



***FIRST U.S. CENSUS OF MARINE LIFE  
WORKSHOP REPORT***

Bartlett Gallery, Peabody Essex Museum, Salem, MA  
21-23 July 2003

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## EXECUTIVE SUMMARY

The US National Committee (USNC) joined prominent marine scientists and agency representatives in Salem, Massachusetts between July 21<sup>st</sup> to 23<sup>rd</sup> to discuss the strategy and research priorities for the United States component of the Census of Marine Life (CoML). The forty participants included representatives from academia, government agencies, research institutes and a member of the International Scientific Steering Committee (Appendix I). Working groups were formed according to expertise and interest to present recommendations for priority issues identified by the participants. Discussion was centered around the following topics: Mission-Driven Research, Making OBIS Work, Gaps in Basic Knowledge, Analysis of Data, Coral Reefs, Plankton and Bacteria, Regional Integration, Genomics, and Tracking Technology.

Although many important and relevant suggestions were presented, consensus on the paramount topics for the US component of the Census are reflected on the following recommendations:

1. Maintain OBIS as a priority in CoML. Work for further integration and complete interoperability with GBIF and IOOS, creating standards for data access, statistics and analysis for scientists and managers.
2. Introduce Coral Reefs (deep and shallow) as an additional CoML research component, using as starting points existing pilot projects, such as NaGISA, and the ecosystem-type approach of the Census of Marine Life in the Gulf of Maine.
3. Explore the diversity, biomass and distribution of Plankton, Archaea/Bacteria and Protists both in existing programs, and as a separate research project.
4. Investigate the use of established programs including the National Marine Protected Areas, National Marine Sanctuary Program and National Marine Fisheries Service resource surveys to provide opportunities for CoML research.
5. Use Gulf of Maine pilot project as a model for similar regional projects in the Gulf of Alaska and Gulf of Mexico.
6. Create an Arctic/Antarctic component to CoML, using the international platform that CoML provides for interaction and cooperation among scientists, and the sharing of resources, such as ship time and equipment.

Four subcommittees were formed and charged with developing documents for the next steps:

- Strategy Document: Clarence Pautzke, Paul Sandifer, Bill Shedd (Penny Dalton)
- New Projects: Nancy Knowlton, Terry Garcia, Jerry Schubel (Ron O'Dor)
- Technologies: Tom Fry, Daphne Fautin, Shirley Pomponi, Sylvia Earle (Fred Grassle)
- Regions: Sylvia Earle, Dan Finamore, Michael Roman (Giselle Firme)

The final US Strategy for the Census of Marine Life document is expected to be ready for distribution at the CoML Launch Event to take place October 24, 2003, at the Smithsonian Natural History Museum in Washington D.C.

### Monday, 21 July- Morning Session

The workshop began with a presentation by Jesse Ausubel (Sloan Foundation) on the history of the Census of Marine Life Program (CoML). Started in 1999, CoML consists of three components: Ocean Biogeographic Information System (OBIS), History of Marine Animal Populations (HMAP), and Future of Marine Animal Populations (FMAP). Senior Scientist Ron O'Dor then described the status of the program internationally and in the United States. Seven pilot projects are currently in progress: Census of Marine Life in the Gulf of Maine (GoMe), Patterns and Processes of Ecosystems in the Northern Mid-Atlantic (MAR-ECO), Pacific Ocean Salmon Tracking (POST), Tagging of Pacific Pelagics (TOPP), Biogeography of Chemosynthetic Ecosystems (ChEss), Natural Geography in Shore Areas (NaGISA), and Census of Diversity of Abyssal Marine Life (CeDAMar).

Prior to the workshop, invitees were sent a ranking card listing priorities for the outcome of the CoML in 2010. At the meeting, participants were asked to rank these priorities by allocating points to each. The ranking card and resultant percentage points allocated to each possible outcome are attached in Appendix II, and are listed below, in order of importance:

- A dramatic improvement in our knowledge of the magnitude and distribution of the diversity of animals, plants, and microbes in the marine environment, in the past, present and future (19.3%)
- Stimulation of the field of marine taxonomy and systematics, particularly the incorporation of molecular techniques for species identification and population differentiation (12.9%)
- Establishment of OBIS as a fully operational system that is used throughout the world (12.7%)
- An enhanced understanding of the fundamental processes responsible for the creation, maintenance, and regulation of marine biodiversity and for changes due to anthropogenic effects (10.3%)
- Provision of valuable information to policymakers regarding the preservation and conservation of marine life in the face of rapidly expanding threats from human activities (10.3%)
- Stimulation of the field of development of new techniques for studying linkages between local (ecological) and regional (oceanographic) processes and definite examples of how these tools have advanced our understanding these linkages (9.8%)
- Coupling of CoML and GOOS, with CoML providing the biological component (9.4%)
- A clearer documentation of life in the ocean before major human impacts. More reliable predictions of future abundance and diversity in the sea (5.8%)

While the results of the exercise were being tabulated, participants divided into three working groups to discuss the same priority outcomes. Each group considered how outcomes could be achieved including possible **approaches** (Will the scientific issue need databasing? Research?), **timing** (What could be accomplished in the short-term? What can be solved with one-time research and what needs longer attention?) and **agency interest** (Are there existing

programs to be built upon that can work synergistically with CoML programs?). The working groups also identified and discussed priorities not included in the distributed list. All working groups identified the need to: (1) examine existing data; (2) include plankton/microbes; and (3) create additional pilot projects, e.g. seamounts, plankton, and corals.

**Working Group A:** Sylvia Earle, Fred Grassle, Tom Fry, Robert Carney, Donna Schroeder, Julie Parrish, Jon Whitman, Doug Beard, David Pawson, Jim Sullivan, Ann Bucklin, Colomban de Vargas, Evan Richert, Donna Turgeon and Giselle Firme.

This group focused on research topics that are important for the scientific community and biodiversity studies, but are not currently addressed by CoML's research efforts.

- A microbes/plankton-focused research effort was proposed to document species diversity, distribution and biomass. Identifying partners, creating a sampling protocol for transects around U.S waters, and analyzing samples could take as little as four years.
- The "twilight-zone" (below 300 m) is under-sampled and could be explored with ROV's.
- Coral reefs and deep-water corals (75-100m) should be added as a CoML component, taking advantage of a major coral reef monitoring programs being developed by NOAA.
- The Gulf of Maine pilot project provides a model that could be adapted to other areas like the Gulf of Alaska and Gulf of Mexico. The approach would foster cooperation among scientists of different regions but similar research interests.
- Historical collections are important resources for determining what lived in the ocean however most marine taxa have few experts. A mentoring program like the NSF PEET Program should be started for late-age taxonomists to teach young scientists.
- Potential organizations that might contribute to CoML with resources, personnel or funding are: USGS, Supply Chain Information Resource Centre (ACIRC), NOAA, Smithsonian, Minerals Management Service, Department of Energy (hydrates), National Park Service, Navy, and National Ocean Industry Association.
- NOAA should be responsible for maintaining OBIS (the non-taxonomic databases/components) in the United States.

**Working Group B:** Nancy Knowlton, Paul Sandifer, Michael Domeier, Mitch Sogin, Wes Tunnel, Steve Brown, Catherine Marzin, Phil Taylor, Phil Bogden, Dale Kiefer, Caroline Good and Kristen Yarincik.

This group looked at scientific considerations for addressing the research priorities, and developed several recommendations.

- Whole ecosystems are the best approach. The most compelling aspects of CoML are those which study the marine life in relation to its environment.
- Researchers should use new and comprehensive taxonomic collections.
- Projects must integrate surveys across scales. An understanding of the various levels of biodiversity will be necessary to interpret the significance of responses and changes.
- Priorities should be placed on developing projects that are well funded and make their results accessible for the largest number of people possible.

What could be accomplished immediately:

- Seamounts and deep sea coral research through Ocean Exploration
- Projects that can be integrated with NaGISA, such as REEF, REEFCHECK
- Major coral reef monitoring project in NW Hawaiian Islands
- Inventory assessment of Caribbean corals through the National Park Service
- Continuous Plankton Recorder (CPR) project
- Photogallery of projects in OBIS as easy way to communicate
- Atlas of ignorance; a distribution map that shows what has and has not been studied
- Combined high-resolution mapping of “hotspots” through coordination with NOS, USGS.

**Working Group C:** Daniel Finamore, Clarence Pautzke, Jo-Ann Leong, Marjorie Reaka-Kudla, Tom Royer, Kim Benson, Robert Gisiner, Bruce MacFarlane, Jeremy Collie, Russ Hopcroft and Andy Rosenberg.

This group looked at problems associated with communicating CoML to the and identified several activities that could be accomplished immediately:

- Mining of available data
- Definition of protocols for sampling
- Use of the infrastructure of Sanctuaries and Marine Parks for pilot projects
- Taxonomic inventory in the Gulf of Mexico
- Inclusion of microbial diversity surveys and sampling of the microbial community.

### **Monday, July 21- Afternoon Session and Tuesday July 22- Morning Session**

In the afternoon, the three working groups re-formed to discuss **Mission-Oriented Research, Making OBIS Work and Gaps in Basic Knowledge**. This discussion continued the following day. Reports from these working groups were as follows:

**Mission Oriented Research Working Group:** Robert Gisiner, Michael Domeier, Jeremy Collie, Andy Rosenberg, Clarence Pautzke, Catherine Marzin, Steve Brown, Bruce Mac Farlane, Tom Fry and Kristen Yarincik.

The group first clarified the definition of CoML to aid the discussion:

*The Census of Marine Life is a growing global network of researchers in more than 45 nations engaged in a 10-year initiative to assess and explain the diversity, distribution, abundance and functional relationships of life in the oceans – past, present, and future.*

The goals of CoML:

- Determining ecological change
- Exploring new habitats and their form and function
- Gaining a deeper understanding of the components of ecosystems
- Identifying the determinants of species distribution and abundance
- Providing a basis for assessing human impacts on marine life

Research programs that address these five goals:

- Project SeaHorse (University of British Columbia, funding by Pew/Packard)
- SeaNet (New Hampshire)
- Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO)
- California Cooperative Oceanic Fisheries Investigation (CalCOFI)
- Winds to Whales
- Gulf of Maine Program
- NMFS Data on Gulf of Alaska
- Continuous Plankton Recorder (CPR)
- Deep Coral Research Program (NOAA)
- Coral Reef Task Force- Hawaiian Islands
- NOAA Ocean Exploration
- National Oceanographic Partnership Program (NOPP)
- Bering-Aleutian Salmon International Survey (BASIS)
- North Pacific Research Board: cold water coral, using submarines in the Kodiak and Aleutian Islands.

**OBIS Working Group:** Daphne Fautin, Fred Grassle, Dan Finamore, Donna Turgeon, Tom Royer, Evan Richert, David Pawson, Julie Parrish, Dale Kiefer, Caroline Good, Steve Gittings, Ann Bucklin, Doug Beard and Phil Bogden.

To become part of OBIS, data must be electronic available, and taxonomically and spatially resolved.

Needs:

- Standards with Federal Geographic Data Committee (metadata compliant)
- Standards for data access
- Visualization

Challenges:

- Establishing interoperability between observing systems
- Develop statistical and analytical tools
- Globalizing the OBIS portal
- Speeding process of getting data from field into system
- Increasing the resolution

**Gaps in Basic Knowledge Working Group:** Jo-Ann Leong, Nancy Knowlton, Colomban de Vargas, Mitch Sogin, Paul Sandifer, Wes Tunnel, Marjorie Reaka-Kudla, Russ Hopcroft, Robert Carney, Sylvia Earle, Kim Benson, Donna Schroeder, Jim Sullivan, Penny Dalton, Giselle Firme.

- Currently there are no CoML projects on Coral Reefs. The timing is especially propitious because the World Bank is funding a US\$ 20 M worldwide research effort with four nodes: Tanzania, Philippines, Caribbean and Indonesia. The United States could add a US Coral Reef node, with emphasis on census, bioproducts, and taxonomy, and create a consortium of interested parties such as the Global Environmental Fund, Coral Reef Task Force, Dept. of Interior, Navy, NSF, NOAA.
- Estimate species richness of the oceans- integrate into ongoing CoML programs, so that in 10 years species can be reassessed and provide a new estimate of number of species.

- Lack of sampling for plankton, especially in deep water (>300m), and of fragile forms. Develop a standard protocol and incorporate plankton and microbe sampling into existing projects, such as GoMe, CeDAMar.
- Need to introduce projects on the Polar Seas, the front edge of climate change and important biodiversity areas.
- Need to synthesize data on areas such as the Gulf of Mexico. Use resources such as MMS, the oil industries, and the Navy that have years of data that can be shared.
- Compare biodiversity inside and outside Sanctuaries.

### **USNC Response:**

After the plenary report of the working groups, members of the US National Committee commented on what they were hearing at the Workshop:

*Tom Fry* -- The strategic document draft was well received, and the real issue is to sell CoML to scientists- what can CoML offer to scientists if it does not provide funds for research?

*Dan Finamore* -- Participants seemed to have different expectations for CoML, particularly how it could help those working on less charismatic groups of organisms. CoML should provide access to funding and tools for scientists, as well as acting in public relations as a forum for announcing new discoveries.

*Paul Sandifer* -- The strategy document is pointed in the right direction. More thought must be put into determining what CoML is for: power to get government and public attention, data that get put into OBIS and other transparent databases, opportunities for sampling, “piggybacking” on other cruises and programs. A coral reef component is missing in CoML, and should be mentioned in the strategic document. CoML should include Gulf of Mexico, Chesapeake Bay, and similar regions, since much interest and funding is at regional levels.

*Nancy Knowlton* – CoML is diffuse and laid-back; it needs a more focused and energetic approach. The best way to interact with scientists is through OBIS. To market CoML there must be an entity for communication with legislators.

*Clarence Pautzke* -- To be successful in the federal appropriations process, a program must appeal to constituents, including fisherman and ocean industries for whom ‘biodiversity’ may carry a negative connotation. Before the October event, USNC needs to: work on an overall “catchy” mission statement including 5- 6 objectives for the US CoML; determine how to create partnerships (funding or services); and determine where CoML will get its momentum and what the incentives for scientists are. Scientists must be partners, not competitors. Is CoML playing a role in providing information to ecosystem managers? A business plan must be developed.

In the ensuing discussion, participants mirrored the concerns of USNC for a stronger PR strategy. A good example is the NOAA Ocean Exploration website, where good graphics and user-friendliness attract one million hits each year. This is a measure of success that can be presented to decision-makers. Participants also indicated that an incentive for scientists to join CoML is the level of recognition that it brings to those who are part of this global program, as well as providing an opportunity to collaborate with other international scientists and projects.

Following the discussion, Wes Tunnel made a brief presentation on the Gulf of Mexico Program that will start in 2005 in collaboration with Cuba and Mexico. Yearly cruises will collect data to develop a census of Gulf species that will be transferred to OBIS. In October a state of knowledge conference will take place to pull together information that has already been collected.

### **Tuesday, July 22- Afternoon Session**

A new set of working groups was formed to provide recommendations on the three themes that were most frequently discussed in earlier working sessions: **Analysis of Data, Coral Reefs and Biogeography and Biodiversity of Plankton and Microbes.**

**Biogeography and Biodiversity of Plankton and Microbes Working Group:** Mitch Sogin, Paul Sandifer, Ann Bucklin, Russ Hopcroft, Colomban de Vargas, Dale Kiefer, Jim Sullivan, Giselle Firme.

- In terms of biological diversity and productivity, the smaller organisms represented by the plankton and the microbial communities are extremely important and should be included within the national and international CoML programmatic framework.
- Special attention should be given to sampling for plankton and microbes at known “hot spots” of biological diversity, such as coral reefs and vent communities.
- In organisms small enough that morphology is difficult to study, molecular methods will be necessary to address questions relevant to diversity and biogeography. Such methods are compatible with other, more traditional sampling approaches so could fairly readily be incorporated into or piggybacked onto cruises or other sampling programs already underway.
- Major advance in knowledge of marine microbial communities could be made through a CoML effort. The first step should be a CoML-sponsored Workshop on Microbial Diversity. This is already being planned (Mitch Sogin).
- Plankton can be easily sampled, but like microbes, much of the cost and complexity will be in analyzing the samples.
- Plankton and microbial communities deserve substantial attention on their own. Samples from particularly interesting environments (e.g., vent communities) suggest that the plankton component will represent a very substantial reservoir of previously unknown forms. The visibility of the MAR-ECO program within the CoML framework suggests that there may be opportunity to develop support specifically for cruises targeted toward plankton and microbes. This needs to be explored further.
- The next step for dealing with the plankton issues should also be a formal workshop organized under aegis of CoML before the end of calendar year 2003.

**Coral Reef Working Group:** Nancy Knowlton, Jo-Ann Leong, Michael Domeier, Jon Witman, Wes Tunnel, Marjorie Reaka-Kudla, David Pawson, Kim Benson, Dan Finamore, Kristen Yarincik.

A workshop on coral reefs should be organized for scientists, agencies and organizations involved in coral reef activities and datasets, such as those of the World Bank, Coral Reef Task Force, NOAA, Society for the Conservation of Reef Fish Aggregations, Hawaii Coral

Reef Initiative, National Cancer Institute, World Wildlife Fund, The Nature Conservancy, Conservation International and ReefBase. The U.S. effort should be linked to a developing proposal from the Australian Institute of Marine Science.

The group identified potential U.S. nodes for a coral survey: Gulf of Mexico, Puerto Rico, Hawaii, Virgin Islands and the Western Pacific Island Territories.

In addition to identifying existing efforts on which to build, the working group identified new research activities that the Census can initiate, including:

- Regional versus local determinants of biodiversity
- Latitudinal studies
- Microbial census of living corals
- Survey of deep water reef fishes
- Twilight zone (50-150m) in the tropics
- Study of meiofauna in sediments and coral rubble surveys
- Update of coral taxonomy

Specific studies must be proposed in a way that shows how they would address the larger context of coral reef communities.

**Data Analysis Working Group:** Daphne Fautin, Fred Grassle, Doug Beard, Phil Bogden, Steve Brown, Robert Carney, Jeremy Collie, Robert Gisiner, Caroline Good, Catherine Marzin, Julie Parrish, Evan Richert, Andy Rosenberg, Thomas Royer, Donna Schroeder, Bruce MacFarlane, Clarence Pautzke.

1. FMAP can be used as a tool for time-series analysis, looking at spatial statistics and creating routines for analyzing tag data.
2. Issues to be resolved include the 'zero problem' (when sampling was not performed), data access and database integration

### **Day 3: Wednesday, 23 July**

The working groups discussed **Regional Integration, Genomics, and Tracking Technology**.

**Genomics Working Group:** Mitch Sogin, Nancy Knowlton, Jim Sullivan, Jo-Ann Long, Paul Sandifer, Colomban de Vargas, Robert Carney, Ann Bucklin, Giselle Firme.

- Barcode of Life will not work with any single gene, but should use a spectrum of genes, such as CO1, rRNA, 18S, 28S.
- There must be agreement on what questions to ask: What is the relative abundance of diversity? What is the novelty of the environment?
- There are 2 possible models for a biodiversity survey: a) centralized, using high throughput sequences with no morphological analysis; and b) distributed, including morphological analysis (students can run the samples and learn morphology in this longer process). Perhaps the models working concurrently would be best.

- It would be useful to do a pilot project for a rapid bulk analysis of the diversity of organisms by extracting organic matter from the water column, or under rocks, and determining if new genes or sequences are found, and then return to the site for a closer inspection.

**Regional Integration:** Thomas Royer, Daphne Fautin, Clarence Pautzke, Steve Brown, Daniel Finamore, Russ Hopcroft, Kim Benson, Donna Schroeder, Dale Keifer, Marjorie Reaka-Kudla, Jeremy Collie, Fred Grassle, Sylvia Earle, Wes Tunnel, Penny Dalton and Kristen Yarincik.

- Use Gulf of Maine model for the Gulf of Mexico and other like regions
- Need better maps of habitats and physical processes, GIS with visualization capability to guide sampling
- Improve Fishery surveys with acoustic approaches (continuous), optical approaches (laser line scan system on AUV, video-bases autonomous sensors), real-time satellite data on currents, more elegant techniques to replace trawling
- Optimize Argo floats for sampling biological parameters
- Share techniques among like regions/habitats
- Create innovative applications of existing technologies
- Develop synoptic maps of the ocean floor

**Tracking Technology Working Group:** Ron O’Dor, Donna Turgeon, Bruce MacFarlane, Andy Rosenberg, Evan Richert, Julie Parrish, Catherine Marzin, Steve Gittings, Robert Gisiner, Phil Bogden, Doug Beard and Michael Domeier.

- Recommend linking smaller tracking projects associated with Marine Reserves using POST in conjunction with NaGISA, and Marine Protected Areas.
- The Navy has a strong interest in locating marine mammals. There are possible projects using the large-scale SOSUS array to track individual whales with voice recognition in parallel with TOPP. Smaller acoustically instrumented test ranges now being developed could also be used in conjunction with TOPP or POST.
- Management issues relating to important commercial species other than salmon (e.g. sardines, anchovy, squid) can be resolved with the POST network and projects on these species can support the data gathering and handling cost of the project.
- The capacity of both TOPP and POST to gather physical data about the ocean is huge. Developing interactive software for connecting CoML projects, OBIS and IOOS are a high priority.
- Alternative satellite communication systems to ARGOS are coming on line and projects to develop new miniaturized animal tags using the extra bandwidth are needed.

**Conclusion:**

Participants identified the following priority recommendations for the United States' component of the Census of Marine Life:

1. Maintain OBIS as a priority in CoML. Work for further integration and complete interoperability with GBIF and IOOS, creating standards for data access, statistics and analysis tools for scientists and managers.
2. Introduce Corals (deep and shallow) as an additional CoML research component, using as starting points existing projects, such as NaGISA, and the ecosystem-type approach of GoMe.
3. Explore the diversity, biomass and distribution of plankton, Archaea/Bacteria and Protists both in existing programs and as a separate research project.
4. Investigate the use of established programs including the National Marine Protected Areas, National Marine Sanctuary Program and National Marine Fisheries Service resource surveys to provide opportunities for CoML research.
5. Use Gulf of Maine pilot project as a model for similar regional projects in the Gulf of Alaska and Gulf of Mexico.
6. Create an Arctic/Antarctic component to CoML, using the international platform that CoML provides for interaction and cooperation among scientists, and the sharing of resources, such as ship time and equipment.

Four subcommittees of the USNC were charged with developing documents for the next steps:

- Strategy Document: Clarence Pautzke, Paul Sandifer, Bill Shedd (Penny Dalton)
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- Technologies: Tom Fry, Daphne Fautin, Shirley Pomponi (Fred Grassle)
- Regions: Sylvia Earle, Dan Finamore, Michael Roman (Giselle Firme)

The Workshop ended with CORE President Admiral Richard West thanking the participation of all attendees, and noting the importance of taking advantage of the timing in the U.S. ocean community with both the Pew Commission Report and the upcoming Ocean Commission Report being presented to the public and Congress.

## Appendix I: Participants

### Scientific and Government Attendees

Doug Beard	National Biological Information Infrastructure
Kim Benson	NOAA Marine Sanctuaries
Phil Bogden	Gulf of Maine Ocean Observing System
Steve Brown	NOAA National Marine Fisheries Service
Ann Bucklin	University of New Hampshire
Robert Carney	Louisiana State University
Jeremy Collie	University of Rhode Island
Colomban de Vargas	Rutgers University
Michael Domeier	Pfleger Institute of Environmental Research
Robert Gisiner	Office of Naval Research
Steve Gittings	NOAA Office of Marine Sanctuaries
Caroline Good	Duke University Marine Lab
Russell Hopcroft	University of Alaska Fairbanks
Dale Kiefer	Wrigley Inst. of Environmental Studies
Jo-Ann Leong	Hawaii Institute of Marine Biology
Bruce MacFarlane	NMFS Santa Cruz Laboratory
Catherine Marzin	NOAA Office of Marine Sanctuaries
Julie Parrish	University of Washington
David Pawson	National Museum of Natural History
Marjorie Reaka-Kudla	University of Maryland
Evan Richert	University of Southern Maine
Andy Rosenberg	University of New Hampshire
Thomas Royer	Old Dominion University
Donna Schroeder	University of California Santa Barbara
Mitch Sogin	Marine Biological Laboratory
Jim Sullivan	NOAA Office of Marine Sanctuaries
Phil Taylor	NSF, Biological Oceanography Program
Wes Tunnel	Harte Research Inst. for Gulf of Mexico Studies
Donna Turgeon	NOAA Coastal Monitoring and Assessment
Jon Whitman	Brown University

### Committee Members (both USNC and SSC) Attending

Sylvia Earle	Deep Ocean Exploration and Research
Daphne Fautin	University of Kansas
Daniel Finamore	Peabody Essex Museum
Tom Fry	National Ocean Industries Associations
Fred Grassle	Rutgers University
Nancy Knowlton	Scripps Institution of Oceanography
Clarence Pautzke	North Pacific Research Board
Paul Sandifer	NOAA Nat. Centers for Coastal Ocean Science

### Consortium for Oceanographic Research & Education (CORE), CoML U.S. Program Office

Penny Dalton	CORE (Vice President)	<a href="mailto:pdalton@coreocean.org">pdalton@coreocean.org</a>
Giselle Firme	CORE (Research Fellow)	<a href="mailto:gfirm@coreocean.org">gfirm@coreocean.org</a>
Ron O'Dor	CORE (Senior Scientist)	<a href="mailto:rodor@coreocean.org">rodor@coreocean.org</a>
Bob Wagner	CORE (Travel and Meeting Planner)	<a href="mailto:rwagner@coreocean.org">rwagner@coreocean.org</a>
Kristen Yarincik	CORE (Research Associate)	<a href="mailto:kyarincik@coreocean.org">kyarincik@coreocean.org</a>

Appendix II: Ranking Card

**U.S. CoML 2010 Priorities & Expectations: A Ranking Card**

***You have a total of 100 points to allocate among the items below.***

CoML Output/Outcome in 2010	% Points
An enhanced understanding of the fundamental processes responsible for the creation, maintenance, and regulation of marine biodiversity and for changes due to anthropogenic effects.	10.3
A dramatic improvement in our knowledge of the magnitude and distribution of the diversity of animals, plants, and microbes in the marine environment.	19.3
Stimulation of the field of development of new techniques for studying linkages between local (ecological) and regional (oceanographic) processes and definite examples of how these tools have advanced our understanding these linkages.	9.8
Stimulation of the field of marine taxonomy and systematics, particularly the Incorporation of molecular techniques for species identification and population differentiation.	12.9
Provision of valuable information to policy makers regarding the preservation and conservation of marine life in the face of rapidly expanding threats from human activities with definite examples, e.g., MPAs, leatherback turtles, management of fisheries, etc.	10.3
Establishment of OBIS as a fully operational system that is used throughout the world.	12.7
Coupling of CoML and GOOS, with CoML providing the biological component.	9.4
A clearer documentation of life in the ocean before major human impacts, e.g. HMAP.	5.8
More reliable predictions of future abundance and diversity in the sea, e.g. FMAP.	5.7
Write in your personal priority for CoML in 2010.	3.8
<b>Total Points</b>	<b>100</b>