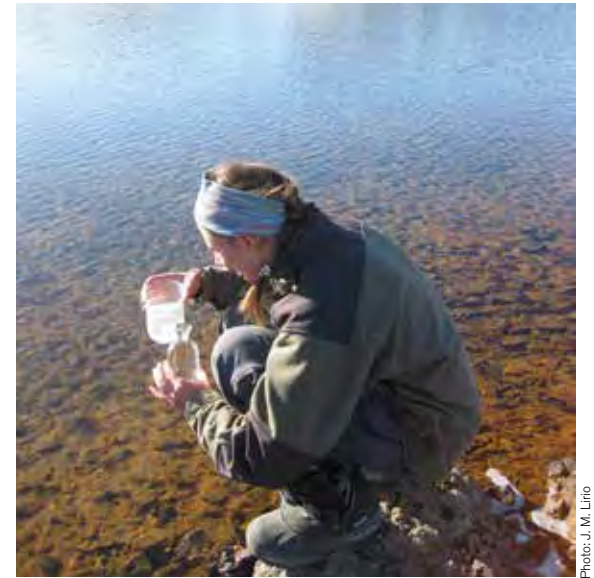
The Dirección Nacional del Antártico (DNA) is the current management body of Argentina's Antarctic activities. The IAA, which belongs to DNA, is the entity through which Argentina develops its scientific activities in Antarctica. It was created in 1951 and represents the first global agency dedicated exclusively to Antarctic research. The IAA is responsible for centralising the planning, co-ordination and control of Argentinean scientific activities in Antarctica. Echoing the spirit of the Antarctic Treaty and promoting international Antarctic science, numerous co-operation agreements have been created. Dallmann Laboratory is an example that illustrates the importance that international co-operation presents under Argentina's national Antarctic programme. The laboratory has been located in Carlini Station since 1994 as a result of a scientific co-operation agreement between Argentina and Germany. Due to the

expansion and diversification of Argentinean scientific research in the Antarctic, DNA was created in 1969 and currently sits under the Ministry of Foreign Affairs and Worship. Its offices are located in the city of Buenos Aires and it has a staff of approximately 180 people, which include scientists, technicians and administrative staff. DNA's main function is to schedule, plan, co-ordinate, direct and control Argentina's Antarctic activities, in order to achieve compliance with the objectives, policies and priorities of the National Antarctic Policy. It is also in charge of communications on Antarctic issues nationwide. International matters are carried out jointly by the Dirección General de Asuntos Antárticos (DIGEA) and DNA, with both sitting under the Ministry of Foreign Affairs and Worship. Major logistic operations are implemented by the Argentinean Army, Air Force and Navy.

DNA hosted the COMNAP IV AGM and the SCALOP V Symposium in Bariloche in June 1992 and the COMNAP XXII AGM and the COMNAP Symposium in Buenos Aires in August 2010. DNA also hosted the COMNAP Antarctic SAR Workshop II in Buenos Aires in November 2009.

Carlos Rinaldi was an EXCOM MNAP representative 1997–2000.

Mariano Memolli was a COMNAP Vice-Chair 2011–13.



Taking water samples

Photo: J. M. Lirio

Argentina's Antarctic research programme

Currently the research guidelines prioritised by the IAA are derived from the Science Strategy 2011–21 and include the study of the phenomena of global climate change, the knowledge and conservation of Antarctic natural resources and associated areas, the development of alternative energies and the history of Argentine activities in Antarctica, among others. Within these research priority guidelines the projects focus on various subject areas, such as structure and functioning of Antarctic ecosystems, past and present; monitoring of Antarctic natural systems (environmental monitoring, biological monitoring and cartographic monitoring); physics and chemistry of the atmosphere, oceans and solid earth in Antarctica and adjacent regions; mineral resources; Antarctic living resources (including bioprospecting); climate change – global change (past, present and future projections); history of Argentine activities in the Antarctica; human adaptations to high latitudes; the impact of human activities on the Antarctic ecosystems (including bioremediation and tourism), and geological evolution of the southern sector of the Antarctic Peninsula.



International laboratory Dallmann, Carlini Station

Photo: DNA



Brown Station Photo: C. Bunge

The national Antarctic programme of Australia

The Australian Antarctic Division (AAD) is the government organisation responsible for leading and delivering Australia's Antarctic programme.

Australia has established and maintains three year-round Antarctic stations on the coast of Wilkes Land, East Antarctica, and one sub-Antarctic station on Macquarie Island.

Australia's first station was established in 1954, and is named Mawson Station, after Sir Douglas Mawson. This was followed by Davis Station in 1957 and Casey Station in 1969. The AAD also administers the Territory of Heard Island and McDonald Islands and manages Mawson's Huts in Commonwealth Bay. The icebreaker RSV *Aurora Australis* resupplies the stations and conducts research in the Southern Ocean. Since 2004, flights have also run between Hobart, Tasmania and Antarctica. Smaller aircraft and helicopters are used for intracontinental shuttling to other stations and field camps.

The AAD advances Australia's strategic, scientific, environmental and economic interests in Antarctica and the Southern Ocean by protecting, administering and researching the region. Australia actively participates in the Antarctic Treaty System to promote Australia's Antarctic interests and to manage and protect the Antarctic environment.

The Australian Antarctic research programme addresses critical issues such as climate change, the human footprint on Antarctica and the increasing demands for food, energy and security caused by human population growth. The diverse programme covers physical and life sciences in the atmospheric, terrestrial and marine domains, as well as human biology and medical research. It is also responsible for a broad suite of ongoing observational activities, including a network of meteorological facilities; ionospheric activity monitoring; seismic, magnetic and GPS networks; and hydrographic and bathymetric mapping.



Mawson Station Photo: Australian Antarctic Division

www.antarctica.gov.au



A319 at Wilkins



Measuring ice core

Photo: N. Harris, Australian Antarctic Division

Photo: J. Chandler, The Age (courtesy of Australian Antarctic Division)

The organisational structure of the AAD

The AAD is located in Kingston, Tasmania. Over 300 permanent staff are employed, including support staff, summer and wintering expeditioners, and scientists. The AAD is an agency under the Department of Sustainability, Environment, Water, Population and Communities of the Australian Government. This department is responsible for implementing the Australian Government's policies to protect our environment and heritage, and to promote a sustainable way of life.

The AAD is run by the Director, who oversees the various branches and liaises with parliamentary and ministerial bodies.

The Australian Antarctic research programme

The Australian Antarctic science programme is directed by the *Australian Antarctic Science Strategic Plan 2011–12 to 2020–21*, developed in consultation with the Antarctic Science Advisory Committee and approved by the Australian Government on 19 July 2010. This plan focusses on four major themes: Climate Processes and Change; Terrestrial and Nearshore Ecosystems – Environmental Change and Conservation; Southern Ocean Ecosystems – Environmental Change and Conservation; and Frontier Science.

The AAD works closely with other national Antarctic programmes in logistics and science. Scientists from over 28 countries and 176 institutions take part in AAD projects, along with around 90 Australian graduate students. Applications for AAD science are open every two years.

Jack Sayers was the SCALOP Chair 1992–95.

Kim Pitt was the SCALOP Chair 2001–05.

Virginia Mudie was a COMNAP Vice-Chair 2008–10.

AAD hosted the COMNAP EXCOM Meeting in Hobart in December 1998, and the COMNAP XVIII AGM and the SCALOP XII Symposium in Hobart in July 2006.

From 1997 until July 2009 Hobart, Tasmania was the home of the COMNAP Secretariat, with Executive Secretaries Jack Sayers (October 1997 through September 2003) and Antoine Guichard (October 2003 through September 2009).

The national Antarctic programme of Belgium

The Belgian Antarctic Research Programme is co-ordinated and managed by the Federal Science Policy (BELSPO) office. As a result of the efforts of the family de Gerlache, who organised the first scientific overwintering expedition (1897–99) and constructed the first Belgian research station in Antarctica, Roi Baudouin (1957–58), Belgium was one of the twelve original signatories of the Antarctic Treaty. After the closure of the Roi Baudouin base in 1976, a period of discontinuous activities followed. In 1985 Belgium resumed its Antarctic activities at the scientific level, with a multi-annual research programme, while at the political level it took an active part in the development of the Environmental Protocol in 1991.

In 2007–08 Belgium constructed a new research station named the Princess Elisabeth Station in Antarctica. This station replaces the Roi Baudouin base. The Belgian Government commissioned the International Polar Foundation (IPF) to co-ordinate the design and construction phases of the station project. The construction of the station was funded by a public–private partnership

and, once completed, the ownership of the station was transferred to the Belgian Government. The station was inaugurated in 2009 and is fully operational during the summer.

The station is situated 220 kilometres inland from the coast, on the Utsteinen Ridge (71° 57' S, 23° 21' E), at the foot of the Sør Rondane Mountains, Dronning Maud Land. It is at the centre of almost 1000 kilometres of virgin terrain, in one of the least occupied areas of Antarctica, in an area that has only been intermittently investigated since the 1950s.

Princess Elisabeth Station is the first Antarctic station aiming to run entirely on renewable energies. In designing and building the station, the objective was to use existing renewable and passive energy technologies with intelligent management systems to create a facility that could function autonomously all year round. Integrating off-the-shelf and novel technologies was a challenge, which is gradually paying off as the energy management targets are reached.



Princess Elisabeth Station with wind turbines, solar panels and satellite dish Photo: R. Robert, International Polar Foundation

www.belspo.be/antar



Jean-Louis Tison (ULB) and team testing the new ice core drill, which was used for the Icecon science project during the BELARE 2012–13 expedition



The base camp from the Belgo–Japanese SAMBA meteorite programme during the BELARE 2012–13 expedition

The organisational structure of Belgium's Antarctic programme

The Research Programme Directorate oversees the science component of the programme and the Belgian Polar Secretariat oversees the support and implementation of operations. Both components work together to develop and support high quality research programmes in Antarctica. A close collaboration with the Ministry of Foreign Affairs and the Ministry of the Environment enables the programme to function in a complementary manner.

The Belgian Polar Secretariat was created in 2009 as a separately-managed state department within BELSPO. Within this structure, representatives of the Belgian Government (the Ministries of Foreign Affairs, Environment, Defence, Science Policy and the Chancellery (representing the Office of the Prime Minister)) and of the private sector (including the IPF) works closely on the development and management of the station. The Belgian Polar Secretariat manages all matters related to the station (administrative, financial, facilities and operational).

Maike Vancauwenberghe was a COMNAP Vice-Chair 2009–12.

Belgium's Antarctic research programme

The project funding provided by BELSPO encompasses money for salaries, functioning, equipment, subcontracting, campaigns and the integration of international research partners in a project. It allows for researchers to build up expertise and international collaborations and to contribute to international discussion and policy forums. Since the closing of Roi Baudouin base Belgian scientists have been able to perform their Antarctic field work thanks to the hospitality of other nations. By participating in a collaborative way in their scientific campaigns, important and sustainable research collaborations have been built up with other countries. Since 2008 Belgian scientists – and those from other nations – can use Princess Elisabeth Station as a hub for their field work. Priority is given to Belgian researchers and projects in collaboration with international partners in the spirit of the Antarctic Treaty.

Belgian Antarctic scientists are employed by universities and research institutes. They apply for BELSPO funding through a competitive peer-review process in which international experts evaluate the scientific project quality. Typically, BELSPO supports four-year network projects that fall within a strategic top-down programme based on international research priorities.

The national Antarctic programme of Brazil

Brazil's situation as an Atlantic country located at relative proximity to the Antarctic region, and the influences on its national territory of natural phenomena that occur in Antarctica, from the outset justify Brazil's historical interest in the southern continent. These circumstances led to Brazil joining the Antarctic Treaty in 1975, and initiating the Brazilian Antarctic Programme (PROANTAR) in 1982.

The Comandante Ferraz Antarctic Station (EACF), located on Keller Peninsula in Admiralty Bay (King George Island), was established in 1984. The station, which had been occupied continuously since 1986, suffered, on 25 February 2012, a fire without precedence in the 30-year history of PROANTAR. Despite the incident, scientific research continues with the available resources: the polar ship *Almirante Maximiano*, the Oceanographic Support Ship *Ary Rongel* and the Emergency Antarctic Modules. The modules were installed in February 2013 on the Keller Peninsula to maintain research and the permanent Brazilian presence in Antarctica. Brazil also operates its 10 support

flights using C-130 aircraft from the Brazilian Air Force, and maintains strong scientific co-operation with other countries in Antarctica.

Brazil's Antarctic research programme

Brazil's entry into the Antarctic Treaty System has created opportunities for the national scientific community to participate in activities which, along with exploration of space and the seafloor, are the last great frontiers of international science. In the context outlined above, the Brazilian Antarctic Programme establishes how Brazil will participate in scientific explorations of the continent, in view of its importance to humanity.

Scientific research in Antarctica, which Brazil has been engaged in since the late 19th century, is of undoubted importance for understanding the functioning of the earth's



The proposed design of the new Comandante Ferraz Antarctic Station (EACF) Photo: PROANTAR

www.mar.mil.br/secirm/proantar.htm



Brazilian polar ships

ecosystem. Clarifying the complex interactions between the global natural processes and the Antarctic processes is therefore essential for the preservation of life itself. Brazil considers that Antarctica plays a key role in global natural ecosystems and that it is the main thermal regulator of the planet, controlling atmospheric and oceanic circulations, and generally influencing the climate and living conditions on earth.

After completing 31 years, the Brazilian Antarctic Programme is experiencing a period of rethinking its future, and it is working hard to build a new station, in accordance with the Protocol on Environmental Protection to the Antarctic Treaty. The Brazilian scientists and society have recognised the importance of maintaining the presence of Brazil in Antarctica, and PROANTAR is pushing the envelope to sustain Brazilian scientific research on the continent.

Brazil hosted COMNAP II AGM and SCALOP IV Symposium in São Paulo, Brazil in July 1990.



Brazilian researchers



C-130 airplane at Frei

The national Antarctic programme of Bulgaria

www.bai-bg.net

The Bulgarian Antarctic Institute (BAI) is the headquarters for the organisation and co-ordination of Bulgaria's Antarctic campaigns. In the summer season of 1987–88, six Bulgarian scientists participated in joint projects with the British Antarctic Survey and the Russian Arctic and Antarctic Research Institute. This Bulgarian programme was aimed at gathering valuable experience both in carrying out scientific research and in the organisation of logistics in Antarctica. During this Antarctic season a refuge was established on Livingston Island (South Shetland Islands) on a spot located on the north-east side of South Bay.

In the period between 1993 and 2013 Bulgaria organised 20 successive Antarctic campaigns. The seasonal summer base named St Kliment Ohridski replaced the refuge, providing normal working conditions and an option for it to be used permanently if necessary. The base can accommodate a maximum of 25 people at any given time. The base functions thanks to logistics support and valuable help from the Spanish, Brazilian, Argentinean and Chilean National Antarctic Programmes.

The organisational structure of the BAI

The BAI functions under the aegis of the President of the Republic of Bulgaria, and by a decision of the Council of Ministers of Bulgaria BAI is assigned to manage the National Antarctic Programme. The BAI therefore organises annual Antarctic campaigns and operates the St Kliment Ohridski base. BAI is a non-profit legal body and has fifty-one members and four member-entities. Those entities are the Ministry of Foreign Affairs, the Sofia University "St. Kliment Ohridski", the Academy of Medicine, and the Atlantic Club of Bulgaria.

Antarctic activities are planned by the BAI Executive Board upon recommendation by the Scientific Board of the Institute. The Bulgarian Government is represented at the Executive Board of the Institute by a Vice-Minister of Foreign Affairs. The Chairman of the Executive Board is the Manager of the National Antarctic Programme, Professor Christo Pimpirev. The National Antarctic Programme is funded predominantly by the Ministry of Education and Science, and partly from the Ministry of Foreign Affairs and Ministry of Environment and Waters.



Bulgarian field party on Antarctic Peninsula



Installing wind generators on roof of main station building

The Bulgarian Antarctic research programme

The main scientific topics of the Bulgarian scientific programme are focussed on Earth sciences such as geology, geophysics, physics, glaciology, meteorology and cartography, and on life sciences including zoology, botany, ecology and human medicine. Research work is implemented by means of three-year projects undertaken by university-based or academic scientists.

The activities under the Biological Research Programme have to date focussed on the study of the biological diversity of the main habitats on Livingston Island. A number of plant and animal species and their communities have been described. The diversity of protozoa, diatoms and other algae, soil nematodes, and freshwater and interstitial crustaceans has been studied. Eight new species for the world flora and fauna have been described and a few more are still to be described and published.

The main objective of the geological research projects is focussed to provide explanation of the stratigraphy and tectonics of the Mesozoic turbidity successions as well as the petrology of the subductional plutons, and to draw up a new model of tectonic-magmatic history of the South Shetland Islands. The first find of a macrofossil, the age-diagnostic Upper Tithonian ammonite reported from the Myers Bluff Formation by the Bulgarian scientists, will change the view on geological evolution of the South Shetland Islands and of the Antarctic Peninsula during the Mesozoic.

The main subject of glaciological and meteorological studies is to design drills and equipment used in vertical and horizontal drillings and to investigate the microclimate phenomena related to complex geography, glaciers and ocean proximity, as well as the securing of automating of meteorological monitoring in order to collect data necessary for glaciological and biological observations. Dating the ice layers across the Hurd Peninsula glaciers and analyses of elements and isotopes in ice samples are among the anticipated results.

BAI hosted the COMNAP XVII AGM in Sofia in July 2005.

Christo Pimpirev was an EXCOM MNAP representative 2006–08 and a COMNAP Vice-Chair 2008–09.

BAI hosted the COMNAP EXCOM Meeting in Bansko in October 2008.

The national Antarctic programme of Chile



Prof. Julio Escudero Station (INACH) located on Fildes Peninsula, King George Island

Photo: E. Barilicovic

The Instituto Antártico Chileno (Chilean Antarctic Institute/INACH) is a technical organisation of the Chilean Ministry of Foreign Affairs, with complete autonomy in scientific, technical and outreach Antarctic activities. It is the national institution responsible for planning, co-ordinating, directing and controlling officially authorised scientific and technological activities of the Chilean Government and of private organisations in Antarctica. INACH organises and leads its own expeditions and maintains scientific stations in the Antarctic.

INACH is also responsible for compliance with Chilean Antarctic policy and advises the Ministry of Foreign Affairs in Antarctic matters. Since 2003 the national headquarters of INACH have been located in the city of Punta Arenas, capital of the Region of Magallanes.

Chile built its first polar base in the Chilean Antarctic Territory in 1947, on Greenwich Island. That semicircular facility of 89 square metres shared the honour of being one of the first facilities in Antarctica with Wordie House, which the United Kingdom built in January of the same year. Since then, all Chilean Antarctic operators have built various other facilities, first and foremost with a commitment to national policy and exploration of the unknown continent, and as a strong support for the scientific work done and to be done by the Chilean and international Antarctic science communities.

Chile has stations and shelters in various locations on the Antarctic Peninsula, in the South Shetland Islands and in the Patriot Hills–Union Glacier area. Additionally, scientific camps are set up in other locations according to the

requirements of projects, and shipping transport is arranged along with co-ordination for Chilean researchers' lodging at other nations' stations and shelters.

The total annual expenditure of the Chilean National Antarctic Programme varies from USD 22 million to USD 24 million depending on the projects that will be supported. Approximately 30 per cent of that goes into science and the rest to logistics.

The organisational structure of INACH

The current organisational structure of INACH consists of four departments:

1. Science: The department is formed by PhD researchers and invited students. Its main functions are to advise the INACH on Antarctic science issues, to conduct their own scientific projects and to promote international scientific collaborations. Its members have to submit projects and develop grants on behalf of INACH, always considering issues relevant and consistent with the guidelines established by the Antarctic international scientific community. In addition, its members may teach at colleges and universities at both undergraduate and postgraduate levels. Currently, this department is formed by seven senior researchers specialised in microbiology, palaeobotany, marine biology, ecology and glaciology. In addition, there are an engineer and a technician helping to look at projects and guide university students on their final years' work and theses.

2. Research Projects: This department advises the INACH Directorate in the planning, co-ordination and implementation of scientific and technological studies conducted by Chilean institutions in Antarctica, by organising competitive calls for proposals and carrying out the annual Chilean Antarctic Scientific Expedition. The main responsibility of this department is the management of the Chilean Antarctic Science Programme (PROCIEN). It also manages Antarctic environmental information and compliance with environmental standards of Antarctic national activities.

3. Budget: This department gives the necessary support for the effective performance of scientific and logistic activities of INACH, prepares the expenditure plan, and undertakes the formulation of the annual budget.

4. Communications and Education: The responsibility of this department is to disclose Antarctic science and institutional activities to the widest possible audience.

The Chilean Antarctic research programme

PROCIEN brings together the universities and centres for scientific research projects that are funded by INACH or other national research financing bodies. These projects are then organised, co-ordinated, and executed in Antarctica by INACH. Projects are funded from various sources through open and transparent calls for proposals subject to peer review.

There are five main areas of research:

1. Relationships between South America and Antarctica
2. Adaptation mechanisms of Antarctic organisms
3. Abundance and diversity of Antarctic organisms
4. Global warming and climate evolution
5. Environment and other initiatives



Cristian Rodrigo analysing glacial marine environments to understand the evolution of the Antarctic Peninsula's climate

Photo: E. Barilicovic



Limacina Antarctica, a tiny snail that floats in Antarctic waters at a depth of 13 metres in Fildes Bay, King George Island

Photo: D. Schories, Universidad Austral de Chile

INACH hosted the COMNAP VII AGM in Santiago in 1995, the SCALOP VIII Symposium and COMNAP X AGM in Concepción in 1998, the COMNAP EXCOM Meeting in 2004 and the COMNAP XXI AGM in Punta Arenas in 2009. INACH also co-hosted the COMNAP Antarctic SAR Workshop I in Viña del Mar in October 2008.

Oscar Pinochet de la Barra was an EXCOM MNAP representative 1994–98.

Patricio Eberhard was the SCALOP Chair 1998–2001.

Jorge Berquño was an EXCOM MNAP representative 2003–06.

José Retamales was the COMNAP Chair 2007–11.

The national Antarctic programme of China

China's national Antarctic programme, led by the Chinese Arctic and Antarctic Administration (CAA) and the Polar Research Institute of China (PRIC), is supported by three Antarctic stations. They are the Great Wall Station, Zhongshan Station and Kunlun Station. The Great Wall Station, which was built in 1985, is located on King George Island of the Peninsula region of Antarctica. The station can accommodate 80 people in summer and 40 in winter. Zhongshan Station was built in 1989 in the Larsemann Hills area of East Antarctica. The summer capacity is 60 people, while 25 can be accommodated in winter. On 27 January 2009 the Kunlun Station, China's Antarctic inland station, was opened at Dome A and, since then, has operated only in summer. Its geographic location is ideal for scientific research in the study of glaciology, astronomy, etc.

The icebreaker *Xuelong* is used for Antarctic research and resupply of the stations. In 1994 it was ice strengthened and equipped with advanced navigational equipment and science laboratories. A new icebreaker is now in the process of being designed.

CAA and PRIC hosted the COMNAP XXIV AGM and SCALOP X Symposium in Shanghai in July 2002.

PRIC hosted the COMNAP EXCOM Meeting in Shanghai in November 2010.

Yuansheng Li was a COMNAP EXCOM Vice-Chair 2010–13.

The organisational structure of China's Antarctic programme

The State Oceanic Administration (SOA) is the government body responsible for leading Chinese polar expeditions and administering polar affairs. Two subsidiary bodies, the Chinese Arctic and Antarctic Administration (CAA) and the Polar Research Institute of China (PRIC), operate China's Arctic and Antarctic programmes.

The CAA is located in Beijing and has about 40 permanent staff. The CAA performs the general function of organising Arctic and Antarctic expeditions and science programmes, administering related Arctic and Antarctic affairs, participating in international organisations and promoting international collaboration in the polar field on behalf of SOA. The CAA also calls on universities and research institutes across the country to participate in the Chinese National Antarctic Programme in various scientific areas.

The Polar Research Institute of China (PRIC), which is located in Shanghai and has about 230 permanent staff, is an institute for polar research, logistics operation and data processing. The PRIC is responsible for conducting some scientific programmes, for operation of MV *Xuelong* and for daily station management, as well as for managing the Chinese polar science database and the publication of the English-language journal, *Advances in Polar Science*.



MV Xuelong Photo: CAA

www.chinare.gov.cn / www.pric.gov.cn



Zhongshan Station

The operational budget of the China's National Antarctic Programme for the year 2012 is CNY 200 million, of which 62 million goes directly to science and 138 million goes to operations and logistics in support of science.

The Chinese Antarctic research programme

The Chinese National Antarctic Programme is largely organised into a five-year programme called the "Chinese Polar Environment Comprehensive Investigation and Assessment Programmes", approved by SOA. In Antarctica, the programme comprises three parts: the Antarctic Marine Environment Survey, the Antarctic Terrestrial Environment Survey, and a Comprehensive Assessment of the Antarctic Environment. The programme will be implemented through a series of multi-discipline surveys and assessments, involving oceanography, biology and ecology, meteorology, astronomy, geology and glaciology. In addition, China will continue to conduct routine winter observations at both Great Wall Station and Zhongshan Station.

More than 30 national research institutes and universities, including PRIC, have been actively involved in the strategic science programme. To strengthen international co-operation in Antarctic research and to fulfil the missions of SCAR, international participants are encouraged to join in the programme through collaboration with those national institutes and universities.



Kunlun Station



The Great Wall Station

The national Antarctic programme of Ecuador

www.inae.gob.ec

Ecuador signed the Antarctic Treaty in 1987 and gained Consultative State status in 1990. The first Ecuadorian national Antarctic programme was named the Ecuadorian Antarctic Programme (PROANTEC), which was founded in 1988. In 2004 this was replaced by the Ecuadorian Antarctic Institute or, in Spanish, Instituto Antártico Ecuatoriano (INAE). The main goals of the INAE are to promote and maintain the country's geopolitical projection and ongoing participation in scientific research activities in the context of the Antarctic Treaty System. The INAE works to harmonise national policies with international conventions and to promote the exchange of information between national Antarctic programmes.

INAE's science is carried out at the Pedro Vicente Maldonado Station on Greenwich Island near the Antarctic Peninsula. This station is seasonal and was built in 1990, for an original maximum population of 22. Since 2012, the capacity has been a maximum of 32 people.

The organisational structure of Ecuador's Antarctic programme

The INAE is a public body attached to the Ministry of National Defence. It is composed of an Executive Administration, and Scientific, Technical and Administrative-Financial departments. A group of researchers and academic institutes makes up a Scientific Advisory Group for the Institute.

Logistics operations are organised by INAE with the support of military and civilian personnel of the Armed Forces of Ecuador.

The average annual budget for expeditions to Antarctica is USD 1,400,000, of which USD 1,000,000 is used for logistics and USD 400,000 for science.

The Ecuadorian Antarctic research programme

The research undertaken by INAE is in accordance with national research policies issued by the National Secretary of Higher Education, Science and Technology (SENESCYT), which is the highest research body of Ecuador. There are four lines of research:

1. Environmental Studies: Antarctica is the last pristine region on the planet and is a place dedicated to research and science. As well as its importance as a generator of global climate, these features oblige all countries undertaking activities on the continent to have respect for the environment and ecosystems. Therefore, Ecuador incorporates important projects related to environmental studies into its programme.

2. Interactions between Ecuador and Antarctica: Despite the distance, there is a very close and dependent relationship between Antarctica and Ecuador. This includes the generation of ocean currents and atmospheric interaction, which have a direct economic and social impact on the development of activities in our country. Andean glacier retreat is likened to ice loss in the Antarctic Peninsula region. From the point of view of ecosystems, some of the species found in the Galapagos Islands come from Antarctica and whale migratory routes pass through an area off our coasts.

3. Climate Change: The Antarctic Peninsula is experiencing a rapid increase in temperature compared with other regions of the world. For that reason, our research station Pedro Vicente Maldonado, located in the South Shetland Islands, constitutes a suitable laboratory to monitor the progress and changes that occur on the ecosystems in the area, thus contributing to the knowledge of this anomaly in the world.

4. Technology Applied to Antarctica: Technological advances should be used to minimise impact to the Antarctic environment and to allow excellence in research, so projects are incorporated that seek to improve the application of technology in Antarctica.

INAE regularly participates in international meetings, including the Antarctic Treaty Consultative Meeting, COMNAP, the Scientific Committee on Antarctic Research (SCAR), the International Hydrographic Organization, and



Collecting samples for geological studies

Photo: T. Oña



Reading sea water parameters

Photo: A. Jeffis

the Reunión de Administradores de Programas Antárticos Latinoamericanos (RAPAL).

The Institute maintains a strong outreach programme to raise awareness and knowledge about Antarctica, especially in Ecuadorian youth, with contests on Antarctic topics being held between schools annually.

José Olmedo is currently a COMNAP Vice-Chair, elected in 2012.

The national Antarctic programme of Finland

The Finnish Antarctic Research Programme (FINNARP) is operated under the Finnish Meteorological Institute. FINNARP's main responsibilities are to carry out Finnish Antarctic research activities in accordance with the Finnish Antarctic Strategy, to maintain the Finnish research station Aboa, to arrange field research, and to supervise to ensure that national and international legislation and obligations are complied with in Antarctica.

The Finnish Antarctic research station Aboa was built in 1988, and it is situated 130 kilometres from the coast on the nunatak Basen in the Vestfjella Mountains, Queen Maud Land. Finland has collaboration efforts with Sweden. The Swedish research station, Wasa, is located only 200 metres from Aboa; together the two stations form the Nordenskiöld Base Camp. The stations co-operate in logistics, particularly with transport.

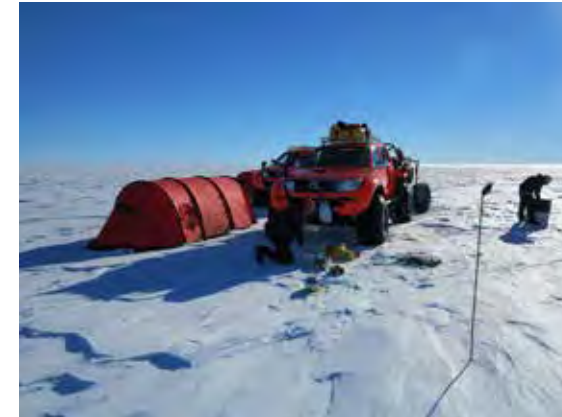
Aboa was enlarged and renovated during the summer of 2002–03. The station is now designed to provide for expeditions with a size of about 12 to 18 persons. The station consists of a main building, two laboratory containers, and three containers for accommodation. One of the accommodation structures is a medical doctor's facility that can also accommodate one patient if necessary.

The research station is occupied during the Antarctic summer only. At that time of the year the conditions are most suitable for research activity, with air temperatures having an approximate range of 0 to -25 °C.

The organisational structure of Finland's Antarctic programme

The authority responsible for Finnish Antarctic research is the Ministry of Education. The Ministry sets up the Antarctic Co-ordination Group, the purpose of which is to promote the co-operation of different authorities, to establish the priorities for Finnish Antarctic research and to supervise the logistics of expeditions to the Antarctic. The Academy of Finland is mainly responsible for the financing of Antarctic research projects.

The Finnish Antarctic projects are funded in four-year periods. All the projects are internationally evaluated. The total budget for science in the four-year period is EUR 2.5 million. For science support and logistics the permanent yearly budget is EUR 890,000.



Travelling in deep field



Aboa Station

The Finnish Antarctic research programme

FINNARP co-ordinates co-operation in scientific support and logistics with other national operators. The Finnish scientists have co-operation with several national Antarctic programmes in different Antarctic stations and on research vessels.

The aim of Finnish Antarctic research is to operate primarily in scientifically outstanding and topical fields in which Finland has high-quality know-how and which are adequately connected to issues and research pertaining to the Arctic.

Finnish Antarctic research has focussed on marine and structural technology, meteorology, marine biology, geology and geophysics. As a result of international co-operation, Finnish Antarctic research has expanded to all parts of Antarctica.

FINNARP has been leading expeditions to the Antarctic since 1988. The activities for the past five years have been as follows:

FINNARP 2012: Parachute drop operation for fuel supply for Aboa and Wasa research stations. Major supply shipment. Arrangements for waste transportation. Maintenance of automatic stations: seismometer, GPS, two weather stations and snow-cover thermo profile station. Launching of controlled meteorological balloons.

FINNARP 2011: GPS and gravity measurements. Maintenance of automatic stations: seismometer, GPS and two weather stations.

FINNARP 2010: Meteorological measurements on radiation, turbulence and UAV. Snow-line measurements and supraglacial lake studies. Maintenance of automatic stations: seismometer, GPS and two weather stations.

FINNARP 2009: Fuel supply by parachute drop operation. Evolution of snow cover. Antarctic aerosols. Antarctic meteorology. Maintenance of automatic stations: seismometer, GPS and two weather stations.

FINNARP 2008: Aboa Station maintenance. Maintenance of automatic weather station (AWS Milos 500), seismometer and GPS.



Loading and refuelling cargo Photo: M. Kalakoski

The national Antarctic programme of France

The French national Antarctic programme is led by the French polar Institute / Institut Polaire Français Paul Emile Victor (IPEV), which was originally created under the name of Institut Français pour la Recherche et la Technologie Polaire (IFRTP) in 1992.

IPEV is a governmental support agency providing a legal framework and the human, logistical, technical and financial resources for the development of French research in polar regions. Its main missions are to support and to implement national and international scientific and technological programmes in polar regions (Arctic, Antarctic and sub-Antarctic), to organise scientific expeditions, to build and to maintain infrastructure and equipment in support of research, and to organise oceanographic campaigns, using its ships RV *Marion-Dufresne* and *L'Astrolabe*.

France operates two stations in Antarctica: Dumont d'Urville Station in Terre Adélie Land and the joint French-Italian Concordia Station. Dumont d'Urville was built in 1956 on Petrel Island, where it houses a maximum of 30 people in winter and approximately 100 in summer. Concordia was built in 1997 and has been operated year-round since 2005. It can house 15 people in winter and 60 in summer. The inland Concordia Station is re-supplied annually by three ground traverses leaving Cap Prud'homme Station, a small annex station of Dumont d'Urville. In addition, France operates three stations in the sub-Antarctic islands: Crozet, Kerguelen and Amsterdam Islands. The RV *Marion-Dufresne* is used for oceanographic studies and logistical support to the sub-Antarctic islands. This ship was built in 1995 and has an onboard giant corer, making it well-equipped to study palaeoclimate, marine geoscience and the physics of the ocean. Outreach and educational programmes are offered to students via the ship through floating universities and teachers-at-sea programmes. Other means of logistical support come from the smaller vessels, such as *L'Astrolabe*, and from Twin Otter and Basler aircraft used under charter.



The RV Marion-Dufresne



Marine research in Terre Adélie

The organisational structure of the IPEV

IPEV is a public interest group composed of nine public and parastatal bodies, including the Ministry of Research, the Ministry of Foreign Affairs and the main French scientific organisations (Centre National de la Recherche Scientifique, Centre National d'Études Spatiales, CEA, Ifremer and Météo-France). Terres Australes et Antarctiques Françaises, the French competent authority in regard to the Environmental Protocol, is also a member of the group. The Ministry of Research is primarily responsible for providing the budget of the IPEV, approximately EUR 28 million, of which about EUR 15 million is allocated to scientific, technical and logistical polar activities and EUR 10 million to oceanography.

IPEV has 50 staff based at its headquarters in Brest, France, with 35 staff appointed by the Centre National de la Recherche Scientifique and 15 appointed by IPEV. In addition, there are up to 70 staff in the field on fixed-term contracts.

The French Antarctic research programme

Some 80 research programmes covering all disciplines are selected every year by IPEV on the recommendation of its Council on Polar Scientific and Technological programmes (CPST), an international group of 16 independent experts in the different fields of science. Seventy-five per cent of the programmes are conducted in Antarctica or in the sub-Antarctic islands. Topics of research include glaciology, meteorology, atmospheric sciences, ice and climate change, astronomy, coastal oceanography, geology, biology, ecology, physiology and psychology. Priority is given to long-term observatories in the fields of Earth and life sciences. France believes international co-operation is crucial for research and logistical support and so works with many other COMNAP national Antarctic programmes, but, in particular, with the national Antarctic programmes from Italy, Germany and Australia.

Gérard Jugie was an EXCOM MNAP representative 2000–04 and the COMNAP Chair 2004–07. He also served on the EXCOM as immediate past-Chair 2007–08.

Antoine Guichard was the COMNAP Executive Secretary October 2003 to September 2009.

IPEV hosted the COMNAP XV AGM (July) and the EXCOM meeting (March) in Brest in 2003.



Dumont d'Urville Station, IPEV Photo: IPEV

The lead agency for the German national Antarctic programme is the Alfred Wegener Institute (AWI), which was established as a public foundation in 1980 and which conducts research in the Arctic and Antarctic, as well as in temperate latitudes. The AWI co-ordinates polar research in Germany and provides the necessary equipment and key infrastructure for polar expeditions. AWI scientists study the natural variability of the climate system from short to long time scales. The Arctic and Antarctic are climatologically the most sensitive regions in the earth system to anthropogenic climate change and in this context they constitute valuable sources of information about possible future global environmental change and its consequences. Key data are obtained on present-day variability of ocean systems and climate, their historic variability in the recent geological past, and in the reconstructions of climate history. Methods exploited range from modern satellite-based remote sensing techniques to deep-sea and ice-core drilling. A priority at AWI is to conduct research on the polar marine regions and their biotas. The Institute has an important role in keeping the federal Government updated on its research results and providing competent advice for the development of environmental policies.

Germany operates three Antarctic research stations. Neumayer III is the current winter-over base, on the Ekström Ice Shelf, the third station to occupy this space since 1981. Close by, at 757 kilometres away, is Kohnen Station, a summer base that was established in 2001 and was used for deep drilling purposes until 2006 and now serves a deep ice lab and as an advance base for deep field activities on the Polar Plateau. The Dallmann Laboratory, founded in 1994, which is a smaller seasonal working space with four laboratories, is an annex to the Argentinian base Carlini on King George Island and operated jointly with the Instituto Antártico Argentino.

The pride of the AWI is the icebreaker RV *Polarstern*, which was first commissioned in 1982. The ship is equipped for biological, geological, geophysical, glaciological, chemical, oceanographic and meteorological research, and contains nine research laboratories. The ship has a maximum crew of 44, and offers work facilities for a further 50 scientists and technicians. Plans for a new icebreaker are currently under development.

There are two ski-equipped polar aircraft (BASLER BT-67) which can be used both for logistic and science purposes. They can be equipped for aerogeophysical, meteorological, glaciological and atmospheric chemistry studies.



Vibroseis traverse showing snow streamer being deployed on the Ekström Ice Shelf



Polarstern supplying Neumayer III Station

The organisational structure of Alfred Wegener Institute

At AWI the Director oversees the scientific work in the three divisions – climate, biology and geosciences – as well as taking final responsibility in all logistic matters.

The Director answers to the Board of Governors, which has representatives from the Government, the federal states, scientists and members of the public. An external science advisory board advises the institute and reviews its scientific success and also reports to the Board of Governors. An internal Scientific Advisory Council comprising section heads and elected scientists advises the Directorate on matters relating to the research programme.

Currently, the framework for ongoing scientific projects at the AWI is provided by the research programme PACES (Polar regions and Coasts in a changing Earth System).

The German Federal Ministry of Education and Research (BMBF) covers 90 per cent of budget, the state of Bremen 8 per cent and the states of Brandenburg and Schleswig-Holstein provide 1 per cent each. The Foundation employs over 1000 staff and in 2012 had a total budget of EUR 112 million.

The German Antarctic research programme

The science programme is structured into four complementary research topics and provides a comprehensive earth systems understanding from a polar and coastal perspective, with special emphasis on vulnerability and resilience in relation to society's needs:

- Changes and regional feedbacks in Arctic and Antarctic
- Fragile coasts and shelf seas
- The earth system from a polar perspective: data, modelling and synthesis
- Research in science–stakeholder interactions

AWI has close ties to many German universities, where joint professorships are established and where formal co-operation agreements are signed. Together with the German Research Foundation (DFG) in its priority programme on Antarctic research, the AWI also funds talented young scientists. The Institute sends scientists to other institutes throughout the world and invites scientists from other nations to cruises aboard *Polarstern*, as well as to Bremerhaven and Potsdam. About a quarter of those participating in *Polarstern* expeditions are scientists from abroad.

Heinz Kohnen was the SCALOP Chair 1988–1992.

AWI hosted the COMNAP EXCOM Meeting in Bremen in 1992, the COMNAP XVI AGM and SCALOP XI Symposium in July 2004, and the COMNAP EXCOM Meeting in Bremerhaven in October 2012.

Heinz Miller is the current COMNAP Chair, elected in 2011.



Neumayer III Station Photo:AWI

The national Antarctic programme of India

www.ncaor.gov.in

India began its national Antarctic programme in 1981 under the aegis of the then Department of Ocean Development (DOD), Government of India. A centre dedicated to Antarctic expeditions, named the Antarctic Study Centre (ASC), was established in Goa in 1988. The ASC was subsequently upgraded into an autonomous research and development institution, the National Centre for Antarctic and Ocean Research (NCAOR) under the erstwhile DOD (since renamed as the Ministry of Earth Sciences).

The primary goals of NCAOR are to plan, promote and implement the entire gamut of scientific and logistics activities related to Indian endeavours in Antarctica, the Arctic and the Southern Ocean. NCAOR is also responsible for the construction of new research bases and for the upkeep of the existing stations in the polar regions.

India's year-round station, Maitri, was built in 1989 on the Schirmacher Oasis in Queen Maud Land. Prior to that, from 1983 to 1989, India had operated the station Dakshin Gangotri, which was abandoned after being buried in ice. India recently extended her presence in Antarctica by

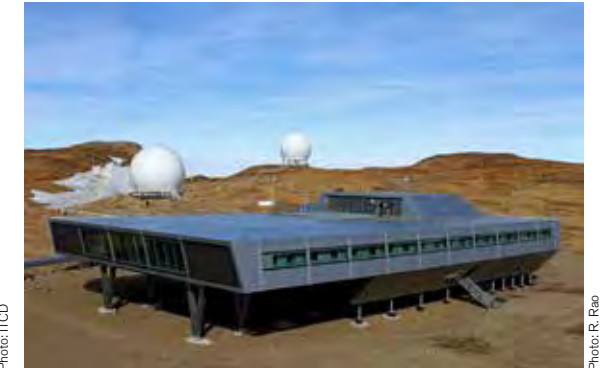
building a new station in the Larsemann Hills region, about 3,000 kilometres from Maitri. The new station is named Bharati and has been operational since 18 March 2012.

NCAOR also manages India's flagship Oceanographic Research Vessel *Sagar Kanya*. This vessel was commissioned in 1983 and has an endurance of approximately 45 days. It is a versatile ocean research platform equipped with advanced scientific equipment and related facilities for carrying out marine geological and geophysical data acquisition as well as meteorological, biological, physical and chemical oceanographic studies in the tropical Indian Ocean region.

The activities of NCAOR in the polar and ocean realms are fully met by the grants-in-aid provided by the Ministry of Earth Sciences. The expenditure incurred in the field of the National Polar Programme for the 2011–2012 financial year was: Antarctic research – INR 703,600,000; building of Bharati station – INR 1,850,000,000; Southern Ocean studies – INR 74,200,000; NACOR – INR 94,400,000; in-house research and development – INR 22,700,000; and Arctic expedition – INR 54,000,000.



NCAOR offices, Goa, India



Bharati Station at Larsemann Hills

The organisational structure of NCAOR

The NCAOR is led by a Governing Council of 12 members representing a cross section of the country's leadership in polar and ocean sciences, research, education and administration. The Secretary, Ministry of Earth Sciences, who is also the *ex officio* Chair of the Governing Council, appoints the other members of the Governing Council, as well as of the Research Advisory Committee and the Finance Committees, the latter two of which advise the Centre on research and financial matters. The overall responsibility for the planning, administration and functioning of the Centre, as well as for the implementation of the research and development activities, is vested with the Director of NCAOR, who is also the Member-Secretary of the Governing Council and of the Research Advisory Committee. The framework for NCAOR is then subdivided into different Divisions: Programme Planning and Evaluation; National Polar Programme comprising Antarctic, Arctic and Southern Ocean; Oceanographic Surveys and Service Group; Research and Development Group; Continental Shelf Project; Management Services etc.

NCAOR hosted the COMNAP XI AGM in Goa in September 1999.

Rasik Ravindra was the an EXCOM MNAP Representative 2007–08 and a COMNAP Vice-Chair 2008–10.

The NCAOR research programme

The Indian Antarctic Programme is multi-disciplinary in scope and multi-institutional in character. Over 60 leading National Institutions, Research Centres and universities are a part of the Programme. The thrust areas of research by Indian scientists in Antarctica comprise atmospheric science, meteorology, Earth sciences, glaciology, human biology and medicine, polar biology, environmental science, engineering and communication. NCAOR, besides supporting the research activities in these disciplines by other institutions, has also its own focus areas of study, with emphasis on palaeoclimatology, sea-ice-atmosphere interaction, climate modelling, and biogeochemistry of the Southern Ocean.

NCAOR maintains state-of-the-art ice core archival facilities along with a Class 100 clean room for processing of snow and ice samples, and analytical facilities as ICP-MS, ion chromatograph, stable isotope mass spectrometer etc. A cryobiology laboratory has recently been added. The Polar Environment and Ecology Laboratory at NCAOR works in close co-operation with the microbiology laboratory to ensure that all experiments are carried out in the most pristine environment. The Polar Remote Sensing Laboratory at the Centre works on development of Digital Elevation Models of snow and ice surfaces of the area around Schirmacher Oasis and Larsemann Hills, and of sea-ice extent and its variability etc.



Maitri Station at Schirmacher Oasis Photo: R. Rao

The national Antarctic programme of Italy

Italy started its national Antarctic programme in 1985 with the formation of the Programma Nazionale di Ricerche in Antartide (PNRA) and the National Scientific Committee for Antarctica (CSNA), and Italy has had Antarctic Treaty Consultative State status since 1987.

Italy maintains two Antarctic research stations. The first one, built in 1986, is Mario Zucchelli Station at Terra Nova Bay, which is open only in the summer season. In 1993 Italy and France agreed to build a joint station at Dome C, named Concordia, which was inaugurated in 1997 and has operated as a year-round station since 2005, accommodating 15 persons in the winter and 60 in the summer.

For shuttling to Antarctic stations and field camps, every year PNRA charters aircraft and helicopters and, every other year a cargo/research ship is used in support of Antarctic operations.

The organisational structure of Italy's Antarctic programme

The PNRA is directed by the Ministry of Education, Universities and Research (MIUR) through three national bodies: the National Scientific Committee for Antarctica (CSNA) for long-term objectives and strategies; the National Research Council (CNR) for the co-ordination of scientific research; and the National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA), through its Antarctic Technical Unit ENEA-UTA, for the implementation of the Antarctic expeditions, for logistics, and for the maintenance of the two Antarctic stations.

The research projects supported at the joint station of Concordia are determined by the Italian–French Steering Committee of Project Concordia.



Mario Zucchelli Station with helicopter in foreground

Photo: M. Maggiore, PNRA

Annually, MIUR defines a budget for the PNRA. Accordingly, the CNR, with the collaboration of ENEA and following the guidelines from CSNA, prepares the Annual Executive Programme (PEA) to be approved by MIUR for execution. PEA contains all the actions to be performed for an expedition and for the implementation of the approved research projects that have received grants.

For the 2012–13 year the total budget for PNRA is EUR 22 million.

The Italian Antarctic research programme

Science projects carried out at Mario Zucchelli are in the fields of life sciences, Earth sciences, atmospheric science, space, technology, and meteorology. A copy of the science strategy can be found on the PNRA website.

Concordia is located in an ideal place for science, with a low snow-fall rate, high elevation and clear skies. That leads to a strong focus on astronomy, astrophysics and atmospheric sciences. There are also projects on seismology, biology, medicine, climatology and glaciology. Scientists there were able to obtain a 3,270-metre-long ice core to study 800,000 years of palaeoclimatology.

The PNRA works closely with many other national Antarctic programmes in collaboration efforts toward logistics and science.

ENEA–PNRA hosted the COMNAP III AGM in Bologna in June 1991 and the SCALOP VI Symposium and COMNAP VI AGM in Rome in August and September 1994.

Mario Zucchelli was the COMNAP Chair 1991–94.

www.pnra.it



Unloading the SAFAIR aeroplane on the ice runway

Photo: A. Beltrame, PNRA



Concordia Station during the polar night

Photo: E. Bordoux, IPEV/PNRA



Aerial view of the Taldice project camp

Photo: PNRA

The national Antarctic programme of Japan

Japan's national Antarctic programme, the Japanese Antarctic Research Expedition (JARE), is organised by a headquarters established in 1955 at the Ministry of Education, Science, and Culture, which is now reorganised as the Ministry of Education, Culture, Sports, Science, and Technology (MEXT). The headquarters comprise many governmental departments and agencies of various ministries, such as the Ministry of Foreign Affairs, the Ministry of the Environment, the Ministry of Defence, the Ministry of Land, Infrastructure, Transport and Tourism, the Ministry of Agriculture, Forestry and Fisheries, and others. Scientific research and observation programmes for JARE are considered and decided on at the general meeting of the headquarters as a mid-term research plan.

The National Institute of Polar Research (NIPR), founded in 1973, is the body responsible for the management of JARE. NIPR has been pursuing cutting-edge studies in collaboration with research communities relating to the earth, the environment, life, space and other fields as well. It is involved in a wide range of activities in the Antarctic research programmes, both temporally and spatially, through research that uses advanced-method, long-term monitoring observations and field and ocean observations in many areas.

Japan has four Antarctic stations: Syowa, Mizuho, Asuka and Dome Fuji. Syowa, the largest of the stations, was built in 1957 and can hold up to 130 people in the summer and approximately 30 in the winter. Mizuho Station is 270 kilometres south-east of Syowa and has had intermittent occupation since 1970. It is currently closed. Asuka Station was operational from 1984 until 1991 to support field work in the Sør Rondane Mountains. Dome Fuji Station was built in 1995 for the purpose of the deep ice-core drilling programme and for atmospheric observations.

The organisational structure of the NIPR

The NIPR is established under MEXT and is in charge of JARE. It started as a multi-university research institute and grew to become a part of the Research Organizations of Information and Systems (ROIS) in 2004. There are 500 Japanese investigators affiliated with NIPR. The Center for Antarctic Programs (CAP) was an early addition to the reorganised structure of NIPR in 2004. The main focus of CAP is to manage JARE in terms of logistics and safety to personnel and to the environment. NIPR is opening up new



S-17 air base near Syowa Station for Japan–Germany collaborative study on airborne geophysics in 2006



PANSY (Program of the Antarctic Syowa MST/IS) radar

frontiers in interdisciplinary research under the framework of the Trans-disciplinary Research Integration Center (TRIC) at ROIS and various other inter-university research programmes.

To orchestrate international collaboration and relationships, the International Affairs Section was established in 2006. This section conducts business in regards to Treaty meetings and conferences, co-operative research scientific agreements with foreign institutes, and international scientific exchange.

The Japanese Antarctic research programme

The training of researchers is a big task of the Institute. As a parent institute of the Graduate University for Advanced Studies (SOKENDAI), NIPR accommodates a five-year doctoral course for graduate students in the Department of Polar Science, School of Multidisciplinary Sciences, and is involved in fostering promising researchers with high-level research capabilities and skills for field science.

With the science comes the responsibility of environmental protection, which NIPR takes seriously, as shown by its long-term monitoring programmes. In particular, at Syowa Station, an extensive programme has been in place since 1997 to monitor changes in global and regional environments.

NIPR promotes outreach activities for schools and, in addition, the Polar Science Museum, which opened on the Tachikawa campus in 2010. The Museum is used as the information centre to transmit history and the current status of polar research and its achievement. NIPR offers many opportunities for graduate students to use Antarctic data and analytical facilities. There is also a public outreach programme sponsoring public lectures, exhibitions of Antarctic items both modern and historic, and Antarctic classes offered to school children.

Japanese scientists collaborate with many international partners. Every summer since 1958 the Japanese Government has dispatched one or two Japanese scientists to the expeditions of other Antarctic Treaty Consultative Parties and invited one to three foreign scientists to join JARE.

NIPR hosted the COMNAP XII AGM and the SCALOP IX Symposium in Tokyo in July 2000.

Okitsugu Watanabe was an EXCOM MNAP representative 2001–04.

Kazuyuki Shiraishi was a COMNAP Vice-Chair 2008–11.



Syowa Station Photo: M. Sano

The national Antarctic programme of the Republic of Korea

The Republic of Korea's polar research history began in March 1987 when the Polar Research Laboratory was opened at the Korea Ocean Research and Development Institute (KORDI); the Korean National Committee on Antarctic Research (KONCAR) was founded in August that same year. The Korea Polar Research Institute (KOPRI) was created as part of KORDI, and it has been the operator of Korea's national polar programme since 1987. KOPRI is a government-sponsored research institute dedicated to polar science and logistic support, established to contribute to the development of national science and technology capacities and to advance knowledge for the benefit of all mankind by undertaking world-class scientific research programmes in co-operation with national and international partners.

KOPRI is the lead agency for conducting polar scientific research and operating research infrastructure, such as King Sejong Station and Jang Bogo Station (currently under construction and scheduled for completion in early 2014). KOPRI is also in charge of operating the icebreaker research vessel *ARAON*, it advises the Korean government on polar affairs, and it organises public outreach programmes. KOPRI has been an active participant in various international organisations and forums, such as the Antarctic Treaty Consultative Committee Meetings, the Commission for the Conservation of Antarctic Marine Living Resources, the Scientific Committee on Antarctic Research and COMNAP.

The King Sejong Antarctic station is located on King George Island on the Antarctic Peninsula. The station has been in operation as a year-round research platform since its inauguration in 1988. *ARAON* is Korea's first icebreaking research vessel. Her name "*ARAON*" is an original Korean word that combines "*ARA*", which means "sea", and "*ON*," which means "all" in the archaic Korean language. As her name suggests, *ARAON* signifies a will to be a platform for unhindered expeditions all over the oceans around the globe. The primary mission of *ARAON* is to conduct scientific research in oceans worldwide, including in both polar areas, and to provide logistics to King Sejong and Jang Bogo Stations. To perform world-class scientific activities, the research vessel is installed with state-of-the-art scientific equipment. *ARAON* is committed to operate logistics and research activities for nearly 300 days a year, including surveys in Arctic and Antarctic waters, and to provide assistance with the construction of the second Korean station on the Antarctic continent. The construction of Jang Bogo is scheduled to be completed in the 2013–14 summer season. This station will be operated as a high-latitude Antarctic research station in the fields of meteorology and atmospheric chemistry, upper atmosphere physics, glaciology, geodesy and long-term marine monitoring.



The icebreaking research vessel *ARAON* Photo: KOPRI

The Republic of Korea Antarctic research programme

In 1988 the first Antarctic field survey by the Korean Antarctic Research Programme took place. KOPRI pursues Antarctic research in four core areas: (a) polar climate change and its impact on ecosystems, (b) biodiversity and adaptation of polar organisms, (c) tectonic structures and their activities in Antarctica, and (d) new emerging science in Antarctica: meteorite expeditions and ice core drilling to reveal palaeoclimate changes.

In 1990 the Polar Research Laboratory was expanded to become the Polar Research Centre, and Korea joined the Scientific Committee on Antarctic Research as a regular member.

The Asian Forum for Polar Sciences (AFOPS) was formed in 2004 and KOPRI provided the initial momentum. The AFOPS aim is to provide a foundation for co-operative research activities, presenting Asian contributions to international polar communities and encouraging the involvement of non-polar Asian countries in polar research. Korea served for two years as the first Chair of AFOPS.

Besides its own research, KOPRI runs a variety of joint programmes to encourage the engagement of investigators from other universities and research institutes in Antarctic science. KOPRI also manages outreach programmes, such as "Pole-to-Pole Korea", to raise awareness, particularly among the young generation. The Pole-to-Pole Korea programme provides opportunities for the general public to experience the Korean Arctic and Antarctic stations, with a view to foster science communication and to enhance public understanding of global environmental changes. Since its launch in 2005 the programme has recruited secondary and tertiary students, science teachers and artists for the Antarctic and Arctic field experience.



Geological survey



Artist's impression of Jang Bogo research station

Yeadong Kim was the an EXCOM MNAP representative 2004–07.

KOPRI hosted the COMNAP EXCOM Meeting in Seoul in October 2005 and the COMNAP XXV AGM in July 2013.

Hyoung Chul Shin is a COMNAP Vice-Chair, elected in 2013.

The national Antarctic programme of the Netherlands

Polar research in the Netherlands is co-ordinated through the Netherlands Polar Programme (NPP), which was initiated in 2002 and builds on the previous Netherlands Antarctic Programme (NAAP). The NPP is operated by the Netherlands Organisation for Scientific Research (NWO) and includes Antarctic and Arctic research. Dutch scientists are sent to Antarctica with other national Antarctic programmes. While the Netherlands has been a signatory to the Antarctic Treaty since 1967 and a Consultative State since 1990, the country had no permanent stations in Antarctica. However, in 2012, four laboratories built in containers were joined in one docking station at the British Antarctic Survey research station Rothera. The whole structure was named the Dirck Gerritsz Laboratory. The laboratory modules were named Faith, Love, Annunciation, and Hope. The labs are built with a sustainability mind-set: solar panels, a heat pump extracting heat from external surroundings, and shared facilities reduce environmental impact. From the Dirck Gerritsz Lab the Netherlands will conduct scientific research in Antarctica.

The organisational structure of the Netherlands Antarctic programme

NWO is organised under the Ministry for Education, Culture and Science. NWO comprises eight divisions, which allocate subsidies and grants, mostly within programmatic limitations, to scientists from specific disciplines. The NPP runs within the Division for Earth and Life Sciences.

The NWO has a budget of EUR 500 million per year. For the NPP, NWO has a funding partnership with the Ministry of Education, Culture and Science, the Ministry of Infrastructure and Environment, the Ministry of Economic Affairs and the Ministry of Foreign Affairs. They jointly invest approximately EUR 3 million per year in the NPP. About half of that budget is spent on Antarctic research.



The opening of the Dirck Gerritsz Laboratory, showing the four separate lab modules

Photo: D. van der Kroef, NWO

The Netherlands Antarctic research programme

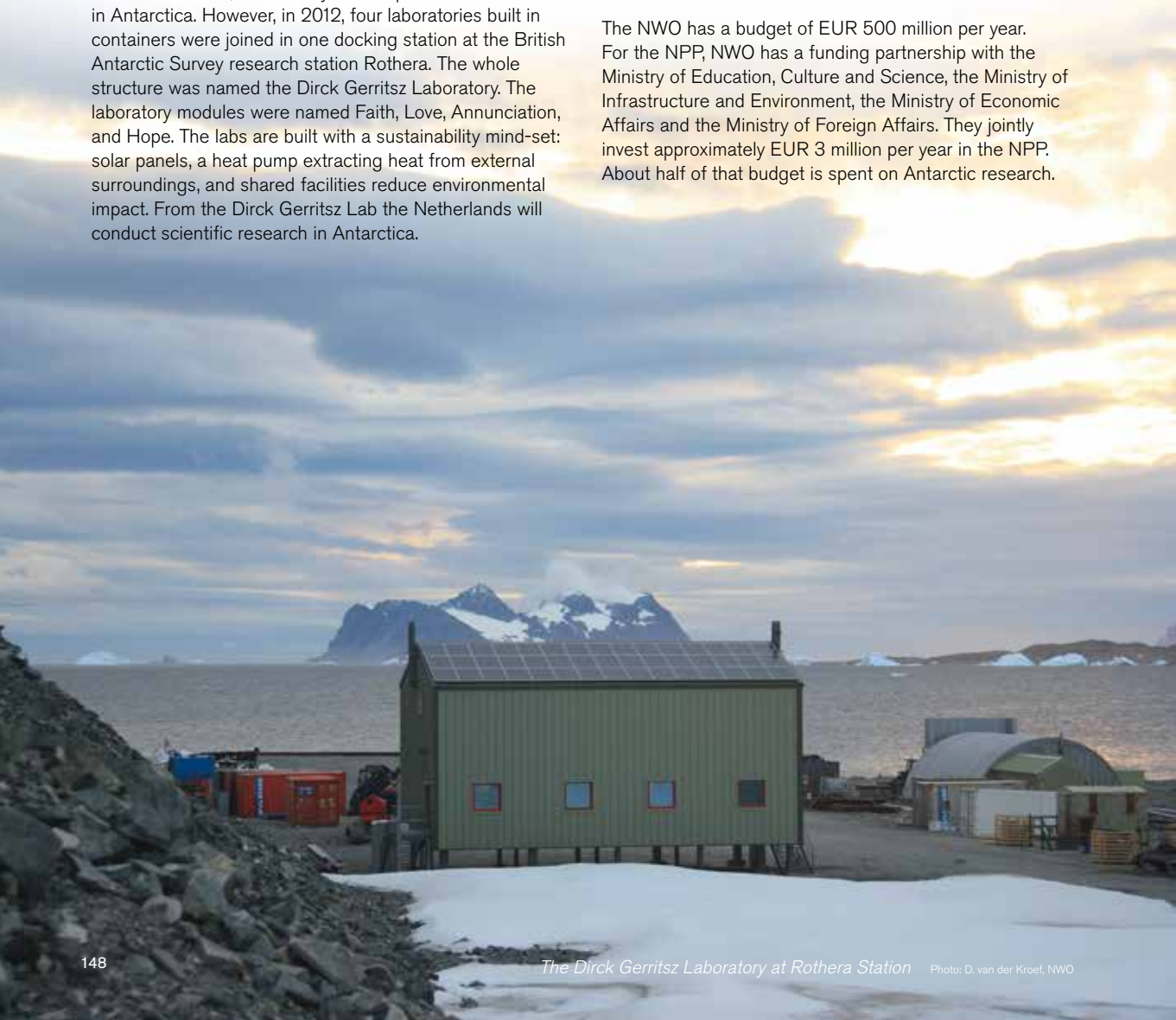
One of the Netherlands research projects studies the chemical reactions in the atmosphere above Antarctica caused by gases released during algal blooms. The rapid warming along the west coast of the Antarctic Peninsula promotes these algal blooms, which in turn affect the global climate. A second project focusses on phytoplankton, viruses and zooplankton, specifically their place in the aquatic food chain and how they respond to climate change. The third project focusses on the changing content of iron and trace elements in sea water and sea ice, elements important to all living organisms. The fourth project will model the increase of melt water from the Antarctic glaciers into the sea; and the fifth project studies the influence of this increase in melt water on the microbial community. Researchers primarily come from Dutch universities and NWO research institutes. The NPP works very closely with the British Antarctic Survey (UK) and the Alfred Wegener Institute in Germany.

The Netherlands Antarctic Programme hosted the COMNAP XIII AGM in Amsterdam in August 2001.



The Dirck Gerritsz Laboratory

Photo: D. Bleker, BAS



The Dirck Gerritsz Laboratory at Rothera Station Photo: D. van der Kroef, NWO

The national Antarctic programme of New Zealand

Antarctica New Zealand is the Crown Entity responsible for developing, managing and executing New Zealand government activities in Antarctica and the Southern Ocean. Antarctica New Zealand manages Scott Base, New Zealand's year-round Antarctic research station. It maintains New Zealand's operational presence in the Antarctic for the benefit of present and future generations of New Zealanders. Key activities include supporting scientific research, conserving the intrinsic values of Antarctica and the Southern Ocean, and raising public awareness (in part through arts, media and youth programmes) of the international significance of the continent. The New Zealand Antarctic programme is also supported by the National Institute of Water and Atmospheric Research's (NIWA) vessel RV *Tangaroa*, and Royal New Zealand Air Force Boeing 757, Orion P3 and Hercules C-130 aircraft operating within the joint USA–NZ logistical pool. New Zealand operates Antarctica's largest wind farm (three 330-kilowatt turbines), which generates power for Scott Base and the USA McMurdo Station.

The organisational structure of Antarctica New Zealand

The Chief Executive Officer of Antarctica New Zealand reports to a six-member board appointed by the Ministry of Foreign Affairs. A five-person management team, which includes the Chief Executive Officer, runs the Antarctic programme. The programme is operated by 30 permanent staff in Christchurch, 35 seasonal staff at Scott Base and 200 New Zealand Defence Force staff carrying out logistical operations. Some Christchurch staff also spend the summer season at Scott Base supporting research groups at the Base and in the field. Antarctica New Zealand's head office is at the International Antarctic Centre in Christchurch, which also houses the United States and Italian national Antarctic programmes and the International Antarctic Attraction.

All Scott Base staff members belong to one of three teams. These are: (a) Base Services (responsible for all administrative and domestic activities at Scott Base);

(b) Engineering (responsible for the day-to-day operation and maintenance of buildings, services, plant, and vehicles at Scott Base); and (c) Programme Support (responsible for supporting all New Zealand science projects and field activities).

The total annual budget for the New Zealand Antarctic programme is NZD 26 million, which consists of NZD 17 million in science support and NZD 9 million from the Ministry of Business, Innovation and Employment/New Zealand universities/Crown Research Institutes.

The Antarctica New Zealand research programme

The New Zealand Antarctic Research Institute (NZARI) was established by Antarctica New Zealand and launched in 2012 by the New Zealand Prime Minister. NZARI will focus on three key integrated science programmes defined in the New Zealand government Antarctic science strategy. The Prime Minister also confirmed in 2013 that one of the ten new national science challenges is "The Deep South", which aims to understand the impact of Antarctica on New Zealand's climate and future environments. Two hundred scientists work in fully integrated programmes with a high priority on international science collaborations. NZARI's board confirms the science programmes, based on an international peer-review process. Antarctica New Zealand, in turn, then provides all science support to the approved programmes.

Antarctica New Zealand hosted the COMNAP V AGM in Christchurch in June 1993 and the COMNAP EXCOM Meeting in September 2009.

Gillian Wratt was EXCOM MNAP Representative 1994–97 and COMNAP Chair 1997–2001.

Lou Sanson was an EXCOM MNAP representative 2007–08 and a COMNAP Vice-Chair 2008–10.

From July 2009 to the present, Christchurch, New Zealand is the location of the COMNAP Secretariat, with Executive Secretary Michelle Rogan-Finnemore.

www.antarcticanz.govt.nz



Penguins on the ice with RV Tangaroa in background

Photo: J. Mitchell, Antarctica New Zealand Pictorial Collection 2000



Inside ice cave at tip of Erebus Ice Tongue

Photo: D. Colett, Antarctica New Zealand Pictorial Collection K150 09/10



NZDF Boeing 757 on Pegasus Ice Runway

Photo: C. Reum, Antarctica New Zealand Pictorial Collection 2009



Scott Base Photo: M. de Ruyter, Antarctica New Zealand Pictorial Collection K242 0506

The national Antarctic programme of Norway

Norway has a long-standing history of Antarctic exploration in the Historic Era. A research institute was established in 1928. This Polar Institute has its head office in Tromsø's Fram Centre – a network of twenty institutes. There are also offices in Longyearbyen and Ny-Ålesund in Svalbard and in Cape Town, South Africa.

The Norwegian Polar Institute (NPI) is active within the fields of scientific research, mapping and environmental monitoring in the Arctic and Antarctica. The Institute advises Norwegian authorities in strategic and thematic matters relating to the polar regions, represents Norway internationally on various occasions and is Norway's competent environmental authority in Antarctica.

The Antarctic facilities of the Institute include Troll Station in Dronning Maud Land: a seasonal station from 1990 turned into a year-round facility in 2005. The nearby field camp of Tor has been in operation since 1985. The ice-strengthened vessel *Lance* has been used for research in polar waters since 1994. The Institute will become the owner of a new national ice-strengthened research vessel that will be operative from 2016.

The organisational structure of the Norwegian Polar Institute

The NPI has approximately 160 employees, organised into 5 departments that work to advise the Director. It is a directorate under the Ministry of the Environment. The Ministry of the Environment defines the Institute's responsibilities and sets its tasks. Within the research sector of the Ministry of the Environment, the Centre for Ice, Climate and Ecosystems (ICE) has been created as part of the Institute to intensify research on climate and ecosystems in polar regions, especially in the north. The Institute also has commissions financed by other ministries, other environmental agencies, research institutes, the Research Council of Norway and the European Union. The Institute is host to the Secretariat for the Climate and Cryosphere (CliC) International Project Office.

Logistically, NARE, the Norwegian Antarctic Research Expeditions, is responsible for supporting all Antarctic research funded by the Norwegian government. NARE is organised by the Norwegian Polar Institute under the Operating and Logistics Department. The department also offers its services to external research projects.

The annual budget for Antarctic science and operations is about USD 11 million, of which 20 per cent is used for science.

The NPI research programme

Monitoring of climate, environmental pollutants and biodiversity, along with geological and topographic mapping, are key activities at the Institute. The work done by the Institute makes a key contribution towards international climate research. The record created by regular monitoring programmes will be valuable for improving Norway's insight into climate and the environment. Another important task is environmental monitoring, working towards a minimised human impact. The science results are then used towards advising management, where polar environmental issues are concerned. All Norwegian science adheres to Environmental Protocol policy.

In an effort to make NPI and other institutions' knowledge available to all, the Institute publishes its own peer-reviewed multidisciplinary scientific journal *Polar Research* at www.polarresearch.net.

The Institute collaborates with many different countries and the Institute itself employs persons from 15 different countries. Logistically, there is much co-operation, especially with nations operating in Dronning Maud Land through the networks of DROMLAN and DROMSHIP. The Polar Institute participates in several national and regional research projects.

www.npolar.no



Troll Station

Photo: E. Ø. Kjartansson, NPI



RV Lance in ice

Photo: H. Hop



RNoAF Orion at Troll Airfield

Photo: NPI



IPY traverse science platform Photo: S. Tronstad, NPI

The national Antarctic programme of Peru



Machu Picchu Research Station

The Antarctic Affairs Division under the Ministry of Foreign Affairs is the body responsible for implementing actions to promote and ensure the active and permanent presence of Peru in Antarctica in the framework of the Antarctic Treaty. Among its specific functions are formulating, evaluating and implementing the national Antarctic programme, organising scientific expeditions to Antarctica, and maintenance and management of Peru's Machu Picchu Research Station.

Peru has been a State Party to the Antarctic Treaty since 1981, and was accepted as a Consultative Party in 1989. That year, Peru also acceded to the Convention on the Conservation of Antarctic Marine Living Resources, and in 1993 it ratified the Environmental Protocol.

Peru's scientific research expeditions to the Antarctic are carried out by the Antarctic Affairs Division in co-operation with Peruvian National Research Institutions, Peruvian universities and non-governmental organisations. Logistics and operational support, as well as specialised services, are provided by the Navy, the Air Force and the Army.

In 1989 Peru established its Machu Picchu Research Station on King George Island in Admiralty Bay. This summer station has a capacity for 32 individuals. Marine scientific activities are carried out with the support of the RV *Humboldt*, which has a capacity of 100 people, comprising crew (57) and scientific and technical staff (43). The vessel is equipped with modern oceanographic and marine laboratories.



Collecting water samples for macrobenthos studies

The Antarctic research programme of Peru

Peru became a full member of SCAR in 2004. Scientific activities carried out by Peru are consistent with the SCAR's Strategic Plan and they target research and environmental objectives. The ongoing projects are:

Ocean sciences: Integrated study of the Bransfield Strait ecosystem and surroundings of Elephant Island

Atmospheric and space sciences: Spectral measurements of solar radiation to quantify the ozone layer, UV index and aerosol optical depth in the Antarctic atmosphere, and relationship to measurements in Peru

Life sciences: Characterisation of biodiversity in Mackellar Inlet and the deep waters in Admiralty Bay

Predation, microclimate and nesting site election of the colony of Antarctic tern (*Sterna vittata* Gmelin, 1789) at Crépin Point, King George Island

Assessment of the lichen biodiversity in Crépin Point, King George Island



Peruvian scientific research vessel RV Humboldt

The national Antarctic programme of Poland

The first independent Polish scientific expedition set off to the Antarctic at the end of 1975. The aim of this maritime expedition was to evaluate krill and fish stocks in the Southern Ocean. It landed on King George Island in the South Shetland Islands, where a plaque commemorating the moment was placed in the rock. Two years later, on 26 February 1977, the Henryk Arctowski Polish Antarctic Station officially began its activity. The station is named after Henryk Arctowski (1871–1958), an eminent Polish polar explorer and a member and scientific leader of the first wintering scientific expedition to the Antarctic (1897–99), on the ship *Belgica*. The scope of scientific inquiries being conducted at the station includes microbiology, oceanography, geology, geomorphology, glaciology, meteorology, seismology and ecology. The station is open year-round, with a maximum capacity of 35 people in the summer and 13 in the winter. There are also refuges and field camps available. Poland is the 13th Consultative Party to the Antarctic Treaty.

The organisational structure of the Polish Antarctic programme

Up to 2012 the Henryk Arctowski Polish Antarctic Station was operated by the Department of Antarctic Biology, Polish Academy of Sciences (PAS), which provided the scientific management of the station and was also responsible for logistic and technical support. In 2012 the Department of Antarctic Biology, PAS was incorporated into the Institute of Biochemistry and Biophysics, PAS, which is one of the leading Polish scientific institutions, particularly in the field of molecular biology. Topics of special attention at the Institute are microbial and yeast molecular genetics, mutagenesis and DNA repair, plant molecular biology, structural biology and bioinformatics. Scientists working for the Polish National Antarctic Programme come from this Institute, from other Research Institutes of the PAS, and from Polish universities. Their research grants are financed by two agencies of the government Ministry of Science and Higher Education: the National Science Centre and the National Centre for Research and Development.

The Polish Antarctic research programme

A group of 28 Polish scientific institutions works jointly toward co-ordinating and conducting research in polar regions. All of them are involved in international collaboration, which is a key part of the Polish National Antarctic Programme. Results are published in the *Polish Polar Research* journal and other science journals. Biology, ecology, climatology and Earth sciences are the main focus of the Polish National Antarctic Programme. Long-term ecological, meteorological and glaciological monitoring programmes are important contributions to the research. Therefore, in 2013 the process was officially initiated to have the Polish refuge "Lions Rump", used for monitoring ASPA (Antarctic Specially Protected Area) 151, recognised as a CEMP Site (a Commission for the Conservation of Marine Living Resources (CCAMLR) Ecosystem Monitoring Program Site).

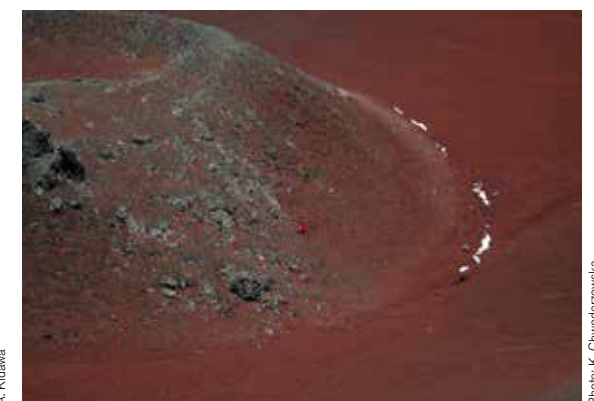


Henryk Arctowski Station in background of Adélie penguin colony

Photo: K. Chwedorzewska



Oceanologists at work



Penguin Island

Photo: K. Chwedorzewska

The national Antarctic programme of Russia

During the period 1819 to 1821 the Russian South Polar Expedition on board the sloops Vostok and Mirny approached the shores of the unknown Ice Continent several times. In 1946 the ships of the whaling flotilla *Slava* began annual operations in the Antarctic, and in the season of 1947–48 scientists began participating in its cruises and carried out oceanographic, meteorological and hydrobiological studies of Southern Ocean waters. The Arctic and Antarctic Research Institute (AARI) was established by a Decision of the USSR Government in 1920, and in July 1955 the Complex Antarctic Expedition of the USSR Academy of Sciences (CAE) was founded. The CAE's objectives included preparation and implementation of research programmes in the framework of the International Geophysical Year of 1957–58. Over the past 57 years the Expedition changed its name several times, and since 7 August 1992 it has been known as the Russian Antarctic Expedition (RAE).

The organisational structure of the AARI and the RAE

By the Order of the Russian Federation Government of 8 October 2012 the AARI was assigned the status of state operator in the Antarctic. Within the structure of the AARI are the following organisations: the Centre of Ice and Hydrometeorological Information and its technical group for data transmission, the Department of the Expedition Fleet, the Logistical Centre of the Russian Antarctic Expedition, the World Sea-Ice Data Bank, the Russian–German Otto Schmidt Laboratory, the Russian–Norwegian Fram Laboratory, the Department of Training of Young Specialists, and the Postgraduate School. The RAE Logistical Centre is responsible for preparation, planning and organisation of expeditions.

In 2011 the financing of AARI activities was from three sources: Roshydromet – RUB 1,538.6 million; Ministry of Education and Science – RUB 20.7 million; and agreements with other organisations – RUB 372.7 million.

Russia operates and maintains the following seasonal and year-round Antarctic stations: Bellingshausen, Druzhnaya-4, Leningradskaya, Mirny, Molodezhnaya, Novolazarevskaya, Progress, Russkaya, Soyuz and Vostok. At the end of 2012 the RAE completed construction of the new wintering complex and the snow-ice runway of Progress station.

The logistical supply of the Antarctic stations and field bases, rotation of wintering personnel, and transport of seasonal personnel to and from the Antarctic are provided by the research-expedition ship *Akademik Fedorov*, which was built in 1987. On 10 October 2012 a new research-expedition vessel, the RV *Akademik Tryoshnikov*, was launched. This vessel will operate in the Pacific Ocean sector between Bellingshausen and Mirny stations. The RV *Akademik Fedorov* will continue operation in the Indian Ocean between Novolazarevskaya and Mirny stations and will also support Progress station. The RAE activities are also supported by means of intercontinental flights from Capetown to the ice airfield of Novolazarevskaya station (IL-76TD aircraft) and from Punta Arenas to King George Island (DC-3 BT-67 Basler aircraft). The resupply of the inland Vostok station is carried out by two sledge-caterpillar traverses each summer season, and the rotation of personnel and delivery/transportation of the seasonal team is by means of DC-3 BT-67 Basler aircraft. The sledge-caterpillar traverses and flights to Vostok are from Progress station (the route length is 1,350 kilometres). Marine geophysical studies are carried out using the RV *Akademik Aleksander Karpinsky*, belonging to the Polar Marine Geological Exploration Expedition (Lomonosov, St Petersburg) of the Federal Agency for Subsoil Use.



Mirny Station



RV Akademik Tryoshnikov

The personnel of the wintering and seasonal expeditions is determined by the Russian Federation Government for each five-year period. At present it numbers 110 and 120 people, respectively, not including the crews of ships and aircraft and a construction team.

The Russian Antarctic research programme

The main directions of current RAE activities are as follows:

- Determination of the role of the Antarctic in the processes of global climate change
- Investigation of subglacial water and lithosphere objects
- Study of biodiversity of Antarctica and the surrounding ocean
- Geological–geophysical study of the Antarctic in terms of its mineral and hydrocarbon potential
- Study of space weather as an indicator of solar–terrestrial physical relations
- Investigation of the anthropogenic impact on the Antarctic environment.

One of the most important directions of activities is constant monitoring of the state of the Antarctic environment, performed by personnel at various stations and by use of several automated meteorological and geodetic stations that operate the year round.

Research is also undertaken within the RAE structure by specialists of scientific and educational organisations of Russia, including the Federal Service for Hydrometeorology and Environmental Monitoring, the Federal Agency for Subsoil Use, the Federal Agency for Fisheries, the Russian Federal Space Agency, the Ministry of Education and Science, the Ministry of Defence, the Ministry of Transport, and the Russian Academy of Sciences.

AARI/RAE hosted the COMNAP XX AGM and the SCALOP XIII Symposium in St Petersburg in July 2008.



Bellingshausen station Photo: AARI/RAE

The national Antarctic programme of South Africa

South Africa has long been involved in Antarctica, and it has built an impressive infrastructure around the South African National Antarctic Programme (SANAP). This programme includes the infrastructure on Antarctica, SANAE IV, as well as bases in the South Atlantic Ocean on Marion and Gough Islands. South Africa is a founder member of the Antarctic Treaty and remains a leading nation and the only African representative in the administration of the Treaty.

Expeditions are undertaken by the South African National Antarctic Expedition (SANAE) under the auspices of the Department of Environmental Affairs; the first such expedition was in 1959 with the purpose of building a permanent base. During that first season the South

Africans utilised an abandoned Norwegian station in Queen Maud Land; then, in 1961, the SANAE station was completed. Since then, several stations have been built to replace older stations that had had to be abandoned because of snow drift. The latest station, SANAE IV, finished in 1997 on Vesleskarvet nunatak, maintains a year-round population with a maximum of 80 people in the summer and 10 in the winter.

The new South African icebreaker, *SA Agulhas II*, has replaced the *SA Agulhas*. This fully equipped ship will be used for resupplying stations and conducting science. The ship has features such as a moon-pool, a drop keel, facilities for coring of seabeds, deep-water probes, an underwater observatory and a meteorology laboratory, amongst other facilities.



Scientists prepare balloon for launch Photo: H. Enlund



SANAE IV station on Vesleskarvet nunatak



The new polar research and supply ship SA Agulhas II undergoing ice trials

The organisational structure of SANAP

Much important scientific research in which South Africa has a comparative advantage takes place under the auspices of SANAP. This research is in line with recent strategy documents and thinking on the direction that sciences and technology should play in the young democracy. In this regard, SANAP has been restructured and all matters dealing with research are now the responsibility of the Department of Science and Technology, and funding is administered from within that department by the National Research Foundation. The administration of SANAP and its technical maintenance, however, remain the responsibility of the Department of Environmental Affairs.

Annual direct research funding is about ZAR 18 million. Logistic support (for Antarctic and sub-Antarctic research, including ship operational costs) is about ZAR 130 million.

SANAP hosted the COMNAP IX AGM in Cape Town in August 1997.

Dirk van Schalkwyk was an EXCOM MNAP representative 1998–2000.

Henry Valentine was an EXCOM MNAP representative 2004–07.

The South African Antarctic research programme

A variety of topics are covered by SANAP research, ranging from upper air research with cosmic rays to earth sciences. Five themes for the research are geospace, climate variability, biodiversity, sustainability, and the social, historical and political nature of human presence in Antarctica.

The SANAE IV base is a well-resourced facility for the observation of various natural phenomena occurring in the cosmos, in the atmosphere, or in the electromagnetic field surrounding the earth, as well as in the crust of the earth itself. Auroras, solar winds and the ozone layer are some of the subjects of this research: topics with direct relevance to the navigation and communication systems upon which we have become so dependent.

Collaboration with regard to research is extensive both nationally (tertiary institutions, research councils, etc.) and internationally (eg Alfred Wegener Institute, Germany and Dartmouth College, USA). Excellent logistic collaboration between SANAP and those countries that use Cape Town as a gateway to the Antarctic exist, particularly with Germany and the Nordic countries.

The national Antarctic programme of Spain

Spain became a Consultative Party to the Antarctic Treaty in 1988 and in 1990 was accepted as a full member of COMNAP and SCAR. After the entry into force of the Environmental Protocol in 1998 the Spanish Polar Committee (CPE) was created in order to co-ordinate all the activities related to scientific research in Antarctica.

Spain has two research stations in Antarctica, both in the South Shetland Islands. Juan Carlos I base, on Livingston Island, was opened in 1988 and Gabriel de Castilla base, which was opened during the 1989–90 campaign, is on Deception Island. Both stations are seasonal and are usually opened from November to March each year. Their capacity varies between 18 and 30 people. In 2005 Spain established an international field camp at Byers Peninsula, which it continues to manage.

A third research platform that Spain launches is the RV *Hesperides*, a vessel that is 82 metres in length, has a capacity for 37 scientists and is fitted with modern scientific equipment. The vessel has contributed significantly to the Spanish Antarctic research programme and is also used, when necessary, for logistical support.

The organisational structure of the Spanish national Antarctic programme

CPE is Spain's polar national authority, and it sits within the Ministry of Economy and Competitiveness. The CPE has responsibility for general co-ordination of Antarctic activities, application of environmental protection measures, international relationships and the establishment of the priorities for all the activities of science, development and innovation related to the Antarctic Treaty. The CPE has a President, an Executive Secretariat and a series of members representing the different ministries and organisations involved in polar research.



International field camp at Byers Peninsula, Livingston Island

Photo: UTM-CSC

The Spanish Antarctic research programme

The first Spanish polar research programme was in 1988. Since then Spain has maintained a polar research programme funded by the National Plan for Research, Development and Innovation. Scientific projects apply through a competitive peer-review process for science funding and logistic support; projects are funded for three years.

The main research topics of the Spanish national Antarctic programme are biology, geology, geophysics, oceanography, glaciology and atmospheric research, including climate change and its impact on ecosystems and the impact of human activity in Antarctica.

Spain welcomes international collaboration in science and logistics, following the spirit of the Antarctic Treaty. Spanish researchers have worked in Antarctica since 1959, due primarily to international scientific collaboration. The opening of the two bases in the late 1980s allowed for further scientific activity in Antarctica.



Gabriel de Castilla base on Deception Island

Photo: Spanish Army

The Mediterranean Center for Marine and Environmental Research hosted the COMNAP EXCOM meeting in Barcelona in October 2011.

Juan José Dañobeitia is currently a COMNAP Vice-Chair, elected in 2011.



RV Hesperides in Gerlache Strait Photo: Spanish Navy

The national Antarctic programme of Sweden

Sweden has been a signatory to the Antarctic Treaty since 1961. To carry out its scientific goals it operates two seasonal stations, Svea and Wasa. The larger of the two, with a 16-person capacity, is Wasa Research Station, which was built in 1988 in Dronning Maud Land. The Svea Research Station was constructed in 1987 in the Heimefront Range about 65 kilometres from the coast. It is primarily used as a seasonal station for summer field camps. The icebreaker *Oden* has been a part of the Swedish Polar Programme since 1989, travelling in both hemispheres. There are also helicopters and all-terrain vehicles to provide logistical support. In addition to its commitment to science in Antarctica, Sweden is dedicated to protecting the Antarctic environment.

The organisational structure of the Swedish national Antarctic programme

The Swedish Polar Research Secretariat is a government agency under the Ministry of Education and Research that promotes and co-ordinates Swedish polar research. Specifically, in the Antarctic, the programme is known as SWEDARP (Swedish Antarctic Research Programme). For research planning the Secretariat co-operates with the Swedish Research Council.

The Swedish Polar Research Secretariat has a staff of about 30 in various units: research management, research infrastructure, communications, and administration. The Swedish Polar Research Secretariat is a single-council authority, which means that the head of authority, (ie the Director-General) is completely responsible for all activities.



Photo: Swedish Polar Research Secretariat



The Svea Research Station is used for summer field camps



The icebreaker Oden

The Government has appointed an Advisory Council that will provide public insight in the organisation and give the Director-General advice.

The annual budget for the Swedish Antarctic programme varies from year to year, depending on current activity. In 2011 the cost for logistics and operations was SEK 3.6 million, while in 2012 it was SEK 8.9 million. This is for operations and logistics only, as science funding is provided by universities separately.

The Swedish research programme

Sweden participates in numerous science programmes. Some main topics for the 2011–12 season were fossils in Victoria Land, atmospheric radar, the cardiovascular systems of fish and reptiles, and physical oceanography. Any Swedish citizen wishing to apply for funding can do so. Resources are also available for citizens of other nations.

Wasa Research Station is not far from the Finnish Aboa Research Station, making collaboration with the Finnish Antarctic Programme easy. The icebreaker *Oden* was used in a Swedish–American partnership during the period 2006–11, along with the US icebreaker, *Nathaniel B. Palmer*, to conduct marine research and to provide logistic support to the US McMurdo Station.

Beyond the science, since 2000 there has been a strong education programme, supporting Swedish teachers and teachers from other nations, including Chile, Germany and

the USA. The programme co-operates with organisations such as the US National Science Foundation, PolarTREC and ESSAC (the Science Support and Advisory Committee of the European Consortium of Ocean Research Drilling) and IODP (the Integrated Ocean Drilling Program).

The Secretariat is upholding tradition by allocating space for artists on Swedish research expeditions, as do several other nations. The arts are interpreted in the broad sense and support is not limited to the visual arts.

Science in Antarctica is under obligation by the government to implement an environmental management system. The Secretariat is driven to uphold best practice, to use environmentally friendly technology and to have continuous monitoring programmes. This includes looking at long-term impacts of Swedish stations and Initial Environmental Evaluations of larger science projects. Environmental work in Antarctica, including monitoring of stations, is carried out with close co-operation from Finland and Norway, and has resulted in the *Nordic Environmental Handbook*.

Anders Karlqvist was an EXCOM MNAP representative 1993–94 and the COMNAP Chair 1994–97.

The Swedish Polar Research Secretariat hosted the COMNAP XXIII AGM in Stockholm in August 2011.

The national Antarctic programme of Ukraine

The National Antarctic Scientific Centre (NASC) is the Ukrainian public body, formed in 1993, that is responsible for co-ordinating, managing and executing Ukrainian activities in Antarctica. In 1996 the British Faraday Station was transferred to Ukraine in compliance with a bilateral governmental memorandum and then the base was renamed the Akademik Vernadsky Station. The base is a year-round station capable of supporting complex and systematic scientific research in Antarctica.

Ukraine's total annual budget for the Antarctic programme is approximately USD 3 million, which consists of approximately 70 per cent of funding for the science programme, and 30 per cent for science support, including ship freight and management of the station.

The organisational structure of the NASC

NASC has approximately 60 permanent staff, consisting of the Chief Executive and staff responsible for the objectives of NASC. The Centre is a component of the State Agency on Science, Innovations and Information of Ukraine. The organisation has a Science Board to provide strategic science direction.

Each year NASC recruits staff for Vernadsky Station. Up to 15 people are appointed for winter-over positions (March to the following March) each year. They are also responsible for seasonal scientific work at the station. During the change-over period, up to five people are appointed to complete maintenance work on the station.



Akademik Vernadsky Station, 2008

Photo: M. Artem



Marine biology investigation

Photo: NASC photo archive

The Ukrainian Antarctic research programme

The State Special-Purpose Research Programme in Antarctica for 2011–20 comprises ten research areas, each involving up to five two-year projects. Ukrainian Antarctic scientists are mostly from Ukrainian universities, National Academy of Sciences institutes and research centres. They apply for funding and support through a competitive peer-review process for science funding through the State Special-Purpose Research Programme in Antarctica for 2011–2020.

The main research topics of the Ukrainian national Antarctic programme include geology, geophysics, hydrometeorology, oceanography, biology, and medico-physiological and geospace research. The research activities have been performed mainly in the Argentine Islands archipelago and on adjoining islands, and also on the Graham Coast of the Antarctic Peninsula.



Glaciological research

Photo: NASC photo archive

The national Antarctic programme of the United Kingdom

The United Kingdom has a long and distinguished history of scientific research and survey in the Antarctic and in the sub-Antarctic islands, starting with the "Heroic Era" of exploration, and is an original signatory to the Antarctic Treaty. The British Antarctic Survey (BAS), formed in 1962, is a component of the UK Natural Environment Research Council (NERC). BAS is responsible for managing the UK's national Antarctic programme and undertakes most of the British research on the continent. BAS delivers a world-leading interdisciplinary research programme in the polar regions, provides a national capability for Antarctic science and logistics, and also undertakes the excellent engineering and operations required to support UK polar research.

BAS conducts its research at five Antarctic and sub-Antarctic research stations. In the Antarctic, these are the year-round research stations at Rothera and Halley VI, and the summer-only Signy research station. There are also summer-only logistic facilities at Fossil Bluff and Sky Blu.

In support of Antarctic science, BAS operates two ice-strengthened research ships: the RSS *James Clark Ross*, used for marine biology, geology and oceanographic studies; and the RRS *Ernest Shackleton*, used primarily to resupply the Antarctic stations and to provide logistics support for field parties. BAS also operates five aircraft – a De Havilland Dash 7 and four De Havilland Twin Otters – which undertake logistics support and airborne scientific surveys.

The organisational structure of the British Antarctic Survey

The BAS employs over 400 staff, and the Antarctic operations and science programmes are executed and managed from Cambridge, England. The organisation is led by the Director and the BAS Board, and has a Science Board to provide strategic science direction. The BAS Programme Office undertakes a key role co-ordinating international partnerships and collaborations.

The total BAS budget for 2011–12 was GBP 48 million. Of this, GBP 13 million was spent on the science programme, and GBP 35 million on supporting the science, which included the costs of running the ships, aircraft and research stations.

The UK Antarctic research programme

Chemistry, physics, biology, and Earth sciences are the main focusses of scientific research conducted by BAS. The current BAS science research strategy, Polar Science for Planet Earth (PSPE), consists of six integrated research programmes involving twenty-five projects. PSPE concentrates on key science questions of global or fundamental importance that can be best answered by research requiring access to the polar regions. There

are also successful long-term monitoring and survey programmes in place. Information on BAS's current science programme can be found on our website.

Antarctic science research funding and access to the BAS polar infrastructure is available to both UK researchers and students through NERC. Investing in the next generation of Antarctic scientists is a vital part of achieving the UK Antarctic science programme. While not a degree-awarding body, BAS works closely with a large number of higher education institutes in the UK and abroad, and is currently linked to over 50 postgraduate research students funded by a variety of mechanisms.

Collaboration is a vital part of BAS research, engineering and operations and is a necessity for the complex large-scale science now being conducted in Antarctica. BAS has established joint research projects with over 40 UK universities, and has more than 150 national and international collaborations. BAS has a particularly strong relationship with the Netherlands Polar Programme, an important part of which includes the joint operation of the Dirck Gerritz Laboratory at Rothera Research Station. BAS also has strong links with other NERC research centres, UK government departments, international research organisations, leading international scientists and other national Antarctic programmes. Collaboration is conducted through joint scientific research, shared use of infrastructure and logistics, and exchange of personnel, knowledge and data.

David Drewry was the inaugural COMNAP Chair 1988–91.

John Pye was the SCALOP Chair 2005–08.

John Hall is currently a COMNAP Vice-Chair, elected in 2013.

BAS hosted the COMNAP I AGM in Cambridge in October 1989, the SCALOP VII Symposium and the COMNAP VIII AGM in August 1996, and the COMNAP EXCOM meetings in October 2007 and September 2013.

www.antarctica.ac.uk



Photo: C. Robinson, BAS

UK played a leading role in the seven-nation Gamburtsev Mountain range project AGAP during IPY



Photo: P. Bucktrout, BAS

The BAS Dash 7 on the Sky-Blu blue ice runway, where a fuel depot is maintained for use by the fleet of Twin Otter aircraft



Photo: C. Gilbert, BAS

RRS Ernest Shackleton tied up against the sea ice on the Brunt Ice Shelf

The national Antarctic programme of the United States

The United States is an original signatory to the Antarctic Treaty and has been fully engaged in Antarctic work since 1956 via the United States Antarctic Program (USAP). The US National Science Foundation (NSF) Division of Polar Programs (PLR) in the Directorate for Geosciences is responsible for managing and funding USAP. The USAP has been a COMNAP member since COMNAP was established in 1988, and the first COMNAP Secretariat was hosted by the United States.

The programme has three year-round Antarctic research stations: McMurdo Station, Amundsen–Scott South Pole Station and Palmer Station. In summer, field camps are established for glaciologists, Earth scientists, biologists, and others to conduct research in areas of the Antarctic that are remote from established research stations.

Large ski-equipped LC-130 airplanes, operated by US Air National Guard crews, provide air logistics support to intracontinental sites and Amundsen–Scott South Pole Station and between McMurdo Station and Christchurch, New Zealand. The US also uses US Air Force wheeled C-17 aircraft to transport personnel and cargo to Antarctica. Helicopters, and Twin Otter and Basler (DC-10) airplanes, flown by contractors, support research teams at remote sites. Tracked or wheeled vehicles provide transport over ice and ice-free ground and small boats are used in coastal areas.

The ice-strengthened research vessels *Laurence M. Gould* and *Nathaniel B. Palmer* conduct oceanography and marine studies. The *Laurence M. Gould* also resupplies Palmer Station. Annually, an ice-strengthened cargo ship and a tanker bring cargo, supplies and fuel to McMurdo Station for McMurdo and South Pole stations. USAP contracts out many aspects of its operations and logistics support to a civilian contractor.

The organisational structure of USAP

The NSF funds and manages USAP via the PLR, supports scientific research, and oversees the co-operative efforts of a civilian contractor, the military, and several federal agencies.

The programme comprises research by scientists competitively selected from universities and other research institutions and operations and support to science carried out by a contractor and other agencies of the US Government. Approximately 3,000 people are involved each year, with approximately 800 scientists deployed to the Antarctic and a majority of the remaining numbers deployed as science support, logistics and operations personnel.



The US research ship *Laurence M. Gould* docked at the Palmer Station pier on Anvers Island in the Peninsula region

Photo: A. V. Williams, US National Science Foundation

USAP also supports an Antarctic Artists and Writers Program. The programme supports writing and artistic projects specifically designed to increase understanding and appreciation of the Antarctic and of human activities on the southernmost continent, by providing opportunities for professional artists and writers to travel to Antarctica and work at research stations and field camps and on board research vessels.

The total budget for US Antarctic research and logistics is approximately USD 330 million (2012). Roughly USD 70 million of this goes directly to research institutions, with the balance going to research support infrastructure and safety and health programmes.

The USAP research programme

US Antarctic research has three broad goals: to expand fundamental knowledge of the region, to foster research on global and regional problems of current scientific importance, and to use Antarctica as a platform from which to support research. Antarctica's remoteness and extreme climate make field science more expensive than in most places; consequently, research is done in the Antarctic only when it cannot be performed at more convenient locations.

Among the scientific disciplines encompassed by this broad mandate are astronomy, astrophysics, atmospheric sciences, biology, climate studies, geospace sciences, Earth science, environmental science, geology, glaciology, marine biology, ocean sciences, and geophysics. The United States

co-operates scientifically and operationally with many of the Antarctic Treaty nations. This collaboration involves having easy access to information, scientists sharing research grants, operational support, and working with other national Antarctic programmes.

The US American Geophysical Union was the home of the COMNAP Secretariat 1988–97, with Al Fowler as the COMNAP Executive Secretary for that period.

Erick Chiang was the SCALOP Chair 1995–98.

Karl Erb was the COMNAP Chair 2001–04.

Brian Stone is currently a COMNAP Vice-Chair, elected in 2011.

The NSF hosted COMNAP XIX in Washington DC in July 2007 and the COMNAP XXIV AGM and Symposium XV in Portland, Oregon in July 2012.

The US hosted COMNAP EXCOM meetings in Oxnard, California in 1994, in Honolulu, Hawaii in 1995, in Santa Fe, New Mexico in 1996 and in 1997, in Maui, Hawaii in 2001, and in Seattle, Washington in 2003.

The national Antarctic Programme of Uruguay

www.iau.gub.uy

The Uruguayan Antarctic Institute (UAI) was founded in 1975. The UAI is in charge of programming and developing scientific, technological and logistical arrangements for the purpose of establishing the national Antarctic programme within the provisions of the Antarctic Treaty System. Uruguay became a Consultative State within that system in 1985 and has run Artigas Station, a year-round station on King George Island, since 1984.

Artigas is the main base of the UAI, with about sixty personnel in the summer and nine during the winter. Uruguay also maintains a seasonal station called T/N Ruperto Elichiribehety, which was built in 1997.

The *ROU 26 Vanguardia* is the main ship used for oceanographic studies and logistical support to Artigas Base and Ruperto Elichiribehety Station. Other ships that usually are involved in Antarctic activities are *ROU 04 Artigas* and *ROU 22 Oyarvide*.

The organisational structure of the UAI

The UAI is a national agency under the Uruguay Ministry of Defence. The science programme is co-ordinated by the Chief Representative of the Ministry of Education and Culture, who acts as the Chief Scientific Co-ordination Director. They are responsible for managing the library and data bank, for conducting primary assessments of submitted projects, for forming and maintaining relationships with universities, and for follow-up on science projects.

Within the UAI, the Public Relations Department is responsible for promoting the State's interest in Antarctica. This is primarily done through public or private education centres and other institutes.

The Uruguay Antarctic research programme

The UAI covers a range of science topics: geophysics, biology, chemistry, meteorology, oceanography and mapping. The UAI has the ongoing activities of environmental monitoring, weather research, monitoring the ozone hole, and monitoring potential impacts of waste and other pollution on birds.

UAI runs a project called the Mobile Marine Meteorology with the Service of Oceanography, Hydrography and Meteorology of the Navy (SOHMA). The project's efforts to collect weather measurements and to report live to ships are instrumental in navigation. SOHMA also contributes to hydrography, oceanography and biology studies. Properties of the ocean tides are also studied with SOHMA.

The Military Geographic Service (EMS) works towards taking accurate GPS satellite observations for a number of research projects; a major one being GIANT – Geodetic Infrastructure in Antarctica – which looks to determine the movement of continental plates.

Researchers come from universities, institutes, and the Navy or other military. They submit proposals on their topics to be evaluated, and if their proposals are highly evaluated they receive funding approval.

Uruguay works towards collaborative efforts in Antarctica. For example, the results of the meteorological studies are shared, in particular with Chile and Argentina.



The AINA building at Artigas scientific base

Photo: Uruguayan Antarctic Institute



ROU 26 Vanguardia and personnel

Photo: Uruguayan Antarctic Institute



Hercules C-130 at Aerodrome Tte. Marsh

Photo: G. Rulener

The national Antarctic programme of the Czech Republic

www.polar.sci.cz/en



Photo: K. Laska, Masaryk University

The Johann Gregor Mendel Czech Antarctic Station and the Antarctic Peninsula in the background

The national Antarctic programme of the Czech Republic is the newest member of COMNAP: represented by the Masaryk University the programme was admitted in 2013 at COMNAP AGM XXV in Seoul. The Masaryk University is a lead institution of the Czech Polar Research Centre, which connects Czech research institutions active in polar research. The Masaryk University owns and operates the Johann Gregor Mendel Czech Antarctic Station on James Ross Island, off the eastern side of the Antarctic Peninsula. The University therefore has the roles of promoting and co-ordinating Czech polar research activities, managing the Antarctic station's development, and organising and leading research expeditions to the Antarctic.

In addition to having a commitment to research in Antarctica, the Czech Republic is dedicated to protecting the Antarctic environment, and it has been a signatory to

the Antarctic Treaty since 1962. An important contribution to international agreement with the Czech Antarctic activities was represented by the Czech Antarctic Law, ratified in 2003. Subsequently, the Czech Republic became a member of the Committee for Environmental Protection (CEP) of the Antarctic Treaty; and, ten years later at the 36th Antarctic Treaty Consultative Meeting (2013) in Brussels, it gained Consultative Party Status.

The Johann Gregor Mendel Czech Antarctic Station, with a 20-person capacity, was built during two summer seasons: 2004–05 and 2005–06. The base bears the name of J. G. Mendel (1822–1884), a founder of modern genetics and a pioneering meteorologist. Since the station's establishment a number of successful scientific expeditions have been based there. The station relies on other countries for logistic support (up to now the Chilean Navy and the Argentinean Air Force have been the usual providers).

The organisational structure of the Czech National Antarctic programme

The Masaryk University, based in Brno, is a public university under the supervision of the Ministry of Education, Youth and Sports. As the owner and operator of the Johann Gregor Mendel Czech Antarctic Station it is the receiver of the mandate to be Lead Agency of Czech Antarctic research activities (which includes COMNAP membership), as well as CZK 10 million per year of support from the Ministry. This sum is for operation and logistic costs only, as science funding is provided separately for universities and other research institutions.

For research planning and co-ordinating, the Masaryk University co-operates with the Czech Polar Research Centre. The Czech Polar Research Centre is also associated with the Czech Geological Survey, the University of South Bohemia in České Budějovice, and several institutes and research centres of the Academy of Science of the Czech Republic.

The Czech Antarctic research programme

The Johann Gregor Mendel Czech Antarctic Station is primarily used as a fully equipped seasonal station with two laboratories, but it also gives support to summer field camps. Since 2007 Czech researchers have stayed and worked here along with researchers from Argentina, Slovakia, the United Kingdom and Russia.

The investigation programme carried out at the station is intended to be long-term and multidisciplinary. The multidisciplinary character of the programme is determined by its focus on a complex study of one of the largest deglaciated areas in Antarctica. Both the abiotic and biotic components of the area are studied, as well as the relationships between those components. Studies on the area include the functioning of the whole system and predictions of its further development. The scientific programme includes fields of Earth sciences (geology, geomorphology, palaeontology, glaciology, geochemistry, analytical chemistry, climatology and hydrology, in particular), and a number of biological disciplines, such as parasitology, botany, ecology, eco-physiology, plant stress physiology, microbiology, ornithology and soil biology.



Photo: R. Vodrazka, Czech Geological Survey

The Czech glaciological team and their weather station at the peak of Davies Dome Glacier



Photo: J. Mikova, Masaryk University and the Czech Geological Survey

The researchers' field camp at the coast of Brandy Bay

The national Antarctic programme of the Czech Republic is the newest member of COMNAP, elected to the COMNAP membership at COMNAP XXV AGM in July 2013.



Appendices

APPENDIX 1

Abbreviations used in this book

ADDS	Antarctic Data Directory System	CIROS	Cenozoic Investigations in the Western Ross Sea	ICAIR	International Centre for Antarctic Information and Research	NZAP	New Zealand Antarctic Programme
AEON	Antarctic Environmental Officers Network	CNRS	Centre National de la Recherche Scientifique	ICAO	International Civil Aviation Organisation	RAPAL	Reunión de Administradores de Programas Antárticos Latinoamericanos
AFIM	Antarctic Flight Information Manual	COMNAP	Council of Managers of National Antarctic Programs	ICED	Integrating Climate and Ecosystems Dynamics	RCC	Rescue Co-ordination Centre
AFOPS	Asian Forum for Polar Sciences	CRAMRA	Convention on the Regulation of Antarctic Mineral Resource Activities	ICSU	International Council of Scientific Unions / International Council for Science	SAR	Search and Rescue
AGAP	Antarctic Gamburtsev Province	CRP	Cape Roberts Project	IEE	Initial Environmental Evaluation	SATCM	Special Antarctic Treaty Consultative Meeting
AGM	Annual General Meeting	DIMS	Data and Information Management Strategy	IGBP	International Geosphere Biosphere Programme	SCADM	Standing Committee on Antarctic Data Management
AGU	American Geophysical Union	DML	Dronning Maud Land	IGY	International Geophysical Year	SCALOP	Standing Committee on Antarctic Logistics and Operations
AINMR	Accident Incident, and Near Miss Reporting	DROMLAN	Dronning Maud Land Air Network	IHO	International Hydrographic Office	SCAR	Scientific Committee on Antarctic Research
AIROPS	Air Operations Working Group	DSDP	Deep Sea Drilling Project	IMO	International Maritime Organization	SCARCOM	SCAR Radio Communications Guidance Manual / SCAR Antarctic Telecommunications Manual
AMD	Antarctic Master Directory	DVDP	Dry Valley Drilling Project	INACH	Instituto Antártico Chileno	SCARLOG	SCAR Working Group on Logistics
ANTOSTRAT	Antarctic Offshore Stratigraphy project	ECG	Environmental Co-ordinating Group	INFONET	Information Officers Network	SHIPOPS	Ship Operations Working Group
APASI	Antarctic Peninsula Advance Science Information system	EDAT	Co-ordinating Group on Education and Training	IPEV	Institut Polaire Français Paul Emile Victor	SOOS	Southern Ocean Observing System
APECS	Association of Early Career Scientists	EIA	Environmental Impact Assessment	IPI	International Polar Initiative	SPRS	Ship Position Reporting System
APIS	Antarctic Pack Ice Seals	EIES	Electronic Information Exchange System	IPICS	International Partnerships in Ice Core Sciences	STADM	Standing Committee on Antarctic Data Management
ATCM	Antarctic Treaty Consultative Meeting(s)	ENMANET	Energy Management Network	IPO	IPY Programme Office	TANGO	Working Group on Tourism and Non-governmental Activities
ATME	Antarctic Treaty Meeting of Experts	EOC	Education, Outreach and Communications	IPY	International Polar Year	TIBA	Traffic Information Broadcasts by Aircraft
ATOM	Antarctic Telecommunications Operators Manual	EPICA	European Programme for Ice Coring in Antarctica	IPYCG	International Polar Year Co-ordinating Group	TRAINET	Training Network
AWI	Alfred Wegener Institute	EWG	Energy Management Working Group	JCADM	Joint Committee on Antarctic Data Management	UNEP	United Nations Environment Programme
BAS	British Antarctic Survey	EXCOM	Executive Committee	MEDINET	Medical Network	WGAM	WMO Working Group on Antarctic Meteorology
BAT	Best Available Technologies	FARO	Forum of Arctic Research Operators	MNAP	Manager of a National Antarctic Programme	WGHB&M	Working Group on Human Biology and Medicine
CAML	Census of Antarctic Marine Life	GCMD	Global Change Master Directory	MoLIBA	Working Group to Monitor the Liability Annex negotiations	WGL	Working Group on Logistics
CATSA	Co-operative Air Transport System for Antarctica	GLOCHANT	Global Change Antarctica	MSSTS	McMurdo Sound Sediment & Tectonic Studies	WMO	World Meteorological Organization
CCAD	Committee on the Co-ordination of Antarctic Data	GOSEAC	Group of Specialists on Environmental Affairs and Conservation	NADC	National Antarctic Data Centre		
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources	HCA	Hydrographic Commission on Antarctica	NAP	National Antarctic Programme		
CEE	Comprehensive Environmental Evaluation	IAATO	International Association of Antarctica Tour Operators	NSF	National Science Foundation		
CEP	Committee for Environmental Protection	IASC	International Arctic Science Committee				
CGASI	Comité Spécial de L'Année Géophysique International						

APPENDIX 2

Record of COMNAP meetings and officers

Meetings					
COMNAP AGM	1988–1989	1989–1990	1990–1991	1991–1992	1992–1993
Meeting	COMNAP I	COMNAP II	COMNAP III	COMNAP IV	COMNAP V
Symposium		SCALOP IV		SCALOP V	
City	Cambridge	Sao Paulo	Bologna	Bariloche	Christchurch
Country	United Kingdom	Brazil	Italy	Argentina	New Zealand
Start date	04 Oct 1989	17 Jul 1990	17 Jun 1991	08 Jun 1992	20 Jun 1993
End date	06 Oct 1989	21 Jul 1990	21 Jun 1991	12 Jun 1992	26 Jun 1993
EXCOM	1988–1989	1989–1990	1990–1991	1991–1992	1992–1993
City				Bremen	
Country				Germany	
Dates					
ATCM/CEP	1988–1989	1989–1990	1990–1991	1991–1992	1992–1993
ATCM	ATCM XV		ATCM XVI	ATCM XVII	
CEP					
City	Paris		Bonn	Venice	
Country	France		Germany	Italy	
Start date	09 Oct 1989		07 Oct 1991	11 Nov 1992	
End date	20 Oct 1989		18 Oct 1991	20 Nov 1992	
COMNAP Officers					
EXCOM	1988–1989	1989–1990	1990–1991	1991–1992	1992–1993
Chair	David Drewry (UK)	David Drewry (UK)	David Drewry (UK)	Mario Zucchelli (IT)	Mario Zucchelli (IT)
Past Chair or Chair Elect				David Drewry (UK)	David Drewry (UK)
MNAP Rep				Anders Karlqvist (SE)	Anders Karlqvist (SE)
MNAP Rep					
MNAP Rep					
SCALOP Chair	Heinz Kohnen (DE)	Heinz Kohnen (DE)	Heinz Kohnen (DE)	Heinz Kohnen (DE)	Jack Sayers (AU)
Exec. Secretary	Al Fowler (US)	Al Fowler (US)	Al Fowler (US)	Al Fowler (US)	Al Fowler (US)

Meetings					
COMNAP AGM	1993–1994	1994–1995	1995–1996	1996–1997	1997–1998
Meeting	COMNAP VI	COMNAP VII	COMNAP VIII	COMNAP VIX	COMNAP X
Symposium	SCALOP VI		SCALOP VII		SCALOP VIII
City	Rome	Santiago	Cambridge	Cape Town	Concepción
Country	Italy	Chile	United Kingdom	South Africa	Chile
Start date	29 Aug 1994	31 Jul 1995	05 Aug 1996	25 Aug 1997	20 Jul 1998
End date	02 Sep 1994	04 Aug 1995	09 Aug 1996	29 Aug 1997	24 Jul 1998
EXCOM	1993–1994	1994–1995	1995–1996	1996–1997	1997–1998
City		Oxnard	Honolulu	Santa Fe	Santa Fe
Country		USA	USA	USA	USA
Dates					15-16 Dec 1997
ATCM/CEP	1993–1994	1994–1995	1995–1996	1996–1997	1997–1998
ATCM	ATCM XVIII	ATCM VIX	ATCM XX	ATCM XXI	ATCM XII
CEP					CEP I
City	Kyoto	Seoul	Utrecht	Christchurch	Tromsø
Country	Japan	Rep. of Korea	Netherlands	New Zealand	Norway
Start date	11 Apr 1994	08 May 1995	29 Apr 1996	19 May 1997	25 May 1998
End date	22 Apr 1994	19 May 1995	10 May 1996	30 May 1997	05 Jun 1998
COMNAP Officers					
EXCOM	1993–1994	1994–1995	1995–1996	1996–1997	1997–1998
Chair	Mario Zucchelli (IT)	Anders Karlqvist (SE)	Anders Karlqvist (SE)	Anders Karlqvist (SE)	Gillian Wratt (NZ)
Past Chair or Chair Elect	David Drewry (UK)	Mario Zucchelli (IT)			Anders Karlqvist (SE)
MNAP Rep	Anders Karlqvist (SE)	Oscar Pinochet de la Barra (CL)	Oscar Pinochet de la Barra (CL)	Oscar Pinochet de la Barra (CL)	Carlos Rinaldi (AR)
MNAP Rep		Gillian Wratt (NZ)	Gillian Wratt (NZ)	Gillian Wratt (NZ)	Oscar Pinochet de la Barra (CL)
MNAP Rep					
SCALOP Chair	Jack Sayers (AU)	Jack Sayers (AU)	Erick Chiang (US)	Erick Chiang (US)	Erick Chiang (US)
Exec. Secretary	Al Fowler (US)	Al Fowler (US)	Al Fowler (US)	Al Fowler (US)	Jack Sayers (AU) ¹

¹ Fowler until 30 September 1997; Sayers from 01 October 1997

Meetings					
COMNAP AGM	1998–1999	1999–2000	2000–2001	2001–2002	2002–2003
Meeting	COMNAP XI	COMNAP XII	COMNAP XIII	COMNAP XIV	COMNAP XV
Symposium		SCALOP IX		SCALOP X	
City	Goa	Tokyo	Amsterdam	Shanghai	Brest
Country	India	Japan	Netherlands	China	France
Start date	20 Sep 1999	10 Jul 2000	20 Aug 2001	15 Jul 2002	08 Jul 2003
End date	24 Sep 1999	14 Jul 2000	24 Aug 2001	19 Jul 2002	11 Jul 2003
EXCOM	1998–1999	1999–2000	2000–2001	2001–2002	2002–2003
City	Hobart	Skukuza	Singapore	Mauii	Brest
Country	Australia	South Africa	Singapore	USA	France
Dates	07–08 Dec 1998	29–30 Nov 1999	28–29 Nov 2000	23–24 Nov 2001	27–28 Mar 2003
ATCM/CEP	1998–1999	1999–2000	2000–2001	2001–2002	2002–2003
ATCM	ATCM XXIII	SATCM XII	ATCM XXIV	ATCM XXV	ATCM XXVI
CEP	CEP II	CEP III	CEP IV	CEP V	CEP VI
City	Lima	The Hague	St Petersburg	Warsaw	Madrid
Country	Peru	Netherlands	Russia	Poland	Spain
Start date	24 May 1999	11 Sep 2000	09 Jul 2001	03 Sep 2002	09 Jun 2003
End date	04 Jun 1999	15 Sep 2000	20 Jul 2001	14 Sep 2002	20 Jun 2003
COMNAP Officers					
EXCOM	1998–1999	1999–2000	2000–2001	2001–2002	2002–2003
Chair	Gillian Wratt (NZ)	Gillian Wratt (NZ)	Gillian Wratt (NZ) ²	Karl Erb (US)	Karl Erb (US)
Past Chair or Chair Elect				Gillian Wratt (NZ)	
MNAP Rep	Carlos Rinaldi (AR)	Carlos Rinaldi (AR)	Karl Erb (US)	Okitsugu Watanabe (JP)	Okitsugu Watanabe (JP)
MNAP Rep	Dirk van Schalkwyk (ZA)	Dirk van Schalkwyk (ZA)	Gérard Jugie (FR)	Gérard Jugie (FR)	Gérard Jugie (FR)
SCALOP Chair	Patricio Eberhard (CL)	Patricio Eberhard (CL)	Patricio Eberhard (CL)	Kim Pitt (AU)	Kim Pitt (AU)
Exec. Secretary	Jack Sayers (AU)	Jack Sayers (AU)	Jack Sayers (AU)	Jack Sayers (AU)	Jack Sayers (AU)

² Term of chair extended by one year because of unforeseen resignation of two EXCOM members from COMNAP during 2000

Meetings					
COMNAP AGM	2003–2004	2004–2005	2005–2006	2006–2007	2007–2008
Meeting	COMNAP XVI	COMNAP XVII	COMNAP XVIII	COMNAP XIX	COMNAP XX
Symposium	SCALOP XI		SCALOP XII		SCALOP XIII
City	Bremen	Sofia	Hobart	Washington DC	St Petersburg
Country	Germany	Bulgaria	Australia	USA	Russia
Start date	25 Jul 2004	12 Jul 2005	09 Jul 2006	09 Jul 2007	30 Jun 2008
End date	30 Jul 2004	15 Jul 2005	14 Jul 2006	13 Jul 2007	04 Jul 2008
EXCOM	2003–2004	2004–2005	2005–2006	2006–2007	2007–2008
City	Seattle	Punta Arenas	Seoul	Kwalata	Cambridge
Country	USA	Chile	Rep. of Korea	South Africa	United Kingdom
Dates	25–26 Oct 2003	17–18 Oct 2004	19–20 Oct 2005	11–12 Oct 2006	03–05 Oct 2007
ATCM/CEP	2003–2004	2004–2005	2005–2006	2006–2007	2007–2008
ATCM	ATCM XXVII	ATCM XXVIII	ATCM XXIX	ATCM XXX	ATCM XXXI
CEP	CEP VII	CEP VIII	CEP IX	CEP X	CEP XI
City	Cape Town	Stockholm	Edinburgh	Delhi	Kiev
Country	South Africa	Sweden	United Kingdom	India	Ukraine
Start date	24 May 2004	05 Jun 2005	12 Jun 2006	30 Apr 2007	02 Jun 2008
End date	04 Jun 2004	17 Jun 2005	23 Jun 2006	11 May 2007	13 Jun 2008
COMNAP Officers					
EXCOM	2003–2004	2004–2005	2005–2006	2006–2007	2007–2008
Chair	Karl Erb (US)	Gérard Jugie (FR)	Gérard Jugie (FR)	Gérard Jugie (FR)	José Retamales (CL)
Past Chair or Chair Elect		Karl Erb (US)		José Retamales (CL)	Gérard Jugie (FR)
MNAP Rep	Okitsugu Watanabe (JP)	Henry Valentine (ZA)	Henry Valentine (ZA)	Henry Valentine (ZA)	Rasik Ravindra (IN)
MNAP Rep	Gérard Jugie (FR) ³	Yeadong Kim (KR)	Yeadong Kim (KR)	Yeadong Kim (KR)	Lou Sanson (NZ)
MNAP Rep ⁴	Jorge Berguño (CL)	Jorge Berguño (CL)	Jorge Berguño (CL)	Christo Pimpirev (BG)	Christo Pimpirev (BG)
SCALOP Chair	Kim Pitt (AU)	Kim Pitt (AU) ⁶	John Pye (UK)	John Pye (UK)	John Pye (UK)
Exec. Secretary	Antoine Guichard ⁵	Antoine Guichard	Antoine Guichard	Antoine Guichard	Antoine Guichard

³ Term as MNAP Representative extended by one year as due to assume chair in 2004/2005

⁴ Third MNAP Representative position created at COMNAP XV (Brest, 2003)

⁵ Jack Sayers until 30 September 2003; Antoine Guichard from 01 October 2003

⁶ Term as SCALOP Chair extended by one year following unforeseen departure of new Chair within weeks of starting his term

Meetings					
AGM	2008–2009	2009–2010	2010–2011	2011–2012	2012–2013
Meeting	COMNAP XXI	COMNAP XXII	COMNAP XXIII	COMNAP XXIV	COMNAP XXV
Symposium		Symposium XIV		Symposium XV	
City	Punta Arenas	Buenos Aires	Stockholm	Portland, Oregon	Seoul
Country	Chile	Argentina	Sweden	USA	Rep. of Korea
Start date	03 Aug 2009	09 Aug 2010	01 Aug 2011	15 Jul 2012	8 Jul 2013
End date	07 Aug 2009	12 Aug 2010	04 Aug 2011	19 Jul 2012	10 Jul 2013
EXCOM	2008–2009	2009–2010	2010–2011	2011–2012	2012–2013
City	Bansko	Christchurch	Shanghai	Barcelona	Bremerhaven
Country	Bulgaria	New Zealand	China	Spain	Germany
Dates	01–03 Oct 2008	24–29 Sept 2009	15–17 Nov 2010	17–18 Oct 2011	18–19 Oct 2012
ATCM/CEP	2009	2010	2011	2012	2013
ATCM	ATCM XXXII	ATCM XXXIII	ATCM XXXIV	ATCM XXXV	ATCM XXXVI
CEP	CEP XII	CEP XIII	CEP XIV	CEP XV	CEP XVI
City	Baltimore	Punta del Este	Buenos Aires	Hobart	Brussels
Country	USA	Uruguay	Argentina	Australia	Belgium
Start date	06 Apr 2009	03 May 2010	20 June 2011	11 June 2012	20 May 2013
End date	17 Apr 2009	14 May 2010	1 July 2011	20 June 2012	29 May 2013
COMNAP Officers ⁷					
EXCOM	2008–2009	2009–2010	2010–2011	2011–2012	2012–2013
Chair	José Retamales (CL)	José Retamales (CL)	José Retamales ⁸ (CL)	Heinz Miller (DE)	Heinz Miller (DE)
Vice-Chair	Rasik Ravindra (IN)	Rasik Ravindra (IN)	Yuansheng Li (CH)	Yuansheng Li (CH)	Yuansheng Li (CH)
Vice-Chair	Lou Sanson (NZ)	Lou Sanson (NZ)	Mariano Memolli (AR)	Mariano Memolli (AR)	Mariano Memolli (AR)
Vice-Chair	Christo Pimpirev (BG)	Maaïke Vancauwenberghe (BL)	Maaïke Vancauwenberghe (BL)	Maaïke Vancauwenberghe (BL) ¹⁰	José Olmedo (EQ)
Vice-Chair	Kazuyuki Shiraishi (JP)	Kazuyuki Shiraishi (JP)	Kazuyuki Shiraishi (JP)	Juan José Dañobeitia (ES)	Juan José Dañobeitia (ES)
Vice-Chair	Virginia Mudie (AU)	Virginia Mudie (AU)	Virginia Mudie (AU) ⁹	Brian Stone (USA)	Brian Stone (USA)
Exec. Secretary	Antoine Guichard	Michelle Rogan-Finnemore	Michelle Rogan-Finnemore	Michelle Rogan-Finnemore	Michelle Rogan-Finnemore

⁷ The structure of COMNAP was changed at COMNAP XX (St Petersburg, 04 July 2008). EXCOM now comprises one Chair and five Vice-Chairs, plus the Executive Secretary as non-voting, *ex officio* member.

⁸ Note this appointment was for a one year transitional term as Chair.

⁹ Virginia Mudie resigned her position as Vice-Chair in October 2010; that Vice-Chair position was vacant until AGM XXIII in August 2011.

¹⁰ Maaïke Vancauwenberghe resigned her position as Vice-Chair in June 2012; that Vice-Chair position remained vacant for 27 days until the 2012 AGM.

At COMNAP XXV AGM (2013) Yuansheng Li (CH) and Mariano Memolli (ARG) completed their three year terms as COMNAP Vice-Chairs. John Hall (UK) and Hyoung Chul Shin (ROK) were elected to those Vice-Chair positions for a three year term.

APPENDIX 3

COMNAP Working Papers and Information Papers

*Paper co-authored with SCAR. **Paper co-authored with IAATO, IHO, SCAR and WMO.

Year	Location	Meeting	WP/IP no	Title
1991	Bonn	ATCM XVI		COMNAP Report to ATCM XVI
				The Antarctic Environmental Assessment Process: Practical Guidelines (presented as part of Report)
				Waste Management Reporting Format (presented as Appendix 1 of Report)
				Visitors' Guide to the Antarctic (presented as Appendix 4 of Report)
		INFO37	Revised SCALOP Oil Spill Recommendations to COMNAP (presented by Australia on behalf of COMNAP)	
1992	Venice	ATCM XVII		COMNAP Report to ATCM XVII
				Guidelines for Oil Spill Contingency Planning (presented as part of Report)
			WP005*	International Directory Network/Antarctic Data Directory System
			IP*	Environmental Monitoring in Antarctica: A Discussion Document
		IP	Checklist of Environmental Obligations for the Planning, Conduct and reporting of Antarctic Activities	
		IP	Alternative Energy	
1994	Kyoto	ATCM XVIII		COMNAP Report to the XVIII ATCM
			INFO31*	Report on Data Management
			WP022	Inspection Checklists
			WP021*	Environmental Monitoring in Antarctica: Recommendations for Next Steps
1995	Seoul	ATCM XIX		COMNAP Report to XXIX ATCM
			WP024*	Environmental Monitoring Initiatives
			INFO73*	Scientific Samples obtained on Antarctic Expeditions/Antarctic Data Directory System inclusion
			INFO61*	Antarctic Master Directory: Progress
1996	Utrecht	ATCM XX	INF038	COMNAP Report to the XX ATCM
			INF039	Tourism and Non-governmental Activities in Antarctica Operational Concerns
			INF114*	Environmental Monitoring Workshop
			INF040	AMEN - The Antarctic Managers Electronic Network
			WP011	Best Available Technologies/Techniques

Year	Location	Meeting	WP/IP no	Title
1997	Christchurch	ATCM XXI	IP102	COMNAP Report for the XXI ATCM
			IP031*	Management of Antarctic Data (Implementation of the Antarctic Master Directory (AMD))
			IP067	Existing environmental monitoring activities
			WP020	Monitoring of Environmental Impacts of Scientific Activities and Operations in Antarctica
1998	Tromsø	ATCM XXII CEP I	IP008	COMNAP Report to the XXII ATCM
			IP006	Survey carried out by COMNAP as requested in ATCM XXI (Emergency Response and Contingency Planning)
			IP062	Guidelines for Reporting Oil Spill Incidents which Occur in Antarctica
			WP013	Code of Safety for Ships Operating in Polar Waters
			IP007	Overview of Scientific and Operational Co-operation in Antarctica
			IP085*	Antarctic Data Management
			IP005	Educational and Training
1999	Lima	ATCM XXIII CEP II	IP043	COMNAP Report to ATCM XXIII
			WP003	Contingency Planning and Emergency Response
			WP016	An Assessment of Environmental Emergencies Arising from Activities in Antarctica
			IP026	Antarctic Shipping
			IP027	The Training Requirements for Ships' Officers and on Navigation/ Communication Equipment for Antarctic Vessels
			IP008*	Antarctic Data Management
			IP103	COMNAP home page
			IP028	Education and Training
			WP017	The Rationalisation of Information Exchanged Through the Antarctic Treaty System
WP004*	The Monitoring of Environmental Impacts of Scientific Activities and Operations in Antarctica			
2000	The Hague	SATCM XII CEP III	WP005	Revised Working Paper on an Assessment of Environmental Emergencies Arising from Activities in Antarctica
			WP022*	Recent Monitoring and EIA Initiatives
			WP020*	Wildlife Diseases
2000	London	ATME Shipping	004	An Assessment of Environmental Emergencies Arising from Activities in Antarctica
			005	Information Paper on Antarctic Shipping
			007	Working Paper on Polar Code
			008	Training Requirements for Ship Officers and on Navigation/ Communications Equipment for Antarctic Vessels

Year	Location	Meeting	WP/IP no	Title
2001	St Petersburg	ATCM XXIV CEP IV	IP	COMNAP Report to ATCM XXIV
			WP014*	Response to XXIII ATCM Resolution 5(1999) Paper submitted jointly by SCAR and COMNAP
			WP020	Working Paper on an Analysis of IEEs Prepared for Antarctic Operations
2002	Warsaw	ATCM XXV CEP V	IP053	COMNAP Report to ATCM XXV
			WP027	An Assessment of Environmental Incidents Arising from Activities in Antarctica
			WP025 rev1	Worse Case and Less than Worst Case Environmental Scenarios
			IP040	The Proposed Antarctic Shipping Guidelines
			IP027	The Interaction Between National Operators, Tourists and Tourism Operators
			IP026	An Analysis of Initial Environmental Evaluations
2003	Madrid	ATCM XXVI CEP VI	IP051	Best Practice to Avoid Waste Water Disposal Onto Ice-free Ground at Inland Stations
			IP039	COMNAP Report to ATCM XXXVI
			WP009	Worst Case and less than Worst Case Environmental Scenarios
2004	Cape Town	ATCM XXVII CEP VII	IP037	The Interaction Between National Operators, Tourists and Tourism Operators
			IP022	COMNAP Report to ATCM XXVII
			WP009	The Applicability to the Antarctic of the IMO "Guidelines for Ships Operating in Arctic Ice-Covered Waters"
			WP010	Guidelines for the Operation of Aircraft near Concentrations of Birds in Antarctica
			IP012	COMNAP's Framework and Guidelines for Emergency Response and Contingency Planning in Antarctica
			IP013	Environmental Training in National Antarctic Programs: A Workshop Between The COMNAP Networks AEON and TRAINET
			IP014	Interaction Between National Antarctic Programs and Non-Government and Tourism Operations
			IP015	An Analysis of Initial Environmental Evaluations (IEE's)
2005	Stockholm	ATCM XXVIII CEP VIII	IP122	COMNAP Report to ATCM XXVIII
			WP026	Practical Guidelines for Developing and Designing Environmental Monitoring Programmes in Antarctica
			IP067 rev. 1	The Use of Heavy Fuel Oil in Antarctic Waters (jointly with IAATO)
			IP121	The Use of Ballast Water in Antarctica (jointly with IAATO)

Year	Location	Meeting	WP/IP no	Title
2006	Edinburgh	ATCM XXIX CEP IX	IP114	COMNAP Report to ATCM XXIX
			IP084	Marine Acoustic Systems used by National Antarctic Program Vessels
			IP082	The Use of Anti-fouling Biocide Paints by National Antarctic Program Vessels
			IP083	The Use of Ballast Water in Antarctica
			IP088*	Practical Biological Indicators of Human Impacts in Antarctica
2007	New Dehli	ATCM XXX CEP X	IP133	COMNAP Report to ATCM XXX
			WP035	Best Practice for Energy Management - Guidelines and Recommendations
			IP050	International Coordination of Hydrography in Antarctica: Significance to Safety of Antarctic Ship Operators
			IP099	Contingency Planning and Emergency Response
			IP098	COMNAP's 2006 Workshop on Waste Management in Antarctica
			WP042	Antarctic Information Exchange: Importance of Unambiguous and Consistent Georeferencing
			2008	Kiev
IP099	Search and Rescue in the Antarctic			
IP092	International Scientific and Logistic Collaboration in Antarctica			
IP091	The COMNAP Fuel Manual, incorporating revised guidelines for fuel handling and storage in Antarctica			
IP098	Survey on existing procedures concerning introduction of non native species in Antarctica			
2009	Baltimore	ATCM XXXII CEP XII	IP105	COMNAP Report to ATCM XXII
			IP078	COMNAPs 20 years: a new constitution and a new way of working to continue supporting science and the Antarctic Treaty System
			WP047	Towards Improved Search and Rescue Coordination and Response in the Antarctic
2009	Wellington	ATME Tourism	IP010	Search and Rescue Co-ordination and Response in the Antarctic: Workshop Discussions
2010	Punta del Este	ATCM XXXIII CEP XIII	IP088	COMNAP report to ATCM XXXIII
			IP076	Towards Improved Search and Rescue in the Antarctic

Year	Location	Meeting	WP/IP no	Title
2011	Buenos Aires	ATCM XXXIV CEP XIV	IP010	COMNAP Report to ATCM XXXIV
			IP008	COMNAP Energy Management Workshop
			WP012*	Raising awareness of non-native species introductions: Workshop results and checklists for supply chain managers
2012	Hobart	ATCM XXXV CEP XV	WP013*	Understanding Risk to National Antarctic Program Operations and Personnel in Coastal Antarctica from Tsunami Events
			IP062	Repair or Remediation of Environmental Damage: COMNAP Report on its Experience
			IP003	The Annual Report for 2011 of the Council of Managers of National Antarctic Programs (COMNAP)
			IP004	Management Implications of a Changing Antarctica – COMNAP Workshop
			IP007	Review of COMNAP Working Papers and Information Papers presented to the ATCM 1988-2011
			IP031	Best Practice for Energy Management – Guidance and Recommendations
			IP032	COMNAP Survey of National Antarctic Programs on Oil Spill Contingency Planning
2013	Brussels	ATCM XXXVI CEP XVI	WP001 **	Review of ATCM Recommendations on Operational Matters
			WP017	SAR-WG Update on actions resulting from the two COMNAP SAR workshops, "Towards Improved Search and Rescue Coordination and Response in the Antarctic"
			IP003	The Annual Report for 2012 of the Council of Managers of National Antarctic Programs (COMNAP)
			IP031	Use of hydroponics by national Antarctic programs
			IP032	Cost/energy Analysis of National Antarctic Program Transportation
IP033	Analysis of National Antarctic Program increased delivery of science			
IP034	Best Practice for Energy Management – Guidance and Recommendations			

APPENDIX 4

Guidelines and Publications

Year	Title
2012	Proceedings of the COMNAP Symposium 2012: Sustainable Solutions to Antarctic Challenges (ISBN 978-0-473-23259-7)
2011	Checklists for Supply Chain Managers for the Reduction of Risk of Transfer of Non-native Species (Published jointly with SCAR)
2010	Proceedings of the COMNAP Symposium 2010: Responding to Change through New Approaches (ISBN 978-0-473-17888-8)
2008	COMNAP Fuel Manual (Replaced/superseded four fuel-related COMNAP guidelines from 1992 and 1993)
2007	Waste Management in Antarctica Manual
2007	Best Practice for Energy Management
2005	Practical Guidelines for Developing and Designing Environmental Monitoring Programmes in Antarctica
2004	Framework and Guidelines for Emergency Response and Contingency Planning
2004	Guidelines for Operation of Aircraft near Birds
2002	Best Practice for Waste Water Disposal onto Ice-free Ground
2000	COMNAP/SCAR Environmental Monitoring Handbook
1999	Guidelines for Advance Exchange of Operational Information on Antarctic Activities (revised)
1995	Antarctic Flight Information Manual (Second Edition)
1993	Visitors' Guide to the Antarctic
1993	Guidelines for the Reporting of Oil Spill Incidents which Occur in Antarctica
1992	Guidelines for Oil Spill Contingency Planning
1992	Recommended Procedures for Fuel Oil Transfer at Stations and Bases
1992	Recommendations for Spill Prevention and Containment of Fuel at Stations and Bases
1991	Practical Guidelines for Antarctic Environmental Assessment
1991	Antarctic Flight Information Manual

APPENDIX 5

Workshops and Symposiums

Year	Workshop Title	Location
2013	Southern Ocean Observing System (SOOS)	Seoul, Republic of Korea
2012	Innovations in Antarctic Communications	Portland, Oregon, USA
2011	Inland Traversing in Antarctica	Stockholm, Sweden
2011	The Management Implications of a Changing Antarctica	Stockholm, Sweden
2010	Energy Management	Buenos Aires, Argentina
2010	Reducing the Risk of Non-Native Species Introductions (jointly with SCAR)	Buenos Aires, Argentina
2010	Infectious Diseases	Buenos Aires, Argentina
2010	Outreach	Oslo, Norway
2009	Search and Rescue in Antarctica II	Buenos Aires, Argentina
2008	Search and Rescue in Antarctica I	Viña del Mar, Chile
2008	INFONET International Polar Year (jointly with SCAR)	St Petersburg, Russia
2008	CENMAN Energy Saving Measures and Renewable Energy Systems	St Petersburg, Russia
2006	INFONET International Polar Year (jointly with SCAR, ICSU, IPY Office)	Washington, DC, USA
2006	Waste Management	Hobart, Tasmania, Australia
2006	ENMANET	Hobart, Tasmania, Australia
2006	TRAINET	Hobart, Tasmania, Australia
2005	Practical Biological Indicators of Human Impacts in Antarctica (jointly with SCAR)	College Station, Texas, USA
2005	MEDINET	Sofia, Bulgaria
2005	INFONET International Polar Year	Sofia, Bulgaria
2005	Review of COMNAP Fuel Handling Guidelines	Christchurch, New Zealand
2003	Environmental Education and Training	Brest, France
2002	Dronning Maud Land Air Network	Bremerhaven, Germany
2002	Science (jointly with SCAR)	Shanghai, China
2000	Risk Assessment and Management	Cambridge, UK
1999	Environmental Monitoring and Environmental Impact Assessment (EIA)	Goa, India
1998	Facilitation of International Science (jointly with SCAR)	Concepción, Chile
1998	Joint Committee on Antarctic Data Management (jointly with SCAR)	Concepción, Chile
1998	European National Antarctic Data Centres (jointly with SCAR)	Bremerhaven, Germany
1998	South American National Antarctic Data Centres (jointly with SCAR)	Santiago, Chile
1998	Forum on Education and Training	Concepción, Chile
1997	National Antarctic Data Centres (jointly with SCAR)	Christchurch, New Zealand

Year	Workshop Title	Location
1996	Monitoring of Environmental Impacts from Science and Operations in Antarctica II (jointly with SCAR)	College Station, Texas, USA
1995	Monitoring of Environmental Impacts from Science and Operations in Antarctica I (jointly with SCAR)	Oslo, Norway
1995	Air Transport Networks	Washington, DC, USA
1994	SCALOP Antarctic Oversnow Vehicle Traverse	Washington, DC, USA
1991	Antarctic Environmental Impact Assessment (EIA)	Bologna, Italy

APPENDIX 6

Subgroups, Working Groups, Co-ordinating Groups, Committees, Projects and Expert Groups

Year	COMNAP Subgroups	Subgroup Chair / Co-Chairs
1989	Environmental Impact Assessment Workshop	Mario Zucchelli (IT) / Hugh Logan (NZ) and Claude Corbier (FR)
1990	Environmental Impact Assessment Workshop	Mario Zucchelli (IT)
1991	Environmental Impact Assessment Workshop	Mario Zucchelli (IT) / Carol Roberts (US)
1992–93	Environmental Assessment and Monitoring	Carol Roberts (US) / David Drewry (UK)
1989–91	Tourism and Non-Governmental Activities	Carol Roberts (US)
1992	Tourism and Non-Governmental Activities	Raymond Schorno (NL)
1993	Tourism and Non-Governmental Activities	Jan Stel (NL)
1991	COMNAP Report to ATCM XV	David Drewry (UK)
1992–93	Information Network	Anders Karlqvist (SE)
1992–93	Human Resources Management	Anders Karlqvist (SE)
1992	Siting of Stations	Oscar Pinochet de la Barra (CL)
1992–93	Financial Support	Mario Zucchelli (IT)
1992–93	Regional Contingency Planning	Carlos Rinaldi (AR) Antonio Teixeira (BR) (Acting Chair)
2002	Medical Standards	John Pye (UK)
Year	SCALOP Subgroups	Subgroup Chair / Co-Chairs
1989	Waste Disposal	Gotthilf Hempel (DE)
1990–91	Waste Management	Roberto Cervellati (IT)
1992	Waste Management	Franco Orlandini (IT)
1990–94	Air Safety (initially known as "Air Operations" then "Aviation Safety")	Al Fowler (US) (Convenor)
1990–94	Oil Spill Prevention and Response	Jack Sayers (AU)
1992–93	Information Exchange	Malcolm McFarlane (NZ)
1994	Information Exchange	Malcolm McFarlane (NZ) / Dave Geddes (NZ)
1992	Alternative Energy	Heinz Kohlen (DE)
1993–94	Alternative Energy	Erick Chaing (US)
1993	Benchmarking and/or Incineration	
1990–92	Antarctic Operations and Logistics Symposia Steering Committee	Olle Melander (SE)
1993	Antarctic Operations and Logistics Symposia Steering Committee	Pietro Giuliani (IT) / John Hall (UK)
1994	Antarctic Operations and Logistics Symposia Steering Committee	Pietro Giuliani (IT)
1994	SCALOP Planning and Co-ordination Committee (SPAC)	John Hall (UK)

Year	COMNAP Working Groups and Networks	Chair / Co-Chairs
1994–95	Contingency Response Planning	Dirk van Schalkwyk (ZA)
1994–95	Environmental Monitoring	Max Tilzer (DE)
1994–95	Antarctic Tourism and Non-Governmental Activities	Jan Stel (NL)
1994	Antarctic Data Management (Joint Planning Group)	Mark Thorley (UK)
1995	Human Resources Management	Barry Heywood (UK)
1996	Tourism and Non-Governmental Activities in Antarctica	Olle Melander (SE)
1996	COMNAP Constitution and Rules of Procedure Drafting	Carlos Rinaldi (AR)
1996	SCAR/COMNAP Joint Committee for Antarctic Data Management (JCADM)	Mario Zucchelli (IT)
1996	Electronic Information	Malcolm McFarlane (NZ)
1996	Finance	Heinz Kohlen (DE)
1996–97	Monitor the Liability Annex (MoLIBA)	Barry Heywood (UK)
1996–97	Environmental Co-ordinating Group (ECG)	Gillian Wratt (NZ)
1996–2000	Antarctic Environmental Officers Network (AEON)	Emma Waterhouse (Co-ordinator)
1997	Finance	Heinz Kohlen (DE) / Dirk van Schalkwyk (ZA)
1997	COMNAP Handbook	Carlos Rinaldi (AR)
1998	SCAR/COMNAP Joint Committee for Antarctic Data Management (JCADM)	Erick Chaing (US) (Chair Steering Committee)
1998	Finance (FICOM)	Yeadong Kim (ROK)
1998	Environmental Co-ordinating Group (ECG)	Jan-Gunnar Winther (NO)
1998	Information Officers Network (INFONET)	Tim Higham (NZ) (Co-ordinator)
1998	Education and Training (EDAT)	Oscar Pinochet De la Barra (CL)
1998	Emergency Response and Contingency Planning (EMRAC)	Antonino Cucinotta (IT)
1998–2000	Joint SCAR/COMNAP Group for Data Management (STADM)	Erick Chaing (US)
1998–99	Electronic Information (ELINF)	Valery Lukin (RU)
1998–99	Monitor the Liability Annex (MoLIBA)	Pentii Mälkki (FI)
1998–2002	Training Network (TRAINET)	Magnus Augner (SE) (Co-ordinator)
1998–2002	Tourism and Non-Governmental Organisations (TANGO)	Anders Karlqvist (SE)
1999	Finance Committee (FICOM)	
1999–2002	Environmental Co-ordinating Group (ECG)	Heinz Miller (DE)
1999–2001	Antarctic Information Officers Network (INFONET)	Guy Gutheridge (US) (Co-ordinator)
1999	Education and Training (EDAT)	Jan Stel (NL)
1999–2002	Emergency Response and Contingency Planning (EMRAC)	Kim Pitt (AU)
2000–01	Co-ordinating Group on Education and Training (CEDAT)	Jan Stel (NL)
2000–01	Monitor the Liability Annex (MoLIBA)	Gérard Jugie (FR)
2001–02	Steering Committee for the Antarctic Master Directory (STADM)	Anders Karlqvist (SE) Erick Chaing (US) (Members)

Year	COMNAP Working Groups and Networks	Chair / Co-Chairs
2001–02	Antarctic Environmental Officers Network (AEON)	Birgit Njåstad (NO) (Co-ordinator)
2002	Co-ordinating Group on Education and Training (CEDAT)	Magnus Augner (SE)
2002–04	Monitor the Liability Annex (MoLIBA)	John Dudeney (UK)
2002	Antarctic Information Officers Network (INFONET)	Luciano Blasi (IT) (co-ordinator)
2003–04	Co-ordinating Group on Education and Training (CEDAT)	Magnus Augner (SE)
2003–05	Environmental Co-ordinating Group (ECG)	Lou Sanson (NZ)
2003–04	Tourism and Non-Governmental Organisations (TANGO)	Olav Orheim (NO)
2003–04	Steering Committee for the Antarctic Master Directory (STADM)	Anders Karlqvist (SE) (Member)
2003	Training Network (TRAINET)	Richard Mulligan (AU) (Co-ordinator)
2003	Energy Management (ENMANET)	Chris Paterson (AU) (Co-ordinator)
2003	Antarctic Environmental Officers Network (AEON)	Shaun Walsh (AU) (Co-ordinator)
2003–07	Medical Network (MEDINET)	Claude Bachelard (FR)
2003–04	Co-ordinating Group of the Medical Network (COMED)	John Dudeney (UK)
2003	Antarctic Information Officers Network (INFONET)	
2004–08	IPY Co-ordinating Group	Anders Karlqvist (SE)
2004–06	Training Network (TRAINET)	Patricio Eberhard (CL)
2004–06	Antarctic Information Officers Network (INFONET)	Jan Stel (NL)
2005–06	Steering Committee for the Antarctic Master Directory (STADM)	Heinz Miller (DE) (Member)
2005–07	Tourism and Non-Governmental Organisations (TANGO)	José Retamales (CL)
2005–06	Co-ordinating Group on Education and Training (CEDAT)	Lou Sanson (NZ)
2005–07	Co-ordinating Group of the Medical Network (COMED)	Mariano Memolli (AR)
2005	Energy Management Network (ENMANET)	
2005	Antarctic Environmental Officers Network (AEON)	Rebecca Roper-Gee (NZ)
2006–08	Environmental Co-ordinating Group (ECG)	Yves Frenot (FR)
2006–08	Safety	Kim Pitt (AU)
2006–08	Energy Management Network (ENMANET)	David Blake (UK) (Co-ordinator)
2006–07	Antarctic Environmental Officers Network (AEON)	Rodolfo Sánchez (AR)
2007–08	Co-ordinating Group on Outreach and Training (CODAT)	Lou Sanson (NZ)
2007–08	Training Network (TRAINET)	Albert Lluberas (UY)
2007	Antarctic Information Officers Network (INFONET)	Linda Capper (UK) and Eva Grönlund (SE) (Co-ordinators)
2008	Medical Network (MEDINET)	Iain Grant (UK)

Year	SCALOP Working Groups, Networks and Committees	Chair / Co-Chairs
1994–95	Revision of ATOM Manual Annexes	
1995	Air Operations	Al Fowler (US) (Convenor)
1995	Information Exchange	Malcolm McFarlane (NZ)
1995	Antarctic Operations and Logistics Symposia Steering Committee	John Hall (UK)
1995	Oil Spill Prevention and Response	Jack Sayers (AU)
1995	Alternative Energy	Erick Chaing (US)
1995	Best Available Technologies (BATs) (Task Group)	Olle Melander (SE)
1996	SCALOP Planning and Co-ordination Committee (SPAC)	
1996–2000	Air Operations (AIROPS)	John Hall (UK)
1996–98	East Antarctic Air Network (EAAN)	Valery Klokov (RU)
1996	Antarctic Operations and Logistics Symposia Steering Committee	John Hall (UK)
1997–98	Emergency Response and Contingency Planning (EMRAC)	Antonino Cucinotta (IT)
1997–2000	Ship Operations (SHIPOPS)	Jan-Erling Haugland (NO)
1997	Antarctic Operations and Logistics Symposia Steering Committee	Patricio Eberhard (CL)
1997–99	SCALOP Planning and Co-ordination Committee (SPAC)	Patricio Eberhard (CL)
1998	Symposium (SYM)	Patricio Eberhard (CL)
1999–2000	Symposium (SYM)	Kazuyuki Shiraishi (JP)
1999	Alternative Energy (ALTEN)	Fernando Jimenez Ugarte (PE)
2000–01	Alternative Energy (ENMAN)	Julian Tangaere (NZ)
2001–03	Air Operations (AIROPS)	John Pye (UK)
2001–03	Ship Operations (SHIPOPS)	Hartwig Gernandt (DE)
2001	Symposium (SYM)	Zhanhai Zhang (CN)
2002	Co-ordinating Group on Energy Management (CENMAN)	Julian Tangaere (NZ)
2002	Symposium (SYM)	Xu Shijie (CN)
2003–06	Co-ordinating Group on Energy Management (CENMAN)	David Blake (UK)
2003–04	Symposium (SYM)	Hartwig Gernandt (DE)
2004–07	Air Operations (AIROPS)	Valery Klokov (RU)
2004–08	Ship Operations (SHIPOPS)	Manuel Catalan (ES)
2005–06	Symposium (SYM)	Kim Pitt (AU)
2007–08	Symposium (SYM)	Valery Klokov (RU)
2007	Co-ordinating Group on Energy Management (CENMAN)	Jan-Gunnar Winther (NO)
2008	Air Operations (AIROPS)	Giuseppe de Rossi (IT)

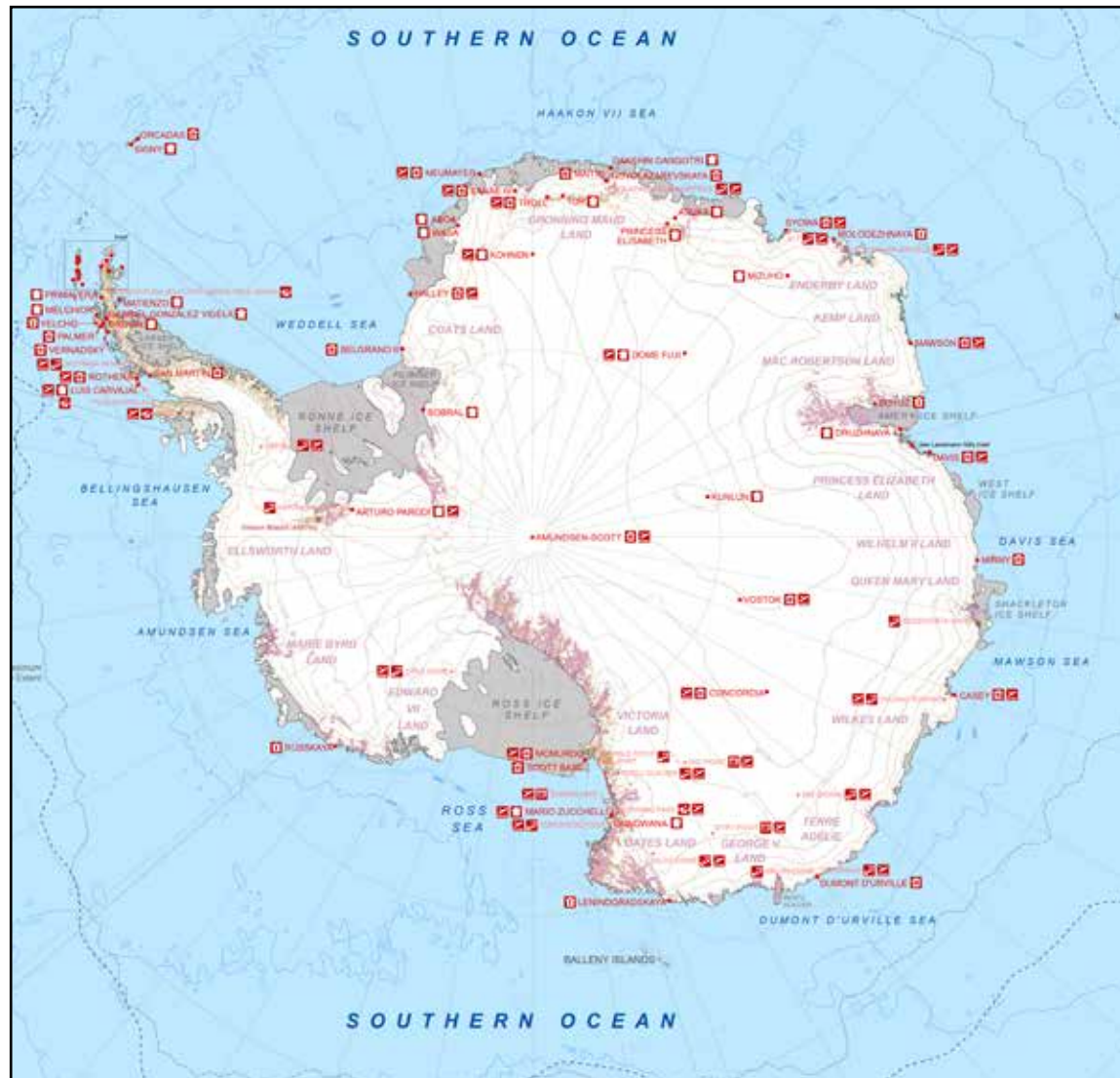
Year	COMNAP Expert Groups	Leader
2008–09	Air	Giuseppe De Rossi (IT)
2008	Energy	David Blake (UK)
2008–09	Environment	Rodolfo Sánchez (AR)
2008	Health and Safety	Robert Culshaw (UK)
2008–10	Medical	Iain Grant (UK)
2008–11	Outreach	Linda Capper (UK)
2008	Shipping	Juan José Dañobeitia (ES)
2008	Training	Albert Lluberas (UY)
2009–10	Science	Heinz Miller (DE)
2009	Training	
2009	Shipping	Juan José Dañobeitia (ES) and David Blake (UK)
2009–11	Safety	Robert Culshaw (UK)
2009–13	Energy and Technology	David Blake (UK)
2010	Air	Giuseppe De Rossi (IT) and Brian Stone (US)
2010–13	Environment	Sandra Potter (AU)
2010–13	Training	Veronica Vlasich (AR)
2010	Shipping	Juan José Dañobeitia (ES) and Will Colston (US)
2011–13	Air	Giuseppe di Rossi (IT)
2011–13	Science	José Retamales (CL)
2011	Joint Expert Group on Human Biology and Medicine (HB&M)	Iain Grant (UK) and Jeff Ayton (AU)
2011–13	Shipping	Miguel Ojeda (ES)
2012–13	Joint Expert Group on Human Biology and Medicine (HB&M)	Jeff Ayton (AU)
2012–13	Outreach	Eva Grönlund (SE)
2013	Safety	Henrik Törnberg (SE)

Year	COMNAP Projects	Project Manager
2008	Science Collaboration	Heinz Miller (DE)
2008	Mechanisms for Logistic Collaboration and Sharing Facilities	Juan José Dañobeitia (ES)
2008	Online Accident, Incident and Near-Miss Reporting System	Robert Culshaw (UK)
2008	Developing Guidelines for Conducting Hydrographic Surveying Using Ships of Opportunity	Albert Lluberas (UR)
2008	Search and Rescue (SAR) Co-ordination	John Hall (UK)
2008	Review of Non-Native Species (NNS) into Antarctica: Determination of Remedial Actions	Yves Frenot (FR)
2008	Explore Options for Syndicate Purchasing	Brian Stone (US)
2008	Review of Current Status of Medical Support Issues	Iain Grant (UK)
2008	Revise and Update AFIM	Giuseppe De Rossi (IT)
2008	Upgrade COMNAP Fuel Manual	Richard Mulligan (AU)
2009	COMNAP Symposium 2010 Organising Committee	Mariano Memolli (AR)
2009	COMNAP Framework for a 5-year Strategic Project Plan	Michelle Rogan-Finnemore
2009	Developing an Action Plan for a Strategic Partnership with SCAR	Michelle Rogan-Finnemore
2009	Pandemic Management in Antarctica Workshop	Iain Grant (UK)
2009	Outreach Workshop	Linda Capper (UK)
2009	Energy and Technology Contact Group and Workshop	David Blake (UK)
2009	Review Issue of Introduction of NNS into Antarctica (Workshop) and Determine Practical Remediation Actions/Quarantine Management Procedures	Yves Frenot (FR)
2009–13	Antarctic Glossary	Valery Lukin (RU)
2009–10	AFIM: Consideration of the Results of the Review	Brian Stone (UK) and Giuseppe De Rossi (IT)
2009	IMO Proposal on the Use of Fuels and What That Means for COMNAP Members	David Blake (UK)
2009–11	AINMR Reporting System and Implementation	Robert Culshaw (UK)
2009	Surplus Equipment Buy and Sell Service	David Blake (UK)
2009	King George Island Project	
2009	"Human Footprint"	Rodolfo Sánchez (AR)
2010	IMO Proposal on Mandatory Polar Code	Will Colston (US)
2010	Antarctic Peninsula Advanced Science Information System (APASI)	Juan Soto (CL)
2010	Energy Management Best practice and Energy Efficiencies	David Blake (UK) and Iain Miller (NZ)
2010	Energy Standard Terminology Development	David Blake (UK)
2011	AFIM: Consideration of the Results of the Review	Brian Stone (US)
2011	Carbon Reporting Survey; Review of implementation of Energy Management Guidelines	David Blake (UK)
2011–13	Preferred Suppliers Database	David Blake (UK)

Year	COMNAP Projects	Project Manager
2011	COMNAP Symposium 2012	Lou Sanson (NZ) and Iain Miller (NZ)
2011–13	COMNAP Twenty-fifth Anniversary Book	Christo Pimpirev (BU)
2011	Contingency Planning Survey	Veronica Vlasich (AR)
2011–13	Antarctic Peninsula Advanced Science Information System (APASI)	José Retamales (CL)
2011	Risk to Antarctic Aviation from Volcanic Ash	Robert Culshaw (UK)
2011	Medical Workshop on Telemedicine	Iain Grant (UK) and Jeff Ayton (UK)
2012	AFIM: Consideration of the Results of the Review	Paul Morin (US)
2012	Energy Management Guidelines Survey Follow-up	David Blake (UK)
2012	Symposium 2012 Proceedings	Michelle Rogan-Finnemore
2012	Contingency Planning Survey Follow-up	Veronica Vlasich (AR)
2012	Medical Workshop on Telemedicine	Jeff Ayton (AU)
2012	Tsunami Communications Brochure	Michelle Rogan-Finnemore
2012	Hydroponics Survey	Sandra Potter (AU)
2012	Communications Survey	David Blake (UK)
2012–13	Conservation Challenges Scoping Workshop (2013) and Joint (2014) Workshop	John Shears (UK)
2012–13	Southern Ocean Observing System (SOOS) Workshop and Further Discussions	Rob Wooding (AU)
2013	An Automated Early Warning System for Fuel Containment	Oleksandr Kuzko (UA)
2013	Waste Water Workshop	Sandra Potter (AU) and José Retamales (CL)
2013	"SAS" Safety System Scoping Discussion	Henrik Törnberg (SE) and José Olmedo (EC)
2013	Search and Rescue (SAR) Webpage	Michelle Rogan-Finnemore
2013	Safety Professionals Workshop (2014) Proposal Development	John Shears (UK)

APPENDIX 7

Map



Above and right shows a portion of the COMNAP map Antarctica and the Southern Ocean, Edition 5, compiled on July 2009 (map reference D8635.04). Topographic data is derived from the Antarctic Digital Database (version 4). The map shows seasonal and year-round stations, airfields, camps and refuges as listed on the COMNAP Facilities list as at July 2009. The current COMNAP Facilities list is regularly updated and can be found on the COMNAP Website.

INDEX

A

AAD (Australian Antarctic Division), 120–121
Aboa station, 134–5
accident reporting, *see* AINMR
Acero, José 'Tito', 69, 71
Adélie Land, 136
Adventure Network International (ANI), 49
AEON
 activities, 60, 75, 78, 87, 88, 89
 overview, 70–2
 role of, 21, 22, 25
AFIM, *see* *Antarctic Flight Information Manual*
AFOPS (Asian Forum Polar Sciences), 42
AGAP (Gamburtsev Province), 65
Agreed Measures (conservation flora and fauna), 69
AINMR (accident reporting), 25, 61, 84, 85
Air Expert Group, 44, 47, 61
air links (intercontinental), *see also* DROMLAN, 44, 46, 47, 48, 50, 120, 158, 170
air operations, *see also* *Antarctic Flight Information Manual*, 44–5
 AIROPS, 25, 46, 56, 61
 COMNAP, 14, 18, 19, 48–9
 near birds, 22, 89
 TIBA, 47
air safety, 46, 47, 49, 55, 56, 61
air transport, *see also* DROMLAN, 45, 49, **51**, **89**, 158
 aircraft, 50, 134, 138, 158, 168, 170
 ANI, 49
 CATSA, 44, 46
 EAAN, 45
 runways, 43, 46, 50, **51**
Akademik Fedorov, 96, 158
Akademik Tryoshnikov, 158–9
Akademik Vernadsky station, 166
Alfred Wegener Institute (AWI), 49, 50, 95, 138–9
alternative energy, *see* energy

Amery base, 158
Amsterdam station, 136
Amundsen–Scott station, 170
ANDRILL, 102, 104, 110
ANI, Adventure Network International, 49
Annex on Environmental Liability, *see* Liability Annex
Annunciation, 65
Antarctic Affairs Division (Peru), 154–5
Antarctic Airbus, 46
Antarctic Data Management, *see also* data management, 98, 99, 100
Antarctic Environmental Monitoring Handbook, 23
Antarctic explorers, *see* expeditions, historical
Antarctic Flight Information Manual (AFIM), 19, 25, 47, 49, 89
Antarctic Gamburtsev Province (AGAP), 65
Antarctic Logistics Centre International (ACLI), 50
Antarctic Logistics Symposium, 14, 15
Antarctic Master Directory, 98
Antarctic Research Fellowship (COMNAP), 98
Antarctic SAR, *see* Search and Rescue
Antarctic Shipping Guidelines, 53
Antarctic Study Centre (ASC), 140–1
Antarctic Treaty Secretariat, 105
Antarctic Treaty System (ATS), *see also* Environmental Protocol, 14, 20, 34, 35, 112, 114
Antarctica and Southern Ocean (map), **48**
Antarctica New Zealand, *see also* New Zealand, 83, 150–1
APASI (Antarctic Peninsula Advanced Science Information system), 25, 98, 106, 107
APECS (Early Career Scientists), 104, 105, 114
ARAON, 96, 146
Arctic Antarctic Research Institute (AARI), 158
Arctic, International Science Committee (IASC), 101
Argentina, 34, 56, 58, 78
 memberships, 17, 44, 63, 72
 overview, 118–119
 RCC, 56, 57

Artigas station, 172–3
artists and writers, 104, 105, 170
ASC (Antarctic Study Centre), 140–1
Asuka station, 144
ATCM, *see also* CEP, 56, 68, 98
 COMNAP, 19, 20, 32–4, 115
ATME (Antarctic Treaty Meeting of Experts), 14, 15, 49
ATOM (*Antarctic Telecommunications Operator's Manual*), 54
Aurora Australis, 120
Australian Antarctic Division (AAD), 17, 44, 63, 102
 overview, 120–1
 RCC, 56, 57
AWI, *see* Alfred Wegener Institute

B

Bahia Paraiso, 78
BAI, *see* Bulgarian Antarctic Institute
Barr, Colin, 57
Barrett, Peter, 102
BAS, *see* British Antarctic Survey
Basen Nunatak, **45**, **91**, 134
Bastias, Juan, 47
BAT (Best Available Technologies), 43, 63
Belarus, 26
Belgian Antarctic Research Programme (BELSPO), 14, 26, 72
 overview, 122–3
Belgica, 14
Belgrano II, 118
Bellingshausen station, 158
Berguño, Jorge, 129
best practice, 114
Bharati station, 140
birds, aircraft near, 22, 89
Bleasel, Jim, 15, 16
Bonner, Nigel, 69
Borchgrevink, Carsten, 14
Brazil, 17, 63, 102
 programme overview, 124–5
British Antarctic Survey (BAS), *see* United Kingdom
Brown station, 118
Bulgarian Antarctic Institute (BAI), 26, **36**, 126–7

C

CAA (Chinese Arctic and Antarctic Administration), 130–31
Cámara station, 118
CAML (marine life census), 110
Cap Prud'homme station, 136
Cape Hallett, **78**
Cape Roberts Project (CRP), 102–3, 110
Capetown, 50
Capper, Linda, 105
Carlini station, 118, 119, 138
Casey station, **107**, 120
Castellvi, Josefina, 30
Catalan, Manuel, 57
CATSA (co-ordinated transport), 44, 46
CCAD (data co-ordination), 98
CCAMLR (conservation marine resources), 19
CEP, *see* Committee for Environmental Protection
CGASI, *see also* International Geophysical Year, 14
Chiang, Erick, 44, 47, 79, 86, 171
Chilean Antarctic Institute (INACH), 17, 63, 104, 107
 overview, 128–9
 RCC, 56, 57
Chilean Antarctic Science Programme (PROCIEN), 129
Chilean Navy, 57
China, National Antarctic Research Expedition (CHINARE), 17, 60, 63, 65
 overview, 130–31
Chinese Arctic and Antarctic Administration (CAA), 130–31
Chown, S L, 90
Christchurch, 48, 98, 151

Civil Aviation, International Organisation (ICAO), 57

climate change, 81, 87, 110

Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), 19

Committee for Environmental Protection (CEP), 32, 68, 70, 71, 73, 113

Commonwealth Bay, 120

communications, *see* technology, telecommunications, outreach, 43

COMNAP, Council of Managers National Antarctic Programs, 14–8, 21, 23, 24, 26, 32–4, 36, 68, 70, 110–115, 114

- 1988–97, 20
- 2001–7, 22–3
- 2012–17, 31, 110

activities tabled, 49, 53, 54, 73, 74, 75, 76, 80, 82, 85, 87, 99, 104

ATCM, 32–4

Chairs, 27–9

constitution, 22, 94

delegates, **20, 37, 56**

guidelines, publications, 188–9

meetings, officers, 178–82

members, 17, 23, 26, 30, 113

- observers, 26, 36

SCAR, 16, 17, 94–5, 97, 98, 106, 107

women in, 30

working papers, 183–7

workshops, symposiums, 45, 129

COMNAP, *see also* Expert Groups, SCALOP

Concordia station, 63, 95, 136, 142–3

- overview, **64**

construction technology, 43, 63, **64**

contingency planning, 72, 78, 79, 80

Cowie, Jim, 102

CPE (Spanish Polar Committee), *see* Spain

CRAMRA (Convention on the Regulation of Antarctic Mineral Resource Activities), 68

Crary Laboratory, 102

Crater Hill wind farm, **81, 85**

Crozet station, 136

CSNA (National Scientific Committee for Antarctica), *see* Italy

Czech Republic, 26, 174–5

D

Dakshin Gangotri station, 140

Dallmann Laboratory, 118, 138

Dañobeitia, Juan Jose, 162

Darlington, Jennie, 30

data management, 25, 32, 98–9, 100, 112

database, preferred supplier, 113

Davis station, 120

de Gerlache, Adrien, 14, 122

Decepción station, 118

Deception Island, 162–3

Deep Freeze, Operation, 44

Dirck Gerritsz Laboratory, 65, 148

Dirección Nacional del Antártico (DNA), *see* Argentina

Dome A, 65, 130

Dome C, 64, 95, 142–3

Dome Fuji station, 144

Drewry, David, 16, 17, **27**, 95, 169

DROMLAN, 45, 46, 48, 96, 153

- overview, 49, 50–1

DROMSHIP, 153

Dronning Maud Land, 45, 46, **51**, 95

- stations, 122, 152–3, 164

Druzhnaya stations, 158

Drygalski Expedition (hist), 44

Dudeny, John R, 32, 86, 112

Dumont d'Urville station, 64, 136

E

East Antarctic Air Network (EAAN), 45, 49

Eberhard, Patricio, 44, 47, 71, 101, 129

ECG (Environmental Co-ordinating Group), 25, 71, 89

Ecuadorian Antarctic Programme (PROANTEC), 26, 132–3

EDAT, (Co-ordination Education and Training), 25, 60

Education, Outreach, Communications (EOC), 104, 105

education, *see* training

EIA (Environmental Impact Assessment), 33, 73

electronic communications, *see also* APASI, INFONET, SPRS, 54, 61, 105

emergency response, *see also* contingency planning, 32, 33, 43, 72, 78

energy technology, 43, 63, 70, 81

- alternative, 81–3, 85, 122

ENMANET, 21, 22, 25, 63, 70, 81, 82, 88

environment officers, *see* AEON

environmental

- impact assessment, 19, 23, 43, 63, 70, 71, 72
- overview, 73

management, 43, 68–72, 69

- monitoring, 32, 33, 70, 72, 74, 76–7
- risk management, *see also* contingency planning, 84
- training, 88

Environmental Co-ordinating Group (ECG), 25, 71, 89

Environmental Code of Conduct, 69, 72

Environmental Evaluation, Initial (IEE), 73

Environmental Experts Group, 70, 72, 76

Environmental Incident Reporting System, 72

Environmental Liability Annex, *see* Liability Annex

Environmental Protocol, *see also* Liability Annex, 23, 32, 68, 69, 70, 75, 76

Emergency Response Action, 78, 79

- see also* Liability Annex

Environmental Protocol, Waste Management Annex

- see* waste management

EPICA programme, *see also* ice drilling, 64, 95, 110

Eppley pyranometer, **91**

Erb, Karl A, 22, **28**, 171

Erebus, Mt, **61**

Ernest Shackleton, 168

Esperanza station, 118

European Polar Board, 42, 105

- expeditions, 43, 65, 101
- historical, 14, 44, 57, 65, 122, 158

Expert Groups, subgroups COMNAP, 18, 21, 25, 26, 43, 52, 60, 61, 81, 94, 98, 104

F

Faraday station, 166

FARO (Forum of Arctic Research Organisations), 101

field bases, seasonal camps, *see* stations

field operations, 43, **61, 62, 73, 96, 106**

- overview, 61

Finnish Antarctic Research Program (FINNARP), 17, 134–5

Fossil Bluff base, 168

Fowler, Alfred N, 15, 17, 20, 26, 42, 47, 69, 171

France, National Antarctic Programme (IPEV), 17, 44, 63, 64, 95, 98

- overview, 136–7

Frenot, Yves, 64, 72

Frezzotti, Massimo, 64

fuel handling, *see also* contingency planning, oil spills, 32, 33

G

Gabriel de Castilla base, 162–3

Gamburtsev Province, 65

Geddes, David, 47

Geolog base, 158

Germany, National Antarctic Programme, 17, 95, 96, 102, 104

- overview, 138–9

Gernandt, Hartwig, 50

Gerritsz, Capt Dirck, *see also* Dirck Gerritsz Laboratory, 65

glaciological project, 101

GOSEAC, 52, 69–71

Great Wall station, 130

Greenwich Island, 128, 132

Guam, Bernard, 79

Guichard, Antoine, 26, 57, 72, 121, 137

guidelines and publications, 188

Gunnar-Winther, Jan, 100

H

H Arctowski station, 156–7

Hall, John, 47, 57, 79, 169, 184

Halley station, 168

Haugland, Jan, 79

HCA, *see* Hydrographic

Heard Island, Territory, 120

Hedman, Ulf, 50

Heimefront Range, 164

Hempel, Gotthilf, 95

Hesperides, 162

Heywood, Barry, 86

Higham, Tim, 105

Hobart, 48, 55, 72, 120

Humboldt, 154
Hydrographic Commission Antarctica (HCA), 26, 52, 53
hydrography, 33, 43, 52, 53
hydroponics, 113

I

IAATO (International Association of Antarctica Tour Operators), *see also* tourism, 26, 47, 52, 56, 60, 68, 113
IASC, International Arctic Science Committee, 101
ICAIR, International Centre Antarctic Information Research, 98
ICAO, International Civil Aviation Org, 57
ice core, drilling, 43, 64, 95, 102, 112
Ice Station Antarctica, 104
ICSU, International Council for Science, 14, 100
IEE, Initial Environmental Evaluation, 73
IGY, *see* International Geophysical Year
IHO (Int Hydrographic Organisation), *see also* hydrography, 26, 52
IMO (International Maritime Org), 26, 53, 57
INACH (Chilean Antarctic Institute), *see also* Chile, 128–9
INAE (Instituto Antártico Ecuatoriano), 132–3
India, National Antarctic programme (NCAOR), 17, 46, 140–1
INFONET, 21, 22, 25, 94, 101, 104, 105
Initial Environmental Evaluation (IEE), 73
Institut Polaire Français Paul Emile Victor (IPEV), *see* France, 136–7
Instituto Antártico Argentina (IAA), 118
Instituto Antártico Ecuatoriano (INAE), 132–3
intercontinental flights, *see* air links
International Centre for Antarctic Information and Research (ICAIR), 98
International Council for Science, *see* Science
International Geophysical Year (IGY) 1957–58, 14, 30, **62**, 100, 114
 overview, 112
International Maritime Organisation, 52, 90
International Partnerships Ice Core Sciences (IPICS), 95, 97, 112
International Polar Foundation (IPF), 122
International Polar Initiative (IPI), 100, 112
International Polar Year 2007–08 (IPY), 22, 65, 98, 99, 105

2007–8, 112
COMNAP, 22, 23, 33, 34, 101
IPYCG, 22, 101
 overview, 100–1, 112
International Union for the Conservation of Nature (IUCN), 90
Italian Antarctic Research Programme (PNRA), 17, 60, 63, 64, 98
 overview, 142–3
 projects, 95, 102, 104

J

James Clark Ross, 168
Jang Bogo station, 146
Japanese Antarctic Research Expedition (JARE), 17, 60, 144–5
Jatko, Joyce, 71
Joint Action Group, 98, 106, 107
Joint Committee on Antarctic Data Management (JCADM), 98, 99
Joint Expert Group on Human Biology and Medicine, 58, 59, 98
Juan Carlos I station, 162–3
Jugie, Gérard, 22, **29**, 72, 86, 95, 137

K

Karlqvist, Anders, 21, **28**, 71, 94, 100, 101, 165
Kennicutt II, Mahlon ‘Chuck’, 77, 94
Kerguelen station, 136
Kim, Yeadong, 101, 147
King George Island, 15, 78, 98, 106, 107
 stations, 130, 138, 146, 154, 156, 172
King George Island/25 de Mayo, 78
King Sejong station, 146
Klenova, Maria, 30
Kohnen station, 95, 138
Kohnen, Heinz, **44**, 79, 86, 95, 139
Korea Polar Research Institute (KOPRI), 17, 60, 96, 102, 104, 146–7
Kunlun station, 65, 130

L

L'Astrolabe, 136
Lake Vanda, **62**
Lance, 152
Larsemann Hills, 130, 140
Laurence M Gould, 170
Law-Racovita-Negoita, 63
Lazarev station, 158
Leningradskaya station, 158
Li, Yuansheng, 131
Liability Annex, *see also* environment, 33, 78, 84, 85, 86
Livingston Island, 162–3
Logan, Hugh, 69
logistics, *see also* SCAR WGL, 14, 15, **39**, 42, 43, 45
Lukin, Valery, 96, 101
Lyons, Berry, 107

M

Machu Picchu station, 154
Macquarie Island stations, 120
Mahar, Harry, 47
Maitri station, 140–1
Mälkki, Pentti, 86
maps, **48**, **192**
Marambio station, 118
Marguerite Bay, 78
 marine
 acoustics, 90
 biodiversity, 87, 110
 conservation, 19
 pollution, 52, 53, 68, 70, 79, 90
Mario Zucchelli station, 142–3
Marion-Dufresne (ship), 136–7
Matienzo station, 118
Mawson summer station, 120
Mawson's Huts, 120
McDonald Island, Territory, 120
McMurdo station, 75, 77, 83, 102, 165, 170
Medical Expert Group, 58, 98
medical screening, 22, 58, 59
MEDINET, 21, 22, 59

Melchior summer station, 118
Memolli, Mariano, 119
metadata, *see* Antarctic Master Directory, 98
meteorology, 43, 55, 101
Miller, Heinrich ‘Heinz’, **29**, 95, 139
Mineral Resources, Convention Regulation of (CRAMRA), 68
Mirny station, **115**, 158
Mizuho station, 144
MNAPs, 17, 23, 95
MoLIBA, *see also* Liability Annex, 25, 70, 84, 85, 86
Molodezhnaya station, 158
Mt Erebus, **61**
Mt Terror, **12**
Mudie, Virginia, 30, 121

N

NARE (Norwegian Antarctic Research Expeditions), 153
Nathaniel B Palmer, **106**, 165, 170
National Antarctic Research Expedition (CHINARE), *see* China
National Antarctic Scientific Centre (NASC), *see* Ukraine
National Centre for Antarctic and Ocean Research (NCAOR), *see* India, 140–1
National Institute Polar Research, *see also* Japanese, 144–5
National Science Foundation, **78**
National Scientific Committee for Antarctica (CSNA), *see* Italy
Netherlands Polar Programme (NPP), The Netherlands, 26, 63, 65, 102, 148–9
Neumayer III Station, 138
New Zealand (Antarctica New Zealand), 17, 71, 72, 98
 overview, 150–1
 projects, **78**, 83, 102, 104
 RCC, 52, 56, 57
Njaastad, Birgit, 71
non-native species, 34, 72, 87, **88**, 113
Nordenskiöld Base Camp, 134
Norwegian Antarctic Research Expeditions (NARE), 153
Norwegian Polar Institute (NPI), 14, 17, 50, 63, 106
 overview, 152–3

Novolazarevskaya station, 50, 122, 158
NPP, NWO, *see* Netherlands

O

Oasis station, 158
Ob, 30
Oden, **106**, 164
Oden Cruise Outreach, 104
oil spill prevention, response, 43, 60, 70, 78, 79, 80
Olmedo, José, 133
Open Science Conference, 96
Operation Deep Freeze, 44
Operations Working Group, ATCM, 115
Orcadas station, 118
Orheim, Olav, 95
Outreach Expert Group, 94, 104

P

Palmer station, 170
Patriot Hills–Union Glacier, 128
Pedro Vicente Maldonado station, 132
Peninsula Byers camp, 162–3
personnel management, *see also* training, 43, 60
Peru, Antarctic Affairs Division, 26, 154–5
Petrel Island, station, 118, 136
Pimpirev, Christo, 127
Pinochet de la Barra, Oscar, 129
Pionerskaya station, 158
Pitt, Kim, 44, 121
PNRA, *see* Italian Antarctic Research Programme
Poland, National Antarctic Programme, 17, 156–7
Polar Early Career Scientists (APECS), 104, 105, 114
Polar Plateau, **61**
Polar Research Institute of China (PRIC), 130–31
Polar Science for Planet Earth (PSPE), 169
Polar Shipping Code, 52, 53, 90
Polarstern, 96, 138
Pole of Inaccessibility base, 158
Primavera summer station, 118
Princess Elisabeth station, **84**, 122
PROANTEC (Ecuadorian Antarctic Programme), 132–3

PROCIEN, *see* Chilean Antarctic Science Programme
Programma Nazionale di Ricerche in Antartide (PNRA),
see Italian
Progress station, **96**, 158
Protocol on Environmental Protection, *see* Environmental
Protocol
Prydz Bay, 78
public relations, *see* Outreach
Pye, John, 44, 169
Pyne, Alex, 102

Q

Queen Maud Land, 134, 140–1

R

RAE, *see* Russian Antarctic Expedition
Rapley, Chris, 100
Ravindra, Rasik, 46, 141
Rescue Co-ordination Centres (RCC), *see* Search and
Rescue
Retamales, José, **29**, 57, 72, 106, 107, 129
Reunión Administradores Programas Antárticos
Latinoamericanos (RAPAL), 42
Rinaldi, Carlos, 119
risk management, *see* environmental
Roberts, Carol, 30
Rogan-Finnemore, Michelle, 26, 30
Roi Baudouin station, 122–3
Romania, 63
Ronne, Edith, 30
Ross Dependency, 150–1
Ross Island wind project, **81**, 83
Ross Sea, 78, 102, 103
Rothera Research Station, 65, 168
ROU 04 Artigas, 172
ROU 22 Oyarvide, 172
ROU 26 Vanguardia, 172
Royal Netherlands Institute of Sea Research (NIOZ), 65
runways, *see* air transport
Ruperto Elichiribehety station, 172
Russian Antarctic Expedition (RAE), 17, 44, 47, 50, 63, 96
overview, 45, 158–9

Russian Antarctic Expedition (RAE), *see also* USSR, 96
Russkaya station, 158

S

SA Agulhas II, 160
Safety Working Group, safety, 23, 43, 61
Sagar Kanya, 140
San Martin station, 118
SANAE station, 161
Sánchez, Rodolfo, 72
Sansón, Lou, 72, 83, 151
Sayers, Jack, 20, 26, 44, 47, 69, 79, 121
SCALOP, 17, 18, 22, 23, 45, 54, 61, 70
Chairs, 44
delegates, **25**
subgroups, 20, 25, 36, 70, 80, 82, 88
symposium, 43
SCAR, Scientific Committee on Antarctic Research, 105
COMNAP, 14–5, 94, 96
data management, 98–9, 100
environmental management, 68, 90
GOSEAC, 69
Joint Action Group, 98, 106
MNAPS, 95
SCAR WGL
activities, 44, 45, 55, 75, 76
role, 14–5, 15, 16
SCARCOM, 14, 15, 54
SCARLOG, 14
science and COMNAP, 97, 110–1
Science Expert Group, 98
science outreach, 104, 105
Science, International Council for (ICSU), 14, 100, 105
Science, Open Conference, 96
scientific co-operation, 42–3, 63, 94, 96, 98, 100, 102
future, 110–1
Scientific Committee Antarctic Research, *see* SCAR, 96
Scott Base, 83, 150–1
Search and Rescue (SAR), 23, 34, 43, 52, 58, 113
delegates, **56**
overview, 56–8
RCCs, 52, 56, 57, 58
Shackleton, Ernest, 44, 57
Shears, John, 65, 71
Ship Position Reporting System (SPRS), 52, 53
SHIPOPS, 25, 46, 52, 53
Shipping Code, Mandatory Polar, 52, 53, 90
Shipping Expert Group, 52
shipping operations, 33, 52–3, 60, 90, 101
DROMSHIP, 153
Shiraishi, Kazuyuki, 44, 45, 57, 145
Shirmacher Oasis, 140–1
Signy station, 168
site clean-up, 43, 75, **78**, 113
Skelton Glacier, **61**
Sky Blu base, 168
Sør Rondane Mountains, 144
South African National Antarctic Programme (SANAP), 17,
45, 56, 57, 160–1
overview, 160–1
South Korea, *see* Korean
South Shetland Islands, 78, 126, 127, 128, 162
Southern Ocean Observing System (SOOS), 25, 111, 112
Sovetskaya station, 158
Soyuz base, 158
Spain, Spanish Polar Committee (CPE), 17, 104, 162–3
St Kliment Ohridski base, 126
Standing Committee Antarctic Data Management (STADM),
25
stations, 43, 63
construction, 63, **64**
site clean-up, 43, 75, **78**, 113
staff, 60
Stone, Brian, 83
Stossel, Dennis, 79
Svalbard, 106
Svea station, 164
Swedish Polar Research Secretariat, 17, 104, 134, 164–5
Syowa station, 122, 144

T

Tanzhou, Qu, 65
technology, 43, 61, 63

telecommunications, 14, 15, 54, **54**
Terre Adélie, 136
Terra Nova Bay, 27, 142
Terror, Mt, **12**
TIBA, Traffic Information Broadcast by Aircraft, 19, 47
Tilzer, Max, 71
Tourism Non-governmental Activities, Working Group (TANGO), 25
tourism, Antarctic, 25, 33, 34, 43, 60
 ANI, 49
TRAINET, 21, 22, 25, 60, 87, 88
training, 53, 59, 60, 72, 88
 EDAT, 25, 60
Training Expert Group, 60
transport, *see* air, CATSA, shipping, 50
Troll station, 50, 152

U

Ukraine, National Antarctic Scientific Centre (NASC), 26, 166–7
United Kingdom (British Antarctic Survey), 17, 65, 100, 102, 104
 overview, 168–9
United Nations Environment Programme (UNEP) 100
Uruguayan Antarctic Institute (UAI), 17, 172–3
US National Science Foundation, 83
USA Antarctic Program (USAP), 15, 77, 83, 96, 98
 memberships, 17, 44
 overview, 170–1
 projects, 75, **78**, 96, 102, 104
USSR, *see* Russian
Utsteinen Ridge, 122

V

Valentine, Henry, 101, 161
Valenzuela, Ivan, 57
van der Kroef, Dick, 65
Vancauwenberghe, Maaïke, 30, 72, 123
Vanda, Lake, **62**
Van Schalkwyk, Dirk, 161

Visitors' Guide to the Antarctic, 19
Vostok station, 96, 158

W

Walton, David W H, 32, 69, 112
Wasa station, 134, 164, 165
waste management, 19, 43, 61, 68, 69, 70, 72, 113
 Code of Conduct, 75
 overview, **75**
Watanabe, Okitsugu, 145
Waterhouse, Emma, 71
weather forecasting, *see also* meteorology, 55
Weddell Sea, station, 96
WGAM Working Group Antarctic meteorology, 55
WGL, *see* SCAR WGL
wildlife, aircraft near birds, 49
Wilkes Land stations, 120
Wilkness, Peter, 15, 16
wind farms, *see also* energy, alternative, **81**, 83, **84**, **85**
women in COMNAP, 30
Wordie House, 128
World Meteorological Organization (WMO), 55, 100
Wratt, Gillian, **28**, 30, 71, 102, 151
Wright, Chris, 57

X

Xuelong, 130

Y

Yelcha, 57

Z

Zhongshan station, 65, 130
Zucchelli, Mario, **27**, 68, 70, 95, 143