



## Artificial Fishing Reefs and Reef Development in Maryland Waters of the Chesapeake Bay

October 6, 2003

by Wayne Young, *MES Artificial Reef Coordinator*

*SUMMARY.* Artificial reefs are established for various reasons. They may be used to restore degraded or damaged natural reefs, to provide three dimensional habitat structure above the bottom, to provide fishing and scuba diving opportunities, to deter illegal netting, and other purposes. In Maryland, artificial reefs help offset the degradation and loss of natural reefs, natural reef functions, and associated reef communities due to sedimentation and to limited natural reef building by the native oyster, which because of disease pressure, is not present at population levels needed to achieve Bay restoration objectives. Designed reef technology has advanced to a state of practice in which reef products that are specifically designed and proven to achieve biological objectives have demonstrated a significant potential to provide three dimensional structures for colonization by benthic marine organisms, cover for crabs and juvenile and small fish, and foraging sites for larger fish. The Maryland Environmental Service administers the State's fishing reefs. The Service is using Reef Ball™ technology to enhance the biological productivity of the artificial fishing reefs and stimulate sponsor support for maintaining the self-supporting program.

### MARYLAND'S ARTIFICIAL REEF PROGRAM

The Maryland Artificial Reef Program is a self-supporting, non-appropriated activity that is administered by the Maryland Environmental Service (MES) in coordination with the Maryland Department of Natural Resources (DNR). The Maryland Artificial Reef Program was discontinued by the State as an appropriated activity in 1997 in response to budget shortfalls. The permits were transferred to MES by DNR to keep the artificial reef program in active status. MES has maintained the program as a self-supporting, non-appropriated, not-for-profit activity.

The program is guided by the following reef development concept.

*Providing artificial habitat designed to achieve biological objectives will increase local area and reef biological carrying capacity and productivity for species that normally frequent nearby reefs, and will, in turn, result in increased fish populations, thereby improving fishing opportunities.*

The program is also guided by artificial reef development guidelines published by the Atlantic States Marine Fisheries Commission and fisheries resource management policy guidance and technical advice from DNR.

The primary goals of the self-supporting Maryland Artificial Reef Program are to provide:

- enhanced estuarine reef habitat at the 20 permitted artificial reef sites;
- increased fish populations;

- improved fishing opportunities;
- beneficial use of suitable materials of opportunity; and
- continuing support for reef development.

To achieve these objectives, the Maryland Environmental Service, in keeping with the agency's environmental mission, is applying a reef development concept whereby fishing opportunities are increased by improving reef site biological productivity. Reef sites are being developed, subject to availability of funding and materials and reef partner support, using:

- designed reef structures; and
- materials of opportunity.

Oyster restoration is an ancillary goal of the program. Although the depths of the artificial reef sites in the main stem of the Bay and minimum clearance requirements result in site conditions that are too deep to support oyster restoration, the Hollicutt's Noose reef site in Eastern Bay and artificial reef sites in the tributaries are within the potential depth range for oyster colonization.

## REEF DEVELOPMENT PROJECT

MES has begun a reef development project to deploy biologically productive designed reef structures to Maryland's fishing reefs. The project is intended to assist in:

- restoring reef habitat by supplementing and offsetting the degradation and loss of natural reef systems;
- demonstrating the biological and fishing productivity that is obtainable using field-proven designed reef technology;
- refining the use of designed reefs to achieve optimal results relative to site-specific conditions; and, through these activities;
- stimulating and building local and regional interest and sustaining support for improvement of Maryland's artificial reefs.

The use of the latest generation of designed reef structures with specific biologically oriented features provides a significant improvement over materials of opportunity and earlier designed structures. Reef Balls™ are being integrated into the program as the program standard because their design and performance are supported by readily available engineering, scientific and monitoring data and there is a proven track record in providing value habitat and fishing opportunities in the mid-Atlantic region (e.g., New York, Virginia, New Jersey, and Massachusetts reefs) for benthic organisms, crustaceans, and multiple fish species. Other suitable designed reef structures and materials, as available, that conform to permit criteria are also eligible for



**Figure 1** *Deployment of Bay Ball with hatchery spat attached at Memorial Reef, October 2002.*

deployment, consistent with program policies, deployment requirements and specifications, and cost recovery.

The artificial fishing reef development project coincides with, but is not a replacement for, the loss of access by the sports fishing and charter fishing communities to the Cove Point LNG docks. The designed reef systems that MES is planning to deploy at the artificial reef sites cannot replace the large-scale, complex underwater structure at the LNG docks that extends through the entire water column. A replacement for that facility is beyond the scope of the artificial reef permit (which has a 15 foot clearance requirement for most reef sites) and the limited resources available to the Reef Program for development of the existing artificial reefs.

Although the planned reef development activities cannot replace the Cove Point facility in terms of scale or overall function, development of the permitted artificial reef sites using designed reef structures, to the extent that funding resources and in-kind services are available, will contribute to Bay restoration. Reef habitat and biological productivity will be increased in the bottom portion of the water column with associated improvements in the public's fishing opportunities.

## **THE NEED FOR ARTIFICIAL REEFS**

Overall, the upper Chesapeake Bay is depositional as a result of heavy sediment loads. Principal sediment sources are upland runoff that enters the Bay from the watershed's major river systems and shoreline erosion. As a consequence, many productive natural reefs, especially oyster reefs, have been degraded or covered with silt, and, in many cases, are no longer productive or functioning as reefs. Former natural reefs that are covered with sediment provide bottom habitat for certain benthic marine organisms, but do not support thriving reef communities or distinguishable aggregation sites, such as for schooling prior to annual migrations, and typically would not provide conditions associated with finfish foraging.

The development of artificial reefs in the upper half of the Bay provides a means to reestablish and enhance reef communities. The permitted artificial reef sites, most shown as "fish havens" or "State Reefs" on nautical charts, are often in the vicinity of existing or former natural reefs, but typically do not contain natural reefs although some bottom structure or bathymetric features may be present. Most, however, are relatively flat. Bottom conditions are changed through the deployment of structural materials to the site, which is why the resulting structures are characterized as artificial reefs. As with natural stone reefs or manmade rock piles, fishermen must take into consideration the structural conditions at artificial reef sites to avoid damaging or losing anchors and to apply the appropriate type of tackle and fishing techniques.

Most of the 20 permitted artificial reef sites are in waters too deep for natural recruitment of oysters because of minimum depth requirements for navigational safety. Structural material nevertheless provides suitable surfaces for attachment of small filter feeders such as barnacles and marine vegetation. Voids and passages in the reef structures provide cover from predators for crabs and juvenile and small fish. With respect to sedimentation, the vertical height of artificial reef structures also provides longevity relative to existing oyster reefs that are relatively level, near the bottom and more susceptible to the effects of sedimentation.

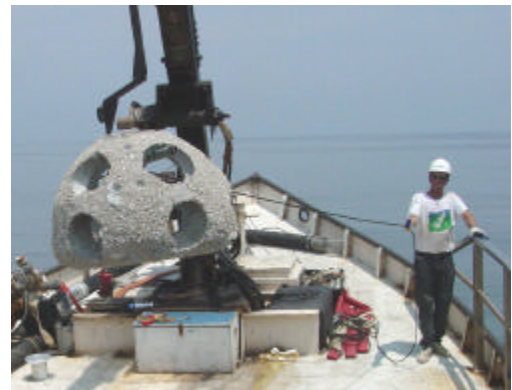
## REEF BALLS

Reef Balls™ have been adopted as a Program standard. Reef Balls in various sizes are being used because their specific features coincide with reef development needs in the region. The module's shape and configuration provides immediate cover in side holes and center cavities for various species immediately upon deployment. Reef Balls have been shown through monitoring required of licensed users by the Reef Ball Development Group to progressively approach the functioning of nearby natural reefs with respect to species diversity and populations as the modules are colonized by marine organisms.

Center cavities can be partially filled with smaller Reef Balls or fragments from broken modules and other suitable materials, which have been shown by monitoring and research to provide additional complexity, cover and biological productivity. Reef Balls also provide a highly textured surface to facilitate the attachment of marine organisms, over three times the surface attachment area in contrast to a level bottom, and complexity through interconnecting holes that enhances fish utilization, among the many features of this product. The modules are also extremely stable; about 80% of the weight is in the bottom 20% of the unit. The modules are also designed so that they can be floated into place using the center bladder of the mold system.

Over 300 Reef Balls in several sizes were deployed to oyster sanctuaries in the Maryland waters of the Bay during mid-2002 through July 2003. 225 were deployed by MES under DNR's sponsorship for field-testing of their potential to support oyster restoration. The Maryland Saltwater Sportfisherman's Association has also produced 90 Lo Pro Reef Balls that were deployed by the Chesapeake Bay Foundation's P/V Patricia Campbell. The initial field reports are encouraging with respect to use of Reef Ball habitat by crabs and fish and fishing opportunities, although it is anticipated that it will take several years more to obtain a more complete understanding of the performance of these modules in local conditions.

As a result of their design, the mold systems for producing Reef Balls are user friendly, bringing fabrication, especially of the smaller modules, within the capabilities of volunteers. This feature is particularly helpful for use in creating opportunities for a new avenue of volunteerism in Bay restoration activities. The capability for small-scale local production also provides a means to achieve incremental enhancements one Reef Ball at a time, particularly for reef sites near shore where the float-into-place option can be used in lieu of marine heavy lift capabilities in order to minimize costs for small-scale deployments.



**Figure 2** Deployment of Bay Ball at DNR's Pt. Lookout Oyster Sanctuary, July, 2003.

*Individuals or organizations that would like to consider sponsoring Reef Balls or demonstration pours or making a charitable contribution to the Maryland Artificial Reef Program through the Reef Ball Foundation may contract the MES Artificial Reef Coordinator for additional information at 410-974-7261. Please check the MES website at [www.menv.com](http://www.menv.com) for additional information about the Maryland Environmental Service and the agency's environmental restoration work involving oyster recovery, the Poplar Island Environmental Restoration Project, Hart-Miller Island South Cell Habitat Development, and artificial fishing reefs. Technical information about Reef Balls can be found at [www.reefball.com](http://www.reefball.com).*