

Evolution and Biodiversity in the Antarctic: The Response of Life to Change (EBA)

Report for SCAR SRP Performance Review March 2008

1. Rationale

Evolution and Biodiversity in the Antarctic: the Response of Life to Change (EBA) was endorsed by SCAR and became operational from January 2006.

The overall aim of the EBA programme is to understand the evolution and diversity of life in the Antarctic, to determine how these have influenced the properties and dynamics of present Antarctic and Southern Ocean ecosystems, and to make predictions on how organisms and communities will respond to current and future environmental change.

This programme involves an explicit integration of work on marine, terrestrial and limnetic ecosystems. The science in this programme thus extends over an entire biome on Earth. By comparing the outcome of parallel evolutionary processes over the range of Antarctic environments, fundamental insights can be obtained into evolution and the ways in which life responds to change, from the molecular to the whole organism level and ultimately to biome level. Most national programmes individually cannot attempt a study on such a bold scale, whereas the collaborative spirit of the Antarctic science community provides a mechanism for achieving outstanding scientific success.

EBA has established five Working Packages to cover the intended areas of research:

- Work Package 1: Evolutionary history of Antarctic organisms
- Work Package 2: Evolutionary adaptation to the Antarctic environment
- Work Package 3: Patterns of gene flow and consequences for population dynamics: Isolation as a driving force
- Work Package 4: Patterns and diversity of organisms, ecosystems and habitats in the Antarctic, and controlling processes
- Work Package 5: Impact of past, current and predicted future environmental change on biodiversity and ecosystem function

2. Overview of Progress

Since 2006, the development of the EBA has not quite followed the intended path as outlined in the EBA Implementation Plan (2005). Whereas pre-2006, SCAR supported separate marine and terrestrial biological programmes, EBA brought these disciplines under one umbrella. This has meant a significant increase in the number of groups that contribute to the one SCAR programme of EBA. From the outset, the EBA Co-Chairs and the SSG-LG representative have had challenges identifying the numerous and disparate groups that contribute to the aims of the EBA. Two work package leaders (one marine and one terrestrial) for each work package have been identified (see Section 5), with the aim of them keeping in touch with the community working on topics within their work package, but there remain challenges in maintaining contact with these members and getting information from them regarding the wider biological community.

However, it is clear that there are a large number of projects/programmes and individuals who are undertaking research towards the goals of EBA, within very diverse areas of biology. Those with which we have positive interactions are summarised in Appendix 1. It remains likely that more will be identified. EBA's role, as is appropriate for a non-science-funding umbrella or facilitator, has quickly developed into one of connection, and encouragement of various initiatives.

The committee will need to remain vigilant in convening workshops before 2013 in order to answer the questions that it poses in its Science Plan (2004).

Information regarding the outputs and inputs specifically concerning the EBA programme and its undertakings are provided in the summary format requested by SCAR below. However, also appended to this report are the submissions from many projects/programmes that contribute to EBA in a broader sense (Appendix 3). This highlights not only the high level, diversity and connectivity of research that contributes to EBA, but also the challenge that EBA has in keeping a track of these widely distributed groups.

3. Major Tasks and Timeframe

Year	Task outlined in 2005 Implementation Timeline	Comments
2005	Planning meeting in Cambridge in March to draft Implementation Plan	Completed
	SCAR Biology Symposium "Evolution and Biodiversity in the Antarctic", Curitiba, Brazil.	Completed
	International workshop on EBA where work package sub-committees will be appointed and specific milestones detailed.	Completed as part of Curitiba meeting
	IPY advanced planning, database construction and integration	Falls within individual IPY programme remits, not EBA
	Circulation of questionnaire about planned and anticipated research activities that will contribute to the aims of EBA in order to collect feedback from potential participants.	Completed
2006	SCAR Open Science Meeting, Hobart. EBA begins. Workshop: Factors driving evolution in the Antarctic.	Decision made to encourage smaller community-led 'targeted' workshops, e.g. within WPs, rather than single large and centralized meetings
2007	Second workshop: World View of Evolution. Miraflores, Spain.	As above, this was removed from planning programme
2008	SCAR Open Science Meeting, St. Petersburg. Evolutionary Biology-Biodiversity Joint Session.	PC on SOC for this meeting, various EBA-linked workshops, overall session structure different to working assumption at time of inauguration of EBA
2009	SCAR Biology Symposium, possibly in Japan or Korea. Major EBA session and third workshop (integrative) one. Also mid-program review.	Symposium planned for Sapporo, Japan; 26 - 31 July 2009
2010	EBA-IPY activities: will be the SCAR Open Science Meeting where we will devote to IPY results.	
2011	last field season	
2012	SCAR Open Science Meeting	
2013	SCAR Biology Symposium – wrap-up of results and last year of program	

4. Deliverables

The EBA Implementation plan (2005) outlined that the main output from the EBA programme would be a significant step forward in our understanding of the Antarctic biota and its evolution. There would also be important contributions to fundamental understanding in a number of disciplines. Specific outputs do and will include the following (as demonstrated in the following sections):

- Primary literature publications and books
- Conference proceedings and publications from workshops
- Programme reports
- Website
- Input to databases
- Advisory reports to ATCM and others (e.g., CEP, CCAMLR, COMNAP)
- Input to, and feedback from, international programmes
- Synergies with other SCAR programmes (e.g., ACE, AGCS, SALE)
- Trained PhD graduates and post-doctoral research fellows
- Capacity development of students from developing Antarctic nations
- Outreach via National Programmes and in coordination with proposed SCAR Outreach Committee

5. EBA Committee

Name	Role	Gender	Country	Term From
Dr Peter Convey	<i>Co-Chair</i>	Male	United Kingdom	2005
Prof Guido di Prisco	<i>Co-Chair</i>	Male	Italy	2005
Shulamit Gordon	<i>Secretary & JCADM Representative</i>	Female	New Zealand	July 2007
Dr Dana Bergstrom	Secretary (past 05-07)/Member	Female	Australia	2005
Prof Angelika Brandt	Member	Female	Germany	2005
Dr Marc Lebouvier	<i>Member (conservation matters)</i>	Male	France	2005
Dr Ad H.L. Huiskes	<i>CO LSSSG (ex officio)</i>	Male	The Netherlands	2005
Dr Michael Stoddart	<i>Census of Antarctic Marine Life</i>	Male	Australia	2005
Dr Brigitte Hilbig	Work Package 1 leader	Female	Germany	2005
Dr Dominic A. Hodgson	Work Package 1 leader	Male	United Kingdom	2005
Prof Daniel P. Costa	Work Package 2 leader	Male	United States	2005
Prof Takeshi Naganuma	Work Package 2 leader	Male	Japan	2005
Prof Antonio Mateo Solé-Cava	Work Package 3 leader	Male	Brazil	Stepped Down February 2008
Dr Elie Poulin	Work Package 3 leader	Male	Chile	March 2008
Dr Ian D. Hogg	Work Package 3 leader	Male	New Zealand	2005
Dr Julian Gutt	Work Package 4 leader	Male	Germany	2005
Dr Satoshi Imura	Work Package 4 leader	Male	Japan	2005
Dr Edith S. E. Fanta	Work Package 5 leader	Female	Brazil	2005
Prof Thomas A. (Tad) Day	Work Package 5 leader	Male	United States	Stepped Down December 2007
Dr David Renault	Work Package 5 leader	Male	France	March 2008

6. Outputs

a. Key achievements

I. *Publications*: Section 6c below demonstrates that at least 142 peer reviewed papers were published by groups contributing to EBA in 2006 and 138 in 2007. Key publications of note are:

- A Paper to be submitted to the upcoming ATCM meeting in Kiev resulting from the joint ATS-EBA workshop that was held in South Africa in October 2006 (see appendix 2).
- IX SCAR International Biology Symposium Evolution and Biodiversity in Antarctica *Antarctic Science Special Edition Volume 19(2) 2007*. Eds E. Fanta, W. Arntz, W. Detrich, H. Kawai
- Antarctic Ecology: From Genes to Ecosystems. Part 1. Rogers, A.D, Murphy, E., Clarke, A., Johnston, N. (eds). *Philosophical Transactions of the Royal Society B*. Vol. 363(1477), 2007.
- Antarctic Ecology: From Genes to Ecosystems. Part 2. Rogers, A.D, Murphy, E., Clarke, A., Johnston, N. (eds). *Philosophical Transactions of the Royal Society B*. 2007.
- CONVEY, P., GIBSON, J. A. E., HILLENBRAND, C.-D., HODGSON, D. A., PUGH, P. J. A., SMELLIE, J. L., AND STEVENS, M. I. (In press). Antarctic terrestrial life - challenging the history of the frozen continent? *Biological Reviews*.
- FRENOT Y., CHOWN S.L., WHINAM J., SELKIRK P.M., CONVEY P., SKOTNICKI M.L. & BERGSTROM D.M. 2005. Biological invasions in the Antarctic: extent, impacts and implications. *Biological Reviews of the Cambridge Philosophical Society*, 80, 45-72.
- PECK L.S., CONVEY P. & BARNES D.K.A. 2006. Environmental constraints on life histories in Antarctic ecosystems: tempos, timings and predictability. *Biological Reviews of the Cambridge Philosophical Society*, 81, 75-109.
- Convey, P. 2007. Non-native species in the Antarctic terrestrial environment: presence, sources, impacts and predictions. "Non-native species in the Antarctic" Workshop Proceedings, Gateway Antarctica, Christchurch, New Zealand. de Poorter, M., Gilbert, N., Storey, B., and Rogan-Finnemore, M. (Eds.)
- Frenot, Y., Convey, P., Lebouvier, M., Chown, S.L., Whinam, J., Selkirk, P.M., Skotnicki, M. & Bergstrom, D.M. 2007. Biological invasions in the Antarctic: extent, impacts and implications. "Non-native species in the Antarctic" Workshop Proceedings, Gateway Antarctica, Christchurch, New Zealand. de Poorter, M., Gilbert, N., Storey, B., and Rogan-Finnemore, M. (Eds.)
- Latitudinal Gradient Project (LGP) *Antarctic Science Special Edition Volume 18(4) 2006*. Eds. M.R. Balks, V. Cummings, T.G.A. Green, C. Howard-Williams, D. Peterson and J.G. Webster-Brown.
- Convey P, Stevens MI. 2007. Antarctic Biodiversity. *Science* 317(5846): 1877-1878.
- Verde C, Parisi E, di Prisco G. 2006. Non-Antarctic primitive and modern notothenioid fish species: tracking the adaptive evolution in the structure, function and molecular phylogeny of haemoglobin. *Deep Sea Research* 53: 1105-1114.
- Verde C, Parisi E, di Prisco G. 2006. The evolution of thermal adaptation in polar fish. *Gene* 385: 137-145.
- -di Prisco G, Verde C. 2006. Predicting the impacts of climate change on the evolutionary adaptations of polar fish. *Rev Environ Sci Biotechnol* 5: 309-321.
- Giordano D, Parrilli E, Dettai A, Russo R, Barbiero G, Marino G, Lecointre G, di Prisco G, Tutino L, Verde C. 2007. The truncated hemoglobins in the Antarctic psychrophilic bacterium *Pseudoalteromonas haloplanktis* TAC125. *Gene* 398: 69-771.
- di Prisco G, Verde C. 2007. EBA: Evolution and biodiversity in the Antarctic. The response of life to change - An overarching SCAR-IPY programme. International Symposium Polar Environment and Climate: The Challenges European Research in the Context of the International Polar Year. Brussels, p 137-139.
- Verde C, Lecointre G, di Prisco G. 2007. The phylogeny of polar fishes and the structure, function and molecular evolution of haemoglobin. *Polar Biol* 30: 523-539.
- Negrisolo E, Bargelloni L, Patarnello T, Ozouf-Costaz C, Pisano E, di Prisco G, Verde C. 2008. Comparative and evolutionary genomics of globin genes in fish. *Meth Enzymol* Vol 436, Chapter 29, pp 507-534.

- Dettai A, di Prisco G, Lecointre G, Parisi E, Verde C. 2008. Inferring evolution of fish proteins: the globin case study *Meth Enzymol* Vol 436, Chapter 30, pp 535-566.
- II. *Workshop Sponsorship:* As the role of EBA has developed several workshops have been sponsored to encourage communication among scientists particularly to foster new ideas and cross-discipline discussions. Appendix 2 lists the various workshops that EBA has sponsored or has been involved in. Of note is the upcoming Antarctic Gradients invited workshop to be held at BAS in May 2008. Sixteen participants from UK, South Africa, Spain, New Zealand, Australia, US and Italy will be attending. This workshop came out of discussions from the Latitudinal Gradient Project community in New Zealand with input from the US' McMurdo Long Term Ecological Research project. This is a prime example of how EBA can facilitate work in new areas of research.
 - III. *EBA Website:* A new EBA website was launched in July 2007 to help promote the cause of EBA and bring to the fore the various that contribute to EBA. See www.eba.aq
 - IV. *EBA Newsletter:* An inaugural EBA Newsletter was distributed in March 2008 to give recent news of the various parts of EBA. We hope that these initiatives will increase the communication of EBA-related news and activities around the Antarctic biological community and the greater Antarctic community. This newsletter is attached to this review (Appendix 5) and also available on the EBA website.
 - V. *Links with the Antarctic Master Directory:* EBA's JCADM representative (who is also the EBA Secretary) has created an EBA portal in the Antarctic Master Directory where information about Antarctic data is stored. This enables us to easily search for all types of data that contribute to EBA outcomes.

b. Contributions to IPY Programmes:

Besides being a SCAR programme, EBA has also been endorsed by the IPY Committee (Project # 137, coordinated by Guido di Prisco). Although the two EBA's have a lot in common, they have some differences:

- Teams that joined EBA-SCAR did so through a specific procedure which involved filling a questionnaire. Teams that joined EBA-IPY have applied through the EoI sent to the national organizations. Although the two procedures were different, the teams often coincide.
- Within national programmes, participation in EBA-SCAR takes place within a longer time span (corresponding to the length of EBA-SCAR 2006-2013) than participation in EBA-IPY (2007-2009). This will affect the provision of funding according to the procedures by each nation.

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Some of the EBA-IPY projects that contribute to EBA are identified in Appendix 1.

Several other projects that contribute to EBA are themselves IPY endorsed projects such as CAML, SCAR-MarBIN, Aliens, TARANTELLA and ICED. These are listed in Appendix 1.

c. Publications in peer reviewed literature

As highlighted, EBA as it stands does not publish, however the many projects and programmes that contribute to EBA do. Individual publications from these groups can be seen in Appendix 3, but we have also compiled all publications into one list, including the project name (Appendix 4). This highlights that many publications are co-written by members of more than one project.

Number of peer reviewed publications that contribute to EBA (from when this report was completed)

Year	Number of Publications
2006	155
2007	159
2008	10
In Press	35

d. Other publications

Please see individual project/programme submissions for details on other publications. Note that particularly significant EBA-related publications have been picked up effectively by the media arms of author parent organizations.

An inaugural EBA Newsletter was circulated in March 2008 to the EBA listserver, the Joint Committee on Antarctic Data Management listserver and the general SCAR community. This can be found on the EBA website in the Publications and Reports section [here](#) and is also appended for your information (See Appendix 5).

e. Brochures, posters, press/media articles and similar PR material

None

f. Web site details and number of hits to this site if data is available

A new EBA website (www.eba.aq) was designed and came into use in July 2007. This replaced a web page that had been hosted by The Netherlands' polar institution.

The current website contains pages on:

- Current EBA News
- Work Package information
- Publications and Reports
- Information about data
- Conferences and Meetings
- Links to other EBA related projects
- EBA Contacts

Statistics of the new EBA Website since its release in July 2007

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Jul 2007	97	154	861	17022	43.50 MB
Aug 2007	159	196	754	15089	41.67 MB
Sep 2007	340	375	874	11412	28.09 MB
Oct 2007	640	765	1440	14696	33.57 MB
Nov 2007	643	937	1758	7368	18.02 MB
Dec 2007	668	853	1374	8149	20.72 MB
Jan 2008	473	584	1119	7175	17.88 MB
Feb 2008	386	528	1342	15211	42.72 MB
Total	3226	4140	8853	86239	217.81 MB

g. Project Databases

Biodiversity Database

The Australian Antarctic Data Centre (AADC) hosts and maintains a Biodiversity Database (<http://data.aad.gov.au/aadc/biodiversity/>) which contains data on Antarctic and Subantarctic flora and fauna. This started through EBA's predecessor, RiSCC, and is EBA's main database. This database contains as many collections of data that Dave Watts at the AADC knows of that are in the public domain (See <http://data.aad.gov.au/aadc/biodiversity/collections.cfm>). The samples and/or observations from each collection are classified into one of three possible habitat domains - terrestrial, limnetic or marine (see table below).

Number of Observations and Collections Currently in the Biodiversity Database (as of 19/2/08)

Habitat Domain	Number of Observations	Number of Collections
Terrestrial	96687	28
Marine	248650	39
Limnetic	3926	7

The terrestrial and limnetic data are from as many accessible data sources as possible. They are dominated by a copy of the Antarctic Plant Database from BAS. Copies of other databases are privately held and could be made public with permission of the data custodians. The Australian data is published to GBIF for inclusion in their global catalogue. The marine component in this database, is restricted to data from the Australian programme and once it becomes public, it is published via webservice directly to SCAR-MarBIN (www.scarmarbin.be) and to GBIF and OBIS.

Over the last year, in conjunction with the improvements and growth of external databases such as the Catalogue of Life, Dave has been validating higher level taxa so that the database has a relatively consistent taxa system, with as many species containing authorities as is possible. There are also plans to improve the on-line mapping tools and utilise the Antarctic Digital Database for background topography. A list of terrestrial and limnetic bioregions contains links to the relevant collections or maps.

Web statistics for this database (as of 19/2/08) are:

39,314 page views in 2007 of which 5,000 were internal to AAD and 34,165 external to AAD.

Other Databases

There are also other databases that are coordinated by several of the individual projects/programmes that contribute to EBA. See: SCAR-MarBIN, MERGE, SO-CPR.

The Antarctic Master Directory

The [Antarctic Master Directory \(AMD\)](#) is a central directory system housed by NASA's Global Change Master Directory that contains information about Antarctic data (metadata). Through the Joint Committee on Antarctic Data Management, Antarctic nations are encouraged to submit their metadata to the AMD so that a record of what data have been collected and where it was collected can be kept.

EBA has set up a portal within the AMD which gives access to metadata submitted since EBA was established and metadata submitted before EBA was established, but that contribute to EBA's aims. This portal can be accessed [here](#). Groups who associate their work with EBA are encouraged to enter their metadata into the AMD and link it to the EBA programme under 'Projects'. Note that metadata can be linked to more than one project.

This means that if EBA wants to see what data has been collected that relate to EBA, this can be done through a simple search function on the AMD. EBA is the only one of the SCAR SRPs that has set up such a portal, though others may be under construction. However, in order for this to be effective, data centres do need to tag their metadata with the EBA project.

h. Number and type of education/training and other capacity building activities

None

i. Notes on new technology/model developments

None

VI. Inputs

a. Number, gender and country of participating scientists in your project

See summary table (Appendix 1) for individual projects/programmes that contribute to EBA.

b. Meetings and workshops

Several meetings and workshops have been, and are planned to be, sponsored by EBA, and many have been linked to EBA. These can be found in Appendix 2.

c. Links to other SCAR SRPs or SCAR Action or Expert Groups

The Southern Ocean Continuous Plankton Recorder Survey (SO-CPR Survey) has identified itself as a project that contributes to EBA and this is currently an LS-SWG Action Group.

Links have been made with ACE and AGCS through the SCAR inter-programme leaders group.

d. Links to other ICSU bodies or to other scientific groups

None that we know of. We would need to go to the component programme level, e.g. CAML links to CoML, and thereby into Diversitas.

Submitted: 1st April 2008
Compiled by: Shulamit Gordon
Pete Convey
Guido di Prisco

Appendix 1: Projects/Programmes that contribute to the EBA Programme

Project Name	Lead Contact	Lead Contact Country	Discipline	IPY Project	Website	Ref'd Pubs (06-08)	Other Countries involved	Number of Participants
Aliens in Antarctica [Aliens]	Dana Bergstrom	Australia	Terrestrial	#170	www.aliensinantarctica.aq	None	9 Countries with scientists involved: Australia, Belgium, France, Japan, New Zealand, Poland, South Africa, The Netherlands, United Kingdom	23 (43% female)
Anemonies Database	Daphne G. Fautin	U.S.A.	Marine	No				
ANTarctic benthic DEEP-sea biodiversity: colonisation history and recent community patterns – SYSTem Coupling [ANDEEP-SYSTCO]	Angelika Brandt & Brigitte Ebbe	Germany	Marine	#66	http://www.cedamar.org/	None. 1 st field season just complete.	8 countries out of: USA, United Kingdom, Belgium, Italy, France, Norway, Spain, Switzerland, Russia, Argentina, Australia	53 participants. 43% female
Automatic Monitoring of Penguin Populations [AMPPoP]	Yvon LE MAHO	France	Combined	#251	Under Construction	1	France, Japan, USA, UK, Australia, Italy, New Zealand	13 (30% female)
Biodiversity-Change in the formerly ice shelf-covered Larsen A/B area	Julian Gutt	Germany	Marine	Under CAML	-	1	14 countries including: Germany, Canada, Czech Republic, Spain, Russian Federation, Belgium, Italy, Ukraine, USA, UK, France, Chile	48 (54% female)
Biodiversity, Function, Limits and Adaptation from Molecules to Ecosystems [BIOFLAME]	Peter Convey	U.K.	Marine/Terr estrial	No	www.antarctica.ac.uk	~110 since 2006	UK, Germany , Australia	14 UK (36% female)
Biodiversity of three representative groups of the Antarctic Zoobenthos - Coping with Change [BIANZO II]	Chantal de Ridder	Belgium	Marine	No				
Census of Antarctic Marine Life [CAML]	Michael Stoddart	Australia	Marine	#53	www.caml.aq	-	20 countries	200
Climate change, human activities and biodiversity in subantarctic terrestrial ecosystems [Ecobio]	Marc Lebouvier	France	Terrestrial	Under ALIENS and TARAN TELLA	Under Construction	8	France, Australia, Belgium, New Zealand, Poland	12 (25% female)
Collaborative Research: Relevance of planktonic larval dispersal to endemism and biogeography of Antarctic benthic invertebrates	Ken Halanynch	U.S.A.	Marine	No				

Comparative Biologic and Monitoring Research of Gentoo (Pygoscelis papua) in Terms of its Conservation as a Living Resource	Roumiana Metcheva	Bulgaria	Marine/Terr estrial	No				
Comparative Studies of Gentoo Populations [GOSGEN]	Volodymyr Bezrukov	Ukraine	Marine/Terr estrial	No				
Cool Plants 9Group of projects)	Sharon Robinson	Australia	Terrestrial	No	http://www.uow.edu.au/science/biol/staff/sharonr/sr_coolplants.html	4	Australian, German, Austrian, Czech Rep, Italian, USA	21 (62% female)
Did Antarctic octopuses colonise the deep sea?	Louise Allcock	U.K.	Marine	No				
Discovery 2010: Integrating Southern ocean Ecosystems into the Earth System [Discovery 2010]	Eugene Murphy	U.K.	Marine	No				
Ecology and Evolution of Antarctic Invertebrates	Sven Thatje	U.K.	Marine	No	-	24	UK, Germany, US, Argentina, New Zealand	5 in UK
Evolution and Biodiversity in the Antarctic [EBA-IPY]	Guido di Prisco	Italy	Marine/Terr estrial/Aqua tic	#173	www.eba.aq	19	All SCAR Nations.	
Health of Arctic and Antarctic bird populations [BIRDHEALTH]	Maarten Loonen	The Netherlands	Terrestrial	#172				
Holocene climate variability and ecosystem changes in the coastal East and Maritime Antarctica [HOLANT]	Wim Vyverman	Belgium	Terrestrial	Under MERGE	www.HOLANT.UGent.be	3	Belgium, UK	11 (36% female)
Impact of CLimate induced glacial melting on marine and terrestrial COastal communities on a gradient along the Western Antarctic PENinsula [CLicOPEN]	Doris Abele	Germany	Marine/Terr estrial	#34				
Integrated circumpolar studies of Antarctic marine ecosystems to the conservation of living resources [AMES]	Svein Iversen	Norway	Marine	#131	www.imr.no	None. 1 st field season still underwa y.	Germany, USA, China, Brazil, Norway	20 Total participants. 25% female
Integrating Climate and Ecosystem Dynamics in the Southern Ocean [ICED]	Rachel Cavanagh	U.K.	Marine	#92	http://www.iced.ac.uk	None	20 countries	~100 scientists (~25% female)
International Collaborative Expedition to collect and study Fish Indigenous to Sub-Antarctic Habitats [ICEFISH]	Cinzia Verde	Italy	Marine	#93	www.icefish.neu.edu	7	Italy, France, New Zealand, USA, Germany, Australia, Brazil, U.K. South Africa	12

Internationally coordinated studies on Antarctic environmental status, biodiversity and ecosystems. (Environmental, Biological, and Ecological Studies in Antarctica) [EBESA]	Roberto Bargagli	Italy	Terrestrial	Under EBA-IPY	-	6 Italian	Italy, Czech, Ukraine Republic	28 (42% female)
Latitudinal Gradient Project [LGP]	Shulamit Gordon	New Zealand	Marine/Terrestrial/Aquatic	Under MERGE and EBA-IPY	www.lgp.aq	51 (some will overlap with others listed here)	New Zealand, Italy, USA.	24
McMurdo Dry Valleys Long term Ecological Research Project [MCM-LTER]	Berry Lyons	U.S.A.	Terrestrial/Aquatic	No	www.mcmlter.org	30	USA, Canada, New Zealand, Australia, UK, Czech Republic, Japan	Pls: 7 Total=7 (2 female); Current Formal Collaborators: Total=6 (2 female);
Microbiological and Ecological Responses to Global Environmental Changes in Polar Regions [MERGE]	Takeshi Naganuma and Annick Wilmotte	Japan and Belgium	Terrestrial	#55	Not one central one for MERGE. Some sub-projects have websites.	7 Publications - Some overlap with other projects	Japan, New Zealand, Brazil, Malaysia, Poland, Spain, Belgium, UK	At least 48 participants (30% female)
Natural climate variability - extending the Americas palaeoclimate transect through the Antarctic Peninsula to the pole [CACHE-PEP]	Dominic Hodgson	U.K.	Marine/Terrestrial	Under MERGE	http://www.antarctica.ac.uk/bas_research/current_programmes/cache/pep/index.php	18 (some will overlap with others listed here)	UK and Belgium are main partner	
Polar Aquatic Microbial Ecology [PAME]	Gunnar Bratbak	Norway	Aquatic	#71	http://www.uib.no/pame/	0	Norway and France	14 (36% female)
Response of Polar, Tropical and Temperate Microalgae to Global Warming and Increased UV Radiation	Phang Siew Moi	Malaysia		No				
Retrospective and Prospective Vegetation Change in the Polar Regions: Back to the Future [BTF]	Terry Callaghan	Sweden	Terrestrial	#214				
SCAR-Marine Biodiversity Information	Claude de	Belgium	Marine	#83	http://www.scarmarbin	See:		International

Network [SCAR-MarBIN]	Broyer				.be	http://www.scarmarbin.be/imis.php?module=dataset&show=search		Scientific Steering Committee: 16 participants from 8 countries
Scratching The Surface [IMARES-SUIT]	Jan Andries van Franeker	The Netherlands	Marine	No	http://www.pooljaar.nl/poolijs www.jafweb.nl	4	Netherlands, Belgium, Germany and Canada	8 Male
Sex and Variation in Antarctic Lichens	Paul Dyer	U.K.	Terrestrial	No	-	4	UK	3 male
Southern Ocean Continuous Plankton Recorder Survey [SO-CPR]	Graham Hosie	Australia	Marine	No	http://data.aad.gov.au/aadc/cpr/index.cfm	7 from 2006	Australia, Japan, Germany, New Zealand, UK, USA and Russian.	25 (32% female)
Structural-functional characteristics of microbe cenoses in Antarctica. The investigation of microorganisms role in biogeochemical cycles	Oleksandr Tashyrev	Ukraine	?	Under EBA-IPY	-	?	Ukraine	5
Terrestrial ecosystems in Arctic and Antarctic: effects of UV light, liquefying ice, and ascending temperatures [TARANTELLA]	Ad Huiskes	The Netherlands	Terrestrial	#59	www.tarantella.aq	None	The Netherlands, Czech Republic, United Kingdom, Norway, Belgium, USA, Canada, Japan, France, Spain	24 (21% female)
Trophic Ecology of the Nearshore Zone [TRENZ]	Jonathan Stark	Australia	Marine	No				
Understanding, valuing and protecting Antarctica's unique terrestrial ecosystems: Predicting biocomplexity in Dry Valley ecosystems	Allan Green	New Zealand	Terrestrial	No				
Vulnerability of native communities to invasive insects and climate change in sub-Antarctic islands [Evince]	David Renault	France	Terrestrial	No				

Appendix 2: Workshops/Meetings Supported by EBA or linked to EBA

Title	Venue	Date	Report/Supported Personnel	Attendees/Supported
2005				
IX SCAR Biology Symposium	Curitiba, Brazil	25-29 July 2005	<u>Antarctic Science Special Edition Volume 19(2) 2007</u> . Eds E. Fanta, W. Arntz, W. Detrich, H. Kawall	
2006				
EBA Core Steering Committee Meeting	Hobart, Australia	8 July 2006	<u>Minutes</u>	6 Attended (3 female); NZ, UK, Italy, France, Korea
EBA Work Package Leader Meeting	Hobart, Australia	10 July 2006	<u>Minutes</u>	10 attended (2 female); UK, Italy, France, Japan, NZ, Brazil, Germany
LGP International Workshop	Hobart, Australia	10 July 2006	<u>Final Report</u>	~40 attended (17 female). Argentina, US, UK, NZ, Belgium, Canada, Germany, Australia, Malaysia, Poland, China, Spain, France
CAML Workshop	Hobart, Australia	11 July 2006		
EBA Open Meeting	Hobart, Australia	12 July 2006	<u>Minutes</u>	38 attended (15 female); Argentina, NZ, UK, Malaysia, Brazil, France, The Netherlands, Japan, Poland, Chile, China, Australia, Germany, India
Aliens Workshop	Hobart, Australia	15 July 2006	<u>Minutes</u>	11 attended (3 female); South Africa, UK, Poland, France, The Netherlands, Japan, Germany
SYSTCO-IPY Workshop	Bremerhaven, Germany	September 2006		
TARANTELLA – IPY Implementation Workshop	Rilland, The Netherlands	9-11 October 2006		24 attended (5 female); The Netherlands, Czech Republic, United Kingdom, Norway, Belgium, USA, Canada, Japan, France, Spain
Workshop on Terrestrial biodiversity in the Antarctic: Microbial, Macroscopic, Indigenous and Alien	Stellenbosch, South Africa	18-20 October 2006	<u>Report</u>	21 attended; Australia, France, Japan, The Netherlands, NZ, South Africa, USA, UK
SCAR Cross-Linkages Workshop	Rome, Italy	6-8 November 2006	<u>Report</u>	15 attended (2 female) Italy, UK, The Netherlands, Finland, USA, Sweden
SCAR-MarBIN Workshop: Evolution of Marine Organisms of the Southern Ocean	Leuven, Belgium	December 2006		
2007				
SCAR-MarBIN Workshop	Bialowieza, Poland	2-8 June 2007		32 attended; Supported personnel: Vanhoorne, Segers, Ramm
International Workshop on Antarctic Biology: Critical Issues and Research Priorities for IPY (2007-2009)	Follonica, Italy	7-9 June 2007	Abstract booklet produced.	48 attended from Italy, NZ, UK, Germany, Korea, Bulgaria, India, USA, Spain, Czech Republic; 30 invited presentations; partially supported (not by SCAR funds).

<u>International Conference on Cryogenic Resources of Polar Regions</u>	Selekhard City, West Siberia, Russia	17-21 June 2007	Joint EBA-MERGE session.	Supported personnel: Roberto Bargagli (Italy), Takeshi Naganuma (Japan), plus 2 Malaysians.
Latitudinal Gradient project Workshop	Wellington, New Zealand	2 July 2007	<u>Minutes</u>	~50 attended; NZ, UK, Australia, Italy. Supported personnel: Diana Wall (female US), Berry Lyons (US), Peter Convey (UK)
<u>10th International Symposium on Antarctic Earth Sciences (ISAES-2007)</u>	Santa Barbara, CA, USA	26 August - 1 September 2007	Joint EBA-ACE session giving a bioperspective.	Supported personnel: Pete Convey, Jan Strugnell (female, UK), Bettine van Vuuren (female SA)
The Southern Ocean Observing System (SOOS) Workshop	Bremen, Germany	1-3 October 2007	<u>Interim Report</u>	32 Attended. Dan Costa and Edith Fanta EBA WP leaders attended.
Upcoming in 2008				
Dynamics in the Southern Ocean (ICED) programme - first model development workshop, Old Dominion	University, Virginia, USA	16 - 18 April 2008		Subsidising 2-3 key participants
<u>Polar and Alpine Microbiology</u>	Banff, Alberta, Canada	11-15 May 2008		Subsidising 3 key participants
Antarctic Gradients – Invited Workshop	BAS, U.K.	19-21 May 2008		16 Invited participants. Some expenses will be covered.
International workshop "The polar and alpine environments: molecular and evolutionary adaptations in prokaryotic and eukaryotic organisms	Naples, Italy	May 29th--30th, 2008	Special Issue in <i>Gene</i> .	18 invited presentations from Italy, UK, USA, Germany, Belgium, France, Austria; partially supported (not by SCAR funds).
Antarctic Gradients Open Workshop	St Petersburg, Russia	5 July 2008		
<u>Extremophiles 2008</u>	Cape Town, South Africa	7-11 September 2008		Subsidising 2-3 key participants, specific conference session
Upcoming in 2009				
Xth SCAR International Biology Symposium	Sapporo, Japan	26 - 31 July 2009		

Appendix 3: Review Responses from Projects/Programmes that contribute to EBA – See attached file: Review Appendices.doc

Appendix 4: Refereed Publications from EBA-Related Projects 2006-2008 – see attached file: All EBA Publications.doc

Appendix 5: EBA Newsletter – see attached file: EBANewsletterMar08.pdf

Version 3**EXTERNAL REVIEWS OF SCIENTIFIC RESEARCH PROGRAMMES****1. Background – the Review Process**

The quality, the progress and success of SCAR's Scientific Research Programmes (SRPs) is to be reviewed every 2 years in order to determine that SCAR is obtaining good value for its investment and that results are emerging at an appropriate rate. A 4-year review is to include external evaluations. This is time for the 4-year review.

The success of SRPs depends primarily on science carried out, funded and peer-reviewed within national programs and there is no wish to duplicate the scientific review process of national activities. SCAR adds value to national efforts by facilitating international collaboration and communication that might not otherwise occur. An assessment of the extent to which that value has been added through such collaboration is the objective of the review process, providing a basis for prioritizing the many competing demands on SCAR's limited resources. If an SRP is judged to be deficient in its performance, SCAR will recommend changes to improve performance, or it may redirect funds to other more deserving activities. SRPs are also to be of a finite duration (6 to 8 years) allowing for the renewal and reinvigoration of the SCAR scientific portfolio on a regular basis. Reviews and assessments are used to encourage this replenishment.

The review process is not meant to be unduly burdensome and should be proportional to SCAR-provided funds. SRP leaders report biennially to the meetings of the Standing Scientific Groups and the SCAR Delegates. In the intervening years SRPs report to the Chief Officers of their Standing Scientific Groups who then report to the SCAR Executive Committee. Where feasible, SRP leaders should personally report to the SCAR Delegates. However, it is recognized that time and resources may not allow this, so the SRP reports can be made on behalf of the SRPs by the Chief Officers of the SSGs.

For the 4-year review of progress, the annual report of each SRP will be vetted by an independent external review group. The reviews will be provided to the Delegates meeting, along with the annual reports, to enable the Delegates to take make informed decisions about continued funding of the SRPs.

The plan was for each report to be reviewed by three external reviewers, by 31 May 2008. To the extent possible, reviewers should not be directly involved in the programme but should be knowledgeable about the demands of science in the Antarctic region (SRPs were asked for nominees). Reviewers evaluated the reports based on the evaluation criteria listed below. They were asked to comment on the extent to which each SRP has met the Terms of Reference given below.

Evaluation criteria for SCAR Scientific Research Programmes

Reviewers were asked to answer these questions, but to provide in total no more than 2 pages of A-4.

1. Science quality. Recognising that the national science on which the research was based has already been peer-reviewed, do the scientific highlights and published papers indicate that the internationally collaborative research stimulated by the programme has produced science that is excellent, or good, or fair? (delete whichever does not apply, and provide a brief justification for your choice).

2. Science importance/relevance/timeliness.

Has the work advanced understanding of the role of Antarctic in the overall earth System? (Yes or no; delete whichever does not apply, and provide a brief explanation for your choice).

3. International Polar Year

Is the programme contributing to the International Polar Year? (Yes or no).

4. Data archival and access

Is the programme adequately addressing the issues of data archiving and data access, and are its data accessible to the wider community? (Yes or no; delete whichever does not apply and provide a brief explanation of your choice).

5. Outreach - Public/policy profile

Is this programme enhancing the public profile of SCAR? (Yes or no; delete whichever does not apply, and provide a brief explanation of your choice).

6. Education

Is the work contributing to education about Antarctic science? (Yes or no; delete whichever does not apply, and provide a brief explanation of your choice).

7. Building capacity across all SCAR Member countries

Has the programme contributed to building the capacity of less technically advantaged nations a lot, modestly, little, or not at all? (delete whichever does not apply, and provide a brief explanation of your choice).

8. Value for Money

Considering that SCAR is only able to invest some \$20-25,00 per year in each SRP, do the results indicate excellent/good/fair/poor value for money? (delete whichever does not apply, and provide a brief justification for your choice).

9. Terms of Reference

To what extent has the SRP met the Terms of Reference given below?:-

Terms of Reference for a Scientific Research Programme

- to oversee and guide the development and execution of the programme's implementation activities, adjusting and optimizing the science and implementation plans in the light of events and progress.
- to actively seek support of the programme's implementation through national and international mechanisms
- to ensure the delivery of agreed/approved scientific outcomes, including synthesis activities and public/policy outreach
- to respond to requests for expert advice/support from the SCAR Executive Committee in a timely and effective manner
- to ensure appropriate exchange and archival of data generated as a result of the programme
- to establish scientific liaison and logistic cooperation with other Antarctic activities as appropriate
- to advise the SCAR Executive Committee and Delegates on progress and on the use of funds

Criteria for Membership

The membership of a SRP will be:

- explicit
- appointed by the Executive Committee in consultation with the Meeting of Delegates
- based primarily on internationally recognized scientific expertise fulfilling required mix of skills and experience with geographical and gender mix taken fully into consideration
- for a 4-year term with the possibility of extension depending on contribution and performance
- governed by a phased rotation scheme.

EBA

General comments:

Reviewer 2: the continuation of national funding, which is so important for EBA is no longer secured in several countries (esp. Italy, Germany and possibly the UK), partly due to escalating logistic costs but possibly also due to shifting National priorities. These shortcomings have already harmed international Biology programmes like Icefish and are about to harm others as well. EBA should be further encouraged and supported by SCAR to the maximum extent possible. It represents a timely and much needed programme, which supports the development of comprehensive insight into the functioning of Antarctic ecosystems and their sensitivity to ongoing change. At the same time I would like to encourage SCAR to take initiative at the level of individual nations to emphasize the relevance of this research programme and the need to secure national funding for its further continuation and success.

Reviewer 3:

As I mentioned when I agreed to do this – the research program that I have been involved with over the past 15 years, the McMurdo Dry Valleys Long-Term Ecological Research (MCM-LTER) site program, currently is lumped under the EBA standard, so my review has some bias. In addition, as a terrestrial scientist, I am not as familiar with the marine side of EBA; so there is a bias there as well.

1. Science quality.

Reviewer 1: The program has resulted in many publications, mostly in high quality journals, representing a breadth of marine, terrestrial, limnetic and astrobiological science. The published papers engage all fields of biology from genes to ecosystems over spatial (microhabitat to landscape to deep ocean) and temporal (paleo to seasonal) scales. The number (over 350) of scientific papers since 2006 (including those in press) is impressive. Articles include those resulting from new exploratory research, from multi-disciplinary integrated syntheses of research, and research incorporating new and old technology from ocean, field and laboratory settings. Papers appear as special issues of peer reviewed journals, as chapters in books, and in books devoted solely to state of knowledge of Antarctic systems. Some projects contributing to EBA have high numbers of peer reviewed publications (more than 60 per year for one project) while others have none; the latter appears to reflect differences in funding, start times for projects and time delays in obtaining data from the field.

Reviewer 2: Overall the coverage by EBA is impressive and that the contributing projects represent a balanced diversity of approaches to answering integrative evolutionary questions from molecular to systemic levels. The scientific highlights and published papers indicate that, in several of the programmes the internationally collaborative research stimulated by the programme has produced science that ranges from good to excellent. This impression relates to the fact that the level of productivity is very diverse between programmes. Some programmes like BIOFLAME may have thrived without EBA but both EBA and those programmes have mutually benefited from each other. Others were in fact set up under or concomitantly with EBA and have (like the programme Systco) already generated papers in Nature despite their short period of existence. Overall the productivity of EBA in terms of published studies is high and justifies its existence as the major

SCAR Biology programme. However, it is endangered at the same time as outlined above.

Reviewer 3: The production of archival articles in 2006 and 2007 is quite impressive – 314. Not only are these papers published in the best “topical” or “specialized” journals, but many are published in more “cosmopolitan” journals so the work will be seen and read by non-Antarctic scientists as well. This is good, in that it demonstrates the importance of Antarctic biology to a larger audience and acknowledges the importance of SCAR to this larger audience. The publications also differ dramatically in subject from genomics to ecosystem structure and function and everything in between, so the breadth is also very good. In general, I think that the publications show international collaboration, but not surprisingly perhaps, this collaboration is dominated by the larger national programs. There has been international collaboration stimulated by EBA with the LPG program being an excellent example of this. The new

“Gradients” program coming from LPG is taking advantage of the LPG initiative and adding to it. This is a very positive accomplishment. The “Trends” Book from the RSCC program and the Follonica, Gradients, Byers Peninsula, Jekyll Is workshops over the past few years that I have been involved in have all been important in producing a tighter international effort. I have not read anywhere close to a majority of these papers, but I would rate much of what I have read as “excellent”.

2. Science importance/relevance/timeliness.

Reviewer 1: Yes. It is important on a global scale to understand how Antarctic biodiversity and ecosystems respond to change. The EBA research has contributed directly to increasing knowledge about Antarctic biological and system level response to global changes such as climate change, pollution, tourism and invasive species. Additional marine and terrestrial projects examine gene to cellular level responses and biogeochemical responses of ecosystems. Papers utilizing new technologies have advanced the ties of the polar biological community to those studying earth system science, while others are addressing basic, and heretofore unknown, issues of interest to the international scientific community, for example, how much diversity is in the ocean and are species declining? These and other topics such as evolution and phylogeny, ecology, biogeography, adaptation to cold and other survival mechanisms and carbon and nitrogen cycling are beginning to provide a cohesive body of knowledge as a result of the EBA project. The list of scientific publications is quite large and very impressive because the work is focussed on important areas of research for polar systems and the earth system as a whole.

Reviewer 2: Yes. EBA not only brings in new more integrative approaches but nicely builds on previous activities, which have led to international efforts of synthesizing knowledge from both terrestrial and marine fields of research into comprehensive volumes (e.g. Antarctic Ecology: from Genes to Ecosystems, published by the Physiological Transactions of the Royal Society.)

Reviewer 3: For the most part, I would say “yes” to this. Recent papers on refugia and glacier dynamics and the Phil. Trans. Royal Soc. volumes are the ones that I am most familiar. Portions of the Antarctic are changing rapidly and other portions are predicted to change dramatically in the next decades, it is important that this is documented. EBA seems to be doing this well.

3. International Polar Year

Reviewer 1: Yes.

Reviewer 2: Yes. SCAR EBA is closely linked to IPY EBA which integrates several projects from inside and outside SCAR EBA.

Reviewer 3: “yes”. The portion that I know most about is not directly involved in IPY, but it seems much of what is listed in Appendix 1 is involved.

4. Data archival and access

Reviewer 1: The EBA maintains a biodiversity data base at the Australian Antarctic Data Center which contains data on Antarctic and sub-Antarctic flora and fauna for freshwater, marine and terrestrial ecosystems. This is in addition to individual projects and programs, many of which are linked to maps. Metadata (where, when and how data was collected) for Antarctica is stored in the Antarctic Master Directory hosted by the NASA Global Change Directory. This is searchable for EBA metadata. The two data bases are open to researchers of all nations.

Reviewer 2: Yes, the report explicitly and convincingly addresses the large scale collection of relevant data, esp. in the Biodiversity data base at AADC or the Antarctic Master directories but also mentions other data bases associated with specific projects.

Reviewer 3: “yes”. This is an important issue in my mind and the data from all countries/programs/individuals involved in EBA should be made accessible to everyone after a short but reasonable time period. We find that there are some issues with metadata differing XML formats in the AMD.

5. Outreach - Public/policy profile

Reviewer 1: The EBA contributes to public understanding of Antarctica through its www site and through activities of individual projects. At present the EBA has little direct emphasis on publicity.

Reviewer 2: Yes, the public outreach for some of the projects and individual expeditions was and is outstanding, the EBA website and Newsletter will make long lasting and wide impacts. Public attention has already been significant, one example being the biodiversity studies in the Larsen area. High ranking publications in Nature and Science resulting from EBA activities also receive a lot of Press attention.

Reviewer 3: Probably could do a better job here. Although given the resources available for SCAR related outreach (zero??), the outreach has to be done by the individual groups involved rather than SCAR itself. There is little about outreach in the report, so it is difficult to evaluate

6. Education

Reviewer 1: The newsletter and www site are means of education, as are the individual projects and workshops that magnify EBA knowledge.

Reviewer 2: Yes, in the sense outlined under 5.

Reviewer 3: I would think that each group and national program involved are training their own students – I know we are. Having said that, it might be good to poll the various groups involved in Appendix 1 and see how many students have been/are being trained through the umbrella of EBA activities.

7. Building capacity across all SCAR Member countries

Reviewer 1: Yes, modestly, but more so for the developing Antarctic nations.

The EBA has projects in several less technically advantaged nations but additionally with nations who are developing programs in Antarctic research.

Reviewer 2: EBA involves workshops, training programmes and largely links nations and projects with existing activities in the Antarctic.

Reviewer 3: Very little is said about this in the report. There are numerous countries listed in column 8 of Appendix 1, so based on what I see in this, I would have to assume that some capacity building is taking place through EBA efforts.

8. Value for Money

Reviewer 1: Yes, excellent value. The EBA Programme has succeeded in providing a network for all biologists that encourages connections across disciplines, biomes, cultures and scales. The many outlets for information exchange (newsletter, www site, workshops, email communication) provide a means for personal and scientific communication and encourage development of a collaborative Antarctic biological research community. This will extend our knowledge base and understanding of global changes.

Reviewer 2: The results already indicate excellent value for money and more than justify the integration of national projects under the EBA umbrella. However, SCAR should support EBA also by responding adequately to the current developments of severe funding shortages at national levels (see above).

Reviewer 3: YES, emphatically, yes! For the little money allocated EBA by SCAR, based on publications alone, this has been an excellent investment. Having said that, it's at the workshops and such functions where real collaborations are begun and sustained. Some of these are supported through national programs and some through SCAR. Finding opportunities for scientists from the smaller national programs to attend these and contribute should be an important consideration in the future.

9. Terms of Reference

Reviewer 1: Most have been met or are underway and show a commitment by the EBA Committee to make this an exceptionally active and productive program.

Reviewer 2: EBA has met most of the terms and is well integrated as well as a strong component of activities of SCAR. Overall, it is definitely developing to be the core program for Antarctic Biology within SCAR.

Reviewer 3: Of the seven terms, I cannot comment on #4 and #7. I would argue that #1 has been done well. We are just beginning to make inroads in #2 and have made important strides (through the workshops) in #3. Number #6, in my view needs much work – as if the EBA (and other biological programs) are to provide contributions to earth system science, we need to have better integration with physical and geo scientists. This is NOT the fault of the current EBA leadership, but, as I see it, a flaw in the way SCAR is set up. I bet other research programs of SCAR have similar issues. We are making progress on #5. So overall, I would say “yes”, EBA is meeting the majority of the Terms of Reference.