# Atlantic States Marine Fisheries Commission

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*Vision: Sustainably Managing Atlantic Coastal Fisheries*


## TRAVEL AUTHORIZATION

**TA No.** 17-001 **Charge To:** 0046000IART **Approved by:** Laura Leach

| | |
|---|---|
| **Meeting Name:** | 2017 Joint ASMFC/GSMFC Artificial Reef Meeting |
| **Meeting Date:** | FEB-06-2017 - FEB-08-2017 |
| **Meeting Location:** | Jacksonville, Florida |
| **Hotel Details:** | Meeting/accommodations at The Crowne Plaza-Jacksonville Airport, 14670 Duval Road Jacksonville, FL 32229 T: 877.559.0015 Identify Group: Atlantic States Fisheries Commission to receive reduced rate |
| **Cutoff Date:** | DEC-31-2016 |
| **Per Diem:** | Hotel: $99 Meals: $46 ($11/$12/$23) |
| **Mileage Rate:** | $0.535/mile, eff. January 5, 2017. Rental cars must be specifically authorized. |
| **Airport Transportation:** | Jacksonville Int'l Airport (JAX): 2mi. Complimentary shuttle provided |
| **Local Transportation:** | Numerous stores and restaurants are located within minutes of the hotel at the River City Marketplace. The Crowne Plaza offers scheduled transportation to the Marketplace for a nominal fee. Contact the Front Desk for additional information. |
| **Basic Guidelines:** | In consideration of the Commission's budget please attempt to select the most reasonable airfare. You are responsible for determining your arrival and departure times. Commissioners (or their proxies) are eligible to attend all meetings; all others are eligible for reimbursement to attend board/committee meetings of which they are a member. If the distance from your office to the meeting site is under 35 miles, ASMFC will not reimburse hotel, mileage or per diem but may reimburse any miscellaneous expenses that would not normally occur during a work day (i.e., parking, tolls). ASMFC reserves the right to disallow travel expenses it deems excessive or unnecessary to conduct ASMFC business. |
| **Reimbursement:** | You must submit an ASMFC travel voucher with receipts within 30 days of the final day of travel. Electronic travel vouchers and scanned receipts are preferred and should be sent to accounting@asmfc.org. Vouchers and receipts will also be accepted via snail mail if emailing is not an option. |
| **General Notes:** | Complete ASMFC Travel Reimbursement Guidelines can be found at http://www.asmfc.org/files/Meetings/TravelReimbursementGuidelines_Jan2017.pdf and the Electronic Travel Voucher: http://www.asmfc.org/files/Meetings/ASMFCElectronicTravelVoucher_Jan17.xlsx Please contact the ASMFC office if you have questions or would like staff assistance. |

## Authorized Travelers:

| | | |
|---|---|---|
| Carberry, Hugh | Clarke, Peter | Deacutis, Chris |
| Ennis, Brad | Havel, Lisa | Laporta, Christopher |
| Malpezzi, Mike | Martore, Robert | Murray, January |
| Nelson, Alicia | Peters, Jason | Rousseau, Mark |
| Tinsman, Jeff | | |

# Joint Artificial Reef Subcommittees Meeting

*February 7 – 8, 2017*

The Crowne Plaza Jacksonville Airport

14670 Duval Road

Jacksonville, Florida 32229

Webinar:
https://global.gotomeeting.com/join/810271821
Conference Call:
a) Call **1-888-394-8197**
b) Enter passcode **222918**

***Tuesday, January 7th***

9:00 Call to Order – *Mark Rousseau*
- Welcome and Introductions
- Adoption of Agenda
- Approval of Minutes from the March 14-15, 2016 Meeting

9:20 HAPCs, Permitting, and Artificial Reef Deployment Discussion – *January Murray*

9:50 PCB-Free Military Vessels for Reefing – *Keith Mille*

10:20 Update on South Carolina's Deepwater Artificial Reef MPA – *Bob Martore*

10:50 BREAK

11:10 Review of 2016 National Artificial Reef Workshop – *Lisa Havel*

11:30 Lunch

1:00 Harwich Reef Update – *Mark Rousseau*

1:30 SMZ Designations in the EEZ off New Jersey – *Jeff Tinsman and Peter Clarke*

2:10 Update on the SAMFC Artificial Reef Policy Document – *Lisa Havel*

2:20 ROI with Relation to Large Artificial Reef Systems in Japan – *Kenta Suda, Tsukasa Takahashi, Jeffrey Stephens*

2:35 BREAK

2:55 Matching SFR Funds in Delaware – *Jeff Tinsman*

3:25 Overview and Implementation of Northeast Florida's Offshore Reef Fish Fisheries-Independent Monitoring Program – *Russ Brodie*

3:45 Status of Historical Resource Survey Requirements – *All*

4:10 Public Comment (including vendor updates on latest equipment and materials)

4:30 Adjourn Day 1

***Wednesday, February 8th***

8:30 Call to Order – *Mark Rousseau*

8:40 GSMFC – *James Ballard*

8:50 ASMFC – *Lisa Havel*

9:00 Federal Agencies – *NMFS, ACOE, BOEM*

9:10 Georgia – *January Murray*

9:20 South Carolina – *Bob Martore*

9:30 North Carolina – *Jason Peters*

9:40 Virginia – *Alicia Nelson*

9:50 Maryland – *Mike Malpezzi*

10:00 Delaware – *Jeff Tinsman*

10:10 New Jersey – *Peter Clarke*

10:20 New York – *Christopher LaPorta*

10:30 BREAK

10:40 Rhode Island – *Chris Deacutis*

10:50 Massachusetts – *Mark Rousseau*

11:00 Louisiana – *Mike McDonough*

11:10 Mississippi – *James Sanders*

11:20 Alabama – *Craig Newton*

11:30 Florida – *Keith Mille/Brad Ennis*

11:40 Texas – *Dale Shively*

11:50 Discuss Next Joint Meeting in 2017
Time
Location

12:00 Other Business incl. chair nominations

12:10 ADJOURN

# National Artificial Reef Workshop




## Alexandria, Virginia
## June 9 – 10, 2016

NOAA FISHERIES

## TABLE OF CONTENTS



**Presentations and Materials**
All presentations and workshop materials are available online at:
http://www.nmfs.noaa.gov/sfa/management/recreational/artificial-reef-workshop.html

# I. Workshop Recap

NOAA Fisheries and the Atlantic States Marine Fisheries Commission (ASMFC) convened a national artificial reef workshop June 9–10, 2016, in Alexandria, Virginia. Nearly 80 participants from around the nation—including state artificial reef program managers, scientists, recreational fishermen, and non-governmental organizations, among others—shared lessons learned in artificial reef application, discussed opportunities and challenges, and considered the potential future direction of artificial reefs in U.S. waters.

A steering committee of artificial reef experts coordinated closely with NOAA Fisheries and ASMFC staff to develop the following objectives for this workshop:

- Provide an overview of current science and applied experience (lessons learned) regarding the application of artificial reefs as a tool to support or enhance sustainable fisheries.
- Identify and examine key considerations associated with artificial reefs as a potential management tool to support and/or enhance sustainable fisheries.
- Identify management challenges and associated research needs, knowledge gaps and limitations, and strategies for monitoring, using, and managing artificial reefs.
- Discuss the potential roles of federal, state, and private sector partnerships in resolving artificial reef challenges and achieving objectives.

A series of opening presentations set the stage for collaborative discussion that took place throughout the course of the workshop. The facilitator presented a summary of pre-workshop survey findings that helped shape the agenda. Key experts then provided artificial reef history, introduced a frame of reference for considering artificial reefs as a potential fishery management tool, and created common understanding of the regulatory framework for all present. NOAA Fisheries staff also introduced the NOAA Ecosystem Based Fishery Management Policy (EBFM). Presentations/presenters included:

- *A Brief History of Marine Artificial Reef Development in U.S. Waters*
  Dr. Bill Gordon (on behalf of Richard Christian), University of Rhode Island
- *Artificial Reefs in Fisheries Management: Has the Time Come?*
  Dr. Steve Bortone, Gulf of Mexico Fishery Management Council (retired)
- *NOAA Ecosystem Based Fisheries Management Policy*
  Kirsten Larsen, NOAA Fisheries
- *Overview of the Regulatory Framework*
  Keith Mille, Florida Fish and Wildlife Commission

Six managers/practitioners from around the nation built upon early framing conversations by presenting on the artificial reef experience from their respective regions, and then participating in a panel discussion. The panel helped create awareness of various state artificial reef program

objectives, strategies, and applied experiences from around the nation. Interested readers are encouraged to view all presentations on the project webpage. Presenters/panelists included:

- *North and Mid-Atlantic:* Mark Rousseau, Massachusetts Department of Fish and Game
- *South Atlantic:* Bob Martore, South Carolina Department of Natural Resources
- *Gulf of Mexico:* Dale Shively, Texas Parks and Wildlife Department
- *Washington:* Theresa Tsou, Washington Department of Fish and Wildlife
- *California:* Eric Wilkins, California Department of Fish and Wildlife
- *Hawai'i:* Paul Murakawa, Hawai'i Department of Land and Natural Resources

Following the panel discussion all workshop participants gathered in small groups of 8 to 10 participants to share experiences and lessons learned, and begin discussing solutions to common challenges. Report-backs to the full group highlighted challenges, methods for overcoming barriers, and future needs. (A comprehensive description of session outputs is included on page 9.)

Day 2 of the workshop began with a series of five presentations, followed by a panel discussion among experts that explored the current state and potential future direction of the science. Presentations/panelists included:

- *Ecological Functioning of Artificial Reefs with Fisheries Management Implications*
  Bill Lindberg, University of Florida
- *Planning Artificial Reefs in the U.S.: Recent Trends and Evolutionary Challenges*
  Bill Gordon, University of Rhode Island
- *Science Informing Artificial Reefing Practices: Key Findings, Knowledge Gaps, and Future Directions from the Northwestern Gulf of Mexico*
  Greg Stunz, Texas A&M University Corpus Christi
- *Artificial Reef Socioeconomics: Everything but the Kitchen Sink*
  Bill Huth, University of West Florida
- *Artificial Reefs: The Good, the Bad and the Ugly*
  Jim Bohnsack, NOAA Fisheries

Similar to day 1 collaborative discussions, participants again self-organized into several small groups following the science presentations. The facilitation team organized tables by topics explored during the presentations. Participants then chose a topic of interest and rotated to other topics as desired. Each group explored science gaps, partnerships, and priorities. (A comprehensive description of the science session outputs is included on page 14.)

The final small group breakout session tasked all workshop participants to build a bridge toward future activities based on new knowledge gained and ideas shared among peers over the course of 2 days together. Specifically, small groups identified and discussed key workshop takeaways that will influence next steps (individual and collective), and improve communication and collaboration among artificial reef practitioners across the United States.

While not consensus-based, final report-backs to the full group identified numerous takeaways that may shape future actions across a broad range of categories, including:

- Management
- Science
- Funding
- Needs and potential future actions
- Identified concerns

At the culmination of the event, the conveners (NOAA Fisheries and ASMFC) thanked everyone for their collaborative engagement on an important national issue and noted that, moving forward, NOAA Fisheries will utilize workshop outputs to evaluate its future role in considering artificial reefs as a potential fisheries management tool. (Interested parties are encouraged to read the summary of workshop takeaways included on page 19.)

## II. Welcome and Opening Remarks

NOAA Fisheries and ASMFC jointly convened a national artificial reef workshop June 9–10, 2016, at the Westin Alexandria in Alexandria, Virginia. Nearly 80 participants attended from around the nation, including state artificial reef program managers, scientists, recreational fishermen, and non-governmental organizations among others.

Russell Dunn, NOAA Fisheries National Policy Advisor for Recreational Fisheries, opened the workshop and welcomed participants. He acknowledged broad interest in artificial reefs, affirmed the need for a conversation about their potential role in fisheries management, and NOAA's need to better understand the science and management challenges, and benefits associated with artificial reefs.

Mr. Dunn thanked the steering committee for its guidance in shaping the workshop objectives and agenda. Patrick Campfield, Director of the Fisheries Science Program at ASMFC, also welcomed participants. He described ASMFC's and the Gulf States Marine Fisheries Commission's (GSMFC) 30-year history of coordinating information exchange and helping guide artificial reef development among the Atlantic and Gulf states.

The conveners thanked all participants for attending and expressed eagerness for new information sharing and discussion of a range of perspectives throughout the workshop. They noted that artificial reefs have been utilized and tested as restoration and mitigation tools in U.S. waters, but the potential as a fisheries management tool has not yet been explored to any meaningful extent.

Facilitator Rich Wilson of Seatone Consulting reviewed the workshop agenda, noting how presentations and panel discussions would frame a series of small group discussions during the course of the workshop. He drew attention to the Participant Workbook, where supplementary

text, an overview of all presentations, and additional materials were compiled as a resource for participants. (All presenter biographies can be found on pages 22–27 of the workbook.)

**Workshop Objectives**

- Provide an overview of current science and applied experience (lessons learned) regarding application of artificial reefs as a tool to support or enhance sustainable fisheries.
- Identify and examine key considerations associated with artificial reefs as a potential management tool to support and/or enhance sustainable fisheries.
- Identify management challenges and associated research needs, knowledge gaps and limitations, and strategies for monitoring, using, and managing artificial reefs.
- Discuss the potential roles of federal, state, and private sector partnerships in resolving artificial reef challenges and achieving objectives.

## III. Summary of Pre-Workshop Findings and Themes

The facilitator presented a summary of key findings from a pre-workshop survey completed by nearly half of all invited participants. The survey captured perspectives and insights from prospective attendees on a range of artificial reef–related topics. Survey results revealed topics of interest, recent advances and important gaps in artificial reef science and management, potential for coordination and partnerships, and lessons learned from different regions around the nation. Most importantly, the results helped shape the workshop agenda and recruit guest presenters who framed key topics and issues that participants then discussed over 2 days.

## IV. Background and History of Artificial Reefs

Scheduled presenter Richard Christian was unable to attend the workshop, so Dr. Bill Gordon, University of Rhode Island, presented *A Brief History of Marine Artificial Reef Development in U.S. Waters* on Mr. Christian's behalf.

The first documented marine artificial reef in U.S. waters was placed in 1850. That said, most artificial reef development occurred over the past five decades. Dr. Gordon described how construction has generally been driven by four factors:

1. An engaged constituency.
2. Availability of suitable materials.
3. Dedicated funds for construction, monitoring, and assessment.
4. Supporting artificial reef policies, state and local programs, and planning documents.

From the 1950s to 1980s, more than 80 percent of artificial reefs were constructed from materials that outlived their original purpose, or "materials of opportunity." Construction, Dr. Gordon noted, has generally out-paced scientific assessments of artificial reef effects on natural

habitat or as a potential fisheries management tool. Early artificial reef policies emerged in the 1970s, culminating in the landmark National Fishing Enhancement Act of 1984. The Act, however, did not provide spending authority for appropriations aimed at supporting artificial reef implementation.

Rigs-to-reefs programs also began developing in the early 1980s. As of 2015, 470 offshore oil and gas platforms have been converted to permanent artificial reefs in the Gulf region. The 1980s were also a popular time for designing reefs out of specific materials to suit a defined purpose. The Japanese government, Dr. Gordon noted, has designed structures for specific aquaculture and commercial fishing activities that may provide lessons learned for U.S. practitioners.

Today approximately half of coastal states have artificial reef program plans. These plans are unique to each state's habitat, geography, and resource use dynamics. The U.S. Federal Aid Sportfish Restoration Fund provides significant resources for state artificial reef programs. Increasingly, these programs will need to coordinate with other entities engaging in marine spatial planning so artificial reefs are appropriately sited and managed. Development of an information clearinghouse, containing a wide range of resources, would likely also benefit practitioners around the nation.

## V. Artificial Reefs in a Fisheries Management Context

To help frame the issue of fisheries management, and the connection to artificial reefs as a potential management tool, Dr. Steve Bortone, retired Executive Director of the Gulf of Mexico Fishery Management Council, presented on the general topic, *Artificial Reefs in Fisheries Management: Has the Time Come?*

Dr. Bortone described how practitioners have deployed different artificial reef types for decades for various purposes (e.g., habitat mitigation, fish aggregation, trawling deterrents, water movement deterrents). He noted that, in defining fisheries management, the key phrase is "active manipulation based on quantitative choices" such that fisheries will be sustained or improved. The management process involves both resource manipulation and influencing human behavior.

Dr. Bortone suggested that artificial reef practitioners consider modifying Seaman and Jensen's 2000 definition of artificial reefs, to read: "One or more objects of natural or human origin deployed on the seafloor to influence physical, biological, and/or socioeconomic processes related to living aquatic resources." He further emphasized that this definition can be sensibly abridged to read "objects deployed to influence aquatic resources."

Currently, artificial reefs play virtually no role in the management of any fishery in U.S. waters, or for that matter, the world. That said, Dr. Bortone reviewed potential artificial reef applications in fisheries management:

- Increase habitat.
- Mitigate stressed or destroyed habitat.
- Enhance life stage survival of a species.
- Facilitate movement or colonization.
- Reduce pressure on natural fishing habitat.
- Redirect water movement.

Conversely, he noted obstacles to applying artificial reefs in fisheries management:

- Difficult to evaluate success in a fisheries management context because they have not been employed as fisheries management tools.
- Challenges with data compatibility and sampling methods.
- Lack of study replication.
- Unintended consequences.
- Studies often do not provide fishery managers the information needed for decision making.

While thousands of artificial reefs (or other objects that function as artificial reefs such as seawalls, docks, and pipelines) have been deployed throughout the world, Dr. Bortone estimated likely less than 0.001 percent of the continental shelf has been affected. To overcome obstacles, he noted, artificial reefs must allow reliable predictability of effects just as is required of other fisheries management options. Pressing needs to support implementation as a potential fisheries management tool include:

- Cooperation/organization.
- Nationwide information database.
- Estimate of artificial reef footprint and impacts.
- Energy budget.
- Meaningful management objectives.

Finally, notwithstanding ongoing scientific debates, Dr. Bortone suggested that future studies may want to focus on how artificial reefs generate both high attraction *and* production. Later workshop conversations, as well as past studies, pointed out a continuum from attraction to production. Resource managers, Dr. Bortone noted, may consider strategic implementation of artificial reefs as a tool directed at select species rather than entire species assemblages. He further stressed that managers need to better communicate to artificial reef researchers the management questions they need answered. (A summary of the question/answer session that followed Dr. Bortone's presentation is listed in Appendix I.)

Next, Kirsten Larsen, NOAA Fisheries Office of Science and Technology, provided an overview of NOAA's recently released *Ecosystem Based Fisheries Management Policy* (EBFM). The policy formalizes NOAA Fisheries' commitment to EBFM. While the policy is new, the concept itself is not. The policy is intended to capture the current state of EBFM within NOAA Fisheries and

provide both the agency and the Regional Fishery Management Councils guidance moving forward. Managing on an ecosystem level may provide more stability for fisheries. It also provides an opportunity to address trade-offs and different stakeholder priorities, balancing social and ecological needs.

NOAA Fisheries is a mandate-driven science agency whose work is needed to support management choices for 750+ taxa and over 5 percent of the world's ocean area. NOAA Fisheries adopted the EBFM policy to more efficiently and effectively fulfill its mandates. The forthcoming NOAA Fisheries EBFM Road Map, expected in summer 2016, builds upon the policy by providing a national implementation strategy. (A summary of the question/answer session that followed Ms. Larsen's presentation is listed in Appendix I.)

## VI. Overview of the Regulatory Framework

In order to create common knowledge and understanding among workshop participants on artificial reef governance, permitting requirements, and associated regulatory issues, Keith Mille of the Florida Fish and Wildlife Conservation Commission provided an *Overview of the Artificial Reef Regulatory Framework*.

The majority of artificial reef activities, Mr. Mille noted at the outset, are overseen by the U.S. Army Corps of Engineers (ACOE). He provided an overview of relevant federal laws, ACOE regulations, and state regulatory jurisdictional issues that apply to artificial reef development in U.S. waters.

In Mr. Mille's home state of Florida, coastal governments (i.e., municipalities) hold artificial reef permits issued by the ACOE (required in both state and federal waters) and Florida Department of Environmental Protection (required in state waters). Regulatory constraints on artificial reef construction address issues such as spatial boundaries for navigation, channels, marine habitat resources, historic areas, sand borrow areas, existing structures and leases, etc.

Many states now implement materials limits for artificial reef structures. Some areas, Mr. Mille noted, face challenges with unpermitted material types and locations, especially for private deployments. Poor past artificial reef practices, many now prohibited, generated negative press from many vivid old photos and records and still contribute to misconceptions about modern artificial reef programs.

Mr. Mille stressed that opportunities do exist for improved coordination among parties working on permitting and regulatory issues. He encouraged pre-permit application consultations between applicants and regulatory agencies. He also noted that achieving permitting compliance does not necessarily mean that fisheries management objectives have been achieved.

Finally, Mr. Mille suggested that interested parties could further explore the topics presented in the opening session at a special artificial reef session planned for the annual meeting of the American Fisheries Society in Tampa, Florida, on April 20–24, 2017. (A summary of the question/answer session that followed Mr. Mille's presentation is provided in Appendix I.)

# VII. Regional Experiences and Lessons Learned

## a. Panel Discussion

Following the opening framing conversations, six managers/practitioners from around the nation shared brief presentations on the artificial reef experience from their respective region, and then participated in a panel discussion. The discussion helped create awareness of different state artificial reef program objectives, strategies, and applied experiences. (Interested parties are encouraged to view all regional presentations on the project webpage.)

Presentations/panelists included:

- *North and Mid-Atlantic:* Mark Rousseau, Massachusetts Department of Fish and Game
- *South Atlantic:* Bob Martore, South Carolina Department of Natural Resources
- *Gulf of Mexico:* Dale Shively, Texas Parks and Wildlife Department
- *Washington:* Theresa Tsou, Washington Department of Fish and Wildlife
- *California:* Eric Wilkins, California Department of Fish and Wildlife
- *Hawai'i:* Paul Murakawa, Hawai'i Department of Land and Natural Resources

Each presenter described specific examples, if available by region, of artificial reef fishery management and/or enhancement applications. All presenters addressed challenges, lessons learned, and needs moving forward. After the presentations the facilitator opened the panel discussion with an initial question, which was then followed by numerous questions, comments, and discussion between presenters and the full group. (A summary of the panel discussion that followed all presentations is listed in Appendix I.)

## b. Small Group Breakouts

Utilizing a "World Café" style format, which encourages diversity of thought and ideas, all participants engaged in the first small group collaboration of the workshop. Groups of 8 to 10 participants shared experiences and lessons learned, and began discussing solutions to common and sometimes unique challenges. Each group considered three guiding questions:

1. What have been your biggest challenges regarding artificial reef application, and how have you overcome them?
2. What lessons have you learned, what has worked well, and what experiences can you share that may benefit others?

3. From your perspective (your constituency/interest group) what are your needs moving forward?

*Discussion note: The facilitator acknowledged that funding challenges are no doubt paramount among many artificial reef practitioners. He requested participants also identify other important challenges and needs.*

**Report-Outs and Full Group Discussion**
After breakout discussions, all participants reconvened and each small group shared highlights from their respective conversations. The following outputs reflect themes and associated responses presented during the report-outs and collected on note-taking sheets and poster paper provided to each group.

**1. What have been your biggest challenges regarding artificial reef application, and how have you overcome them?**

*Science and Research*

- Site selection and spatial habitat utilization by life stage and species life history (e.g., spawning, nursery).
- Addressing species bottleneck issues.
- Understanding if/how artificial reefs contribute to the existing mosaic of marine protected areas (MPAs).
- Unknown/unanticipated ecological impacts of artificial reefs (e.g., introduction of new predators or invasive species; converting one habitat to another; human impacts of favoring one fishery over another, etc.).
- Accounting for different concepts of scale.
- Understanding which species are habitat-limited.
- How to integrate artificial reef habitat into fisheries management stock assessment models.
- Science questions from managers are difficult to answer, especially with limited resources.
- Difficult to study and monitor productivity of artificial reefs with active fisheries.

*Permitting and Regulations*

- Permitting can be a "moving target" at both state and federal levels.
  - ⇒ The definition of an artificial reef in California is too specific.
  - ⇒ In Texas permits changed from each reef zone to each individual reef.
  - ⇒ Potential solution: Create a single entity (federal-state partnership) that can set permit standards for the nation so requirements do not change along with regional staffing changes.
- Delays associated with Endangered Species Act section 7 consultations.
  - ⇒ Potential solution: Create standardized protocols for data collection and possibly have a programmatic Environmental Impact Statement for an entire region.

- It is not always clear what matching funds are permissible for a project in permitting application materials.
- State permitting hurdles:
  - ⇒ Process can take several years and cost hundreds of thousands of dollars.
  - ⇒ Different review agencies require different levels of detail and different application methods.
  - ⇒ Potential solution: Need permitting consistency within each department and among designated permitting review staff.
- Federal plans may not fit regional needs.
- California lacks an artificial reef policy.
- Obtaining water quality certifications from issuing agency is difficult
- Lack of state policy and federal consistency.
- Liability

*Monitoring*

- Increased monitoring demands and difficulty obtaining accurate citizen science data.
- Lack of baseline data (for user group benefits, economics, recreational use, etc.).
- Limited ability to monitor artificial reefs due to inadequate resources.

*Communication and Outreach*

- Public perception and/or awareness of state artificial reef programs.
  - ⇒ Potential solution: Regular outreach and easily accessible information about public artificial reef sites (e.g., website and printed material for fishermen).
- Effective public education and outreach methods—cross-communication challenges among stakeholders with various interests, expertise, etc.
- Lack of awareness, and lack of public relations around artificial reefs.
- Overcoming the stigma of "ocean dumping."
- Identifying suitable sites for informal meetings with stakeholders.

*Planning, Management, and Maintenance*

- Recreational fishermen do not always acknowledge they are part of the problem.
- Capturing institutional knowledge within organizations.
- Defining a clear purpose(s) for new artificial reefs (e.g., socioeconomic, mitigation, etc.).
- Deployment challenges for large structures.
- Identifying potential user conflicts.
- Maintaining artificial reefs.
- Unclear goals and plans for proposed artificial reefs.
- User and interagency conflicts.
- Securing a reliable source of materials, transportation, and materials storage space.

**2. What lessons have you learned, what has worked well, and what experiences can you share that may benefit others?**

*Science and Research*

- Spatially explicit sampling of all habitat types is necessary.
- Research/report requirements could benefit by developing objectives and structure in order to standardize data collection and help put questions up-front.
- Success metrics should be clearly defined by the applicant and permitting agency in advance of project.
- Ensure metrics are concise, obtainable, and measurable.
- Specific artificial reef types can benefit one species more than others (e.g., gag grouper); design and implement artificial reefs according to specific management objectives.
- Citizen science does not always work well for monitoring artificial reef productivity.

*Design, Siting, and Deployment*

- Beneficial to aggregate materials into large clusters with satellite materials dispersed around the central cluster.
- Consult user groups and permitting agencies early in the process of artificial reef design, site selection, and project implementation in order to identify and address concerns.
- Develop a "Best Practices" document.
- Diversify materials to support different life stages of species.
- Recognize that concrete materials continue to cure/hydrate when underwater.

*Permitting and Documentation*

- Recognize benefits of streamlining the permitting process (e.g., regional permits, interagency review teams, programmatic consultations by NOAA and/or ACOE).
- Use innovative in-kind donations to help raise matching funds for artificial reef permitting costs (e.g., cost to build a structure, services training value of a decommissioned tank, logistics value for artificial reef deployment, etc.).
- Pay attention to funding source requirements. Build in funding for ongoing monitoring and maintenance.
- Recognize benefits of having a local partner who takes ownership of the artificial reef once installed, with a contract containing long-term management commitment.
- Maintain good artificial reef documentation with regular monitoring and data updates.
- Consider lessons learned from the Gulf region regarding how to streamline the permitting process among multiple agencies.

*Outreach and Education*

- Recognize the importance of doing outreach and education to all audiences (e.g., general public, fishing groups, environmental groups, NGOs, elected officials, etc.).
- Engage private sector/non-profit partnerships.
- Understand it is important to have a diversity of artificial reef materials that can provide suitable habitat for different life history stages of important species.

*Other*

- Recognize the benefits of securing buy-in across stakeholder groups.

- No "painless solution" exists. Balanced solutions require sacrifice from all stakeholders.
- Marine reserves and uncharted reefs help reef fish populations rebound. Advances in technology, however, make it easier for fishermen to locate uncharted reefs.
- Consider the "shifting baselines" phenomenon and how the concept applies to conservation perspectives and targets among different generations.
- Regional differences in the acceptance, or not, of artificial reefs as "the norm" affects the level of development.

**3. From your perspective (your constituency/interest group) what are your needs moving forward?**

*Science, Research and Monitoring*

- Better understanding of how research can inform science-based products for fisheries managers.
- Climate change planning—ecosystem effects, sea level rise, etc. affecting species composition.
    - ⇒ Understanding cumulative impacts of habitat alteration and/or habitat loss from wind farms.
    - ⇒ Working with renewable energy installations (e.g., wind farms) to achieve artificial reef effects.
- Scientifically defensible data to support artificial reef development, including greater understanding of the difference between designed and donated materials.
- Scientifically sound, standardized studies that cover large geographic areas.
- Reference points (e.g., artificial reefs where no fishing rules are enforced) are needed to implement monitoring for management effectiveness. Explore the possibility of using existing MPAs to install artificial reefs and create de facto reference sites.
- Habitat needs of species by life stages.
- Standardized coast-wide monitoring programs/protocols, including long-term monitoring. Use well-established, consistent monitoring metrics.
- Socioeconomic analyses by region (e.g., cost/benefit analyses).
- Piggyback/leverage data collection programs (e.g., Marine Recreational Information Program) of other agencies/researchers.
- Data on artificial reef catch rates and fishing efforts.
- Identify and address data gaps.
- More rigorous scientific data at the regional level.
- Synopsis of research completed since 1997.
- Science-based outreach to the public.

*Relationship to Fisheries and Ecosystem Management*

- More artificial reefs that enhance fishing and replace lost fishing opportunities from habitat loss, degradation, and fishing closures; reduce pressure on existing reefs.
- Artificial reefs to replace and/or recover lost reef habitats.
- Protection of existing commercial fishing opportunities.

- Management strategy evaluation trade-offs to develop adaptive management strategies.
- Reliable funding source for both baseline and continued monitoring.
- Measurable goals for artificial reef projects.

*Permitting and Regulations*

- Defined national priorities with regional flexibility.
- Streamlined, comprehensive permitting processes.
- Simplified regulations that help facilitate enforcement.
- Individualized/developed permits and regulations for each artificial reef (not permits "translated" from other federal/state environmental programs, such as wetlands).

*Coordinated Planning*

- National program (federal or federal/state partnership); coordination and consistency.
- National cross-dialogue, inclusive of diverse stakeholder types.
- Central clearing-house of artificial reef research and information.
- Non-regulatory national artificial reef coordination program.

*Other*

- Understanding needs for historical restoration and the role of artificial reefs.
- Staffing and training support for regulators.
- More diverse funding sources and private funding increases.
- Marketing campaigns directed at policy-makers.
- Receiving better materials from the Navy and Maritime Administration (MARAD).

# VIII. Current State and Potential Future Direction of Science

## a. Panel Discussion

A series of five presentations followed by a panel discussion with science experts explored the current state and potential future direction of the science. The session aimed to:

- Describe and facilitate discussion on the scientific basis that informs the application of artificial reefs as a potential management tool to enhance sustainable fisheries.
- Identify science gaps that need to be addressed to advance the potential for use of artificial reefs as a management tool.
- Illustrate key elements of partnerships and/or cooperative arrangements among federal, state, university, and other researchers.
- Identify short- and long-term priorities, then foster discussion on how future research might be better focused.

Presentations/panelists included:

- *Ecological Functioning of Artificial Reefs with Fisheries Management Implications*
  Bill Lindberg, University of Florida
- *Planning Artificial Reefs in the U.S.: Recent Trends and Evolutionary Challenges*
  Bill Gordon, University of Rhode Island
- *Science Informing Artificial Reefing Practices: Key Findings, Knowledge Gaps, and Future Directions from the Northwestern Gulf of Mexico*
  Greg Stunz, Texas A&M University Corpus Christi
- *Artificial Reef Socioeconomics: Everything but the Kitchen Sink*
  Bill Huth, University of West Florida
- *Artificial Reefs: The Good, the Bad and the Ugly*
  Jim Bohnsack, NOAA Fisheries

At the completion of all five presentations, the facilitator opened the panel discussion with an initial question and then welcomed questions and comments from the full group. He requested that both panelists and questioners keep comments relatively brief so as to allow for inclusive discussion on what may be various topics of interest during the panel discussion. Interested parties are encouraged to view all science presentations on the project webpage. (A summary of the panel discussion that followed all presentations is listed in Appendix I.)

## b. Small Group Breakouts

Similar to the day 1 collaborative discussions, participants again self-organized into several small groups following the science presentations. The facilitation team organized tables by topics explored during the presentations. Participants then chose a topic of interest and rotated to other topics as desired. Each group explored science gaps, partnerships, and priorities.

1. From your/your agency's perspective, what are the primary **science gaps** related to this topic that need to be addressed to inform management and artificial reef application?
2. Related to this topic, can you describe key elements of successful **partnerships** and/or cooperative arrangements among federal, state, university and other researchers?
3. From your/your agency's perspective, what are the short- and long-term **science priorities** related to this topic, and how can future research be better focused?

**Report-Outs and Full Group Discussion**
After breakout discussions, the groups reconvened and shared highlights from their respective conversations. The following outputs capture responses presented during the report-outs and collected on note-taking sheets and poster paper provided to each group.

**Discussion Topic: Fisheries Management/Reef Function**

*Primary Science Gaps*

- Habitat use/needs by various life stages of species.

- Spatially explicit sampling of the different habitats and life stages (e.g., where is the bottleneck and how should reefs be designed)?
- How artificial reefs feed into the fisheries management process, and into science products for managers (e.g., stock assessments and fisheries allocations).
- Role of reefs—is it foraging space or a refuge? What species are actually benefitting from a particular artificial reef?
- Understanding how artificial reef habitat contributes to overall productivity.
- Understanding the type and amount of fishing effort occurring on artificial reefs.
- How natural habitats contribute to overall fisheries impact.

*Key Elements of Successful Partnerships*

- Identify leaders to initiate partnerships. Forged partnerships help leverage funding, streamline monitoring, etc.
- Recognize that personal relationships are the key to maintaining successful partnerships.
- Facilitate greater coordination and engagement with federal agencies in each step of the artificial reef permitting and development process.
- Ensure correct stakeholders are engaged when initiating a project (e.g., stock assessment scientists, ecologists, recreational fishing entities).
- Establish clear goals and outcomes at the outset of any partnership. Ensure accountability and engagement with all partners.

*Science Priorities*

- Integrate artificial reefs into ecosystem management and understand their potential role in fisheries management.
- Habitat use by various species and life stages.
- How/if artificial reefs can ameliorate climate change and species distribution shifts.
- Explore what site fidelity means for fish using artificial reefs.
- Duplicate peer-reviewed artificial reef science so management decisions are founded on robust science, and not one study.
- Establish clear goals and objectives up front so artificial reefs are designed to achieve defined outcomes. Identify who sets goals and tools used to achieve them.

**Discussion Topic: Design, Siting and Deployment**

*Primary Science Gaps*

- How to select appropriate materials to maximize ecological benefits (size, shape, concentration/density, etc.).
- Mapping the seafloor bottom to reduce potential for sinking/subsiding materials.
- Predictability and cost-benefits of using pre-designed materials versus materials of opportunity.
- Review and, when needed, refinement of stated artificial reef development goals.
- Artificial reef interaction with natural reef habitat.

- How to site reefs in shallow water without violating clearance regulations.

*Key Elements of Successful Partnerships*

- Demonstrate interdisciplinary capability and share resources (e.g., equipment, people, time, funds, etc.).
- Recognize partnerships are successful when:
  - ⇒ Fisheries management agencies take the lead.
  - ⇒ Partners provide information on artificial reef needs.
  - ⇒ Partners offer political leverage.
  - ⇒ The number of partners on one project is limited.
  - ⇒ Open information exchange occurs among all parties.

*Science Priorities*

- Design comparative studies.
- Understand the pros and cons of using different materials and site designs; keep information up to date as new technologies emerge.
- Explore how to improve access to artificial reefs and monitor how improved access affects reef ecology.
- Determine how to implement lessons learned by other countries.

**Discussion Topic: Monitoring**

*Primary Science Gaps*

- Regional-scale, scientifically sound, standardized studies (e.g., gear and methodologies that produce comparable data for stock assessments).
- More standardized, comparable studies on inshore reef sites and their ability to enhance nursery habitats.
- Baseline data on a site before artificial reef material is deployed in order to better assess environmental changes that result from the new reef.
- Standardized, baseline monitoring across regions to assess how artificial reefs are functioning over time and how they perform compared to natural reefs. Also need long-term consistent source of funding to support such monitoring.
- Assessment of changes in angling effort as a result of new deployments to reduce bias in long-term fishery-dependent surveys.
- Assessment of other user groups' activities on a proposed artificial reef site to help expedite the permit process.
- Comparable site versus system-related data.
- Clearly defined, realistic, and achievable goals for new artificial reef projects, and monitoring protocols that assess whether goals are being achieved.

*Key Elements of Successful Partnerships*

- Incorporate performance monitoring protocols into new artificial reef projects when applying for the permit. Helps expedite the permit process.
- Bring universities into state artificial reef programs to provide monitoring and scientific studies on artificial reef function.
- Get buy-in from other user groups on new artificial reef projects to bolster support for state programs and improve how they are perceived.
- Recognize that monitoring is an important aspect of collaboration.
- Be aware universities can assist state programs.
- Coordinate efforts through the ASMFC and GSMFC Artificial Reef Technical Committees; provides a venue for information sharing on what has worked and what has not, as well as information on new monitoring technologies.
- Consider coordination with Regional Fishery Management Councils.
- Use/share different gear types to help address monitoring visibility.
- Use volunteer divers and other citizen scientists where appropriate (surveys).
- Develop collective performance metrics.

*Science Priorities*

- Set clearly defined, realistic, and obtainable goals—and standardized monitoring protocols to assess those goals—for new artificial reef project permit applications.
- Outline standard monitoring procedures within permit paperwork. How is standardized monitoring determined? Via committee, use of templates, other?
- Conduct research on what material type(s) works for different species life cycles.
- Recognize monitoring and data collection feeds information to all other topics under discussion.
- Develop long-term, standardized studies that provide scientifically based answers to what is working best or demonstrate programs are meeting goals.

**Discussion Topic: Socioeconomics**

*Primary Science Gaps*

- Lack of data on user groups (fishermen, divers and other non-extractive users); inconsistency that results in lack of compatibility.
- Difficulty in setting up socioeconomic surveys and methodologies employed across regions; also poses difficulties in comparing studies.
- Use of aerial surveys.
- How to accurately consider extraneous costs, such as promoting diving and fishing at artificial reef sites.
- Ecosystem-wide socioeconomic evaluations; analysis of positive *and* negative artificial reef effects for all user groups; economic multiplier effects.

- How to measure dollar amounts by human use versus human effect on artificial reefs (e.g., scuba diving is more expensive than fishing, and brings in more revenue, but at many reefs more fishermen are present than divers).

*Key Elements of Successful Partnerships*

- Establish regional and national expert panels that conduct surveys.
- Learn lessons from academic partnerships. Partnerships are strong in some regions while not in others.
- Recognize up front stakeholder engagement is critical:
  - ⇒ Florida: Annual Sea Grant event organizes all regional stakeholders.
  - ⇒ Need active, frequent, and open communication.
- Integrate matching financial contributions for socioeconomic studies to instill partnerships that "go beyond words" to action.
- Capitalize on partnerships to think outside the box about development (e.g., using artificial reefs as living art).
- Share information to help create and maintain partnerships.

*Looking Ahead*

- Practitioners must consider existing regulated areas and sustainability of communities.
- Socioeconomics should be a primary consideration when discussing the potential of artificial reefs as fishery management tools.
- Socioeconomics is also critical to understand and implement human/user management on artificial reefs.
- How should practitioners determine what socioeconomic impacts are important for decision-making? Just because an artificial reef brings financial benefits to a single stakeholder group, does that mean it is the right thing to do?

**Discussion Topic: The Good, the Bad and the Ugly**

*Primary Science Gaps and Priorities*

- Artificial reefs as sources and/or sinks.
- Economic valuation of artificial reefs.
- Develop monitoring protocols at different scales—devise artificial reef plan based on population or local level?
  - ⇒ Establish control sites to understand impacts when artificial reef sites are fished/not fished.
  - ⇒ Conduct frequent sampling and replication.
  - ⇒ Design sampling for individual species and specific life stages.
- Recreational fish surveys: ask "did you catch fish on a reef or not?"
- Understand the role of artificial reefs in reducing natural mortality in order to relieve bottlenecks.
- California needs life history data to inform development of a future artificial reef plan (e.g., data on larval habitats).

- Design artificial reefs to target specific species.

*Key Elements of Successful Partnerships*

- Develop a "Best Practices" document to guide artificial reef practitioners:
  - ⇒ Perhaps update the National Artificial Reef Plan. Ensure any updates consider and incorporate regional differences.
  - ⇒ Create accessible, supplementary guidelines for small groups who do not want to utilize the full plan.
- Address issues where improvements are needed:
  - ⇒ Illegal reefs and not enough enforcement to address this problem.
  - ⇒ Ghost artificial reefs—no longer in human use but at times trap and kill turtles and other animals.
  - ⇒ Lack of expertise and training in artificial reef deployment.
- Partnerships should recognize regionally different priorities, including the purpose for applying artificial reefs (e.g., fishing, mitigation, etc.).
- Facilitate open and transparent planning processes, forge partnerships with the recreational fishing community and consider competing interests.
- Anticipate road blocks when developing partnerships (e.g., liability/insurance).

## IX. Fostering Mutual Learning and Advancing the Discussion

During the last breakout, participants discussed how to build a bridge toward future artificial reef–related activities (individual and collective) based on new knowledge gained and ideas shared during the course of the workshop. Participants also discussed ways to improve communication, information sharing, and collaboration. Again in small groups, the facilitator suggested participants consider discussing the following topics, or any subject that came to mind as each group considered next steps:

- Enhancing communication and information sharing.
- Building partnerships and strengthening collaboration.
- Improving management, regulations, and policy.
- Advancing the natural and social science.
- Identifying and mobilizing resources (e.g., human, technological, financial).

The full group reconvened one final time and small groups shared workshop takeaways. The following themes and associated takeaways are not necessarily consensus-based. Rather, these outputs grew from 2 days of extensive information sharing and collaborative discussions about regional experiences, challenges, science, and lessons learned.

*Management*

- Incorporate artificial reefs into ecosystem-based management and marine spatial planning efforts.

- Consider arrays of artificial reef zones as potentially beneficial for drawing fishing pressure away from natural habitat zones.
- Science and management must recognize that humans are part of the ecosystem and their behaviors need to be factored into artificial reef planning.
- Artificial reefs may exacerbate problems in overfished stocks if not properly managed/enforced.
- Artificial reefs may play an important role for species success in the face of future climate change and warming ocean temperatures.
- On-the-water observations of recreational users are a valuable tool for monitoring and informing decision-making.
- Artificial reefs as a fisheries management tool needs formal recognition and regular discussion, even if society never gets to actually using them for this purpose.

*Science*

- Recognize "attraction/production" does not have to be an either/or question; it can be looked at as a continuum. Individual artificial reefs may produce both attributes.
- Standardize data collection/housing protocols so that information is easily accessible and usable for managers.
- Include artificial reefs in fisheries stock assessment analyses. The habitat component of stock assessment is too often (or nearly always) missing.
- Advance large-scale, scientifically based studies (e.g. monitoring, function, socioeconomics, etc.) to fill data gaps.
- Evolve state programs from opportunity-based to science-based. Target specific species and life history stages that benefit from increased suitable habitat.
- Do not let available artificial reef science go to waste because it is not perfect.
- Utilize targeted citizen science to benefit state programs.
- Recognize that now is the time to determine the role artificial reefs play in fisheries management models.

*Funding*

- Funds from the Deepwater Horizon catastrophe create an opportunity for the Gulf states to incorporate artificial reef research and development into applied science.
- Consider acquiring funds to integrate artificial reefs into new or revised coastal zone management plans and integrated seafloor planning efforts.

*Needs and Potential Future Actions*

- Create a national clearing house of information (i.e., database) where relevant, up-to-date information can be easily obtained; include information on artificial reefs, lessons learned from around the world, and video interviews with first generation practitioners.
- Be proactive with artificial reef design. For example, consider writing in pre-approved construction materials into permit applications (e.g., decommissioned bridge materials).
- Determine an effective grassroots mechanism to continue efforts from this workshop:
    - $\Rightarrow$ Several participants stated the need for more artificial reef workshops.

⇒ Several suggested using this workshop as a catalyst for continued collaboration.

- Foster consistent outreach about state programs to a variety of user groups.
- Consider using monitoring videos shared during the workshop as educational material for the general public. These videos present excellent visual demonstrations of activity occurring on artificial reefs.

*Identified Concerns*

- Most recreational fishermen believe artificial reefs have value, but not all resource managers are convinced. Recreational fishermen are connected to and can raise artificial reef issues in the fisheries management process. Federal agencies can and should play a role in coordinating some of these efforts.
- Conspicuous absence of commercial fishermen in this process (including this workshop).

## X. Closing Comments

The facilitator thanked all note-takers, timekeepers, and those offering report-backs from collaborative discussions. Mr. Dunn thanked all participants and ASMFC, the workshop host. NOAA is pleased, he noted, to hear new ideas, connections, and possible future actions resulting from the workshop. Moving forward, NOAA will utilize the discussion outputs to evaluate its future role in considering artificial reefs as a potential fisheries management tool.

## Appendix I: Presentation Q&A and Panel Discussions

A Q&A session followed most expert presentations, especially the Panel discussions. A summary of back-and-forth discussions between presenters and workshop participants, often helping to clarify key concepts or flag important issues, is included below. Readers should refer to sections above for a description of presentations that helped frame workshop discussions.

**Presentation:** *Artificial Reefs in Fisheries Management: Has the Time Come?*
**Presenter:** Dr. Steve Bortone, Gulf of Mexico Fishery Management Council (retired)

Summary of post-presentation comments, questions, and responses:

- Comment: Deploying artificial reefs in estuaries can play an important role in fisheries management. In Delaware, we have nine artificial reef sites in one bay, providing habitat for juvenile marine sea bass.
    - Response: This is an important point. Estuarine reefs are not highly touted, and more research and demonstration projects are needed in this area.
- Question: Regarding the "attraction/production" debate, is it recommended to look at whether artificial reefs are harmful or beneficial to production?
    - Response: This is a species-specific question. Both attraction and production can be studied to a degree for the species one is attempting to manage. Artificial reefs can also be multi-functional wherein the same artificial reef has different functions for several species. Some have argued it is a continuum from attraction to production. I would argue that there are at least two axes – attraction and production where you can have low and high attraction and low and high production that are not mutually exclusive characters.
    - Additional comment: The question about attraction versus production will almost always be impossible to answer unless the researcher is 100 percent sure of all activity of the reef the previous day or days (e.g., boating and fishing impacts), as this affects fish counts.
- Question: How might managers move beyond this long-debated issue?
    - Response: It is not possible to move beyond this debate, as it has embedded human elements. It is reasonable for an artificial reef to have high attraction and high production for some species; high attraction and low production for others; low attraction and high production for others; and low attraction and low production for others. Managers must decide what they want to manage for and be cognizant of the attributes of species they are interested in.

**Presentation:** *NOAA Ecosystem Based Fisheries Management Policy*
**Presenter:** Kirsten Larsen, NOAA Fisheries

Summary of post-presentation comments, questions, and responses:

- Question: Is NOAA Fisheries attempting to identify monitoring gaps as it considers how to conduct EBFM?
    - Response: Yes, data gaps will be addressed under item #2 in the EBFM Guiding Principles pyramid: "What is the foundational science we need?" NOAA Fisheries is exploring how to conduct and organize monitoring efforts and utilize data in new, innovative ways.
- Comment: Please consider the value of artificial reefs to recreational tourism. For example, artificial reefs make a significant contribution to the Florida economy.
    - Response: Indeed, there are human use benefits from artificial reefs beyond ecological considerations (e.g., recreational use/no commercial take).
- Question: Has NOAA considered the cumulative ecological impacts of introducing artificial reefs into large areas? For example, if one million acres of artificial reef habitat is introduced into a soft-sediment bottom will the entire species composition of that area change?
    - Response: NOAA scientists are currently researching this question.
- Comment: Japanese researchers have explored this topic and found it a matter of trade-offs. For example, artificial reefs in an area like this may attract octopus at the expense of reducing flounder because a large area of muddy bottom habitat was removed.
- Question: How will NOAA address monitoring and enforcement requirements, and funding needs associated with these activities, within its policy? These questions will come up when new permit requests or renewals are submitted to ACOE for review and approval.
    - Response: This is not yet known.
- Question: How will NOAA address scale in the context of ecosystems? Are humans considered as another dimensional scale in EBFM?
    - Response: Scale has been discussed at length within NOAA Fisheries. Most management decisions are made at the local or regional scale. Assessment design may initially be conducted at an individual stock level, and then scaled up to an ecosystem level as we continue to develop new models and collect needed data. Humans are an integral part of the ecosystem the way NOAA has defined "ecosystem."

**Presentation:** *Overview of the Regulatory Framework*
**Presenter:** Keith Mille, Florida Fish and Wildlife Commission

Summary of post-presentation comments, questions, and responses:

- Question: Is the second regulation listed under 33 CFR 322.5(b) "*Facilitate access and utilization by recreational and commercial fishermen*" in direct opposition to special management zone regulations that exclude use of specific fishing gear at a certain site?
    - Response: ACOE regulatory requirements provide guidance for artificial reef construction that could be used for both recreational and commercial fishing activities. In order to protect certain artificial reefs from being fished or limit

specific gear types, or to minimize conflicts between user groups, some are designated as special management zones (SMZs). For example, sometimes funding sources such as USFWS Sport Fish Restoration (SFR) require assurance that recreational fishing access at SFR funded artificial reefs will not be impeded by commercial activities, and establishment of a SMZ might be necessary to comply with those funding requirements. While 33 CFR 322.5(b) could possibly be interpreted to mean that federal agencies cannot prohibit commercial fishing, regardless of whether the fishing occurs on a natural or artificial reef, restrictions on access may be a stipulation of the funding source which is not prohibited by ACOE permits. Additionally, for areas in state waters, the respective state permit may contain proprietary authorization which may similarly mandate use limitations as part of the sovereign submerged lands authorization. It is important to make the distinction between regulatory, funding and proprietary requirements. Comment: This is should be considered during the breakout groups or at a subsequent workshop/meeting.

- Question: How much information exchange occurs between Florida and the federal fishery management council system regarding decision-making on artificial reefs?
    - Response: Very little to none. Typically, the only time the fishery management councils have been directly involved in artificial reef permitting is during establishment of SMZs, which is rare.
- Question: If all of the man-made substrates were removed from the Gulf of Mexico would fish be able to survive on remaining natural habitat?
    - Response: Human contribution to seafloor structure is very small, especially in regions where there exist large expanses of existing natural reef structure. Historical records pre-dating artificial reef development demonstrate that fish would survive on natural habitat. The question then becomes will people be able to catch fish at the same rate in the absence of artificial reefs? The species, location and the quality of the artificial reef habitat are variables for consideration too. This question is also linked to the prior discussion on species-specific management (i.e. overfishing, habitat degradation).

**Panel Discussion: Regional Experiences and Lessons Learned**
Presentations/panelists included:

- *North and Mid-Atlantic:* Mark Rousseau, Massachusetts Department of Fish and Game
- *South Atlantic:* Bob Martore, South Carolina Department of Natural Resources
- *Gulf of Mexico:* Dale Shively, Texas Parks and Wildlife Department
- *Washington:* Theresa Tsou, Washington Department of Fish and Wildlife
- *California:* Eric Wilkins, California Department of Fish and Wildlife
- *Hawai'i:* Paul Murakawa, Hawai'i Department of Land and Natural Resources

Summary of comments, questions, and responses during the Panel discussion:

- Question: A number of panelists cite SMZs and MPAs as tools that help managers implement, monitor, and better understand artificial reefs. What are the drivers behind designating such zones? Are they designed proactively or in response to high fishing pressure? And do any scientific studies exist that demonstrate a spillover effect from regulated artificial reefs?
    - Response: In most cases, special designations are put in place to protect artificial reefs from fishing pressure. For example, a permit application can state that an artificial reef is intended as a SMZ. It is a long, complicated process to achieve such designations. Regarding spillover effects, some small-scale studies have been conducted though nothing published to date. Additional response: Planning zones in the Gulf are linked to the rigs-to-reefs programs and are intended to assist with accurate seafloor planning. If an artificial reef was proposed outside a particular zone, or was up for renewal, it was previously possible to bypass the general permit process until regulations changed about 1 month ago. Currently, a new permit must be filed for new artificial reefs, or if new material is to be added to an existing site.
- Question: From the perspective of a recreational angler, it appears the Atlantic and Gulf coasts have well established artificial reef programs, and the west coast states have a very limited number of artificial reefs. California recently set aside a percentage of its marine habitat as MPAs, where recreational fishing is limited or prohibited in certain areas. Is there an opportunity for artificial reefs to support recreational fishing in this state?
    - Response: There is a possibility for establishing artificial reefs in California, however a state plan is needed first that provides structure and appropriate regulations. It is critical for state agencies and their federal agency partners to be aligned on these issues. Additional response: Several California Department of Fish and Wildlife staff have visited Texas and Louisiana to learn from our artificial reef programs. This kind of workshop helps improve collaboration and learning among states and federal agencies, as states primarily operate independently.
- Question: Several years ago, a research effort revealed that sport and party boat owners were deploying their own materials in undisclosed locations, often illegally, to meet client demands. Is this an issue the states are concerned about and, if so, are there any suggestions on how to address it?
    - Response: Some regions struggle with this issue more than others. There is little that can be done to prevent these activities beyond increasing law enforcement, which is very costly. Additional response: In the Gulf, particularly in Alabama, members of the public can deploy their own materials as long as they are approved. Some have recently requested fish aggregation devices (FADs), though these tools may have limited to no habitat value.
- Question: What is your source of non-public funds for unpublished artificial reef sites that serve as MPAs in South Carolina waters?
    - Response: Funding has come from a variety of sources. For example, the South Atlantic Fishery Management Council provided its own project funding.

- Question: How does liability apply for permitting unpublished reefs? Is it navigation departments, habitat preservation departments, other?
    - Response: In the south liability lies with the permit holder. Additional comment: ACOE reviews whether or not applicants are insured. Insurance is difficult for private citizens to obtain, therefore states typically become applicants.
- Question: Are efforts underway to quantify economic activity generated by artificial reefs on the west coast?
    - Response: No such studies are currently underway in California or Washington. Additional comment: One past study demonstrated that the Yukon, a sunken ship in southern California, has generated $4.5 million in revenue for the state. Similar studies have been done for rigs-to-reefs projects.
- Question: Do protocols exist for monitoring sediments for toxins that leach from materials of opportunity?
    - Response: Such protocols are established on a case-by-case basis. Occasionally the U.S. Environmental Protection Agency (EPA) will establish regulations for monitoring the leaching of toxins.

**Panel Discussion: The Current State and Potential Future Direction of Science**
Presentations/panelists included:

- *Ecological Functioning of Artificial Reefs with Fisheries Management Implications*
  Bill Lindberg, University of Florida
- *Planning Artificial Reefs in the U.S.: Recent Trends and Evolutionary Challenges*
  Bill Gordon, University of Rhode Island
- *Science Informing Artificial Reefing Practices: Key Findings, Knowledge Gaps, and Future Directions from the Northwestern Gulf of Mexico*
  Greg Stunz, Texas A&M University Corpus Christi
- *Artificial Reef Socioeconomics: Everything but the Kitchen Sink*
  Bill Huth, University of West Florida
- *Artificial Reefs: The Good, the Bad and the Ugly*
  Jim Bohnsack, NOAA Fisheries

Summary of comments, questions, and responses during the Panel discussion:

- Question: From a scientific perspective, what are the enabling conditions that will allow resource managers to move in the direction of using artificial reefs for fisheries management, and what does that mean for the future direction of the science?
    - Response: As fish, crustaceans, mollusks, etc. grow, they rely on cavity space scaled to their body size for habitat. Sometimes animals outgrow this space. If a species demonstrates a bottleneck related to habitat structure in their life history, installation of artificial reef structures may help alleviate this bottleneck. However, this only occurs if a very strong year class is moving through the system, and it applies only to certain species. Spatial and temporal components

must be considered in population dynamics modeling. Fisheries performance can be one indicator of artificial reef performance.

- Question: If all artificial reefs and other man-made structures were removed from the coast of Maryland, would the resident reef fish populations (e.g., black sea bass, tautog) survive on remaining natural reef? Same question for red snapper off Texas?
    - Response: Some evidence exists showing that in muddy bottom portions of the western Gulf region of Texas, artificial reefs support colonization and rapid recovery of certain species. However, there is also a high abundance of different species on natural reefs, indicating that perhaps artificial reefs have enhanced populations in this area.
- Question: What does science tell us about production potential of red snapper and gag on artificial reef pyramids, and how this potential may change relative to the proximity of artificial reefs to natural reefs?
    - Response: One paper, currently under peer review, estimates a 2 percent or less production rate of artificial reefs located in close proximity to natural reefs. Fish are being caught young, before they are able to reproduce and contribute to reef productivity. Shrimp trawls are one big source of species mortality. Others are the large size and bag limits of the fishery. If artificial reefs were installed, and fishing limited or prohibited, these structures certainly show potential to contribute to production regardless of proximity to natural reefs.
- Question: Can the panelists speak on the topic of artificial reef habitat valuation?
    - Response: A growing number of scientists are engaged in this emerging area of ecosystem service valuation. Generally, valuation is conducted from the human perspective, and the collective science community is just beginning to explore this topic. It is an area that needs more attention, and could be included in more requests for proposal processes nation-wide.
- Question: Many studies have been conducted on the role artificial reefs play relative to recreationally important species, but have any studies been conducted on how artificial reefs may support bait fish that are the food source for recreational species?
    - Response: Some researchers are interested in studying this issue. Broadly speaking, the forage base issue is an important one in fisheries management, but has not been tightly linked with artificial reefs yet. In the Gulf, some initial characterizations of food source/forage species, and associated utilization of artificial reefs, are being conducted. Not much work has been conducted looking at how cryptic species use artificial reefs.
    - Response: One must consider if humans are competing with other fish species—and by extension affecting the goals for artificial reef functionality—by fishing at the base of the food web. This also gets to the point of catching fish before they reach reproductive age. In red snapper, one big, old female fish has the same reproductive capacity as 210 smaller females.
- Question: In your view, what is needed from fisheries managers to help strengthen artificial reef science, habitat science, etc. to inform decision-makers?
    - Response: Formal program evaluation is the key. Programs should be reviewed in a formative and summative way (possibly state by state). This formal review

method is not actively practiced in artificial reef resource management. Goals and parameters for success must be articulated at the outset of any program. Resource managers and scientists must have a solid understanding of *why* artificial reef programs are successful in order to articulate that success to decision-makers. An analogy can be made to the "Sesame Street" television program, where at the end of each episode viewers are informed of the math, communication, etc. skills the children have gained. This allowed the show to obtain a large amount of broadcast funding.

- Question: Do you see any future role for the Interstate Marine Fisheries Commissions relative to artificial reef management?
    - Response: Yes, there is a role, which is already happening in the Gulf. Moving forward, the Gulf region, as well as other states, could develop consistent sampling/monitoring methods and programs to compare and analyze artificial reefs from the management perspective. NOAA has not been actively engaged in any coordination or management of artificial reefs recently. That said, the Commissions could potentially act as liaison between NOAA and scientists.
    - Response: Coordination of research is highly important. Each state agency could partner with researchers and begin replicating studies on regional or even broader scales.

## Appendix II: Workshop Participants

* Workshop Steering Committee Member

| *Name* | *Affiliation* |
|---|---|
| Alisha Gray | Florida Fish & Wildlife Conservation Commission |
| Amy Comer | North Carolina Department of Environment and Natural Resources |
| Bill Gordon | University of Rhode Island |
| Bill Huth | University of West Florida |
| Bill Lindberg* | University of Florida |
| Bob Martore | South Carolina Department of Natural Resources |
| Bob Williams* | NOAA Fisheries |
| Brian Nunes-Vais | Ann E. Clarke Foundation |
| Chris Deacutis | Rhode Island Department of Environmental Management |
| Chris Laporta | New York Department of Environmental Management |
| Chris Meaney* | NOAA Fisheries Office of Habitat Conservation |
| Chris Wojcik | Artificial Reef Sculptor |
| Clay Tam | Western Pacific Fishery Management Council |
| Craig Newton | Alabama Department of Conservation and Natural Resources |
| Dale Shively | Texas Parks and Wildlife Department |
| Dan Reed | University of California Santa Barbara |
| Dave Witting | NOAA Fisheries Office of Habitat Conservation |
| David Bacon | Fish Reef Project |
| David Fries | Institute for Human Machine Cognition |
| David Molnar | Connecticut Department of Energy and Environmental Protection |
| Dawn Hayes | NOAA Office of National Marine Sanctuaries |
| Dean Rewerts | California Ships to Reefs |
| Dean Sensui | Western Pacific Fishery Management Council |
| Ed Bonner | Philadelphia Army Corp of Engineers |
| Ed Parnell | Scripps Institution of Oceanography |
| Eleanore Rewerts | California Ships to Reefs |
| Eric Wilkins | California Department of Fish and Wildlife |
| Fred Baddour | Artificial Reefs International |
| George Frankel | Eternal Reefs Sarasota |
| George Sedberry | NOAA Office of National Marine Sanctuaries |
| Greg Stunz | Texas A&M University-Corpus Christi |
| Heather Coll | NOAA Fisheries Office of Protected Resources |
| Heather Sagar | NOAA Fisheries Office of Policy |
| James Ballard* | Gulf States Marine Fisheries Commission |
| January Murray | Georgia Department of Natural Resources |
| Jason Peters | Georgia Department of Natural Resources |
| Jeff Stephens | Water Gremlin Company |
| Jeff Tinsman | Delaware Department of Natural Resources and Environmental Control |

| | |
|---|---|
| Jessica Coakley | Mid-Atlantic Fishery Management Council |
| Jim Bohnsack | NOAA Fisheries Southeast Fishery Science Center |
| Jimmy Sanders | Mississippi Department of Marine Resources |
| Joe Weatherby | Artificial Reefs International |
| John Froeschke | Gulf of Mexico Fishery Management Council |
| Kate Spidalieri | NOAA Office of National Marine Sanctuaries |
| Keith Mille | Florida Fish & Wildlife Conservation Commission |
| Kirsten Larsen* | NOAA Fisheries Office of Science and Technology |
| Lisa Havel* | Atlantic States Marine Fisheries Commission |
| Mark Rousseau* | Massachusetts Department of Fish and Game |
| Meghan Lapp | Seafreeze, Ltd. |
| Michael Malpezzi | Maryland Department of Natural Resources |
| Moira Kelly | NOAA Fisheries Greater Atlantic Regional Office |
| Monty Hawkins | Recreational Fisherman (Maryland) |
| Patrick Campfield* | Atlantic States Marine Fisheries Commission |
| Paul Murakawa | Hawai‘i Department of Land and Natural Resources |
| Pete Clarke | New Jersey Division of Fish and Wildlife |
| Pua‘ala Pascua* | NOAA Fisheries |
| Rich Seagraves | Mid-Atlantic Fishery Management Council |
| Rob Workman | Artificial Reefs International |
| Ron Dean | NOAA Fisheries Office of Protected Resources |
| Roy Miller | Atlantic States Fishery Management Council |
| Russell Dunn* | NOAA Fisheries |
| Sean Meehan | NOAA Fisheries Southeast Regional Office |
| Stephanie Hunt | NOAA Fisheries Office of Sustainable Fisheries |
| Steve Bortone | Gulf of Mexico Fishery Management Council |
| Steve Donohue | Environmental Protection Agency |
| Steve Schroeter | University of California Santa Barbara |
| Terra Lederhouse | NOAA Fisheries Office of Habitat Conservation |
| Theresa Tsou | Washington Department of Fish and Wildlife |
| Tim Mullane | Coleen Marine Inc. |
| Tony Marshak | NOAA Fisheries Office of Science and Technology |
| Virginia Fay | NOAA Fisheries Southeast Regional Office |

*Facilitation Team*

| | |
|---|---|
| Rich Wilson | Seatone Consulting |
| Meagan Wylie | Seatone Consulting |
| Cathy Plume | Seatone Consulting |

GEORGIA
DEPARTMENT OF NATURAL RESOURCES
COASTAL RESOURCES DIVISION

MARK WILLIAMS
COMMISSIONER

A.G. 'SPUD' WOODWARD
DIRECTOR

# JOINT GSMFC & ASMFC ARTIFICIAL REEF SUBCOMMITTEE MEETING

## Georgia Artificial Reef Report

**Jacksonville, FL**
**February 7th–8th, 2017**

The Georgia's Department of Natural Resources (GADNR), Coastal Resources Division (CRD), Habitat Restoration and Enhancement Unit (HREU) continues to focus on providing suitable and accessible quality habitats for coastal recreational anglers through enhancement of Georgia's 30 marine and 15 estuarine artificial reefs. These reefs play an important role in Georgia's marine and estuarine ecosystems and coastal economies along with providing recreational opportunities as popular fishing and diving destinations. Reef project partnerships include local sport fishing clubs, private businesses, and other interested organizations as well as the acceptance of financial and material donations in order to further develop Georgia's Artificial Reef System.

## Offshore Artificial Reefs

The Offshore Artificial Reef (OAR) Project covers ~116 square miles consisting of 30 artificial reef sites: 20 offshore reefs, two beach reefs, and eight Department of Defense (DOD) Tactical Air Crew Training System (TACTS) Towers. GADNR is currently consulting with the DOD on deployment plans to fully submerge the eight decommissioned TACTS Towers. Once deployed to the seafloor, the ownership of the Towers will be transferred to GADNR to allow the structures to continue to serve as habitat for marine life while providing recreational opportunities. Project SCUBA divers conducted material and compliance inspections during summer of 2016 where six reefs were visited and 46 dives were conducted.

During 2016, GADNR conducted one OAR enhancement through deployment of donated materials of opportunity. On June 30th, 2016 approximately 68 metal poultry transport cages (PTCs), 26 culvert sections, and six truckloads of concrete culvert/boxes were deployed at SAV Reef site (31°54.705'N / 80°47.195'W). This deployment would not have been possible without partnerships from the East Coast Terminal Company who staged materials landward in Savannah; Industrial Marine Services, Inc. who donated labor and equipment to load materials onto a contracted barge; Fieldale Farms Corporation who donated PTCs; TW3 Transportation who provided transportation of PTCs at a discounted rate; Astra Group, Inc. who donated 26 concrete culvert sections; and Consolidated Pipe and Supply Company who donated six truckloads of concrete culvert/boxes.

All of GADNR's OARs, 30 existing and one proposed, are permitted under the United States Army Corps of Engineers (USACE) Regional Permit No. 36 (RP 36), (SAS-2008-00584). In 2016, GADNR requested a new beach reef site, BSF, be considered for addition to RP 36. This 400 yard diameter site, approximately 4 nm southeast of Little Tybee Island (center of reef 31°54.089'N / -80°50.073'W), was identified in partnership with the Savannah Sport Fishing Club. RP 36 authorizes the deployment and maintenance of materials at Georgia's OAR sites located in the Atlantic Ocean and remained valid until July 27, 2016. RP 36 renewal documents were submitted to USACE on January 11, 2016. In September 2016, USACE determined that the proposed project may affect, but is not likely to adversely affect the following species: North Atlantic right whale (Eubalaena glacialis), and the loggerhead (Caretta caretta) and Kemp's ridley (Lepidochelys kempii) sea turtles (Appendix I). In addition, USACE determined that the proposed reissuance may effect, but is not likely to adversely affect listed critical habitat for the North Atlantic right whale. In October 2016, USACE generated an effects determination/request for concurrence letter. National Marine Fisheries Service (NMFS) Section 7 consultation was initiated in November 2016 and GADNR responded to a list of questions in December 2016 (Appendix II).

In 2016 the HREU drafted an Artificial Reef Strategic Plan (ARSP) to establish strategies for promoting reef habitat enhancement along the Georgia coast. The ARSP is intended to serve as a blueprint for HREU statewide operational activities, serve as a guide for future activities, and to provide a coordinated approach to habitat enhancement projects. GADNR also maintained a You Tube Channel that houses OAR videos (https://www.youtube.com/channel/UCHrnTJ6fzvAF8BoItzN9-Nw) which are linked to the Georgia Outdoor Map website (http://georgiaoutdoormap.com). The Georgia Outdoor Map is an interactive map that identifies GADNR managed lands and outdoor recreational opportunities, including offshore and inshore artificial reefs, by using any device with a web browser.

**Inshore Artificial Reefs**

The Inshore Artificial Reef (IAR) Project consists of 15 total sites located within seven of Georgia's estuaries, covering all six coastal counties. Thirteen of the reefs were established within the intertidal zone, zero to three feet deep at mean low water (MLW). These reefs provide small vessel anglers additional fishing opportunities since they were designed to replicate oyster beds and other naturally occurring structures. Two reef sites, Little River and Jekyll Island Pier, were established as subtidal reefs which are accessible by land. These reefs were positioned in waters eight to twelve and five to six feet deep MLW respectively.

During April 2016, GADNR conducted two IAR enhancements at estuarine reef sites identified for development within existing permitted areas while working with coastal sport fishing organizations, anglers, and donors. The Troupe Creek reef (31°13.772'N / 81°26.501'W) is located northeast of the Troupe Creek Marina, St. Simons Sound, Glynn County whereas the Joe's Cut reef (31°55.910'N / 80°59.297'W) is located at the mouth of Romerly Marsh Creek, Wassaw

Sound, Chatham County. Both of these habitat enhancement sites used fabricated Fish Aggregating Device (FAD) units: a FAD consisting of a three foot square, four inch thick concrete base with 1.5 inch diameter PVC protruding from the surface of the base combined with a donated steel frame. FAD units constructed by Department personnel provided each IAR site structurally complex fish and oyster habitat. On April 8th and 11th a total of 50 FAD units were deployed by GADNR staff at Troupe Creek reef in partnership with Rayonier Inc., Jesup Plant (donation of frames); Boykin Steel and Crane (donation of transportation); and a private property owner Dr. Neal Boswell (donation of use of property to stage materials). On April 26th a total of 48 FAD units (Figure 1, foreground) were deployed by GADNR staff at Joe's Cut reef in partnership with Rayonier Inc., Jesup Plant (donation of frames); the Savannah Sport Fishing Club (donation of funding); Boykin Steel and Crane (donation of transportation); and TW3 Transportation (discounted transportation).

**Oyster Reefs**

Georgia's estuaries contain a high density of natural oyster spat. However, there is a lack of suitable "natural cultch" materials available for oyster settlement; therefore shell and other materials must be reintroduced into the environment to promote growth and expansion of new oyster reefs. In order to have shell available for projects GADNR manages seven Shell Recycling Centers along the coast where community members from restaurants, oyster roasts and other events voluntarily donate oyster shells to be used in future projects. Shell is also bagged through volunteer outreach events and placed at designated restoration sites each spring. After shells are planted, oyster spat attach and grow creating a new oyster reef. Forty-four volunteers participated in a total of four "bagging events" where approximately 1,117 bags (8.4 tons) of recycled oyster shells were created thus donating a total of 88 hours to project activities. GADNR's Oyster Shell Recycling Project provided 37.9 tons of cured (three to six months) shells for use in 2016 projects but only 3.6 tons of shells were required in two oyster reef maintenance projects in Chatham and Glynn counties, creating a 34.3-ton reserve.

Performance monitoring at both Overlook Park (Glynn) and Florida Passage (Chatham) sites indicated maintenance deployments were required to augment existing areas of oyster reef restoration sites that had been overtaken by sedimentation. On March 30th-31st, 2016 Overlook Park maintenance materials, 100 oyster balls placed on top of 25 wooden double pallets including 75 oyster shell bags, were deployed adjacent to prior restoration materials (2013-2015). This type of maintenance material was subsequently tested on site (2015) and found to be successful in combatting sedimentation as well as recruiting oysters quickly. On April 4th, 2016 400 oyster shell bags were deployed on top of the existing footprint covered by sedimentation at the Florida Passage site. While the perimeter of the previously deployed (2013) reef materials were sufficient to recruit and sustain large (2"- 3") oyster growth, the majority of the remaining footprint was buried by sediment. Both sites were monitored bi-annually according to methods established in the GADNR Oyster Reef Restoration Monitoring Plan (2015). Maintenance deployments were

conducted under previously obtained state (CMPA No. 600) and federal (USACE Nationwide No. 27: SAS-2012-00898 and SAS-2012-00524) permits.

The "Georgia Oyster Reef Mapping Project" was conducted in partnership with The Nature Conservancy, Georgia Coastal Management Program, and National Oceanic and Atmospheric Administration (NOAA) Office for Coastal Management to create a Geographic Information System (GIS) dataset of existing natural and restored oyster reefs along the Georgia coast. This project mapped existing inventories of oyster reef locations using 2013 high resolution low tide aerial imagery. The data from this project were converted from a shapefile format to a polygon overlay in a .kml file that can be displayed in Google Earth™ for broader usability. This dataset can be used to search for favorable conditions of potential oyster reef restoration sites while not disturbing known oyster reefs. The dataset is available for public use and can be downloaded from NOAA's Digital Coast data repository at: https://coast.noaa.gov/dataregistry/search/dataset/info/benthiccover or viewed via the GADNR Georgia Wetlands Restoration Access Portal (G-WRAP) at: http://gcmp.maps.arcgis.com/apps/webappviewer/index.html?id=7fcb79b84b9440f9b35b3a5e4efd6afc


Figure 1. Joe's Cut Inshore Artificial Reef materials. In 2014, steel frames (photograph background) were deployed at this site to enhance fish and oyster habitat. Historical FADs consisting of concrete bases and PVC pin-cushion style arms (photograph midground) were deployed in the 1990's directly on the mudflat and have subsided below the mudline with only a small portion of the arms remaining. In 2016 a modfided FAD design was deployed, historical FAD units placed inside a steel frame in order to minimize subsidance (photograph foreground).

**APPENDIX I**

GEORGIA
DEPARTMENT OF NATURAL RESOURCES
COASTAL RESOURCES DIVISION

MARK WILLIAMS
COMMISSIONER

A.G. 'SPUD' WOODWARD
DIRECTOR

**MEMORANDUM**

**To:** Sarah Wise, USACE Regulatory Division

**From:** January Murray, Habitat Restoration and Enhancement Unit Leader

**Date:** September 21, 2016

**RE:** Reissuance of RP0036: No Effects on Protected Species

There are 30 approved and one proposed offshore artificial reef sites maintained by DNR, four of which were located within the 1994-defined Southeast right whale critical habitat. In early 2016 the Southeast right whale critical habitat was expanded so that 20 reefs are now within the critical habitat boundaries. During the last 5-year permit cycle (July 2011 - 2016), reef material was deployed 11 times on six of the 30 reef sites. Two of these deployments occurred during the right whale calving & migration season (November 1st to April 30th) in areas that were not at the time within the critical habitat but are now inside the expanded critical habitat boundary.

We anticipate deploying materials approximately two to four times each year during the next five years, with the majority of deployments occurring outside of the right whale calving window due to inclement weather and staff availability. Most reef materials are "material of opportunity" donated to the Department and we do not have long-term staging facilities to store these materials for a six-month period. If we are not able to deploy them within a few weeks of the proposed donation, which occurs throughout the year, we may be forced to turn them down. The Department would like the ability to deploy materials on all 31 reef sites throughout the year and have incorporated the following measures to ensure that there are no effects on protected species:

Vessel Strike Avoidance Measures:

1. DNR will ensure that vessel operators and crews maintain a vigilant watch for manatees, cetaceans and sea turtles by maneuvering, slowing down or stopping their vessel to avoid striking protected species.
2. DNR will ensure that all vessels 65 feet or larger comply with the NOAA Right Whale Ship Strike Reduction Rule (50 CFR 224.105 et. seq.) in order to reduce the likelihood of collisions with right whales.
3. DNR will maintain 500 m or greater separation distance from any right whale, 100 m or greater separation from any other whale species, and 50 m or greater separation from any

dolphin or sea turtle species.

4. DNR will ensure that vessel operators and crew are briefed to ensure they are aware of the above requirements.

Material Deployment Measures:

1. DNR will ensure that a 200 m exclusion zone is maintained at the deployment site to protect manatees, cetaceans and sea turtles for the duration of all deployments. A 500 m exclusion zone will be maintained for right whales.
2. The exclusion zone will be monitored by a protected species observer posted on the deployment vessel or another vessel located at the immediate deployment site.
3. Deployments will not be conducted at any time when lighting or weather conditions (e.g., darkness, rain, fog, sea state) prevents visual monitoring of the exclusion zone.
4. Clearance of exclusion zone: Deployment activities will not commence until the protected species observer reports has reported the exclusion zone clear of all cetaceans and sea turtles for at least 60 minutes.
5. Shut down procedures: Deployments activities will cease immediately if a sea turtle, manatee or cetacean is sighted within the exclusion zone. Deployment activities will not recommence until the exclusion zone has been cleared for at least 60 minutes of sea turtle, manatee or non-delphinoid cetacean and for at least 10 minutes of delphinoid cetacean.

Reporting Requirements:

1. DNR CRD staff will report all documented and suspected manatee, cetacean and sea turtle injuries and mortalities to DNR Nongame Conservation Section staff immediately, and will assist with carcass salvage if requested. Incident reports will be completed and submitted to the National Marine Fisheries Service Southeast Regional Office (for cetaceans and sea turtles) or the U.S. Fish and Wildlife Service Jacksonville Office (for manatees) within 48 hours, respectively.
2. All sightings of right whales will be reported to the U.S. Coast Guard immediately.

cc: Spud Woodward, Director of Coastal Resources Division

**APPENDIX II**

GEORGIA
DEPARTMENT OF NATURAL RESOURCES
COASTAL RESOURCES DIVISION

MARK WILLIAMS
COMMISSIONER

A.G. 'SPUD' WOODWARD
DIRECTOR

**MEMORANDUM**

**To:** Sarah Wise, USACE Regulatory Division

**From:** January Murray, Habitat Restoration and Enhancement Unit Leader

**Date:** December 19, 2016

**RE:** Additional Information NMFS, Protected Resources Division Requested by Jacquelyn A. DeAngelo, Endangered Species Biologist

**1) Please provide a project description including methods:**

**a) How will artificial reef materials be deployed?**

Offshore Artificial Reef (OAR) deployments involve materials transported via a barge and tow vessel to the deployment site. The barge typically contains some type of earth moving machinery (e.g. a skid-steer, backhoe, or small bulldozer) to push materials off the barge while the tow vessel operator maintains the position above the seafloor at a specified location. In situations where an entire vessel is deployed, holes are cut in the hull, and the seacocks and/or scuppers are opened to expedite sinking. The time for a vessel to sink to the seafloor varies by size, sea conditions, and structural integrity. Average sinking time is 30 minutes and staff remain on site until the vessel is resting on the seafloor and a latitude/longitude location is recorded. When possible, additional materials are loaded onto the vessel to add to the footprint and complexity of the reef.

**b) How will artificial reef materials settle on the existing artificial reef or on the ocean floor?**

Materials are pushed over the side of the barge within the reef footprint and gravity settles the materials onto the ocean floor.

**c) How will it be determined that reef materials are settled in the accurate location.**

The desired deployment location within the reef site is determined prior to deployment. Whenever possible/feasible, new materials are placed adjacent to existing materials and/or form groups of materials on the seafloor. Enhancing offshore habitats in this configuration allows for mobile fish to utilize both the artificial reef and the transitional zone (adjacent sand habitats) thereby dispersing fishing effort over a wider area. Once Georgia Department of Natural Resources (GADNR) staff are at the desired deployment location, a survey is conducted via side scan or conventional sonar to confirm the condition of the seafloor. A small anchored float is deployed to serve as a visual reference point to maintain the barge in a specified location throughout the deployment. The marker float is removed post deployment and latitude/longitude coordinates for the location of the deployed material are recorded.

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## APPENDIX II

**d) What method of monitoring will be used?**

In order to help ascertain the long-term structural integrity and performance of deployed materials, monitoring surveys are conducted annually (May – October) utilizing the 13.7 m (45 foot) *R/V MARGUERITE* at as many offshore reef sites as possible. Monitoring surveys consist of visual inspection of the material and associated marine life by divers. Due to poor water clarity at many artificial reef sites, visual inspection is not feasible. In those situations, sonar technology and navigation electronics are used to confirm material locations are within permitted site footprints and depth clearances.

**2) When were reef sites previously authorized? Did NMFS consult on the existing artificial reef structures?**

The OAR Project began in 1970 under the authority of the Georgia State Game and Fish Commission and is currently administered by GADNR Coastal Resources Division (CRD) to create fisheries habitat and fishing opportunities in the Atlantic Ocean. GADNR has not been asked to coordinate with the NMFS previously during the process of renewing the USACE permits for offshore artificial reefs. GADNR records indicate the following Corp permits:

| USACE Permit # | Date Issued | Reef Sites & Descriptions |
|---|---|---|
| 074 OYN 003918 | 11/08/1978 | KC |
| 074 OYN RP0036 | 08/27/1985 | KC; L; J; F; G; A |
| 074 OYN RP0036 | 10/07/1985 | Modification requested to include C Reef in this permit |
| 074 OYN 006965 | 03/06/1989 | Modification requested to J Reef height limits |
| 074 OYN RP0036 | 04/03/1989 | Modification requested to include SAV; DUA; CAT; SPL; ALT; KBY in this permit |
| 199100977<br>074 OYN RP0036 | 08/02/1991 | New KBY and CCA Reefs added to this permit; Updates to corner coordinate for C and A Reefs |
| 199191718<br>074 OYN RP0036 | 02/06/1995 | 5 year reissuance |
| 970003532<br>074 OYN RP0036 | 12/16/1998 | New WW Reef added to this permit |
| 200012980 | 11/27/2000 | Modifications to this permit |
| 200501190 | 05/22/2001 | Modifications to this permit, add or rename reef sites |
| 200501190 | 09/03/2005 | 5 year reissuance and modifications to this permit |
| 074 OYN RP0036 | 12/22/2006 | Request to modify SFC Reef perimeter coordinates |
| 200800584 | 01/16/2011 | Modifications to this permit, added 8 TACTS Tower sites |
| 074 OYN RP0036 | 07/27/2011 | 5 year reissuance |
| 200501190 | 03/31/2014 | Modifications to this permit |

*Reef names have periodically changed throughout the history of the OAR Project. For example, CCA-JL formally known as CCA Reef; CDH formally known as C Reef; HLHA formally known as G Reef; JY formally known as J Reef; and KTK formally known as SPL Reef.*

**3) Please provide a benthic survey of the proposed beach reef site, BSF.**

Side scan sonar (SSS) surveys were conducted on September 8, 2015 at a potential beach reef site in the near shelf waters approximately 4 nm southeast of Little Tybee Island. Beach reefs are located in highly dynamic sand-sharing zones typified by strong currents and wave action. SCUBA

diving at the potential beach reef site was not feasible due to poor underwater visibility. The 400-yard diameter potential beach reef site was vetted with extensive public review by GADNR staff and liaison with the Georgia commercial shrimping fleet, recreational anglers, and in partnership with the Savannah Sport Fishing Club. The BSF site was identified by recreational anglers interested to develop an additional beach reef site located offshore and within sight of land especially in light of rising fuel costs. Attached are BSF survey map and SSS screen shots confirming bottom conditions.

**4) What time of year will be materials be deployed?**

GADNR anticipates deploying materials approximately two to four times each year during the next five years, with the majority of deployments occurring outside of the right whale calving window due to inclement weather and staff availability. GADNR OAR Project receives material and financial donations as they become available and deployments may occur during the right whale calving season when necessary to prevent the loss of donated material. Although GADNR does not have the ability to forecast the timing of donations, every reasonable effort will be made to persuade donors to allow GADNR to schedule deployments outside of the right whale calving season.

**5) Will the artificial reef materials include any sort of exposed rebar or other protruding steel components?**

The GADNR-CRD policy is to not deploy any offshore artificial reef materials with exposed rebar or other protruding steel components.

**7) How does the applicant intend to avoid entrapment of marine turtles, mammals or fishes in the artificial reef materials or in derelict fishing line/gear?**

The South Atlantic Fishery Management Council (SAFMC) has designated 19 of the GADNR OAR sites (A; ALT; CAT; CCA-JL; CDH; DRH; DUA; DW; F; HLHA; JY; KBY; KC; KTK; L; MRY; SAV; SFC; WW) as Special Management Zones (SMZs). SMZs assist in increasing numbers of fish in an area and / or create fishing opportunities that would not otherwise exist (SAFMC 2014). The basic premise of this concept is to reduce user conflicts through gear and harvest regulations at locations that feature limited resources, managed for specific user groups. SMZs allow for: 1) fishing gear restrictions to prevent overexploitation of fishery resources; 2) orderly use of fishery resources on and around artificial reefs; 3) reductions in potential user group conflicts; and 4) maintain the intended socioeconomic benefits of artificial reefs. GADNR SMZ gear restrictions include: 1) fishing may only be conducted with hand line, rod and reel, and spearfishing; 2) use of sea bass pot or bottom long line is prohibited; and 3) possession of South Atlantic snapper-grouper taken with a power head is restricted to bag limits specified in federal code ss 622.187(b).

**8) Please define the term "Material of opportunity" what materials are you proposing to use for the artificial reef?**

Artificial reefs materials are typically of two general types, man-made manufactured/designed reef structures and materials of opportunity. Due to funding limitations, Georgia's artificial reef development efforts have been opportunistic with regards to materials utilized for artificial reef

construction. These projects have relied on surplus concrete and metal materials, as well as natural materials such as rock. Since the availability of these materials is unpredictable, they have been broadly categorized as "materials of opportunity," also known as "secondary use materials," since their function as reef structures is not the primary purpose behind their construction. Additional background information on types of artificial reef materials are found in the Guidelines for Marine Artificial Reef Materials, Second Edition (Lukens and Selberg 2004) and the National Artificial Reef Plan (Stone 1985).

**a) What is the size of the materials proposed for use in the artificial reefs?**

**b) What materials will be used for the artificial reefs?**

**8(a-b):** Sizes of materials vary for use in artificial reefs. Before approving any materials for reef construction, GADNR carefully inspects items to ensure they are designed to be suitable for submersion in an ocean environment, environmentally safe, and capable of being deployed in a cost-effective and safe manner. All materials utilized shall minimize impacts to environmental quality and must be free of hydrocarbon, contaminants, and toxins, as required by the United States Army Corps of Engineers, Environmental Protection Agency, United States Coast Guard, and other agencies involved in the permitting of an artificial reef in offshore waters. All trash, wood, lines, and other floating debris must be removed from materials prior to sinking. A variety of concrete and metal materials of opportunity have been utilized to create productive long-term fisheries habitat off the Georgia coast: concrete materials include designed units, rubble, bridge supports, transmission line poles, pallet balls, culvert/boxes, whereas metal materials include vessels; tugs, barges, subway cars; poultry transport cages, bridge supports, debarking drums, and surplus military equipment.

**c) Will there be openings for the species to enter/exit? If so:**

All artificial reef materials will include openings for species to enter and exit.

**d) What will the size and shape of the openings be for entry/exit?**

Size and shape of artificial reef openings will vary based upon the materials deployed. Openings are designed to allow for light penetration; current flow; and forage fish species such as anchovies, cigar minnows, etc.; small demersal fish; juvenile fish; and motile epifauna entry and egress from artificial reef materials.

**9) Do any of the proposed reef sites overlap with recommended shipping lanes off of Brunswick, Savannah, or St. Mary's?**

No.

**10) Will artificial reef sites be marked with buoys or moorings?**

No. However, the sites are clearly designated on all NOAA charts and precise location and description of each individual deployment within each site is available on our website.

**a) How will buoys or moorings be anchored?**

Not applicable (N/A).

**b) What precautions will be taken to avoid mooring entanglement?**

N/A.

**11) Are any of the artificial reefs located within recommended shipping lanes or in an area that would fall within a recommended lane if the lane were extended eastward along the same orientation and same width?**

## APPENDIX II

None of the artificial reefs are located within recommended shipping lanes nor are they located in an area that would fall within a recommended lane if the lanes were extended eastward along the same orientation and same width.

**a) Do you have a shapefile of the existing and proposed artificial reefs?**

Yes. Available upon request.

**b) If so, is this shapefile available for replication in maps for public notice?**

Yes.

**12) Is the applicant willing to:**

**a) Report any collision(s) with and/or injuries to any sea turtle, sawfish, whale, or sturgeon occurring during the construction of the proposed project and report immediately to NMFS's Protected Resources Division (PRD) at (727-824-5312 <tel:%28727-824-5312> ) or by email to takereport.nmfsser@noaa.gov <mailto:takereport.nmfsser@noaa.gov>**

It is GADNR-CRD policy to immediately report to an up line supervisor all interactions with protected species. Incident reports will be completed and submitted to the National Marine Fisheries Service Southeast Regional Office (for cetaceans and sea turtles) of the U.S. Fish and Wildlife Service Jacksonville Office (for manatees) within 48 hours.

**b) Perform all work only during daylight hours**

GADNR will conduct all work only during daylight hours.

**13) It must be ensured that right whales are able to move over and around reefs so that they may select a combination of dynamically occurring habitat features.**

GADNR's offshore artificial reefs are located in areas where right whales have been observed. A habitat model by Gowan and Ortega-Ortiz (2014) found right whales are most likely to occur at depths of 10-25 m in the Southeast United States. Consultation with GADNR's Wildlife Biologist, Mr. R. Clay George, who regularly conducts right whale boat and aerial surveys confirmed that right whales are rarely found in Georgia waters shallower than 10 m (personal communication). Mr. George doubts right whales would normally travel inshore to the areas where beach reefs are located because the surrounding habitat is too shallow. Mr. George stated it is possible that right whales may avoid offshore artificial reefs or just swim around them as there is nothing barring them from doing so. Right whales have been frequently seen in close proximity to the shallower offshore reefs such as: CAT, KTK, ALT, F, A, and KBY and Mr. George has not observed any anecdotal evidence that right whales avoid those reef areas.

**14) Is the applicant willing to move proposed artificial reef BSF to an area with an existing depth greater than 30'?**

No. The location (center of reef 31°54.089'N / -80°50.073'W) of this 400 yard diameter reef was vetted with extensive public review by GADNR staff and liaison with the Georgia commercial shrimping fleet, recreational anglers, and in partnership with the Savannah Sport Fishing Club. The BSF site was identified by recreational anglers interested to develop an additional beach reef site located offshore and within sight of land especially in light of rising fuel costs. The Mean Low Water depth at the proposed site is 29 feet. Moving the proposed artificial reef to a location with a depth of over 30' would provide minimal protection for the cost and effort associated with having to repeat the public review process.

## APPENDIX II

**15) Is the applicant willing to limit reef heights to less than 20' off the sea floor?**
Yes. The BSF site is intended for low relief concrete and/or metal materials. For example, materials include but are not limited to concrete: rubble, pallet balls (designed units), culvert / boxes / tetrahedrons, and metal: poultry transport cages, bridge supports, etc.

**16) Is the applicant willing to plan/place BSF such that the resulting placement does not exceed two reefs (existing plus new per 10 nmi2**
Yes.

**An additional typo correction is required for the documents submitted to USACE on 1-11-16 for Special Condition 15 (z): "SFC" Artificial Reef perimeter coordinates.** "SFC" Artificial Reef corner coordinates should be updated to: 31°00.8'N, 81°03.4'W; 31°00.8'N, 81°01.4'W; 30°59.3'N, 81°03.4'W; and 30°59.3'N, 81°01.4'W. Located approximately 18.0 nm east of Little Cumberland Island, Georgia. Minimum authorized water depth clearance: -28'MLW. "SFC" Reef consists of a 1.72 nm x 1.5 nm footprint.

**References:**

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**South Carolina Artificial Reef Activities**
**February 2017 Update**

- It has been a very average year for the SC Marine Artificial Reef Program. Sixteen material deployments were made during the past calendar year, comprised of surplus concrete material, designed structures, and vessels. One new reef site was permitted.

- A concerted effort is being made to construct and deploy new reef modules in-house. Three new designs of concrete and steel have been built which can be deployed from our own research vessels. Two of these designs have already been placed on three separate reef sites while the third, which is larger than the others, is currently under construction. These new structures will be monitored regularly to determine which warrant further construction and distribution.

- Our request to the South Atlantic Fisheries Management Council (SAFMC) to have our two unpublished experimental reefs declared Type II Marine Protected Areas (MPAs) has been approved as part of the Council's Amendment 36 to the Snapper Grouper Fishery Management Plan. These areas are now classified as Spawning Special Management Zones (SMZs).

- The latest site visit to our deep-water artificial reef MPA, now 2-years old, revealed numerous grouper species including Warsaw, Snowy, Misty, Yellowedge, and Scamp, as well as Red Snapper. The original purpose for creating this reef was to provide spawning habitat precisely for these species so, although no spawning behavior was observed, their presence here is highly encouraging.

- A fifth edition of the "Guide to South Carolina Marine Artificial Reefs" has been printed and is being distributed as requested. This guide is a comprehensive listing of all reef sites and materials, with GIS generated maps of all South Carolina artificial reefs.

Artificial Reef Mtg Feb7-8, 2017

**Rhode Island Update 2017**

Fish Habitat Restoration planning for the urban marine environment


Providence River (top of the Bay) looking South

The water quality in the urban Providence River has shown improvements due to increased treatments of wastewater discharges (including a >50% decrease of nutrients), major decreases (> 90%) in toxics from dischargers, and major decreases in raw sewage discharges from Combined Sewer Overflows. The RIDEM Division of Fish & Wildlife Marine Fisheries Program is engaged in a multi-year collaborative study with The Nature Conservancy (TNC) funded by Sport Fish & Wildlife Restoration funds to examine whether fish habitat has improved in the urban Providence and Seekonk Rivers. Seining surveys (12-14 sta) as well as benthic video transects and water quality measurements (T,Sal,D.O.) in these urban areas were initiated in summer 2016 and will continue with the addition of fish pot surveys through 2017. Overall, we will be looking for evidence of changes in juvenile fish species occupying these areas due to both warmer local waters and improved water quality (decreased toxicity and less hypoxia).


This information will be used to develop plans for habitat improvement opportunities. Once we have an idea of where the best zones are for juvenile fish and what species are utilizing the area, we will develop plans for potential habitat enhancement and restoration efforts that can improve the conditions for growth and survival of juvenile fish. We will be considering a variety of habitat enhancement and restoration techniques, from “reef balls” to oyster cultch reefs, to other types of structures, as well as any opportunities to improve the few areas of salt marsh that provide fish habitat.

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Initial seine stations Providence - Seekonk Rivers, Narragansett Bay

Louisiana Artificial Reef Program
Status and Activities
February 2017

The Program continues to be very active in accepting new platforms into permitted artificial reef sites. Multibeam survey imagery of the offshore reefs can be found at: http://www.wlf.louisiana.gov/fishing/artificial-reef-program

- 76 established offshore reefs
  - Oil & gas jackets accepted (380 total)
    - 15 deployed in 2016
    - 29 additional structures permitted for deployment
    - 28 in permit process
  - Drill rig legs accepted (8 total)

The Program now has 5 established nearshore reefs. Our Artificial Reef Council approved twelve Nearshore Planning Areas. There is one active permit request for a new nearshore reef. The Program is actively soliciting the owners of platforms within Nearshore Planning Areas for potential reefing opportunities.

The Program now has 27 established inshore reefs. The Artificial Reef Council also approved two new inshore reef sites located in the southwest portion of Lake Pontchartrain and the southeast portion of Calcasieu Lake. Permitting for these new sites, as well as enhancing the existing Point Mast reef site in Lake Pelto is ongoing. These three inshore reef projects are slated to be constructed later this fiscal year. The Program has been conducting pre-deployment monitoring at the planned inshore project sites, and post-deployment biological monitoring at the recently enhanced Independence Island reef site.

The Program continues multi-beam surveys of selected reef sites, followed by high resolution video ROV surveys.

# Mississippi Department of Marine Resources Artificial Reef Bureau 2016 Annual Update for the ASMFC-GSMFC Joint Artificial Reef Subcommittees

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During 2016, the Artificial Reef Bureau (ARB) continued to monitor fish assemblages and physiochemical parameters at selected inshore reef sites. Personnel periodically checked and re-marked 22 inshore reefs in the three (3) coastal counties (Hancock, Harrison and Jackson) to assist small boaters in locating the low-profile reefs. Offshore reef sites were visited to check reef sustainability, subsidence rates, and fish community structure. ARB staff also assisted the Finfish Bureau with collecting samples for a reef fish assessment project funded by the National Fish and Wildlife Foundation (NFWF).

The ARB continued work on securing and deploying structure. In 2016, the ARB secured approximately 1,475 concrete culverts from five local construction companies. This material was stockpiled at the Gulfport staging site for future offshore deployments. During the months of May and June, the ARB deployed 222 juvenile reef fish habitat boxes in FH-3, FH-13, and FH-14 for the Coastal Impact Assistance Program (CIAP).

Artificial Reef Bureau members also used side scan equipment for in house applications and to assist the Shellfish Bureau. Mapping to monitor deployed cultch material was completed in April for the Mississippi Oyster Cultch Early Restoration Project. ARB members also utilized side scan equipment to map historic oyster bed locations in Biloxi Bay. Eleven inshore artificial habitats were side scanned to assess reef status and precise boundaries of deployed habitat.

Additionally, the ARB partnered with NFWF to complete the Artificial Reef Habitat Mapping Program. This program consisted of 100% multibeam coverage and 100% side scan sonar coverage and included the survey of all 15 offshore Artificial Reef sites and all 8 Rigs to Reefs sites. The survey provided the following: coverage graphic of the location of each feature, an image of the side scan feature, a 3-D perspective image from the multibeam point cloud, position of the feature in NAD83, the dimensions of the feature and the minimum depth of the feature below MLLW.

Throughout the year, the ARB contributed to multiple outreach events and educational meetings. Staff personnel represented the bureau and MDMR at several outreach events including Capital Day in Jackson, MS in February, the Biloxi Boat Show in Biloxi, MS in March and the Wildlife

Expo in Jackson in August. In March, the ARB attended the Gulf States Marine Fisheries Commission & Atlantic States Marine Fisheries Commission Artificial Reef Subcommittee Meeting in San Antonio, TX. In June, ARB staff also attended the Artificial Reef workshop in Alexandria, VA. In October, ARB staff members attended the Gulf States Marine Fisheries Commission 67th Annual Spring Meeting.

Lastly, the ARB is currently preparing for and working on ongoing projects. The Coastal Conservation Association and the ARB are collaborating to deploy concrete culverts within Cat Island Reef site. Also, MDMR is working with Oscar Renda Contracting to obtain and deploy valuable artificial reef material. The concrete culverts will be deployed in several locations in FH-1, FH-2 and FH-13.