Fish aggregating devices

Sheltering the fish

The construction of fish shelters is a traditional technique to enhance fish production in Nigeria

With an estimated population of 129 million in July 2002, Nigeria is Africa's largest consumer of fish and fish products. It has a coastline of 853 km, bordering the Gulf of Guinea. It is also richly endowed with large water bodies, including rivers, lakes, reservoirs, creeks, lagoons and estuaries, which have a total surface area of about 12.50 million hectares.

Fish aggregating devices or fish shelters, as they are called in Nigeria, have been recognized as one of the potent techniques for significant increases in productivity and stock size. Refined and environmentally friendly fish shelters can increase fish production in shallow water bodies so as to meet the shortfall in fish demand. Fish shelters account for over 35 per cent of the total fish produced in the Lagos Lagoon, which, at 208 sq km, is the largest of the lagoon systems in the West African subregion.

Fish shelters that create artificial habitats are used nationwide, with various degrees of intensity. Three main groups of fish shelters have been identified:

- brush parks constructed with plant parts in both fresh and brackish water bodies. The plants used include mangrove plants (*Rhizophora racemosa* and *Avicennia* sp.) or other shrubs as well as fronds of oil palm (*Elaeis guineensis)* that are staked in shallow (1-5 m depth) and relatively calm waters. Worn-out automobile tyres and weighted plastic or polyvinyl chloride (PVC) pipes can also be added to provide crevices for fish to hide.

- floating aquatic weeds, consisting mainly of luxuriant water hyacinth (*Eichhornia crassipes)* and duck weed (*Pistia stratiotes*), are also staked and stationed in one place and prevented from drifting with the tide or current.

- floating logs that form mats of shelters, mainly in fresh and brackish water systems in the rain forest region, where they are transported from one location to the other.

An overview of fish shelters worldwide shows that there are no general rules for the design and construction of the refined shelters. However, some major principles should be seriously taken into consideration to optimize productivity.

Considerations for design and placement of materials should cover various aspects, including the following: (a) the amount of materials used; (b) the area / volume covered; (c) the vertical relief, which is important in deep waters, and the complexity of the structures in relation to the spatial arrangement, number of chambers, spaces and crevices for fish prey to hide from predators; and (d) the texture and composition of materials and their capability of withstanding decay, rot or rust in the aquatic environment.

The structures are meant to provide shade and shelter from strong currents, hiding places for prey from predators, firm substrate for attachment of sessile life forms like *Crassostrea gasar*, source of food such as plankton, algae, invertebrates and small herbivores, and also spawning or breeding and nursery area.

Categorization

Fish behaviour and orientation can be categorized according to the stimuli provided, as follows: (a) rheotaxy—

orientation with respect to the current direction; (b) geotaxy—orientation with respect to the beach or the coast or the shoreline (c) thigmotaxy—physical contact with the structure; (d) phototaxy—response to light; (e) chemotaxy—response to olfactory stimulus; and (f) hydro-acoustics—auditory response to sound in water.

The area around the structures where fish species aggregate and are caught is referred to as the 'enhanced fishing zone'. It ranges between a few meters to about 100 m. The zone may not be symmetrical around the installation because fish tend to congregate either up or down current in response to availability of food or any of the stimuli indicated above.

The structures can be harvested partially or completely. Gillnets, traps, hand-lines, and longlines can be used for partial harvest of the structures. Cast-nets can also be operated superficially to capture fish in some of the shelters. The encircling gillnet and the seine-net can be used for total harvesting. The net is used to encircle the structures and all the debris within the shelter are removed.

It has been observed that fish shelters produce more fish (by weight) than the open waters, which contain more fish diversity. In the brush parks in the Lagos Lagoon, for instance, a few fish species, including tilapia (*Sarotherodon melanotheron),* catfish (*Chrysichthys nigrodigitatus)* and mullets (*Liza* spp.) constitute the main fish composition. As much as 8 tonnes of fish per hectare per year has been recorded in some fish shelters. The amount of fish caught correlates positively with the size of the shelter, the density of materials and the duration of installation.

The management measures needed to maintain optimal fish production should include:

- unravelled polypropylene rope streamers, which are synthetic materials attached to promote the growth of juvenile fish. These are colonized quickly by algae and invertebrates, which serve as food for the fish.
- the use of streamers and other rot- and rust-free materials, such as worn-out tyres, which minimize water pollution.
- the minimized use of plant materials so as to prevent deforestation and erosion of the mangrove area as well as the destruction of the spawning and nursery grounds of some of the economically important fish species.

- building, at a time, a pair of shelters, one for fishing and the other for habitat improvement to induce fish recruitment. Flags with different colours can be placed to easily distinguish the different shelters.

- allowing fish shelters, especially brush parks, to lie fallow for a period of time (say, three to four months) to allow for better growth of fish.

- the continuation of fisheries laws and regulations to prevent, for example, destructive fishing.

- communal or joint ownership of brush parks to minimize conflicts arising from multiple ownership claims.

- regulations to limit the number (or area) of fish shelters, so as to prevent stress on the resources and avoid conflicts with other users of the aquatic environment.

It is imperative that major modifications should involve the use of environmentally friendly materials such as synthetic netting and plastics to replace the plant parts, especially the mangroves that are used for the construction of fish shelters. This should help reduce the destruction of the mangrove belt, which serves as the nursery and breeding grounds of commercially important fish species. The construction of fish cages and pen enclosures in relatively shallow and expansive water bodies should also be encouraged. Materials for the construction of cages and pen enclosures that have been tested and proven to be efficient elsewhere, especially in tropical waters, should be identified and utilized.

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