

## Artificial Reefs: The Basics

Contributed by Giovanni B. Rodriguez  
Thursday, 05 July 2007

The Philippines has one of the longest coastlines in the world. As an archipelago of approximately 7,100 islands, the seas around our country continue to be the main source of cheap protein for a majority of our ever increasing population.

Over the years, unlimited human exploitation of our marine resources has pushed it to the point of irreversible damage. A good example is the classic woe of small fishermen, who now have to expend more fuel and time in pursuit of fish in distant areas. Not too long ago, a bountiful catch could be made just a few meters from the shoreline.

Fishery scientists will say that the Catch Per Unit Effort (CPU) has exceeded the Maximum Sustainable Yield (MSY) of a particular fishery resource.

For most of us Filipinos, this simply translates to the prospect of not being able to afford to eat Tangigue or Marlin steak unless we win the lotto. As it is, many can't afford this "luxury" anymore. more»

The Philippines has one of the longest coastlines in the world. As an archipelago of approximately 7,100 islands, the seas around our country continue to be the main source of cheap protein for a majority of our ever increasing population.

Over the years, unlimited human exploitation of our marine resources has pushed it to the point of irreversible damage. A good example is the classic woe of small fishermen, who now have to expend more fuel and time in pursuit of fish in distant areas. Not too long ago, a bountiful catch could be made just a few meters from the shoreline.

Fishery scientists will say that the Catch Per Unit Effort (CPU) has exceeded the Maximum Sustainable Yield (MSY) of a particular fishery resource.

For most of us Filipinos, this simply translates to the prospect of not being able to afford to eat Tangigue or Marlin steak unless we win the lotto. As it is, many can't afford this "luxury" anymore.

### Marine Conservation in the Philippines

The concept of Marine Conservation in the Philippines has been around for sometime now. There are specific conservation groups that started it in the 1970's but stayed in the sidelines. Some of these groups were labelled as radicals, considered as eccentrics, and dismissed as greenies or remnants of the 60's hippie generation.

Today, marine conservation has made a great leap to become a household word as the soaring prices of marine products (especially fish) are getting harder to meet with a shrinking household budget. Case in point: Galunggong (round scads), once considered "the fish of the masses", is really beyond the reach of many households now.

Marine conservation is now being promoted by a wide range of people. We have individuals and corporations giving financial support to conservation groups, people joining beach clean-ups, local schools with conservation programs, and provincial governments involved in marine sanctuary development.

The conservation measures come in all shapes and sizes. There are big resource management programs, marine reserves, eco-tourism, and private initiatives. Most of these projects cost a lot of money and resource to implement, making it formidable for small groups to contribute to the conservation effort.

### Marine Conservation Alternative for Small Groups

There is one activity affordable to small groups and communities who want to support the conservation effort. All it takes are locally available materials and the bayanihan (community) spirit. This is the Artificial Reef or commonly known as AR.

The construction of artificial reefs can be undertaken by small groups wanting to make a contribution to managing our depleted marine resources. However, a lot of consideration must be taken before doing this kind of project. As the name implies, it is an "artificial" reef. It is a man-made physical structure imposed on nature and can easily cause much damage to the environment if not properly planned and managed.

Any group who would like to do this project must be committed on a long term basis. Sustainability is key and Artificial Reefs have to be monitored and managed over time to achieve its purpose. Otherwise, it will just be some junk in the bottom of the sea thrown by some group nobody can remember. This has been the case of many such structures sunk in the 80's when it first became fashionable.

### Artificial Reefs: Forming a Self-Sustaining Marine Community

But what is an artificial reef? An artificial reef is basically a fish aggregating device. It is a physical structure that encourages marine life to live in it. It is a structure that encourages the growth of marine life – from algae to corals and on to fishes. A fully established AR forms a self-sustaining marine community.

To fully appreciate an AR, we can compare a sandy/muddy sea bottom against an existing coral reef. In a sandy/muddy sea bottom, there is hardly any marine life except for bottom dwellers like shells and worms. In contrast a coral reef, think of the movie Nemo, which showcased abundant marine life from top to bottom. What then makes the difference? It is the presence of hard substrate where algae and soft corals and other invertebrates can establish. Marine invertebrates are a huge class of organisms with no backbones. Common examples are soft and encrusting corals and sponges. The presence of algae and invertebrates provide the food base for small fishes and crustaceans like baby shrimps and crabs. The hard substrate also provide a sheltering effect for these creatures against predators. These small organisms attract bigger ones who seek them for food which in turn attract bigger and bigger fishes and other creatures eventually forming the classic food chain. In contrast, an empty sandy/muddy bottom has nothing to start with.

### Finding a Suitable Location for an Artificial Reef

Anyone contemplating making an AR must first define its primary purpose. There are many examples. An AR can be set up to rehabilitate a damaged reef system. It can be used to ease fishing pressure on a nearby reef by providing a fishing alternative allowing the other reef to recover. It can be used to increase the fishing productivity of a barren area to help local fishermen increase their catch. Artificial Reefs are also used as an educational area for recreational scuba divers.

Once the purpose is established, site selection is next. Finding the site for the AR is largely influenced by its purpose. Building an AR to rehabilitate a natural reef is the easiest way to go about finding a suitable location, with the natural reef itself determining the site.

If the AR is used to increase the productivity of barren sea bottom, then site selection is also a straightforward task. However, for bare areas, it is advisable that ARs are situated a good distance from an existing reef system. A good starting distance is about 100 meters. If the AR is constructed too close to a natural reef, it will just recruit fishes from it and no new fish colonies will be developed.

When building ARs for other purposes, the process becomes slightly more complicated especially if it is used for recreational/educational diving. There will be more emphasis on safety in terms of depth of the AR and its construction, ensuring that it does not pose any hazard to divers.

In choosing a site, the physical stability of the AR must be taken into consideration. The last thing we need is an AR that moves around during stormy conditions. The ability of the AR to attract marine life is based on its total bulk or size. If it moves around and becomes separated, then it loses the congregating ability of fish. It defeats its purpose, becoming pieces of junk polluting the sea.

Here, the factors of the sea bottom depth and topography comes into play. The topography or the general physical characteristics of the area influences the movement of the water currents around it. Then, there is also the slope. Some areas can be relatively flat and others steep. Steep slopes should be avoided because the probability of the AR rolling to deeper areas is very high. The depth is important to avoid storm surges, or waves that move the water column deeper than ordinary wind-generated waves. If the storm surge is deep enough, it might scatter an AR that is not properly located and anchored. This can be a bit complicated. Some areas can be shallow yet stable and some deep but have strong currents and prone to storm surges. At this point, it is best to consult people with expertise in the field.

### Materials for Artificial Reef Construction

The type of materials to use in AR construction is a matter of choice for the group building it. It can be influenced by what

is available in the locality, the budget, and purpose of the Artificial Reef. Again, an Artificial Reef for recreational/educational scuba divers will have a more stringent requirement because aesthetics will play a big factor. It has to be a pleasant place to dive. The construction has to be sturdy and neat to avoid entanglements that can pose a hazard to divers.

Artificial Reefs built for reef rehabilitation, fish biomass increase, or as alternative fishing areas, are seldom seen -- except by divers who come to check it from time to time. How it is arranged at the bottom will not matter for as long as the AR has the bulk or size to form a self-sustaining marine community.

Used tires were the 'in thing' for Artificial Reef construction in the 1980's and many were sunk at that time all over the country. It is easy and cheap to secure, and people are just pleased to have it taken away from their properties. Tires are basically non-biodegradable, a factor that can be both good and bad. Artificial Reefs are meant to last forever, so tires are good in this respect. However, if the Artificial Reef is neglected and loses its purpose, then it will result to pollution. Tires are also easy to work with when you build the reef. It gives you a lot of flexibility in construction. You can do a high profile or low profile reef, you can assemble it in the bottom in a modular way as when you assemble Lego, and shape it into any architectural fancy you like. Of course, only after having considered the physical factors of the area.

Some rural fishing communities use bamboos and palm fronds. They make a pyramidal structure out of the bamboos then tie the fronds around it and weigh it down with rocks. Very simple and very effective. It is more environmentally friendly than tires, but it doesn't last long and has to be replaced every few years.

Of course, people and countries with big budgets use concrete structures the size of townhouses. In New Zealand, they even use decommissioned battle ships.

Used tires fell out of grace in the 90's partly because Artificial Reefs built out of tires were neglected and made dump sites out of the area they were sunk. This created an environmental issue, and many argued against its use. Today, the tires still remain the most affordable and versatile material for Artificial Reef construction. However, it is crucial for people who use them to be committed to managing and maintaining the structure in the long term.

#### Documentation is Key

A much neglected task in AR construction is the documentation. It must be done from the planning stage and continued to the construction phase and all the way to invertebrate and fish population counts and identification over time.

The wealth of information can be used by others and improved. It will also give the non-divers supporting the AR a good idea of how the project is moving and a conservation learning platform for everybody.

This is where many have failed. They take the AR project as a one-off deal. So much hoopla is raised in its construction and sinking and that's about it. Once it is sunk, the whole project is literally sunk and nobody will hear about it for the rest of their natural lives.

A more appropriate term should be 'AR programme' where it is a continuing activity. The Artificial Reef can be built in modules and bulked up over time, monitoring its progress for the public to follow.

The big difference between today and twenty years ago is the existence of cyberspace, a borderless dimension that is available to everyone from everywhere in the world.

If the documentation is done right, it should provide a continuing story in a website for everyone to follow in the years to come. This is a challenge for the generation contemplating on embarking on an Artificial Reef Programme.

A fully established AR after a few years of committed work is a reward in itself. It is to nature's credit that a fully functioning food web is put in place where there used to be nothing, but the fact that we have helped to push it along is a great and humbling experience.

About the Author: Giovanni B. Rodriguez is an advanced scuba diver based in Auckland, New Zealand with a Marine Fisheries degree from the University of the Philippines Institute of Marine Fisheries and Oceanology. He is currently studying for a Graduate Diploma in Environmental Science from Massey University in New Zealand.

