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**US Geological Survey  
NOAA/National Marine Sanctuary  
Program's Joint Seabed Mapping  
Initiative**

**Workshop Report: Mapping Maritime  
Heritage Resources in the National  
Marine Sanctuaries**

**14-15 August, 2003, Alpena, MI**

*A joint initiative of the US Geological Survey and NOAA/National Marine Sanctuary  
Program, supported by the Center for Coastal and Ocean Mapping at the University  
of New Hampshire*



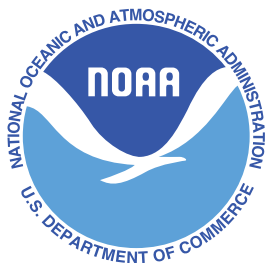


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## Executive Summary

### ***Mapping Maritime Heritage Resources in National Marine Sanctuaries***

On August 14 and 15 of 2003, maritime historians and archaeologists and scientists and managers from the National Marine Sanctuary Program, NOAA Office of Ocean Exploration, National Undersea Research Centers, and the academic community came together in Alpena, Michigan at the Thunder Bay National Marine Sanctuary and Underwater Preserve in the second of a series of workshops convened by the Office of National Marine Sanctuaries in support of development of a national strategy for seabed mapping in the sanctuaries. This workshop focused on the particular requirements for mapping maritime heritage resources (MHR), including shipwrecks, paleo-shorelines areas and other submerged cultural and historic resources. During the two-day workshop, participants discussed research needs, approaches to mapping and MHR characterization, technologies, building capacity and training, and other related issues.

This workshop provided critical guidance to the ONMS with regard to mapping MHR in the national marine sanctuaries. Recommendations were offered on both how to go about mapping these resources, and technologies that will yield the most comprehensive assessment and characterization. A number of overarching recommendations were put forward: 1) multiple survey methodologies using multiple mapping technologies is the only way to insure that the site characterizations are comprehensive; 2) methodologies and technologies utilized at each site may be different, depending on availability of instruments and platforms, as well as individual site needs, but guidance is available to help design and implement these efforts effectively; 3) like most NMS initiatives, effective partnerships will be required; and 4) understanding the environmental history of the region in which each site is located is an essential context for characterization.

The specific findings and recommendations on MHR mapping requirements will be integrated into the program-wide strategy that continues to be developed under the ONMS Joint Seabed Mapping Initiative. A number of issues raised at the workshop require additional attention, and these have been forwarded to the ONMS Maritime Archaeological Center for follow-up.





## Workshop Report:

### ***Mapping Maritime Heritage Resources in National Marine Sanctuaries***

The second in a series of Workshops by the Office of National Marine Sanctuaries to guide and inform the development of a comprehensive seabed mapping strategy for the National Marine Sanctuary System.

Hosted by the Thunder Bay National Marine Sanctuary and Underwater Preserve  
Alpena, Michigan, 14-15 August, 2003

#### Introduction

The National Marine Sanctuary Act (16 USC 1431 et seq., as amended by Public Law 106-513) includes specific provisions regarding the preservation and management of maritime historical resources. In the National Marine Sanctuaries Amendments Act of 2000 [Sec. 6(f)(1)(b)(ii)] includes additional specific direction by Congress to: "...complete site characterization studies and inventory known sanctuary resources, *including cultural resources*, for each sanctuary in the System..." To assist the ONMS in systematically and efficiently meeting this requirement, efforts have been underway since 2001 to develop and implement a strategy for seabed mapping. These maps will provide essential information the Sanctuary managers regarding both natural and cultural resources to support resource management, education/outreach, conservation science, and enforcement activities. This workshop was held to bring together the wealth of expertise and experience available both within and outside the NMS System to focus attention on the issue of mapping and characterizing maritime heritage resources (MHR) in the



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sanctuaries. The agenda for the workshop and a list of participants is included in the appendices.

The first day of the workshop focused on familiarizing the participants with the goals and progress of the ONMS Seabed Mapping initiative, as well as provide an opportunity for participants to present relevant information on program-wide MHR programs and initiatives, the status of MHR mapping at the sanctuaries, the use of those maps in support of characterization and management of these resources, and observations about the issue of mapping needs, technologies, and opportunities for collaboration. Presentations were made by ONMS, The NOAA Office for Exploration, the National Undersea Research Centers, and maritime archaeologists and historians from the University of Rhode Island and Mystic Seaport. Brief summaries of these presentations are included in the appendix, and copies of the Powerpoint Presentations are available from Brad.Barr@noaa.gov). The second day was devoted to posing a series of key questions regarding MHR characterization needs and approaches, and seeking consensus on recommendations related to those questions. The questions around which the discussions were focused included:

- Is the “ecosystem” base mapping identified at Workshop 1 (focused on natural resource mapping and characterization) an acceptable base for MHR seabed mapping? Will this provide an appropriate base for sanctuary MHR mapping/inventory?
- What additional elements must be added to appropriately identify MHR/maritime archaeological resources.
- What approach do we take to identify targets for higher resolution mapping...what resolution (size of feature of interest) is appropriate for hi-res MHR mapping.
- What about mapping areas outside sanctuaries...Adjacent areas? Areas of potential archaeological/maritime heritage in regions? Other?
- Do we, and if so how do we, address the issue of protecting mapped sites.
- Can we identify priority research issues? How do we engage the academic community?
- Are there capacity or training issues that should be addressed?



- What about data management?

The participants achieved some measure of consensus on a number of recommendations, and these are articulated below. Several issues remain unresolved, and will require additional work to assemble information and seek guidance from other partners with expertise and experience unavailable at the workshop. Some of the unresolved issues were also referred to the ONMS Maritime Archaeological Center, as the group felt that this would be a more appropriate venue and forum for addressing these issues and concerns.

### Summary of Findings and Recommendations

As an overarching caveat to these recommendations, the participants felt that it was important to recognize that any field studies for the sites will be tailored specifically to site needs. It was agreed that the findings and recommendations of this workshop will help to guide and inform that site-specific process, but that each survey and related characterization analyses are best tied to site needs, availability of technologies and expertise, and local knowledge of resources and historical context.

There was general agreement that it is critical to identify environmental history of site, describe the patterns of human use over time and the impacts of this use in shaping the cultural and ecological environment of the sanctuary. Such knowledge will provide a solid foundation for MHR characterization. For example, understanding historic patterns of use will more effectively guide prioritization of mapping effort by focusing activity on areas where MHR are more likely to be located (historical shipping lanes and port approaches, paleo-shorelines for archaeological resources, for example). History helps illuminate the present, providing a context for understanding both the evolution of human uses within a sanctuary and its regional geography, in addition to its great value in guiding and informing MHR characterization/

Another overarching issue was the importance of guarding against simply characterizing cultural landscape of sanctuaries by the identifying the “monument sites” (generally 19<sup>th</sup> and 20<sup>th</sup> century shipwrecks) and not using techniques, methods and sensing instruments that are insensitive to earlier history, both 17<sup>th</sup> and 18<sup>th</sup> century shipwrecks and submerged archaeological resources (paleo-encampments, burial caves and grounds, middens, etc.) Cultural archaeology and history should be broadly defined, and techniques and instruments used capable of identifying all cultural, anthropological, and historic resources at each site.



Another concern was the lack of and need for magnetometry. Magnetometers, which identify the presence of iron related materials, is a primary tool of maritime archaeologists. Little, if any magnetometer data is available for sanctuaries at the present time, and acquiring this data should be a priority for the Program.

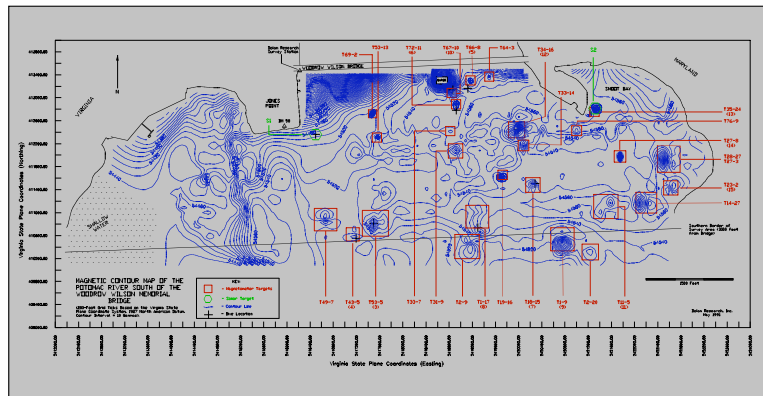


Fig. 1 – Example of Magnetic Contour Map – Potomac River  
(from Mather Presentation)

With regard to the specific discussion questions:

- 1) Is the “ecosystem” base mapping identified at Workshop 1 an acceptable base for MHR seabed mapping? Will this provide an appropriate base for sanctuary MHR charting/inventory?

The first seabed mapping workshop sponsored by ONMS, hosted by the Center for Coastal and Ocean Mapping at the University of New Hampshire in November of 2002, recommended that all sanctuaries be mapped using swath bathymetric methods (“acoustic” - multibeam and sidescan sonar, and “optical” – LIDAR) to a resolution not less than tens of meters horizontal and tens of centimeters vertical (a typical resolution for multibeam mapping at the average depth encountered in national marine sanctuaries). Discrete areas of particular interest (such as management zones, research areas, and identified MHR “targets” could be mapped at higher resolution (on the order of one meter or less, horizontal) to better support management, conservation science, and resource characterization, but this base mapping resolution would be useful and appropriate to support more routine management, research, education/outreach, and enforcement needs.

The consensus of this workshop was that developing such maps would be useful, but not sufficient in a MHR context. The archaeologists and historians at this workshop recognized that base mapping provided by 100% swath coverage provides excellent single

site maps for geo-referencing all other essential data collected, and invaluable for support of related functions of sanctuary operation, including research, education and outreach, monitoring, raising public awareness, etc. Therefore, consistent with the findings of Workshop 1, 100% swath coverage is useful and appropriate goal for the NMS System, but not an endpoint sufficient, by itself, to fully support MHR characterization and management.

2) What additional elements must be added to appropriately identify MHR/maritime archaeological resources.

As mentioned previously, particularly important for managers to acquire, as early as possible in the characterization process, a good understanding of the history of human use at each site, which provides information critical to the identification of the full suite of cultural resources. This provides an essential context for how characterization is approached and executed.

The participants recommended that “highest resolution possible” should be goal for MHR mapping in support of characterization and management. There was some agreement that mapping using sidescan sonar may be more valuable than additional multibeam at this point for many sites, largely because of the higher resolution that can be obtained from sidescan, and not being particularly interested in the backscatter data collected from multibeam mapping, which is highly valued by natural resource scientists and managers for its ability to resolve sediment characteristics – bottom type being a major determinant of biological habitats. Except for very shallow water, where the resolution of multibeam data would approach or achieve one meter resolution, most participants felt that multibeam data would not adequately identify potential “targets”, particularly earlier 17<sup>th</sup> and 18<sup>th</sup> century shipwrecks which are not likely to be intact, but might only be visible as debris fields of ballast stone or very limited remnants of the ship’s hull structure.

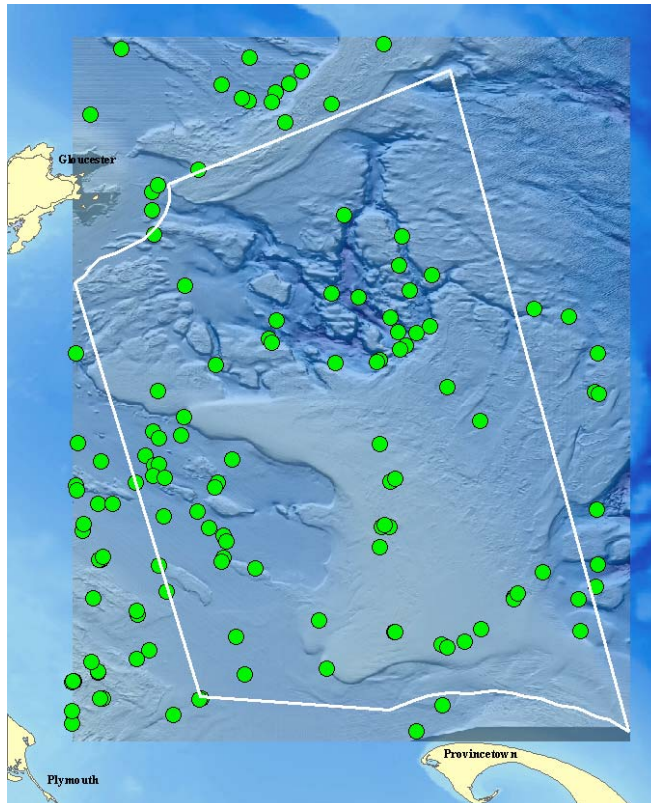
Subsequent to the Workshop, Larry Mayer, Director of the Center for Coastal and Ocean Mapping, was consulted regarding this issue of multibeam vs. sidescan for MHR characterization. Recently having completed a survey of the WW II-era debris in the nearshore areas off the beaches of Normandy, and having participated in a number of other surveys where MHR were either targeted or encountered and mapped, Dr. Mayer had a slightly different perspective than some of the Workshop participants with regard to the utility and application of multibeam mapping to MHR charting and characterization. As someone with considerable expertise at the cutting-edge of multibeam mapping technology and application, he felt that new and improved



multibeam technologies, which are becoming far more readily available, can be far superior to what has been available, and very appropriate for this application, and provided numerous examples of how these new technologies are being successfully applied. (Dr. Mayer had been invited to participate in the workshop, had intended to come, but was ultimately unable to participate because of a change in schedule for a mapping cruise for which he was responsible).

A similar perspective was provided by Ben Haskell from SBNMS. The USGS has developed a multibeam dataset and maps for this site, and this data has been used to identify anomalies that have been used to guide subsequent MHR exploration and characterization (Fig. 1) This data set is fully consistent with the base mapping resolution identified in Workshop 1. The opinion was offered that these maps provided useful and appropriate MHR information, and would likely produce similarly useful and meaningful results at other sanctuaries.

Figure 2: Shipwreck “targets” identified in multibeam data at Stellwagen Bank NMS (from Haskell Presentation.)



While clear consensus was not reached on this issue, it is reasonable to conclude that multibeam maps, such as that developed for Stellwagen Bank NMS, consistent with the base mapping recommendations of Workshop 1, can provide useful and appropriate information for characterizing MHR, but that it is clearly not sufficient, by itself, to successfully characterize a sanctuary with regard to MHR. This information would be greatly enhanced by the collection of higher resolution mapping data in key areas, by the acquisition of other data like magnetometry, and the development of a comprehensive

evolutionary history of human use for the regions in which sanctuaries are located (helpful in guiding the selection of “key areas” for higher resolution mapping).

The significant need for magnetometry data has been discussed elsewhere, but warrants being re-emphasized here. There is a paucity of available magnetometer data generally throughout the System, and the need for this data has been demonstrated, especially to supplement base mapping data. Sub-bottom data would also be very useful, and was identified in both workshops as needed, as supplement to, but not a priority over base mapping. Not only can such data offer some window into the geological evolution of a site, but help to illuminate its MHR.

Taken together, historic use pattern data, base mapping bathymetry, magnetometry, sub-bottom profiling, any other relevant information should be used to guide the design and implementation of MRR site characterizations.

- 3) What approach do we take to identify targets for higher resolution mapping...what resolution (size of feature of interest) is appropriate for hi-res MHR mapping.

Priorities related to areas can be identified many ways, but “prospecting” and random sampling designs might be particularly useful and appropriate strategies. “Prospecting” surveys, as the name implies, involve analyzing available information to identify locations where MHR are likely to be found. These areas are visited and mapped using the highest resolution technology available (routinely sidescan sonar). Stratified random sampling methodologies, widely used in maritime and terrestrial archaeology, involve dividing a site into grids and randomly mapping areas identified in the sampling design again using the highest resolution technology available. This mapping can then be used, in turn, to target the use of ROV’s and other remote video collection platforms, to document sites identified. Ultimately, this could feed into the development and use of predictive models to guide and inform the identification of cultural resources.

Other drivers for identifying higher resolution mapping needs were identified. Resources and Undersea Threats (RUST) Program is likely to need higher resolution mapping and imaging for characterizing threats. At Thunder Bay NMS&UP, there is a significant need for data in shallow water sites. Clearly, each site will be different, and some flexible approach to determining priorities for high resolution mapping is required, but “prospecting” and random sampling design approaches will be useful tools to address the hi-res mapping element of MHR characterization comprehensively and systematically.

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- 4) What about mapping areas outside sanctuaries...Adjacent areas?  
Areas of potential archaeological/maritime heritage in regions?  
Other?

Mapping outside sanctuaries was also considered to be important, especially in the regions where sanctuaries are located. The development of site “environmental history” will help to inform and guide delineation of these “regions.” While clear justifications should be provided for higher resolution mapping outside sanctuary boundaries when funding for MHR characterization is limited, there should be opportunities to make a case for such work.

Given that the RUST Program has interests in both natural and cultural resources, in some instances evaluating whether a wreck contains any hazardous substance that may be discharged and “enter the sanctuary and harm a sanctuary resource or quality” (prohibited by the NMSA), mapping outside a sanctuary boundary may be essential to “connect” the wreck site to the sanctuary. Such a connection on the base map will facilitate the analysis of threat to resources.

One particularly useful observation was offered with regard to likely data availability. The NOAA Office of Coast Survey, that has mapped and continued to update maps of coastal waters adjacent to ports and harbors, will be an excellent source for maps and data in such areas of high maritime use in regions where sanctuaries are located.

- 5) Do we, and if so how do we, address the issue of protecting mapped sites.

While not strictly a mapping “need”, mapping MHR sites can make the public more aware of these sites, and potentially make them more likely to be damaged. A similar sort of problem has been noted when high resolution seabed maps identify smaller, more productive areas that may have been previously overlooked by fishermen, making them more susceptible to increased fishing pressure. A tension exists between need to protect and need to freely investigate. Protection must be insured in short term and over the long term. There is a need for clearer guidance on what we can and cannot protect in terms of the release of information, particularly data acquired from outside sources under the condition that it not be made public. In the short term, before the Maritime Archaeological Center and staff with appropriate expertise can convene and address this issue, Workshop participants recommended that the NMS HQ archaeologist and Director of the MAC be consulted prior to the public release of site



locations. Longer term solutions should involve education, outreach, and awareness, as well as effective enforcement specifically trained to deal with MHR issues. Agreements with enforcement partners, training of enforcement personnel, and baseline documentation are all essential to be able to document artifacts removed from wrecks. Systematic video documentation and guiding protocols would be useful to produce, and this would be another issue for the MAC and the experts on staff to address. Proposed National Register designations may be supported by such programmatic and site-specific actions being taken.

6) Can we identify priority research issues? How do we engage the academic community and other potential partners?

With regard to characterization of MHR, environmental history must be a significant element. As a kind of emerging issue for the MHR community, developing some guidance would be useful and appropriate for the conduct of such regional characterizations. The development of this guidance would be best accomplished by the MAC, and this issue will be referred to them as a follow-up to this discussion.

As was noted in the previous discussions at the first workshop related to natural resource mapping, research leading to technological advancement in imaging and mapping is critical. This technology is evolving rapidly, particularly through the leadership of the Center for Coastal and Ocean Mapping at the University of New Hampshire, both in terms of technology, interpretation and visualization of mapping data, and these advances need to be recognized and incorporated into the mapping strategy being developed by the ONMS. Mapping MHR is an important component of the work of the ONMS, and particular attention should be paid to making sure these new technologies and interpretive methods are pursued with those who are at the cutting edge of this work.

Techniques, methodologies and approaches for mapping to characterize MHR in national marine sanctuaries need to be better articulated. While each site may approach this somewhat differently, there is obvious utility in having some guidance on when and how “prospecting”, “random sampling” and other survey methodologies are most effectively applied, and to insure quality control for the data collected. While this seems to be an evolving area of research in the maritime archaeological community, what research has been done should be captured and areas where additional research is needed should be identified. There appears to be much applicable research in this arena from terrestrial archaeology, and this should be reviewed and integrated as well. This research will assist the ONMS in identifying the distribution and location of cultural resources in sanctuaries and the

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regions in which they are located. Again, the MAC would be the appropriate venue to conduct such an analysis.

Partnership with academic community on technology development, mapping methodologies, and application to MHR mapping and characterization is essential. We have an excellent partner in the Center for Coastal and Ocean Mapping at the University of New Hampshire, and will continue to work with CCOM to insure that new and innovative research is integrated into the ONMS mapping strategy, particularly with regard to advances in mapping technology. The larger academic maritime archaeological community is also a significant resource, and efforts should be made to reach out to them for collaboration and advice. One way this might be done is to make available funds and in-kind support to support graduate students who would work on projects of particular importance to ONMS and the Sanctuaries. Existing academic programs have a need for such support, and new ones are being developed, including a new maritime archaeological program at the University of Connecticut (where another very important partner, the National Undersea Research Center is located and involved with this new program) and others at URI, East Carolina, Texas A&M, Florida State and University of West Florida, that would provide an excellent pool of expertise upon which a partnership could be built. This is an area of program development where the MAC could play an important facilitation role. A particularly useful tool in encouraging academic partnerships would be the development of a list of priority research questions that could be distributed to academic colleagues as potential thesis and dissertation topics for students to consider pursuing. Even if funding could not be found to support these students, this may generate interest in seeking funding for these projects from external sources.

Sanctuary MHC staff should be encouraged to present their relevant work at professional meetings and workshops. If the ONMS is to take a leadership role in the MHR community, that community must be aware of the excellent work going on in national marine sanctuaries, and the resources that might be made available for developing partnerships. We are aware that good maps are especially valuable to academic researchers, being a sort of “field of dreams” that “if we build it, they will come.” This phenomenon has been noted with regard to the mapping we have already completed, and as many of our sanctuaries contain concentrations of MHR, mapping and characterization is likely to entice outside maritime archaeological researchers to come and work at our sites.

Partnerships with private industry and individual maritime historians and archaeologists should also be pursued. Such a partnership has



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already contributed to the success of the work on the PORTLAND at Stellwagen Bank NMS through the partnership with Arne Carr and John Fish at American Underwater Search and Survey, and other private companies routinely conduct MHC work that could be quite valuable to the ONMS in their MHR stewardship responsibilities. An example discussed at the workshop is the national consulting firm PBS&J, that has considerable experience in this arena, and might be interested in such a partnership.

Also important to pursue is collaboration and coordination with the National Park Service, states and other governmental entities. A number of discussions have been initiated with NPS regarding collaboration, and we have a programmatic agreement with NPS that should greatly facilitate expanding that partnership. Additional emphasis and attention should be given to evolving this collaboration. State offices involved in historical preservation are another ongoing partnership opportunity at many sites where jurisdictions overlap, and more could be done to foster expanded partnerships. Clearly, as mentioned previously, this is an area where the MAC could and should take a leadership role when it is fully on-line and operational.

7) Are there capacity or training issues that should be addressed?

Just as recommended in Workshop 1, a recommendation was made that training be developed for site and HQ staff to build skills on reading and interpreting mapping data. In order to effectively use the data and maps produced to support management, research, monitoring, characterization, education/outreach and enforcement, a base level of skills are required. This training should focus on what questions are being asked of the data and what confidence can be given to the answers that might be provided? Again, this should be part of a larger capacity-building initiative developed around MHR by the MAC.

There are some larger capacity-building issues around understanding the technologies, particularly their strengths and limitations. It has been suggested, by Sanctuary staff, that some primer on mapping technology be produced to help better understand and guide effective use of these data, and this is being considered.

There was also some discussion of operational capacities. Given that many of the maritime archaeologists and historians attending the workshop advocate the use of sidescan sonar, it was recommended that the ONMS look into developing the capacity at sites or in regions to collect this data from our small boat fleet. Such a capacity might also be useful in the collection of magnetometry, which can also be collected from smaller platforms. The Program could either acquire the



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instruments, borrow them from partners or do the work in collaboration with partners (USGS has sidescan units we might be able to borrow, NURC/NAGL maintains and operates an Edge-tech sidescan, OE is acquiring a magnetometer). In addition to acquisition of appropriate technology, we may seek partners in the academic community to assist in providing training and technical assistance in developing in capacity of Program staff to effectively operate these instruments (as mentioned above in “engaging the academic community”). Such academic partnerships in training might also encourage these programs to focus other student projects and research in sanctuaries. Alternatively, instead of doing this ourselves, we might contract the work to private sector companies who do this work. Additional discussion, particularly with ONMS Operations staff, partners, and staff MHR specialists, needs to be conducted to determine the best path forward. Clearly, appropriate solutions may be different at different sites, depending on the on-water assets and instruments available, the capabilities of site and regional staff to post-process this data effectively, and available resources and the magnitude of need any site might have for this data.

8) What about data management? Any contributions to this discussion.

It was recommended that sanctuaries should have capability to handle, store and use, data generated, and underestimated part of the overall process, but this capacity may be difficult to achieve given the possible volume of data involved (many gigabytes of information are generated for each map produced). Data and metadata must conform to FGDC standards. As was discussed in Workshop 1, some centralized HQ processing and archiving might be useful as well. It was felt that a combination of site, regional and national repositories, based on capabilities and infrastructure, will evolve. As it is likely that sites may receive, in some cases, particularly from NOAA OCS data acquisition cruises, map data sets, but perhaps not any final products. There needs to be some capacity to complete post-processing so that the data is available in useful formats. Part of the ongoing discussions with CCOM, USGS, OCS and others regarding the entire ONMS seabed mapping initiative is how we can best address this need.

### Summary

While there are questions and issues remaining to be addressed more fully, and like all such discussions additional issue and concerns were added to the list, this workshop provided critical guidance to the ONMS with regard to mapping MHR in the national marine



sanctuaries. Recommendations were offered on both how to go about mapping these resources, and technologies that will yield the most comprehensive assessment and characterization. A number of overarching recommendations were put forward: 1) multiple survey methodologies using multiple mapping technologies is the only way to insure that the site characterizations are comprehensive; 2) methodologies and technologies utilized at each site may be different, depending on availability of instruments and platforms, as well as individual site needs, but guidance is available to help design and implement these efforts; 3) like most NMS initiatives, effective partnerships will be required; and 4) understanding the environmental history of the region in which each site is located is an essential context for characterization.

The specific findings and recommendations on mapping needs will be integrated into the program-wide strategy that continues to be developed under the ONMS Joint Seabed Mapping Initiative. Issues that have been identified as best addressed by the MAC will be passed on for their consideration. Follow-up on other unresolved issues has begun, and in collaboration with the MAC, and ONMS MHR Working Group, and our partners, consensus recommendations on these issues will be sought.



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## Appendices

## Appendix 1: Workshop Agenda

### **Mapping SCR and Maritime Archaeological Resources in National Marine Sanctuaries**

#### 14 August

- 8:30 Welcome, Introductions
- 8:45 Charge to Workshop Participants: Developing a seabed mapping strategy for submerged cultural resources in national marine sanctuaries.
- 9:00 Overview of JSBMI and previous Workshop at UNH
- 9:30 Participant Presentations: Bring a presentation to share with the group on SCR mapping...what's happening at your site or other SCR mapping effort, what technologies you are using, what problems you have encountered, what needs you have identified. Illustrative underwater pictures and map products get extra credit!
- 10:30 Break
- 10:45 Participant Presentations (continued)
- 12:00 Lunch
- 13:00 Developing an SCR Mapping Strategy: What do we want and need, what technologies should we be using, what are the challenges to implementing a strategy?
- 14:30 Break
- 14:45 Developing an SCR Mapping Strategy (continued)
- 17:00 Wrap-up and Dinner

#### 15 August

- 8:30 Recap of Previous Day's Work
- 8:45 Developing an SCR Mapping Strategy (complete discussion and summarize points of consensus and outstanding issues)
- 10:30 Break

- 10:45        Priorities: Can we agree on any priorities...what sites, or areas of sites are priorities for mapping? What shiptime or equipment issues should be dealt with first, and what are they? Are there capacity or training issues that should be addressed? What about data management?
- 11:45        Workshop Wrap-up
- 12:00        Logistics for Afternoon Events (optional)...End of Workshop

## Appendix 2: Workshop Participants

<u>Participants</u>	<u>Affiliation</u>	<u>E-Mail</u>
Brad Barr	ONMS/Director's Office	Brad.Barr@noaa.gov
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## Appendix 3: Summaries of Participant Presentations

### USGS/NMSP Seabed Mapping initiative – Brad Barr, ONMS

Presentation provided overview of history and ongoing activities of JSBMI, including outcomes of preliminary needs assessment, mapping inventory, Workshop 1 and points of consensus/outstanding issues, and next steps.

### Introduction and Overview: USGS/NMSP Joint Seabed Mapping Initiative Workshop 2: Mapping Submerged Cultural Resources – Brad Barr, ONMS

Provided further background on the JSBMI and articulated goal for Workshop 2: “To articulate ‘what we want’ in sufficient detail to inform the seabed mapping strategy regarding submerged cultural resources for the NMS System.” In specific, workshop participants were challenged to seek consensus on what it is we want and need for seabed maps related to submerged cultural resources, identify key questions and issues as well as identify products and research needed to support this initiative.

### RUST: Resources and Undersea Threats - Mike Overfield, ONMS

Presentation provided information regarding the development of a database and comprehensive inventory of undersea threats and potential environmental hazards within United States waters. Initially focused on waters in and around national marine sanctuaries, RUST will assist NOAA and other trustees to locate and identify potential hazards and develop resource protection strategies, improving emergency preparedness and contingency planning for America’s coastal and maritime resources. This database structure has been developed and being populated with NMSP information. With regard to linkage to the ONMS seabed mapping efforts:

- Use of 10 meter horizontal by 10”s of centimeters vertical resolution maps as background layers to plot existing Lat/Long/Depth info from database.
- Establish search grids to locate probable targets (wrecks/dumpsites).
- Once targets located, closer inspection with either groundtruthing or high resolution mapping.

### NOAA and USGS: Successful Collaboration and Integration through Ocean Exploration - Jeremy Weirich. NOAA/OE

Presentation provided an overview of collaborative OE mapping activities. Recommended that “Charting” MHR sites better term than “survey” which is term of art in MHR community. Included examples from Puerto Rico Trench, Hudson

Canyon, Flower Garden Banks NMS, and various MHR mapping projects, as well as some important “lessons learned” (Scapa Flow wrecks off Northern UK good example of MHR charting; “ALLIGATOR” cruise showed critical need to match task to tool, as multibeam system on NOAA Ship THOMAS JEFFERSON may have been incapable of identifying 40’ submarine). Current OE priorities for exploration are Arctic EEZ, Gulf of Mexico, Northwestern Hawaiian Islands, Pacific Rim, North Atlantic, South Atlantic Bight and Caribbean, and invited ONMS to identify greatest needs for mapping and the types of data to be collected.

#### Searching for Shipwrecks in the SBNMS: The Role of Seabed Mapping - Ben Haskell, SBNMS

Provided overview of the MHR work being conducted at the site, focusing on the PORTLAND and CRARY/PALMER projects, and how mapping has been used to support this work. Offered some observations regarding how valuable the existing multibeam mapping has been. Some issues to be resolved include shadow areas, created by sun-illuminated renderings of maps, may obscure some targets, and need for develop algorithms in ARCVIEW to do some initial MHR screening of targets...National Register and Historic Landscapes Protections worth pursuing, and will be at SBNMS.

#### A New Dual Use – Mapping Natural and Maritime Heritage Resources at Multiple Scales– Ivar Babb, NURC/NAGL

Presentation offered overview of NURC/NAGL involvement and support for seabed mapping and MHR management in national marine sanctuaries. Recommended that mapping be thought of as “dual use” for both natural and cultural resources. Offered some thoughts about the potential for and benefits of linking Integrated Ocean Observing Systems (IOOS) to MHR characterization and management. Also mentioned that NURCs are procuring an AUV, a technology which can be used to get greater resolution for deepwater multibeam mapping.

#### Survey and Instrumentation Issues for Seabed Mapping & Archaeology - Rod Mather – University of Rhode Island, John Jensen – Mystic Seaport

Presentation provided overview and recommendations regarding successful MHR mapping and survey strategies, and particularly the issues surrounding not embracing comprehensive approaches to characterization. Dr. Mather offered that there is a significant possibility of identifying the most obvious but missing most significant archaeological resources when not using multiple survey strategies using multiple instruments. Compared instrumentation commonly used on land and for maritime surveys. A number of strategies for site characterization are available could be applied to sanctuary sites but likely to

need to apply a number of them to be able to comprehensively identify all MHR. Naming part of history and heritage of an area. High resolution mapping is essential for discovering 17<sup>th</sup> and 18<sup>th</sup> Century wrecks and similar sites, as what may be identifiable on the seabed surface is just debris fields (like the one pictured here). Emphasized that magnetometry is essential, and almost non-existent for national marine sanctuaries.



Debris Field from 17<sup>th</sup> Century Shipwreck (from Mather Presentation)

Dr. Jensen spoke of the significant need for developing a regional environmental history for guiding and informing MHR site characterization. Suggested that mapping the history of human activities is an essential element of understanding cultural heritage. While this is an emerging issue in maritime history, sufficient guidance is available through the review of examples of where this has been done successfully elsewhere.