



30 Year History of Collaboration Between the Bureau of Ocean Energy Management's Collection Archiving Project and the Smithsonian Institution, National Museum of Natural History, Department of Invertebrate Zoology



In October, 1979, the Department of the Interior, Environmental Studies Program of the Bureau of Ocean Energy Management (BOEM) contracted with the National Museum of Natural History's (NMNH), Department of Invertebrate Zoology (IZ) to provide professional collection management services for the long-term curation of its collection of marine invertebrate specimens taken during the environmental baseline surveys of various oil and gas lease sites on the US East and Gulf Coasts. These studies, begun in 1973, sampled existing biological communities along the continental shelf to document their composition and to help predict the potential impacts of future oil/gas explorations.

The BOEM collections amassed during these intensive studies were comprehensive and unusually well documented. They presented the biodiversity research community with a veritable treasure trove of research material. As evidence of the composition and natural history of marine invertebrate communities at specific times and places, these collections were important complements to Invertebrate Zoology's existing programmatic collections, especially those from the US Fish Commission research vessel *Albatross*. BOEM and NMNH both appreciated the potential research value of these collections and collaborated on the creation of a project that would help ensure these invaluable collections would be cared for and made accessible for future research. As of November 2008, more than 220,500 specimen lots have been curated into the Invertebrate Zoology collection. These BOEM specimens represent almost 20% of the invertebrate collection records in our on-line catalog database (<http://collections.nmnh.si.edu/search/iz/>).

Not only has this collaboration benefited the research missions of both BOEM and NMNH, it has also provided valuable educational and career development opportunities for the project's staff. From its start in 1979 through today, a total of 44 Museum Technicians and 2 student volunteers have worked on the project, most doing cataloging and basic curation. Of these 44 Museum Technicians, 6 resigned from the project and successfully completed PhD programs in ecology or systematics and 14 resigned from the project to pursue permanent careers at the Smithsonian Institution (12 at NMNH, 1 at the Smithsonian Environmental Research Center (SERC) and 1 at the National Zoo). A total of 30 of these 44 project technicians are successfully pursuing scientific careers. The remaining 14 project technicians have pursued diverse careers including one who is a Fairfax County Emergency Medical Technician (who worked the rescue operations at the Pentagon on 9-11), one who is an analyst with the CIA, and one who is an Information Technology specialist.

Cataloging Process

STEP 1: Sorting

Specimen lots are sorted taxonomically, by station number, and by collecting date. Unusable specimens or lots with incomplete data are documented and then discarded.



STEP 2: Data Capture

Taxonomic and locality data from each specimen lot are entered into the KE EMU database. Labels are then printed using the DataMax thermal printer.



STEP 3: Vialing/Jarring

Each lot is placed in an appropriately sized jar or vial with a corresponding label. Specimens are curated using 70% ethanol. Larger specimens are placed directly in an archival container. Small specimens are placed in a vial, fitted with a cotton plug and placed into a large archival container.



STEP 4: Curation

Curated specimens are incorporated into the appropriate taxonomic collections. Fluid collections are stored at the MSC and most dry collections are stored at the NHB.



CHEMO



Ice Worms (*Hissocoea methanicola*)

Four decades ago, biodiverse hydrothermal vent communities were discovered in the Pacific Ocean. In 1984, communities of chemosynthetic organisms were discovered around cold hydrocarbon seeps in the Gulf of Mexico. From 1991-2001, these seep communities were further identified, documented and studied in the BOEM programs, Chemosynthetic Ecosystem Study (CHEMO I), Stability and Change in Gulf of Mexico Chemosynthetic Ecosystems (CHEMO II), and Investigations of Chemosynthetic Communities on the Lower Continental Slope of the Gulf of Mexico (CHEMO III). We currently have a few type specimens from the CHEMO programs, including the Holotype of the toworm (*Hissocoea methanicola*, Polychaeta). We will receive a large collection of specimens from Dr. Chuck Fisher (Penn State University) from the CHEMO I and II programs.

MAPTEM

The BOEM Mississippi/Alabama Pinnacle Trend Ecosystem Monitoring program (MAPTEM) was conducted from 1996-1999 to characterize and monitor biological communities and environmental conditions at carbonate mounds along the Mississippi/Alabama Outer Continental Shelf. We received a voucher collection 129 MAPTEM specimens from Continental Shelf Associates. The specimens collection was supplemented by 228 Kodachrome slides of ocean bottom taxa *in situ*. These images were taken by the ROV Seavarer from stations of the R/V Tommy Munn. These MAPTEM images were identified to the lowest practical level and have been cataloged and linked to appropriate station and taxon records in Emu, and are web-accessible (<http://invertebrates.si.edu/>).

POSP



Unidentified Xanthe crab



10 and 20 arm leather-stars (Ctenoidea) and unidentified white tube sponge (Porifera)

On April 27, 1986, there was an oil spill in the Republic of Panama, Bahia Las Minas caused by a ruptured storage tank at a coastal oil refinery. There was a loss of an estimated 240,000 barrels of crude oil. From 1987 - 1990, the BOEM supported Panama Oil Spill project assessed the biological effects of the spill by monitoring the long-term changes distribution and abundance of marine organisms after the spill. 13,963 lots of invertebrates collected from POSP have been cataloged and incorporated into IZ collections.

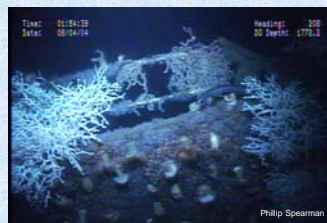
SOCAL

The Southern California Baseline Study, a comprehensive investigation of all major habitats of the sea floor of the California Bight, ran from 1975-78. The investigation involved studies of the benthic macrofauna and ecology, micro-paleontology, sedimentology, trace metals and hydrocarbon geochemistry. Sampling sites ranged in depth from the shallow shelf to deep basin (7 - 1866 m). 1,777 lots of invertebrates collected from SOCAL have been cataloged and incorporated into IZ collections.



Callistoeca canaliculatum (Lighthouse, 1786) Tridacna, Gastrotricha

Deep Wrecks (WRECK)



Colony of branching deep water coral (Scleractinia, Caryophyllia, Lophelia sp.) on the bow of the submerged tanker Gulfstream

As a partner of the BOEM Rigs to Reefs program, the Deep Gulf Shipwrecks of World War II (Deep Wrecks) program investigated in July - August, 2004, how 7 of the 56 ships sunk by German submarines in the Gulf of Mexico during World War II function as artificial reefs in deep water. A few voucher specimens of Crisida (Anchozoa, Antipatharia & Gorgonacea) from the Tankers Halo and Virginia were accessioned. Included with the voucher specimens were digital photographs of the specimens *in situ*, images of whole preserved specimens with station labels and close-up images of identification structures. The specimens were cataloged into the Invertebrate Zoology collections and the images were appended to the corresponding specimen catalog record.

BOEM Programs

- ASLAR:** Atlantic Slope and Rise Program
250 - 8000 m: 1984-1985
- BIMP:** Georges Bank Benthic Infauna Monitoring Program
38 - 168 m: 1981-1984
- CABP:** Central Atlantic Benchmark Program
14 - 700 m: 1975-1977
- CAMP:** California Monitoring Program
25 - 930 m: 1983-1988
- CARP:** Central and Northern California Reconnaissance Program
60 - 607 m: 1987
- CASPS:** Canyon and Slope Processes Study
100 - 1800 m: 1979-1982
- CGPS:** Central Gulf Platform Study
6 - 98 m: 1978-1979
- CHEMO:** Chemosynthetic Ecosystem Study
500 - 1500 m, 1991-2001
- DGOMB:** Deepwater Program: Northern Gulf of Mexico Continental Slope Habitats and Benthic Ecology
300 - 3000 m: 2001-2002
- IXTOC:** IXTOC Oil Spill Assessment Study
5 - 55 m: 1979-1980
- LMRS:** South Atlantic Outer Continental Shelf Living Marine Resources Study
15 - 79 m: 1980-1981
- LOPH:** Deepwater Program: Characterization of Gulf of Mexico Deepwater Hard Bottom Communities with Emphasis on *Lophelia* coral (*Lophelia* study)
310 - 686 m: 2004
- MAFLA:** Mississippi, Alabama, Florida Survey
10 - 189 m: 1975-1978
- MAMES:** Mississippi-Alabama Marine Ecosystem Study
20 - 200 m: 1987-1989
- MAPTEM:** Mississippi/Alabama Pinnacle Trend Ecosystem Monitoring
60 - 110 m: 1996-1999
- NEEB:** New England Environmental Benchmark Program
38 - 290 m: 1977
- NGOMCS:** Northern Gulf of Mexico Continental Slope Study
291 - 2935 m: 1983-1984
- POSP:** Panama Oil Spill Program
0 - 1 m: 1986-1987
- SABP:** South Atlantic Benchmark Program
6 - 520 m: 1977
- SOCAL:** Southern California Baseline Study
intertidal: 1975-1978
- SOFLA:** Southwest Florida Shelf Ecosystem Study
10 - 160 m: 1980-1981
- STOCS:** South Texas Outer Continental Shelf Study
15 - 182 m: 1975-1977
- WRECK:** Deepwater Program: Archaeological and Biological Analysis of WWII Shipwrecks in the Gulf of Mexico: A Pilot Study of the Artificial Reef Effect in Deep Water (Deep Wrecks)
85 - 146 m: 2004

The number of project-related lots cataloged for each collection since October 1, 1979

Program	Crustacea	Mollusca	Worms	Brachy	Podocera	Cnidaria	Porifera	Tunicata	Neobryozoa	Phoron	Benthic Samples	TOTAL Program
ASLAR	533	507	17,502	220	789	1,211	193	270				21,225
BIMP	11,620	3,718	30,207	328	683	103	320	94			650	48,045
CABP	6,361	5,822	5,763	219	958	1,054	145	156		667		21,133
CAMP	159	126	250	4	23	20	10					629
CARP	49					57	10					116
CASPS	3,194	1,021	3,586	60	138	115	1	3	276			7,800
CHEMO	2	3				18						23
IXTOC			161									161
DGOMB	448	94	4		44	51	17	1				655
LOPH			5,546			172	3					5,721
LMRS	4,857	2,574	5,137	302	1,828	2,182	1,184	1,775				20,745
MAPTEM	1,842											1,842
NEEB	19	0	1	6	40	37	40					133
MAMES	1,821	562	15,819	96	7	349		30				18,677
NGOMCS	4,762	1,334	3,832	673	278	257	150	55				11,241
POSP	4,608	3,322	4,668	11	1,403	448	59					14,829
SABP	2,439	1,214	14,662	358	759	800	69	70	976	107		24,428
SOCAL	222	955	74	112	41	84	184	60				1,774
SOFLA	3,926	4,229	7,028	1,820	2,289	2,000	3,316	497		288	388	30,403
STOCS	30		4,749									4,779
WRECK		29			3	70	20					122
Worms total	0	0	34,348	0	4	25	0	0	0	0	0	34,377
TOTALS	53,509	28,265	119,364	4,142	9,189	11,309	5,664	3,044	2,210	1,144	650	233,220

¹Image lots from Kodachrome slides

Future Focus

DATA MANAGEMENT - Efforts to improve the accessibility of project-related specimen data will continue. Currently, BOEM program specimen data is web-accessible through IZ's Collection Catalog and through OBIS.

- Station data for BOEM programs represented in the Invertebrate Zoology collections will be added to our web-based station data file (<http://invertebrates.si.edu/iztechprog/index.cfm>).

- Specimen records will be enhanced with the addition of multimedia data including images, video, links to technical reports, cruise logs and scientific publications, and pdf scans of species descriptions of BOEM type specimens.

COLLECTION ACQUISITION - In addition to acquiring new material from current or recently completed BOEM-funded surveys, we expect to acquire material from the CHEMO I and II projects and the MAMES III-Hill setting plates.

CATALOGING - Cataloging will continue to be the foundation of our project. Incoming types, voucher specimens and specimens of significant immediate research interest will have the highest priority project.

COLLECTION CURATION - Routine maintenance and physical curation of program specimens in the holdings areas will continue. Fluid levels and container integrity will be monitored and detailed inventories of the collection will be maintained.

SORTING - There are substantial backlogs of "fine-sorting" (sorting to lowest practicable level - typically order or family for Department of Invertebrate Zoology collections) in all taxa. Sorting priorities will be determined based on the research needs of BOEM and NMNH staff and contractors and the interests of the scientific community.

IDENTIFICATION - Based on preliminary surveys of the collection it appears that a significant number of specimens are representatives of undescribed taxa. If funds are available within the project's budget we will attempt to hire specialists on a temporary basis to resolve taxonomic problems of interest to BOEM and NMNH.