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Artificial
Reefs:
Design, Placement,
And Permitting

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Artificial Reefs: Design, Placement, And Permitting

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Why Artificial Reefs?

In the aquatic environment, almost any material that provides some topographical relief will attract fish and increase the catch. More than 6,000 artificial reefs apply this concept in a permitted reef area off coastal Alabama (Figure 1).

One reason for the interest in artificial reefs is that people prefer to catch certain species of fish over others. The preferred species are likely to gather around a certain reef. Many scientists believe that reef construction does not increase the amount of fish but simply changes the species. For example, extensive habitat for long spine porgy and sand perch

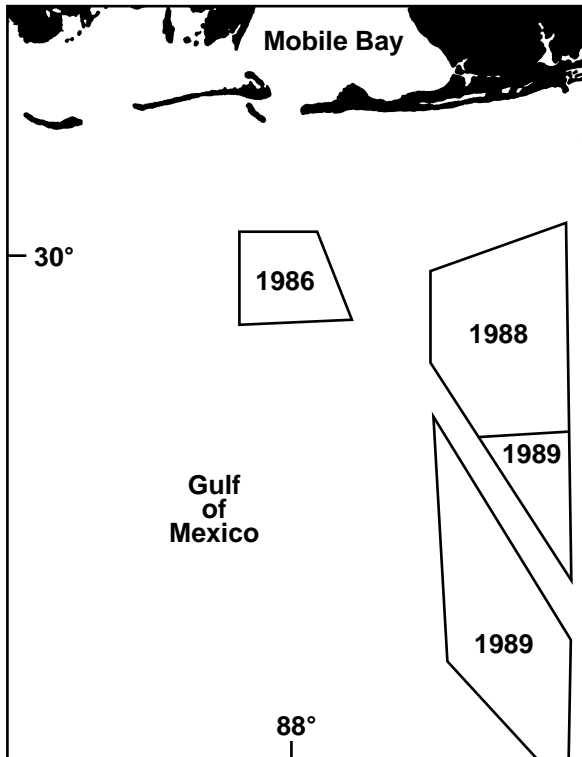


Figure 1. Permitted reef area off coastal Alabama. About 6,000 artificial reefs lie within these areas.

changed to red snapper reef habitat with the reef construction off coastal Alabama. A second example is the conversion of croaker habitat to tautog habitat with the construction of the 15-mile-long Chesapeake Bay Bridge tunnel.

Another reason for the interest in artificial reefs is the feeling that you are creating a private spot where you will fish with little or no competition from other people. In Japan, all reefs are private property, and other anglers would no sooner fish your reefs than they would walk into your corn field and collect a bushel of corn. Private ownership is not the case in the United States, where we rely on the difficulty of finding reefs to keep fishing pressure down.

Reef Design And Materials

Materials of opportunity. By far the greatest effort in reef building has been with “materials of opportunity” (Figure 2). These include car bodies, tires, old bridges, oil rigs, ships, and almost any material that will sink. These have been placed off the Alabama coast. These materials will increase the catch. But, as has happened in Japan, the future is limited for “materials of opportunity.” One problem is that the productive life span of a car body is short—about 5 years. Another problem is that the actual effect of all the rusting metals on the ecology of our coastal waters is unknown. Many scientists are asking if our coastal waters are becoming the unwitting site of a huge junk pile!

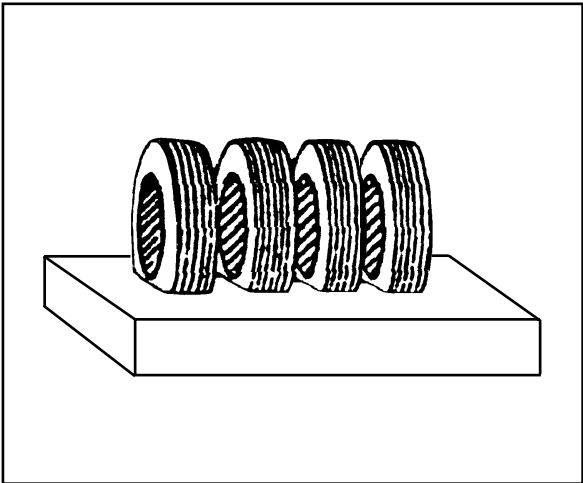


Figure 2. Tire reef, with the required four tires set into 180 pounds of concrete.

Specially designed reefs. Many scientists from around the world as well as those who actually fish coastal waters are asking if specially designed reefs will work better than materials of opportunity without the same potential for pollution. Probably the best material for reef construction is concrete. It will remain intact over long periods, it is heavy and shows little if any movement, and it provides a very good substrate to start the food chain that brings in the larger fish. Concrete can be poured into almost any shape, and many designs have proved very successful (Figure 3). One factor that should go into a

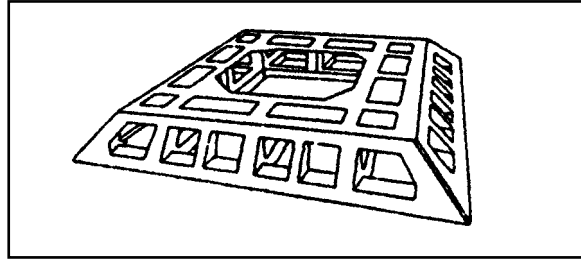


Figure 3. Low profile concrete reef module developed and deployed in Japan. The base is 28 x 28 feet; the top is 19 x 19 feet; and the height is 3 feet. In an area of 1 square mile 540 of these units were placed off the coast of Japan.

concrete design is to make holes in the reef that go completely through the reef. This design gives fish an escape route, promotes water flow through the reefs, and increases the number of fish. Also, you should vary the size of the holes so that the reef holds both large and small fish (for example, a reef with 12-, 6-, and 2-inch holes). A design factor that should be considered is a smooth profile that will allow a trawl to slide over a reef without hanging up. Several low profiles have proven ability to attract and hold fish and yet permit a trawl to pass over (Figures 3, 4, and 5).

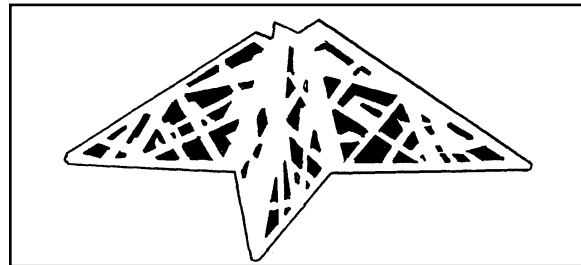


Figure 4. Sea Grant/Sea Lab star reefs placed in coastal Alabama waters (Loran-C = 47019.4 - 12900.0). These 8-foot wide x 5-foot high reefs are made of plastic and anchored with concrete.

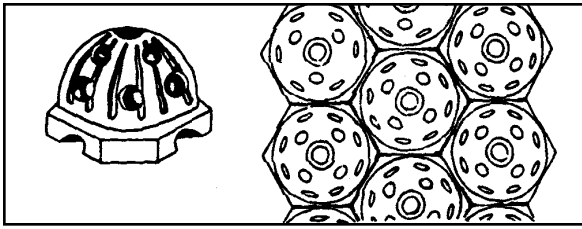


Figure 5. Dome-shaped concrete reef modules. The base is 7 feet in diameter and the height is 3 feet. These domes can fit together to make a reef of any size.

In general, the more complex the reef design, the better it will produce.

Location, Location, Location

As in real estate, the three most important factors in artificial reef design are location, location, and location. First, the makeup of the coastal water bottom or seafloor varies from very soft mud-silt to natural hard rock outcroppings. For obvious reasons, we would not construct reefs over soft mud-silt substrates, because the reef would quickly sink into the sediment and disappear. Also, we would not wish to place artificial reefs over the top of natural reefs. That would do little to increase your catch, and it may destroy existing habitat. So, we need to locate areas that are coarse sand or sand and shell substrates.

How can substrate be determined? If you cannot scuba dive and examine an area directly, you can weight down an old coffee can and drag it across the bottom to collect a sample of sediment.

Another important limit on location, at least in coastal Alabama, is that all reefs must be placed in one of the three designated permitted reef areas (Figure 1). These permitted reef areas were created through the cooperation of the U.S. Army Corps of Engineers, Alabama Marine Resources Division, and recreational and commercial harvesters, and they are located within the following boundaries:

1. Don Kelly North Reef: Off Perdido Pass and bounded by Loran-C readings: 12900/47020, 13060/47040 13025/46878, and 12900/46980.

2. Don Kelly South Reef: Off Perdido Pass and bounded by Loran-C readings: 12900/46960, 13022/46850, 13010/46775, and 12900/46845.

3. Hugh Swingle Reef: Southeast of Dauphin Island and bounded by Loran-C readings: 12700/47035, 12788/47035, 12815/47000, and 12700/47000.

The Permit Process

No material may be placed as a reef without an inspection and proper permits. For a reef permit, you need to fill out an "Application for Artificial Reef Construction—Outer Continental Shelf Off Mobile And Baldwin Counties, Alabama." These application forms are available from the following agencies:

The U.S. Army Corps of Engineers
Attention: Regulatory Branch
P.O. Box 2288, Mobile, AL 36628-0001

The Alabama Department of Conservation and Natural Resources, Marine Resources Division
P.O. Drawer 458, Gulf Shores, AL 36542

The Alabama Department of Conservation and Natural Resources, Marine Resources Division
P.O. Box 189, Dauphin Island, AL 36528

Submit three copies of the application to the Army Corps of Engineers or the Marine Resources Division. The material for reef construction must be available at a shore point. At the time of inspection, the applicant will be given two signed copies, one for the applicant's records and one to be returned to the Corps of Engineers when the work is completed.

All materials must be permitted before leaving the dock. A copy of the permit must be onboard in either state or federal water. Materials inspected must bear an inspection sticker.

Several special conditions must be met in the reef permitting process. First, all reef materials must be drained of all oil products (no-sheen rule). For example, with cars, drain:

- Antifreeze from the radiator.
- Oil from the engine block and gear boxes.
- Transmission and brake fluid.
- Gas in gas tanks. In addition, two holes must be made in the gas tank.
- Engines, power trains, undercarriages, or other components that may be covered with oils or greases should be steam or power washed.
- Remove pans on engines and transmissions and the inspection plate on rearends.

- All materials that could float during deployment must be removed.
- A vehicle identification number for cars must be provided.
- For the Swingle area, cars must be chained in groups of two or more.

Second, tire reefs have the following restrictions:

- Tires should be mounted on vehicles and slashed.
- If tires are not on vehicles, a tire reef unit must contain at least 4 tires imbedded in a minimum of 180 pounds of concrete (Figure 2).
- Tire reefs must be placed at depths of 70 feet or more.

The following restrictions also apply:

Boats, barges, ships, and small vessels—

- Large vessels, barges, and ships will be subject to additional requirements as determined by the inspecting agent.
- All oils, greases, and fluids must be drained as with cars (the no-sheen rule).
- All materials that could float must be removed.
- All airspaces must be holed out to let water in.
- Vessels must be heavily weighted for the length of the boat.
- On each side of the boat paint the word “REEF” in 24-inch letters.

White ware (appliances)—

- Remove all insulation, compressors, and motors from refrigerators, freezers, or hot water heaters.
- For the Swingle area, appliances must be chained in groups of three or more.
- All materials that could float should be removed.

Plastics—

- No floatable plastic or plastic film will be permitted.
- All plastic must be sufficiently weighted.
- Industrial chemical containers must be certified by the builder to be free of any harmful residue.

Other materials—

- All materials must comply with the no-sheen rule.
- Material that could float must be removed.

- All material must be substantially weighted to stay in place.

Commerical reef builders—

- Materials for building reefs must be available for inspection.
- After building the reefs, the builder must obtain a permit.
- Builders have 30 days to construct their reef after receiving the permit.

One last point about the permit process: Some people have placed reefs outside of the permitted reef area after the official inspection and permits were issued. A small number of reef builders may think that, since no one can see them, no one will know. Unfortunately, shrimpers hang their nets when towing outside the reef area and immediately report the hang ups to the Army Corps of Engineers. The Army Corps has stated that the solution is simple: a total closure of the reef building program.

Angler Etiquette

Stealing loran readings causes a great deal of conflict in the coastal area of Alabama. A serious angler often goes to a great expense in time, effort, and money to place artificial reefs legally. The practice of driving up to a location where a person is fishing and asking, “How’s the fishing?” while recording your position is extremely annoying.

Another conflict sometimes occurs between scuba divers and people who are fishing. Always use the first-come-first-served attitude. It can be extremely annoying to be fishing a particular reef and have a dive boat pull up and two scuba divers jump overboard with spear guns. Likewise, it is equally annoying to a scuba diver with a dive flag showing to have a fishing boat pull up and start dumping chum overboard, which attracts sharks. The solution is really quite simple: don’t go near other boats unless specifically invited.

Conservation And Harvesting

How artificial reefs actually work is not yet understood. There are two main schools of thought: Artificial reefs may simply attract fish from other areas, or, certain fish species may be habitat limited and additional reef habitat results in more fish.

Scientists have for many years tried to address this

question of attraction or production, but they have made few conclusions. Whichever of the two is the functioning mechanism will greatly affect the strategies for management. If attraction is the main mechanism, the placement of artificial reefs may be actually depleting stocks because they make them easier to catch. If production is the main mechanism, artificial reef construction is helping fish stocks and, in one sense, we are farming the sea. But, because we don't know which is the main mechanism—attraction or production—let's be conservative in our fish harvest. For example, don't always take your limit of red snapper and keep only what you and your immediate family can consume.

Artificial reef placement and increased catches have been observed for more than 100 years in the United States. The first reference dates back to 1860 by John Holbrook in *Ichthyology of South Carolina*. Undoubtedly, efforts will be ever expanding in the future. Critical to this expanded effort, though, is a greater understanding of how artificial reefs actually work. With a better understanding of attraction or production, we will be better able to manage the valuable fishery resources.

New Public Reefs Off Alabama

1. GCCA (bouy tender)	47035.3	13059.3
2. Morrisette Reef (fire trucks, airplanes, cars)	47035.4	13051.7
3. Surplus property	47035.5	13044.6
4. Surplus property	47035.5	13051.6
5. Surplus property	47035.1	13044.1
6. Surplus property	47035.0	13044.0
7. Swingle reef (oil platform)	46827.7	12983.5
8. Dry Dock II	47018.0	12879.9
9. Marathon Reef (oil jacket)	46865.3	12999.2
10. Marathon oil platform	46844.2	12973.4
11. Mobil oil platform	47020.0	13070.0
12. Bobby Mudd reef (140-foot barge)	47017.1	12749.1



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