

BOEM ENVIRONMENTAL STUDIES PROGRAM: ONGOING STUDIES

BOEM OCS Region: Gulf of Mexico

Planning Area: Gulfwide

Title: Optimization of Non-Voucher Gulf of Mexico Benthic Fauna Specimen Archives with the U. S. Museum of Natural History (GM-09-01-11)

Total Cost: \$307,755

Period of Performance: FY 2012-2014

Conducting Organization: [Louisiana State University Coastal Marine Institute](#)

BOEM Contact: [Dr. Maureen Mulino](#)

Description: LSU has amassed extensive natural history collections of marine organisms and rock samples from the Gulf of Mexico (GOM) during the course of more than 20 years of BOEM/MMS support. Voucher specimens from the underlying studies were archived with the United State National Museum of Natural History (USNMNH), but numerous non-voucher specimens are still of scientific and management interest. It is the primary intent of the proposed work to substantially improve specimen-based background information about the GOM through the selective transfer of specimens to the USNMNH. The collection consists of approximately 2000 formaldehyde-preserved biological lots, 300 frozen (80°C) samples and 450 carbonate rock samples. The primary sources of specimens were MMS/BOEM studies CHEMO-I-II & III (deep seeps and background, 1989 - 2006) and Characterization of Algal- Invertebrate Mats at Platforms (1992-3).

Archiving will be accompanied by the production of data products and metadata to assure awareness of data availability and usage. Specimen archives provide two very important types of information. The first is an aspect of biodiversity where specimen lists are augmented with vouchers to assure taxonomic quality assurance. The second concerns the state of the population and environment as can be assessed by analyses and statistical analyses of morphology and/or composition. Web content describing GOM biota linked to data and metadata archives will be prepared as a final report and made available online at appropriate international portals. Tasks will primarily be accomplished through the use of undergraduate student workers during the summer months along with year-round work by Drs. Carney and Roberts.

1. The School of the Coast & Environment Specimen Archive will be fully re-inventoried and incompletely-sorted lots sorted into morphologically similar and consistent groups. The best available preliminary identification will be applied.
2. Based on sorting and preliminary identification the SC&E inventory will be updated to include specimen number and geospatial information.

3. The updated inventory will be submitted to four programs at the U.S. National Museum for consideration, the BOEM Voucher Archive Program, the Invertebrate Zoology Acquisition Committee the Geology Acquisition Committee, and the and the Marine Sciences Program. Material selected by any of the four groups will be transferred. Remaining material will be offered to experts for study or alternate recognized repositories such as the Field Museum of Chicago.
4. Data products will be prepared in conjunction with the staff of the USNMNH and made available via the internet.

Background: Since the initiation of BLM/MMS/BOEM faunal surveys there has been an appropriately high programmatic interest in the assurance of correct and consistent identification of species. Misunderstood by many laypersons and even resource managers, species identification is actually highly error prone. Without adequate quality control and quality assurance separately developed species inventories cannot be compared. Taxonomic errors greatly reduce the ability of BOEM to assess time- series and wide- geographic base data developed by multiple experts in separate studies.

A key component of the QA/QC effort was initiated in 1979 as a programmatic collection at the US National Museum of Natural History. To date approximately 350,000 specimen lots have been archived from 23 projects. Routinely projects submit a small portion of their specimens to the Museum to serve as voucher specimens. The fate of larger non-voucher sample collections is problematic. The decision of the USNMNH to accept such a large collection rests on the quality of the specimens, the associated data and the expectation that those specimens will provide research materials for future investigations.

Over the past several years the Museum and BOEM/MMS have realized the considerable value of collections beyond the basic taxonomy QA/QC effort. The archiving of multiple non- voucher specimens capable of supporting destructive analyses is now seen as an important task. Since the Museum has limited staff, most of the work of selecting and transferring specimens needs to be assumed at LSU and made possible by CMI funding. The materials to be submitted will meet USNMNH criteria which allow maximum utilization. These are listed below:

1. Specimens must have accurate, complete data; including ecological, habitat and physical data in addition to basic collecting information.
2. Specimens will increase collection habitat and taxonomic breadth of scope.
3. Specimen will increase redundancy due large numbers of specimens of the same species and from the same areas are present.
4. Specimens will increase collection temporal and methodological breadth.
5. Specimens will provide sufficient material to document community composition, life history and natural intra-specific variability over time and space.

The main LSU working collection consists of approximately 2000 formaldehyde-preserved biological lots, 300 frozen (-80°C) samples and 450 carbonate rock samples. The primary sources of specimens were MMS/BOEM studies CHEMO-I-II & III (deep

seeps and background, 1989 - 2006) and Characterization of Algal-Invertebrate Mats at Platforms (1992-3).

Objectives: The single objective is to increase the scientific value of specimens currently in current collections at LSU. This increased value will be of use to BOEM in a management role.

Methods: Methods are extremely simple. Existing material will be re-inventories in a jar- by-jar effort. Incompletely sorted lots will be hand sorted following a priority list developed with USNMNH. Then lots selected by the USNMNH will be properly packaged and shipped.

Data Products - The area of useful biodiversity data products is evolving quite rapidly. Rather than duplicate the efforts of international database structuring efforts, data derived from the LSU collections will be included in multiple archives including but not limited to: the Encyclopedia of Life (EOL), the Oceanographic Biogeographic Information System (OBIS) and the National Oceanographic Data Center (NODC). A website providing data summaries mostly in map form will be created and hosted by the LSU School of the Coast and Environment for 2 years after completion of the project.

Geological databases and tools for analysis lag behind biodiversity developments. As a result there are few existing archives which can assure widespread access and use. Geological data will be submitted to NODC. Progress of the National Science Foundation Earth Cube initiative will be monitored and LSU data submitted should a suitable archive be developed during the award period. Summary geological data will be included on the LSU-hosted website.

Mapping of biological and geological data will employ Keyhole Markup Language (.kml) file structure which allows use of Google Earth rather than proprietary software for visualization. Mapping will make use of GOM bathymetry

Data Management Specimen containers are currently stored with an internal sample label and an external barcode label. The information on the wet label is associated with the barcode in a collection data table. Collection data at LSU are maintained in simple Excel tables and Microsoft Access databases. When inventories are finalized these will be submitted to BOEM and NODC as per contract specification. For all specimen lots being accessioned by the USNMNH data will be prepared in a format suitable for input to EK software's Electronic Museum (EM), the collection management software in use at the Museum.

Data protection is maintained through use of a daily upload to an off-campus "cloud" server. Actively used data are on external hard drives and are backed up weekly on DVD disk.

Products: The principle deliverables will be:

- Biological and geological specimens transferred to the US National Museum of Natural History. The actual number will be determined by the curatorial staff at the Museum
- A final report detailing the transfer process with an assessment of best practices for similar non- voucher specimen collections.
- Digital images of organisms, rocks, people, etc. that may be used by BOEM for illustrations of supported work.
- ITM presentation
- Quarterly progress reports

Importance to BOEM: Since our charge as biologists is to protect deep water black coral, soft coral, tube worms and chemosynthetic communities, it is essential that we know what they actually look like. Many of us will never go out on cruises to establish this essential knowledge. This project gives us an insight to the forms of organisms that we are concerned with.

Current Status: Work began in the summer session of 2012 and will continue through the summer session of 2013.

Final Report Due: October 2014

Publications: None

Affiliated WWW Sites: None

Revised date: November 2012

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