

Aerial photo of Benin's brush parks.

Acadjas: The Brush Park Fisheries of Benin, West Africa

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Fishing installations consisting of branches of trees, bushes or other soft vegetation stuck into the muddy bottoms of lagoons, lakes or rivers, are common throughout the world. Collectively, these may be termed "brush parks" and are found in many parts of west Africa, Madagascar, Sri Lanka, Bangladesh, Cambodia and China, as well as in Ecuador and Mexico. Two main types are common: (a) small, circular piles of branches sometimes surrounded by fences of more durable wood, and (b) larger, rectangular installations (see diagram of types). Brush parks have usually been considered simply as devices for the attraction and concentration of fish, shrimps and crabs from the surrounding waters. However, one study in Benin has shown that the situation is in reality more complicated. In Benin, there is a complex variety of "acadjas," which have evolved over the last 200 years.

Nature of brush parks

Several observations indicate that the

populations of fish within the confines of the park are distinct from those of the surrounding waters. Firstly, there is an exponential curve of fish density over time (see graph). Secondly, species in the park are very different from those in adjacent waters. Thirdly, mature fish within the park are often in breeding condition, and the presence of numerous juveniles indicates that reproduction has taken place there.

From these, it would appear that a brush park initially attracts certain species. The initial colonization of parks occurs as a result of migration from more mature parks. As populations become more dense, an increasing migration of fish from the park occurs until, theoretically, a stable population level is reached. Of course, such mechanisms are more evident where a number of installations are gathered together to form a field (see photo). Thus, any park may be considered as passing through two phases: an initial phase as a refuge trap, and a second phase

as an extensive fish culture site.

Harvesting and yields

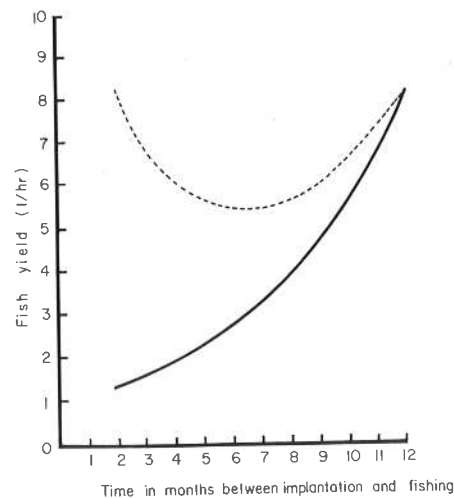
Usually, brush parks are encircled with a net or a fence. The branches are then removed as the net or fence is advanced to enclose a progressively smaller area. Less commonly, the parks are fished solely by traps or hooklines.

Extremely high yields are obtained from such fisheries, comparable even with those from modern sophisticated and intensive aquaculture operations. In the Ivory Coast, Ghana, Madagascar and Sri Lanka, annual yields vary from 2 t/ha with fishing intervals of 3-4 days, up to 17 t/ha with an interval of 70 days. Yields from mature parks in Benin, left for one year without fishing, have reached about 20 t/ha.

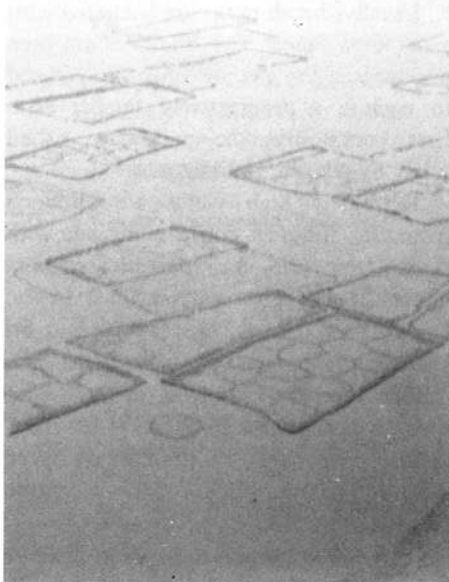
The enormous yields can be accounted for in different ways. Firstly, there is the physical attraction of the shelter itself. Secondly, nutrient-rich particles of organic matter settle from the water onto the rotting branches. The particles, along with nutrients dissolved in the water, fuel the growth of fish food organisms. Finally, the continuous cropping activity of the fishes, the production of their metabolic wastes, and the decomposition of the wood ensure that nutrients are rapidly recycled within the system.

Management

Experience with the Benin parks gives us some idea of the proper management of such fisheries.



Graph shows increase in density of fish population with increasing time of implantation. The dotted line shows the yield per annum when the acadja is fished at different fishing intervals in months.



For coastal lagoons, brush parks appear to be advantageous biologically and economically.

Locality. Suitable sites for installations of brush parks are relatively calm waters between 1 and 1.5 m deep, with mud bottoms soft enough for branches to be pushed in but firm enough to retain the branches once they are in position. Salinity is less important, as brush parks are productive in both freshwater lakes and brackishwater lagoons.

Supply of wood. Experiences from Benin show that the denser the implantation of branches within the park, the greater the eventual population of fish. Nevertheless, for economic reasons, the density of branches usually varies between 12 and 16 branches per square meter, equivalent to about 30 or 40 t (dry weight) of wood per hectare. Under normal conditions, between 30 and 40% of the branches has to be replaced each year, giving a replacement requirement of about 10 tons of wood/ha/year. Thus, it is obvious that large amounts of wood are needed for extensive brush-park fields and, therefore, development of this type of fishery can occur only when backstopped by an abundant and cheap source of branches.

Mixed installations

In Benin, it is common to find mixed fields of large and small installations. This system has many advantages. One is that the smaller parks attract fish from neighboring bigger ones and rapidly attain important population densities. Thus, high

yields are sustained with little effect on the main fish stock. Furthermore, absolute quantities of fish caught are enough to sustain the day-to-day nutritional and financial needs of the family owning them. On the other hand, the larger installations require a considerable number of fishermen but generate sufficient capital for major expenditures.

Evaluation of brush parks

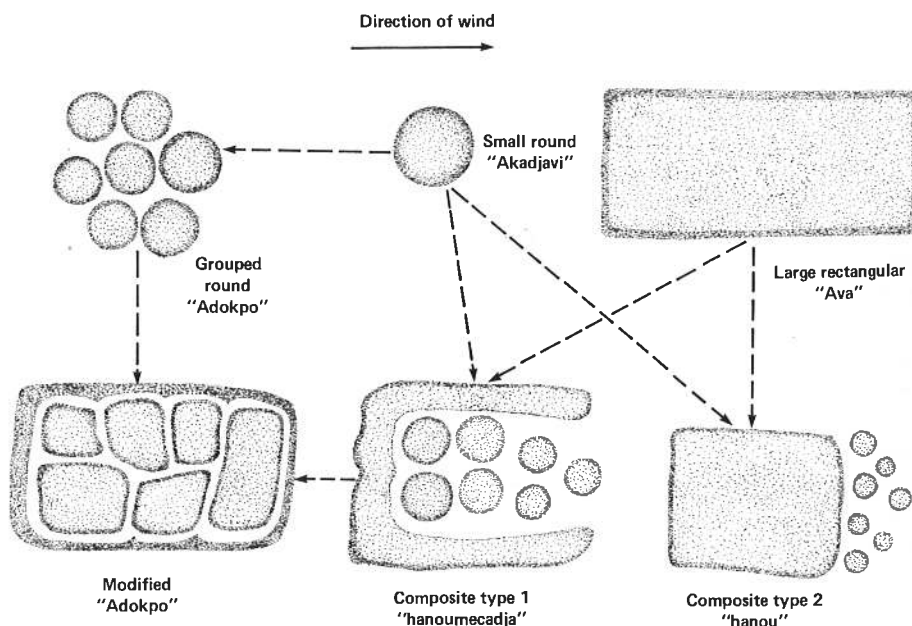
Brush-park fisheries appear to offer a number of biological and economic advantages in the management of small-scale fisheries in coastal lagoons, rivers and lakes. Among these are the high yield and the possibility that the "overflow" from the brush parks contributes to the stocking of open waters. Only a low level of technology is required for installation and maintenance, and harvesting is no more complex than many of the commonly practiced traditional fishing methods. Brush-park fisheries are labor-intensive and therefore attractive as a means to maintain a high level of local employment. The brush parks may be private property and, thus, there is some incentive for the owners to conserve fishery resources in order to obtain maximum economic gain. Alternatively, brush parks are also ideally

suitable to financing, development and management schemes at a cooperative or community level. And the large quantities of wood required to construct and maintain the parks can contribute to local income and employment by fostering a wood-growing and wood-transporting industry.

On the negative side, it is conceivable that widespread adoption of brush-park fishery technology could lead to socio-economic and environmental problems. These might include competition with adjacent capture fisheries if the parks are fished too frequently and if the parks attract the same species preferred by capture fishermen. Equally damaging could be a perception that the parks are competing for space and resources with capture fisheries. There have been cases where the too-rapid increase in brush parks has resulted in social turmoil and destruction of all the parks. Environmental drawbacks could include local deforestation and consequent environmental degradation, and increased rates of silting due to the interference of the parks with current and water flows.

Yet, overall, the potential advantages of brush-park fisheries seem to outweigh the disadvantages. However, given the present state of knowledge on their biological functioning and the nearly complete lack of information on their sociological and economic influences on already established fisheries, dissemination of the technology is inadvisable without detailed studies being conducted first.

Diagram of principal brush park types found in Benin. Such technology, although apparently advantageous, should be investigated in detail before any attempt to disseminate it to target audiences is made.



Photos by H. Texier.