Deep-Sea Coral Research and Technology Program
Information Management Workshop
July 20th & 21st, 2010, Silver Spring, Maryland – Workshop Summary

Executive Summary:

The National Oceanic and Atmospheric Administration (NOAA) held an information management workshop for deep-sea corals in Silver Spring, Maryland, on July 20th and 21st, 2010. The workshop was designed to support the development of a NOAA Deep-Sea Coral Information Management Plan and the implementation of NOAA's Deep Sea Coral Research and Technology Program. The Information Management Plan will develop a system for managing new and existing information to enhance access to deep-sea coral data as well as meet the provisions of the Magnuson-Stevens Fishery Conservation and Management Act Section 408: Deep Sea Coral Research and Technology Program (DSCRTP). The workshop primarily focused on three areas of consideration:

- Site characterization and field survey protocols
- Formats and information on the location of deep-sea coral; and,
- High leverage products and activities to be conducted by the DSCRTP

The workshop was attended by 29 participants. Presentations by several external partners set the stage for discussions that included all participants. Results from the workshop included identification of common categories of data collected during field surveys, identification of existing compilations and databases of deep-sea coral locations, discussion of database formatting, identification of high leverage potential activities for the program, and approaches to recording absence data during field surveys.

Follow-up actions from the workshop include:

- NOAA will put together a team of internal and external partners to develop draft guidance for providing information on deep-sea coral and sponge habitats from field research activities.
- NOAA will use the U.S. Geological Survey Cold-Water Coral Geographic Database as a starting point for adopting a standard for recording known deep-sea coral locations.
- NOAA will develop a Deep-Sea Coral Information Management Plan.
- NOAA will solicit input from workshop participants and others on content and formats for data collecting of deep-sea corals.

Workshop Summary

Introduction and Background:

The Deep-Sea Coral Information Management Workshop was held in Silver Spring, MD, on July 20th & 21st, 2010 (Appendix A – Workshop Agenda; Appendix B – Workshop Participants). The workshop was funded and led by NOAA's Deep Sea Coral Research and Technology Program (DSCRTP). The Deep-Sea Coral Research and Technology Program (DSCRTP; MSA Section 408) is implemented under the auspices of NOAA's Coral Reef Conservation Program (CRCP), a matrix program that leverages expertise from National Ocean Service (NOS), National Marine Fisheries Service (NMFS), Oceanic and Atmospheric Research (OAR) and National Environmental Satellite, Data, and Information Service (NESDIS) with a mission to protect, conserve and restore coral resources by maintaining healthy ecosystem function. The goal of the DSCRTP is to provide sound scientific information needed to conserve and manage deep-sea coral ecosystems.

The DSCRTP first received funding in fiscal year (FY) 2009. This first year saw an integrated set of activities designed to inform the management of deep-sea coral ecosystems and included developing data management capabilities. The program is now in its second year and expanding its data management capabilities to include the development of a deep-sea coral data management plan that will serve to guide the policies and practices associated with managing information from field research activities for the program. The Information Management Workshop was held to begin the discussion and initiate input from partners on the current state of practices for managing deep-sea coral information and learn more about existing information reserves.

Workshop Purpose:

The primary purpose of the workshop was to gather input that will assist NOAA in building a deep-sea coral data management system that will better manage existing and new information to enhance collaboration and access to data for management purposes as well as meet the mandates of NOAA's Deep Sea Coral Research and Technology Program.

Workshop Objectives:

- Increase understanding of historical and current approaches for deep-sea coral and sponge location observations and site characterizations
- Gather input on content and preferred formats of national databases for observation locations and site characterization to meet requirements of NOAA's DSCRTP
  - Format question: What information should be in this data set?
  - Format question: What format would be most effective?
  - Process question: How can we insure information is submitted to the national program?
- Solicit recommendations on products/analysis NOAA could develop as a national program

Participants:

Kathy Scanlon Catanach (USGS), Dave Packer (NEFSC), James Sinclair (BOEMRE), Curt Whitmire (NWFSC), Bob Stone (AKFSC), Steve Ross (UNCW), Les Watling (UH), John Guinotte (MCBI), Chris Kelly (HURL), Amy Baco-Taylor (FSU), Steve Cairns (SI), Ed Bowlby (NMS), Rhian Waller (USGS/UH), Ed Bowlby (NMS), Sandra Brooke (MCBI), Martha Nizinski (SI), Chris Yesson (ZSL), Roger Pugliese (SAFMC), Chris Yesson (ZSL), Tim Batista (NCCOS), Don Collins (NESDIS), Stephanie Kavanaugh (NCCOS), Jessica Morgan (NESDIS), John Tomczuk (OAR), Fan Tsao (NMFS), Tom Hourigan (NMFS), Jamie Higgins (NCCOS), Tom Bigford (NMFS), Dan Dorfman (NCCOS)
(A complete list of participants with contact information is attached as Appendix B)

Workshop Findings:

The workshop focused on three topics of primary concentration: recording and presenting data from field surveys of deep-sea coral communities, existing data compilations of deep-sea coral locations, and developing value-added products from data.

Presentations:

Tom Bigford (NOAA - NMFS, Office of Habitat Conservation) provided opening comments on the objectives of the DSCRTP, its history, and the Program's vision for a collaborative effort. Dan Dorfman (NOAA – NOS) provided an overview of the DSCRTP's mandates and focus on delivering data and information relevant to NOAA's management responsibilities, especially fisheries and National Marine Sanctuaries; its matrix configuration, field research efforts, past and current activities, strategic plan, and an overview of the workshop plan.

1. **Site Characterization/Field Survey Protocols:**

    a. *Characterizing deep-sea coral habitats*

NOAA often needs to provide summaries of scientific findings in formats that are comprehensible and useful to natural resource managers. Often the timelines for development and submission of such information is driven by regulatory deadlines that may be shorter than the time needed for the production of peer-reviewed journal articles. NOAA's DSCRTP is therefore interested in developing approaches to summarize management relevant information and associated metadata from its funded field studies. In addition to such summaries, however, the DSCRTP is committed to support more detailed analysis and scientific publication of data collected in its field research activities.

Steve Ross, University of North Carolina at Wilmington, provided a presentation outlining the site characterization approach that was employed for the Southeastern United States Deep-Sea Corals Initiative (SEADESC; Partyka et al. 2007). The SEADESC report was developed "to generate bottom habitat characterizations along with basic metadata from direct observations that are useful to a broad audience, have reasonable repeatability (with simplified, clearly defined

habitat categories), and that could be generated quickly" (Partyka et al. 2007). The SEADESC Report presented standardized forms including habitat descriptions, metadata and corrected submersible tracks for individual submersible dives, and summary forms for geographic sites where several dives took place. The SEADESC approach was used as a starting point to inform discussions on the development of standard protocols for summarizing data from field surveys and site characterization.

Discussion following Steve Ross' presentation:

The SEADESC approach was generally seen as a valuable model for getting summary information to managers quickly. It has been utilized in this fashion by the South Atlantic Fishery Management Council. The SEADESC format can also be used to summarize historical dives in a common framework.
Lots of additional information is available to be input to this format. This is true both in the Southeast and other regions. One next step could be to provide quick access to information such as GIS products. Google Ocean could provide an outlet for this type of information. However, it was noted that there are currently inaccuracies in Google Ocean.

Verifying taxonomic identifications is a major issue in developing timely information products. Final identifications can take years, and a number of deep-sea coral taxa are in need of revision. However, in many cases, the information needed first by managers relates to the density and extent of habitats for a subset of organisms and need not be delayed while waiting for subsequent species identifications and systematic revisions.

This model has shown value in the Southeast and participants indicated its potential for use in other regions (west coast, Alaska). SEADESC received initial funding from NOAA's Office of Ocean Exploration and other sources, including most recently the South Atlantic Fishery Management Council. Further refinement and additions to the existing SEADESC database are not currently funded. If the DSCRTP were to adopt a site characterization and dive summary format similar to the SEADESC model for reporting on field research, it could, in association with other parts of NOAA, provide an opportunity for supporting this kind of work.

b. Field Survey Protocols

NOAA's DSCRTP is a national program that anticipates supporting deep-sea and sponge field research in different regions around the country. The program's data management should therefore be developed to handle the major categories of data that will be collected across the nation.

A group discussion was held to identify similarities in field survey protocols and to assess current methods. Currently, each research group has developed their own field survey protocol and data collection procedures. However, several consistencies were identified in the information which is being collected. A standard list of characteristics which are recorded was developed. A list of formats currently being used for reporting was also developed.

Following our initial discussion of types of information that may be recorded during field surveys, we broke the group into two sub-groups. Each sub-group was asked to list different protocols which were in use by their groups and specifically to address which characteristics were being tracked. The list of general categories of data collected in field surveys is found in Appendix D.

Three general categories of information were discussed in greater detail: (i) Video from ROVs and submersibles; (ii) recorded field observations; and (iii) biological samples.

Video, collected either by ROV or submersible, is a principal tool used in most deep-sea coral field investigations. Post-cruise analysis of videos, often in association with additional observations recorded during the dive can provide annotated datasets that hold a wealth of data. A high level of skill is often required to review and annotate videos. Also time and money need to be provided to insure this task is completed. Several participants noted new technologies that can facilitate video review and annotation, e.g., the Video Annotation and Reference System (VARS) developed by the Monterey Bay Aquarium Research Institute.

Results from the break-out groups and preceding discussion have been provided to a smaller workgroup, which will continue the development of draft site characterization and field survey protocols to meet the needs of the DSCRTP.

2. Databases of Deep-Sea Coral Locations:

The second issue addressed by the workshop was the development of a consistent database on known coral locations. The DSCRTP is required to identify known locations of deep-sea corals and submit such information to the appropriate Regional Fishery Management Councils. New discretionary authorities granted under the MSA as reauthorized in 2007, allow the National Marine Fisheries Service and the Regional Fishery Management Councils to protect from fishing impacts areas identified as containing deep-sea corals by the DSCRTP. Currently, there are an unknown number of compilations of deep-sea coral locations, some of which have been formalized into databases. Several compilation efforts in the U.S. and internationally have already attempted to bring together this information for individual regions, taxonomic groups, or projects. The DSCRTP is seeking to develop a single comprehensive resource of known coral locations in U.S. waters.

Currently, the most formal compilation project is the USGS Cold-Water Coral Geographic Database, version 1.0 (CoWCoG; Scanlon et al. 2010). Kathy Scanlon (USGS) presented the procedures and results for the development of this database. The database, developed in partnership with NOAA, includes over 1700 entries covering primarily U.S. waters in Gulf of Mexico and western North Atlantic Ocean. Most records are of scleractinian deep-sea corals, mostly from published scientific literature and museum collections, supplemented by other databases, notably, the Watling et al. (2003) geographic database of deepwater alcyonaceans of the northeastern U.S., one of the first deep-sea coral databases. CoWCoG relied upon expert taxonomic advice in its development and stands out for the extensive fields of metadata associated with each record.

Peter Etnoyer has recently developed a similar compilation for the geographic locations of gorgonians of the Gulf of Mexico, based on published records and museum specimens. Information on this recent effort was also presented to the group. Dr. Etnoyer is currently incorporating these data and metadata into the CoWCoG format.

Following the two database presentations, we asked the group to consider data formats and to evaluate existing approaches for their relevance to the current effort. The DSCRTP expects to build upon the structure of the USGS CoWCoG database, adding additional fields as needed and incorporating additional coral records, including from other regions, as they become available.

In addition to the discussion of database integration and structure, we also asked the participants to review our current collection of databases (see Box) and to suggest additional sources of information.

Deep-Sea Coral Geographic Datasets Currently Accessed by the DSCRTP:

Global Datasets
- Smithsonian Institution National Museum of Natural History
- Freiwald et al, (2004)

Regional Datasets
- USGS Coldwater Coral Geodatabase (Scanlon et al. 2010)
    - Incorporates Watling et al. (2003)
- Theroux and Wigley (1998)
- John Reed (unpublished)
- Etnoyer (in prep), Gulf of Mexico Gorgonian Dataset
- Deepwater Program: Northern Gulf of Mexico Continental Slope Habitats and Benthic Ecology, MMS, TDI Brooks International
- Marine Conservation Biology Institute (Compilations used in Etnoyer and Morgan, 2003; and (Morgan et al. 2005)
- Pacific Coast Ocean Observing System (PaCOOS), 1980-2007
- Monterey Bay Aquarium Research Institute
- Southern California Coastal Water Research Project
- Hawaii Undersea Research Laboratory Photo database

NOAA Datasets
- NMFS/AKFSC, Resource Assessment and Conservation Engineering (RACE) Division Trawl Survey Database
- NMFS/AKFSC NORPAC (Observer Database)
- NMFS/NWFSC Trawl Survey Database (data also incorporated in PaCOOS)
- Olympic Coast NMS Data – 2008 and 2010 data being processed; 2004 and 2006 preliminary data published.
- SWFSC – database on corals and structure-forming invertebrates has over 1,000 video dive surveys off Southern California (8,000 records; 20-900m)
- Flower Garden Banks National Marine Sanctuary – invertebrate database.

In response the workshop participants identified the following additional efforts that include information on deep-sea coral locations:

- Ocean Biodiversity Information System (OBIS)
    - Census of Marine Life of Seamounts (CENSEAM); global database of all corals on seamounts and all octocorals in all habitats.

- Biogeoinformatics of the hexacorals (Fautin and Buddemeyer, 2006)
- More MMS than listed dating back to the 1980's.
- Steve Ross (unpublished) Southeast U.S. and Gulf of Mexico datasets
- Numerous datasets from individual researchers

Discussion on existing databases:

Several areas were identified as key to ensuring the usefulness of geographic databases for deep-sea coral locations:

- Metadata associated with coral records are critically important. Without complete metadata, it is difficult to analyze the meaning of a "point on a map."
- Accurate taxonomic identifications at the appropriate level. While managers may be satisfied with knowing that corals exist in an area, the usefulness of a database for scientific purposes will depend upon the accuracy of the identification of the corals, and on the inclusion of citations and metadata that will allow tracking new names when there are subsequent systematic revisions to coral groups. However, species level identifications are not always necessary. Genus level determinations can be useful to discern, compare, and contrast habitat types.
- Locational accuracy is also a major issue. In some cases it requires estimation and judgment calls. Records should include a code for locational accuracy.
- It is also important to identify whether the coral records were from live corals or fossil corals.
- There are opportunities to link locations of corals with additional data or photos of the corals to add value to the databases.
- Further development of a National Deep-Sea Coral Geodatabase would benefit from an editorial committee including outside scientists with taxonomic and sampling methodology expertise.

International Perspective:
Chris Yesson from the London Zoological Society presented an update on their deep-sea coral work, in particular, efforts conducted under the European Coral Fish Project and CENSEAM. These activities include collaborative efforts to compile data on corals in the Northeast Atlantic and on octocorals on a global basis. He highlighted the need for identifying and cleaning up historic datasets and for central, long-term repositories for international data.

Coral Absence Data:

The majority of data efforts, including those described above, record only the presence of deep-sea corals. Lack of comparable data on where field surveys were conducted but no coral were found (absence data) often limits the usefulness of such data. For example, datasets that include both presence and absence data can produce much more robust models for coral habitat suitability.

Coral Absence Data Discussion – what characteristics should be recorded?

Discussion of coral absence data centered around which characteristics should be recorded. In many cases absence of corals occurs over portions of transects. There is limited opportunity for field work, so efforts tend to focus on areas where corals are expected to be found.

3. Products Derived from NOAA's Deep-Sea Coral Data Holdings:

NOAA's DSCRTP represents a continuing commitment to mapping, characterizing, and studying deep-sea coral and sponge habitats of the United States. In addition to research funded directly under the program, NOAA has a mandate and opportunity to synthesize existing and new data and provide value-added products for the scientific and natural resource management communities, and for the public at large. These efforts are tightly linked to the Program's national data management efforts.

Roger Pugliese presented on the deep-sea coral work being conducted by the South Atlantic Fishery Management Council. This presentation was provided to initiate a discussion on potential products or activities that could be conducted by the DSCRTP. Participants were asked which activities would have high leverage for advancing their work.

Group Discussion: National Deep-Sea Coral Data Products
Objective: To determine what products could be produced at the national level to advance management efforts, research and regional initiatives.

Suggestions:

- NOAA maintains a deep-sea coral coordination group which meets regularly to share information on current DSC activities. It was recommended that NOAA expand NOAA-wide deep-sea coral updates to include external participants (presentations, conference calls, etc.).
- Regional deep-sea species catalogs.
    - NOAA could make other regional catalogs like the Flower Garden Banks National Marine Sanctuary (FGBNMS) regional catalog, with the following:
    - More photos of different morphologies; close-up photos
    - History of the name
    - Distribution tables
    - Database format by regions
    - Current problem with catalogs is that you end up "pigeonholing" into common taxa, but you don't want to be too detailed.
    - Catalogs should be auto-updated via the web.
- Gorgonians need regional catalogs for taxonomic identification (3-4 regions); (for example: in the West Atlantic, there is a clear distinction between species occurring on the northern vs. southern U.S. coast)
- DNA bar-coding offers a useful tool for identification of unique taxa. There is already a DNA bar-coding pilot project for Hawaiian octocorals, and the DSCRTP is supporting bar-coding of octocorals collected in trawl surveys along the west coast.
- Information from reports should be available to the public.

    - Cruise reports and synthesis/conclusions.
    - Electronic forum.
    - Publicly-funded information should be publicly available.
    - Establish up-front what information will be available to whom.
- Post-processing of information collected during field research activities is often delayed due to scheduling and resource availability. DSCRTP needs to insure timelines and resources are provided for video analysis after field surveys are conducted.
- Maintenance of video is challenging – but it's really valuable to have it to go back to.

Outputs from Regional Field Investigations

- Web- and GIS-based, interactive maps with links.
- Products talked about today should be regional products. Work on a database in a region, then move on to next region.
- Some GIS products are already out there (IOOS) and NOAA needs to make sure people will use them.
- Integrate with existing IOOS products.
- What are the low-hanging fruits, considering cost is a limiting factor?
    - Research is progressing in all regions
    - Report format serves broad purpose: technical, multi-authored book should follow on regional report publication.
    - There will be a time-lag to report publication.

State of Deep Sea Corals of the United States

In 2007, NOAA published the first peer-reviewed report on the State of Deep Coral Ecosystems of the United States. The report consisted of an Introductory Chapter/National Summary and seven regional chapters authored by experts working in those fields. NOAA's Strategic Plan for Deep-Sea Coral and Sponge Ecosystems (NOAA 2010) indicates that NOAA intends to support regular updates of this report. There was a discussion on the value and timing of such an update.

- Overall the first report was viewed as highly useful and an update would be timely, as significant new work has occurred in many regions.
- There is a learning curve for producing regional reports, so utilizing the same authors would result in a timelier product this time around.
- Updates by region after each 3-year regional cycle of field research would result in a lag of more than ten years for updates from certain regions.
- The 5th International Deep-Sea Coral Symposium in Amsterdam (2012) would be a potential target for such a report.

Action Items:

NOAA's DSCRTP has begun working with partners on several activities based on recommendations from the workshop:

1. **Draft protocols for analyzing and reporting DSCRTP field data:**

Following the workshop a small group was formed to continue the development of a standard protocol for reporting from field surveys conducted during DSCRTP-funded research cruises. The group, led by Dan Dorfman (NOAA - NOS), consists of Tom Hourigan (NOAA/NMFS), Andrew Shepard (UNCW, NURP), Curt Whitmire (NOAA/NMFS), and Chris Kelly (UH, HURL). This group will address the development of consistent formats for field data reporting for key categories of work supported by the DSCRTP. This approach includes the following three draft standards:

a. A draft reporting format for summarizing research dive logs, metadata, and characterizing field research sites. An initial draft builds on the model of the SEADESC initiative and will be field tested in an upcoming research cruise off Florida aboard the NOAA Ship Ron Brown
b. A draft minimum standard recommendation for dive video annotation for deep-sea corals, sponges, and associated species of fishery management concern.
c. A draft standard set of metadata for tracking samples collected in the field.

2. Guidance to DSCRTP regional field research teams:

Results from the data management workshop are being used to refine guidance from the DSCRTP to regional three-year initiatives regarding expected deliverables. This information is intended to assist current efforts in the South Atlantic and along the West Coast as well as future initiatives.

3. Video analysis options:

Several participants at the Workshop noted the usefulness of the Video Annotation and Reference System (VARS) developed by the Monterey Bay Aquarium Research Institute (MBARI). VARS is a software interface and database system that provides tools for describing, cataloging, retrieving, and viewing the visual, descriptive, and quantitative data from video files and is regarded as state of the art. Dan Dorfman arranged for a site visit to MBARI to review VARS in terms of applicability to DSCRTP needs. The system appears to form a solid basis for standardizing video annotation techniques. Ed Bowlby at Olympic Coast NMS and Chris Kelley at the Hawaii Undersea Research Laboratory have arranged to have MBARI install VARS and adapt the system to meet their needs. MBARI is willing to share their system, provide training and individual adaptation, and the DSCRTP plans to further explore the utility of this system for NOAA's use.

4. Integrated database of known coral locations:

The USGS CoWCoG database presented at the Workshop was released in August 2010. NOAA's DSCRTP has agreed to partner with USGS in the future development of this database, and expects this to form the basis of a national database for recording known locations for deep-sea corals. Current data holdings are being added to this database and the CoWCoG structure is being reviewed to identify potential revisions needed to accommodate data from a range of current data holdings. This work is being initiated in the Northeast region in order to support a request for information from the New England Fishery Management Council. NOAA and USGS, along with external experts, will collaborate on approaches to ensure the quality of subsequent versions of the database.

5. Products derived from NOAA's Deep-Sea Coral Data:

The DSCRTP is funding a number of small scale projects to meet the priority needs of NOAA and the broader research community. Developing predictive models, collecting knowledge of coral locations from existing dive videos, evaluating fishing impacts, and the development of bycatch identification guides and training were all seen as high leverage activities. The DSCRTP will continue these projects. In addition, NOAA expects to begin work on an update on the State of Deep-Sea Coral and Sponge Ecosystems of the United States in 2011.

6. NOAA Deep-Sea Coral Data Management Plan:

The NOAA - DSCRTP is developing a data management plan for NOAA's deep-sea coral work. This plan will build on the results from the data management workshop and will also likely reach out to the workshop participants and other partners for additional information and advice. This plan will be integrated within a Coral Reef Conservation Program data management plan which is being developed concurrently.

References:

Etnoyer, P. 2009 Distribution and diversity of Octocorals in the Gulf of Mexico, PhD dissertation, Texas A&M University – Corpus Christi .

Etnoyer, P., and Morgan, L., 2003, Occurrences of Habitat-forming Deep Sea Corals in the Northeast Pacific Ocean: Marine Conservation Biology Institute, Richmond, WA.

Scanlon, K.M., Waller, R.G., Sirotek, A.R., Knisel, J.M., O'Malley, J.J., and Alesandrini, Stian, 2010, USGS cold-water coral geographic database—Gulf of Mexico and western North Atlantic Ocean, version 1.0: U.S. Geological Survey Open-File Report 2008–1351, DVD-ROM. (Also available at http://pubs.usgs.gov/of/2008/1351/).

Theroux, R., and Wigley, R., 1998, Quantitative Composition and Distribution of the Macrobenthic Invertebrate Fauna of the Continental Shelf Ecosystems of the Northeastern United States: NOAA Technical Report #100-455-339, Silver Spring, MD.

Watling, L., Auster, P., Babb, I., Skinder, C., and Hecker, B., 2003, A Geographic Database of Deepwater Alcyonaceans of the Northeastern U.S. Continental Shelf and Slope, version 1.0: National Undersea research Center, University of Connecticut at Avery Point, Groton, CT.

Appendix A:

Deep-Sea Coral Information Collection, Integration & Management Workshop

July 20-21, 2010
Courtyard Marriot, Silver Spring, MD
DRAFT

Purpose:
To gather input that will assist NOAA in building a data management system that will better manage existing and new information to enhance collaboration and access to data for management purposes as well as meeting the mandates of NOAA's Deep Sea Coral Research and Technology Program.

Workshop Objectives:

- Increase understanding of historical and current approaches for deep-sea coral and sponge location tracking and site characterizations
- Gather input on content and preferred formats of national databases for observation locations and site characterization to meet the DSCRTP requirements.
- Solicit recommendations on what products/analysis NOAA could develop as a national program.

Day 1 – Tuesday, July 20

8:30am	**Registration, Coffee & Light Breakfast**
9:00am	**Welcome & Introductions**
9:15am	**DSCRTP Overview & Workshop Objectives – Dan Dorfman, NOAA DSCRTP**
9:50am	**Agenda Review – Stephanie Kavanaugh**
10:15am	**Southeastern U.S. Deep-Sea Corals (SEADESC) Initiative – Steve Ross, University of North Carolina at Wilmington**
10:45am	**BREAK**
11:00am	**Group Discussion 1: Field Observations, Site Characteristics and Deliverables** *Objective: To gather input on content and preferred format for field observations or site characterization to meet requirements of NOAA's Deep Sea Coral Research & Technology Program.*
12:15pm	**LUNCH**
1:00pm	**Group Discussion 1 Report Outs**

1:45pm	**Data & Compilation Efforts** USGS Cold Water Coral Geodatabase – Kathy Scanlon Catanach, US Geological Survey (USGS) & Rhian Waller, University of Hawaii (UH) Gulf of Mexico Gorgonians – Peter Etnoyer, NOAA's Coastal Center for Environmental Health and Biomolecular Research (*CCEHBR*) *Objective: To provide examples of data compilation efforts for consideration and discussion in Group Discussion 2.*
2:30pm	**BREAK**
2:45pm	**Group Discussion 2: Developing a Database of Deep-Sea Coral Information** *Objective: To determine what information should be included in a national database; and where that information may be obtained.*
4:00pm	**Day 1 Wrap-Up – Fan Tsao, NOAA DSCRTP**
4:10pm	**ADJOURN**

Day 2 – Wednesday, July 21

8:30am	**Coffee & Light Breakfast**
9:00am	**Day 2 Workshop Objectives – Tom Hourigan, NOAA DSCRTP**
9:15	**South Atlantic Fishery Management Council Deep-Sea Coral Conservation Efforts, Roger Pugliese, South Atlantic Fishery Management Council (SAFMC)**
9:45am	**Breakout Group Discussion 3: National Deep-Sea Coral Products** *Objective: To determine what could be produced at the national level to advance management efforts, research and regional initiatives.*
11:15am	**Closing Remarks – Dan Dorfman**
11:30am	**ADJOURN**

Appendix B:

Attendee List for NOAA's Deep Sea Coral Workshop
July 20-21, 2010

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Appendix C. Magnuson-Stevens Fishery Conservation and Management Act (MSA) Section 408. Deep Sea Coral Research And Technology Program

(a) IN GENERAL- The Secretary, in consultation with appropriate regional fishery management Councils and in coordination with other federal agencies and educational institutions, shall, subject to the availability of appropriations, establish a program--

(1) to identify existing research on, and known locations of, deep sea corals and submit such information to the appropriate Councils;
(2) to locate and map locations of deep sea corals and submit such information to the Councils;
(3) to monitor activity in locations where deep sea corals are known or likely to occur, based on best scientific information available, including through underwater or remote sensing technologies and submit such information to the appropriate Councils;
(4) to conduct research, including cooperative research with fishing industry participants, on deep sea corals and related species, and on survey methods;
(5) to develop technologies or methods designed to assist fishing industry participants in reducing interactions between fishing gear and deep sea corals; and
(6) to prioritize program activities in areas where deep sea corals are known to occur, and in areas where scientific modeling or other methods predict deep sea corals are likely to be present.

(b) REPORTING- Beginning 1 year after the date of enactment of the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006, the Secretary, in consultation with the Councils, shall submit biennial reports to Congress and the public on steps taken by the Secretary to identify, monitor, and protect deep sea coral areas, including summaries of the results of mapping, research, and data collection performed under the program.

Appendix D. General categories of data collected in deep-sea coral field surveys identified by workshop participants.

(Givens include: latitude/longitude & depth, observer, taxon and date)

- Size
- Water chemistry
- Currents (direction, etc.)
- Topography
- Visual record
- Dive/number
- Station
- Substrate type
- Where specimen was collected
- Live or dead
- Disturbance
- Method of sampling
- Biological sample/type of sample
- Associated species
- Any other type of species present
- Abundance/density
- Multibeam, etc. available?
- Sidescan or other acoustic?
- Fish absence/presence
- Precision & accuracy
- Slope
- Rugosity
- Aspect/perspective
- Other comment
- Water sample taken? Other sample taken?
- Color of living coral
- Time code