

Census of Antarctic Marine Life (CAML)

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The CAML project is directed by a Scientific Steering Committee of ten international
scientists
(see <http://www.caml.aq/contact>) as appointed by SCAR.

<http://www.caml.aq>
<http://www.scar.org>
<http://www.scarmarbin.be>
<http://www.cousteau.org>
<http://www.ipy.org>

1. NEW INFORMATION

A. GENERAL PROJECT REVIEW

Please provide a brief update on the status of the project and goals for 2010. Focus on areas that require improvement or assistance. If needed, identify ways the Secretariat or SSC could help with these areas.

Based on the largest-ever survey of marine biodiversity in Antarctica, CAML is currently integrating samples and data taken on 18 major research vessels during the IPY. Over a million geo-referenced species records are available in the newly-restructured dataportal, linked to a register of 15,860 taxa (including 10,120 verified species) and 11,000 DNA barcodes. The South American coordination of CAML has completed a matrix of research across the Antarctic programs of seven countries. In the next year, CAML plans to double the number of species records and barcodes.

The CAML survey is of global significance and will provide data for scientific investigations for many years. Integration and synthesis of the data are underway in selected projects, with key discoveries in the biogeography of octopus and pycnogonids; review of circum-Antarctic ecoregions, regime shift in zooplankton and time-series analysis of benthic fauna over 30 years in Admiralty Bay. A gap analysis using current data has explored the spatial, depth and taxonomic coverage of the survey.

The capacity of Antarctic biodiversity researchers has been enhanced by CAML through SCAR. CAML funded three early career scientists for the July 2009 SCAR Biology Symposium in Sapporo, Japan and a total of 15 CAML papers were presented. The discoveries in molecular biology were outstanding, showing that the Antarctic fauna is the source of many far-flung groups including isopods, pycnogonids and octopus. Jan Strugnell received a SCAR young career research award for her presentation showing evidence from eight genes on the repeated colonisation of the deep sea by octopus from Antarctica. In July 2010, CAML will present the latest results at the SCAR Open Science Conference in Buenos Aires, Argentina. Results from the deep sea will be featured at the International Polar Year Science Conference in Oslo, Norway in June 2010.

To summarise the CAML project status – major changes since 2008:

1. in collaboration with SCAR-MarBIN; doubling to over 1 million georeferenced species records, deeplinking to 10,000 barcodes; major restructure of dataportal and services to users
2. secured external funding to continue SCAR-MarBIN at a minimal level until Dec 2010
3. populated the bibliographic database on SCAR-MarBIN with over 900 references
4. analysed data for the Polar Synthesis Macroscope project at a 2-day workshop at Duke University in Oct 2008 and another in Villefranche, France in May 2009
5. linked Arctic species and seafloor area to Antarctic for comparison of bipolar species
6. written an abstract, accepted for development to a *Nature* paper, on bipolar species
7. produced a 4-minute video “Life Under the Ice” to publicise ice oceans, presented at CoML Queen Mary in Feb 2009, on YouTube and many websites
8. produced pop-ups for the CoML layer of GoogleOcean, including octopus colonization story
9. major media release Feb 2009, CAML selected as 1 of 6 highlights of International Polar Year
10. drafted the CAML chapter for the McIntyre synthesis book, lead author Julian Gutt
11. submitted the Antarctic regional chapter for the Griffiths book, lead author Huw Griffiths
12. held a major synthesis symposium in Genoa, Italy in May 2009 for publication in a special volume of *Deep-Sea Research II*, to be published in Oct 2010
13. made new discoveries in biogeography (faunal richness at high latitude, affinities of midwater fishes, regime shift in zooplankton, single ecoregion united by the Antarctic Circumpolar Current) and molecular biology (repeated colonization of octopus to the deep sea, radiation of pycnogonids and isopods beyond the Southern Ocean).
14. presented results at the SCAR Biology Symposium at Sapporo, Japan in July 2009

15. consolidated the South American CAML, annual conference
16. contributed 3 papers to the 50th anniversary Antarctic Treaty Consultative Meeting, Baltimore
17. provided expert advice on a Southern Oceans Observing System and access to data
18. provided information for CCAMLR's declaration of two Vulnerable Marine Ecosystems

Goals to end 2010 include:

1. doubling to 2 million georeferenced species records in SCAR-MarBIN
2. doubling to 20,000 barcodes linked to SCAR-MarBIN including bipolar species
3. transferring content to 500 species pages of Encyclopaedia of Life
4. updating bibliographic database on SCAR-MarBIN, uploading selected publications generated by CAML to the CoML database, taking an inventory of the most significant publications
5. joining LA-CAML with CoMARge on margins in the Southern Ocean in Rio, Nov 2009
6. convening workshops on evolutionary processes in the Western Antarctic Peninsula, dataportal services, synthesis of SYSTCO pelagic/benthic coupling voyage; analysis of epibenthic sled samples, new patterns in biogeography
7. organising a final workshop and outcomes of Polar Synthesis Macroscope, in Dec 2009
8. producing a 6-minute stereoscopic video of CAML highlights for the Decade of Discovery and rehearsal at Uni Rhode Island in July 2010; developing other presentations
9. submitting the CAML chapter for the McIntyre synthesis book, lead author Julian Gutt
10. presenting CAML results at IPY Science Conference, Oslo Norway in June 2010 and SCAR Open Science at Buenos Aires July 2010
11. completing key publications including special synthesis volume of *Deep-Sea Research II*, CEAMARC voyage volume of *Deep-Sea Research II*, other voyage publications, CAML signature paper, paper for *Nature* on bipolar species,
12. submitting a document entitled *Status of Antarctic Marine Biodiversity* to the Antarctic Treaty Consultative Meeting in April 2010
13. progress the Southern Ocean Observation System, working with SCAR and TOPP
14. working with CCAMLR, IUCN, CEP on societal benefits of CAML
15. selecting and promoting the legacies of CAML
16. securing the legacy in publications, archived documents, SCAR activities and ongoing research and networks

Ways that the CoML Secretariat or SSC could help:

Items 1-4: continue collaboration with OBIS via Edward Vanden Burg, Guelph barcoding via Dirk Steinke and Encyclopaedia of Life via Cyndy Parr. See B below, New Opportunities # 1-3.

Items 5-7: continue close collaboration with Mapping and Visualisation via Ben Best and Synthesis Group via Michele DuRand

Item 8: continue excellent collaboration with Education and Outreach via Darlene Crist. See B below, New Opportunity # 4.

Item 9: continue contact with Synthesis Group to clarify content of CAML Synthesis Chapter

Items 10-11: continue to update Secretariat about progress and any problems

Items 12-16: work with CAML SSC and CoML SSC Liaisons Patricia Miloslavich and Victor Gallardo to select the major legacies of CAML, for presentation to a wide audience. We could group these under science (key discoveries, papers published, papers expected by 2010); data (records in OBIS, records expected); uptake of new technology including microbes, barcoding; enhanced capacity (scientists, networks, utilization of infrastructure); progress towards an integrated physical and biological observing system for the Southern Ocean; links between Antarctic and Arctic; societal impacts; securing the legacies.

The CAML project is on track with our Milestones and Synthesis Plan, to deliver significant achievements in the final year. The CAML has catalysed a renaissance of thinking about the evolution and functions of life around Antarctica, stimulating new areas of enquiry about the biodiversity of ice oceans. The major discoveries are already published in high-impact journals, with over 200 published and an expectation of up to 1,000 papers by end 2010.

B. NEW OPPORTUNITIES

Does your project have any new opportunities (since / not included in your last renewal to Sloan) for activities or products that would contribute to and enhance the Census of Marine Life in 2010? Please list these here, along with the timeline and cost.

1. Barcoding the bipolar species

The Polar Synthesis Macroscope group has identified 250 species that occur in both polar oceans. In September 2009, we started to barcode their DNA, to determine whether these look alike or are genetically identical taxa. CAML has allocated modest funds to coordinate a “bipolar hub” but this new molecular work is clearly beyond our resources. The analysis group is overwhelmed with the level of participation and public interest; an abstract has been accepted by *Nature* for development into a paper in the CoML suite. This is an area of potential scientific breakthrough that would benefit from further resource, coordination of specimens across the relevant CoML projects and continued priority at the barcoding laboratory in Guelph.

Timeline: November 2009 – July 2010.

Cost: USD 30,000.

2. Comprehensive inventory and “Density Analysis” of data from 18 voyages

As identified by the reviewers of our renewal proposal (July 2009), we need to follow up our preliminary gap analysis with a comprehensive inventory and “density analysis” to show where the data are richest. The preliminary exercise revealed where data are sparse or absent, based on the spatial, temporal and taxonomic coverage of samples processed to date. Once located, the dense data seams will be mined in detailed analyses in the final stages of the project. In this way, analysis resources will be targeted to give the greatest return on the capital already invested in the Antarctic surveys. The metadata from all 18 voyages will be verified during this process, to ensure that future researchers can accurately point to the data reserves. We will display the data hotspots on the OBIS map and on high-resolution sidescan sonar images of the seafloor. The exercise will accelerate progress to our Milestone for early 2010 in Category 9 Data Management – “anticipate quantum of data and strategy to save”.

Timeline: December 2009 – January 2010.

Cost: USD 10,000.

3. Converting Antarctic field guides to Encyclopaedia of Life format

CAML has five field guides ready for publication; we recognise here a new opportunity to contribute to CoML goals by providing about 250 pages of the Encyclopaedia of Life. To convert our pages to the format required, we need guidance from staff at the Encyclopaedia of Life. CAML is in the final stages of signing a Memorandum of Understanding with Encyclopaedia of Life. Kristen Yarincik has offered some assistance to coordinate this activity. Resource for a workshop to get the relevant experts together would assist in reaching our November 2009 Milestone in Category 9 Data Management – “engage at technical level with EoL”.
Timeline: November 2010.
Cost: USD 20,000.

4. Visualisation of global oceans, based on GEBCO bathymetric data.

While producing a stereoscopic video about CAML for the Decade of Discovery events, we have played with visualisations of the bathymetry of the world’s oceans. Peter Morse and colleagues produced an accurate globe in sintered ceramic from a 3D printer, using accurate GEBCO data. This fascinating tool animates our discussions about the trenches and ridges of the Southern Ocean. Its global coverage could unify CoML in a visualisation and sculpture for the finale. The Education and Outreach group (Darlene Crist) and Mapping and Visualisation group (Ben Best and Pat Halpin) are evaluating this suggestion.
Timeline: January 2009 – February 2010.
Cost: USD 15,000.

2. UPDATES ONLY

Please only update sections that have changed since submitting the 2008 Annual Report.

A. SYNTHESIS PRODUCTS

Please provide any updates or changes from your 2008 Synthesis Plan, particularly with respect to individual products, their timing and publishing strategy.

CAML has submitted the Antarctic Regional Chapter by Huw Griffiths to the CoML synthesis. The CAML Synthesis Chapter by Julian Gutt is behind schedule, by arrangement with Alistair Mc Intyre, due to the timing of CAML’s major synthesis symposium in May 2009 in Genoa. The abstract for Nature submitted to the CoML suite by the Polar Synthesis Macroscope group has been accepted; development to a full paper is underway led by Louise Allcock, coordinator of the bipolar species hub.

Through the Polar Synthesis Macroscope group, CAML has contributed to the CoML synthesis, particularly of ice oceans. The recent report cited 14 publications from this group.

B. POLICY BRIEFINGS AND UPTAKE OF INFORMATION

Please provide any updates or new information related to policy briefings or examples where the project’s work has influenced policy. We are seeking examples to point to rather than theoretical applications.

The Commission for the Conservation of Antarctic Living Resources (CCAMLR) declared two Vulnerable Marine Ecosystems in late 2008, based on images and samples collected during CAML’s voyage on *Aurora Australis*.

Discussions in February 2009 on the Queen Mary with Kristina Gjerde and Jeff Ardron from IUCN led to expert information being provided by CAML as background to conservation in the Southern Ocean. A further meeting was held at the British Antarctic Survey in November 2009. The German government is supporting IUCN in a two year project designed to provide input into the CBD workshop (in late 2009) as well as a report to the CBD COP10 (late 2010) and the UNGA on the best scientific information available relevant to the identification of ecologically and biologically significant marine areas beyond national jurisdiction.

The Southern Ocean Observation System (SOOS) group will meet in September 2009 in Venice, Italy. Lucia Campos will represent CAML and with Dan Costa (TOPP) will ensure that biological observations and animal oceanographers remain on the agenda, in addition to the traditional physical and chemical observations. CAML participants have provided expert information to SOOS at previous meetings.

C. PROJECT MANAGEMENT & INTERNAL COMMUNICATION

Please list any changes in management or governance since the 2008 Annual Report.

The Project Leader, Michael Stoddart, remains fully involved with CAML at his new appointment as Interim Chair of the Institute of Marine and Antarctic Science at the University of Tasmania. His new email is shown on the covering page.

D. PARTNERSHIPS & COLLABORATION

Please identify any organizations, government agencies, science programs, and non-CoML projects with which your CoML project has an affiliation and briefly describe the nature of each relationship. List only those that are new since submitting the 2008 Annual Report.

Organization Name	Point-of-Contact (Name)	Nature of Relationship
IUCN	Kristina Gjerde	Providing information on ecoregions in Antarctica
Supercomputer Facility University of Western Australia	Karen Haines, Peter Morse	Development of stereoscopic videos, 3D rendering, 3D ceramic printing
CCAMLR	Denzil Miller	Designation of Vulnerable Marine Ecosystems
Shirshov Institute. Moscow	Andrey Gebruk	Rescue of Antarctic data not in electronic format

E. LIAISONS

Please list only changes to your liaisons since submitting the 2008 Annual Report.

No change

3. APPENDICES

Please be sure to complete the following attachments:

Three Appendices a,b,c, attached. No change since submission of CAML renewal proposal to Sloan in July 2009.

a. Milestones

Attached are the Milestones submitted with your 2008 Annual Report (or last renewal proposal, if more recent). Please review and note any milestones that will not be accomplished, along with a brief explanation of the reason(s).

b. Current Funding Report

Please use the template provided to report on new grants and pending applications since submitting the 2008 Annual Report.

c. Ship-time Report

Please use the template provided to report on ships used by your project and days at sea. Please include new information since submitting your 2008 Annual Report and note any update on shiptime noted as "tentative" in the 2008 report. If not applicable, just ignore this appendix.

d. Images

Please provide 1-2 high resolution images illustrating this year's scientific highlights or accomplishments (These are used by the Secretariat and SSC members in presentations about CoML). Please be sure to include the appropriate photo credit.

Two images attached.

Photo 1. CAML crew wins the Outstanding Excellence award at the Census All Programs Meeting, Long Beach USA, February 2009. Credit: Alan Butler CSIRO.

Photo 2: CAML Synthesis Symposium, Genoa Italy, May 2009. Credit: Chazz Marriott NIWA.

e. Methodologies (Optional, only if updated)

Please provide updated project Methodologies, only if they have been updated in the past year.

With the Mapping and Visualisation group, CAML has used innovative software and analysis methods, including probabilistic habitat mapping, ecoregionalisation, and GeoPhylo Builder for georeferenced dendrograms of phylogenetic relationships displayed on ArcGIS.

4. INPUT TO THE ONLINE DATABASES

Please be sure to add and/or update your project's information in the following CoML online databases*:

Upload of CAML bibliography and community data to CoML database – see below a and b.

CAML has entered 210 papers in the CoML bibliography and 322 contacts in the CoML community database. Many more await entry, preferably as a bulk upload. This work-in-progress was discussed with Chris Knowlton and Kristen Yarincik at the Mapping and Visualisation Workshop at Duke University in October 2008. The timing continues to slip and we have not completed the technical connections for the upload. This needs to be addressed and resourced, in order to reach our Milestone for early 2010 in Category 7 Tangible Outputs "All publications in SCAR-MarBIN and CoML database".

Timeline: October 2009.

Cost: USD 2,000.

a. Bibliography Database (Publications)

Check the references for your project that have already been entered and add any new references for Submitted, In Press, or Published; books, chapters, or significant peer reviewed papers, as well as for papers in preparation or development with an estimated date of submission or publication (<http://db.coml.org/comlrefbase/>). Whenever possible, it is also important to include an abstract, which will help Paul Snelgrove and others in reviewing potential content for inclusion in synthesis products. This exercise is important. We would like to be able to cite the impressive number of publications produced by the CoML projects. To date, there are almost 1700 records in the database.

Where possible, please upload PDFs of the papers. PDFs will only be accessible by Census users with appropriate passwords.

The 978 publications in the CAML bibliography of SCAR-MarBIN include some historical papers to which we regularly refer but do not regard as "products of CAML". We are ready to upload the publications produced by CAML, to the CoML Bibliography Database. The status of 157 papers waiting to load (published, in press, in prep etc) is listed under five categories (refereed publication, through media article).

To easily access PDFs, we recently found that the cross-browser, cross-platform 3D globe Poly 9 Globe at <http://www.poly9.com/> provides PDFs of Antarctic publications by clicking on the coordinates.

b. Community Database (Project Participants / Personnel Report)

Enter (or update) all of your project's participants (Principal Investigators, Project Manager(s), E&O participants, scientific participants, post-docs, graduate students, etc.). As guided, include addresses, roles, expertise, languages spoken, etc. (<http://db.coml.org/community/>). This exercise is important. Our brief program description currently states that CoML includes 2000 participants from around the world. There are currently 1100+ individuals listed in the community database. For October 2010, it is our plan that the website and some products will list every individual who participated in the Census throughout its ten years. This is only possible with your help.

c. Schedule Database

Lists all upcoming events, including project meetings, conferences, cruises and field work, etc. (<http://db.coml.org/schedule/> – note login information is the same as for the Community Database)

- If you have lost your login information or you need help entering your project's information, please contact Kristen Yarincik at the Secretariat (kyarincik@oceanleadership.org). For technical assistance with the database, contact Chris Knowlton at URI (cknowlton@gso.uri.edu).

The CAML calendar at <http://www.caml.aq/members/> is regularly updated and transferred to the CoML Schedule Database. The password available from victoria.wadley@aad.gov.au is required to protect copyright and unpublished material in the Members section.