

FISHING SYSTEMS; VIABILITY IN NIGERIA

By

N. O. Fadayomi
FISESCO, Lagos, Nigeria

INTRODUCTION

Because of the rationale underpinning the choice of this topic, and the limited time allotted to this symposium, I have deliberately left out fishing systems that are adopted for fish exploitation at subsistence level. These include: angling, trapping, lift and cast-netting.

The focus of this paper, therefore, is on fishing systems, around which sustainable fisheries had developed. For the avoidance of doubt, the world fisheries in this context has economic implications. In like manner, viability could be substituted for profitability.

The major consideration in fishing technology is the community behaviours of the target fish species such as feeding habits, spawning habits, response to external stimuli such as: temperature, hydrospheric pressure, light, salinity and electricity.

Over centuries, man has come to terms with these variables and has developed contrivances to exploit the fish resources. Depending on the levels of tolerance of the hydrospheric pressure of a given fish species, fish stocks position themselves at different levels within the ecosystem. Some fish communities have preference for the benthic region, some have preference for the mid-water region, some have preference for the pelagic region and, in some lakes and the estuary, some prefer the littoral regions. With this understanding fishing systems had been developed to exploit these resources at these locations.

The existing Fishing Systems

For fish communities inhabiting the benthic region, the following fishing systems have been developed viz. Otter trawling (this could be operated over the stern, side or the out-riggers), beam trawling, scottish/Danish seining (which in some parts of the world is referred to as Wing trawling).

In certain waters, where the substratum is muddy shell fish (such as crustaceans) embed, iron chains referred to as tickler-chains are giffed on trawls for better catchability. Tickling of prawns and shrimps out of the substratum become such an important factor of the fishing exersives to extent that alternating current is used in some countries along with tickler chain to electrically shock the animals out of the mud and be caught by the approaching fishing gear.

At the littoral region, beach-seining is adopted. This system is commonly used in lakes, marine envrionment and flood ponds. This is labour intensive and without mechanisation. the beach-seine which may be constructed like a wing trawl is pulled on the beach at either side of the wings by able-bodied men. The catch, using this system, could be appreciable, depending on the season of the year.

The fishing systems afore-mentioned apply mostly to the exploitation of fish resources of the marine environment. In lakes, rivers and the estuary, the most popular fishing systems are gill-netting and trapping. gill-netting, a passive fishing system, is equally popular in the marine

environment and it is in fact the main fishing system adopted by artisanal fishermen who contribute as much as 95% to the aggregate National Fish Production.

Because of submerged vegetation, rocks and other obstructions in swamps and some rivers, the electro-physiological properties of fish is being exploited through the use of electric fishing gear which sensitises the neuro-physiological centre located close to the vagus nerve. The exposure of fish to electric field in water brings about cathelotrotonic or anelectronic conditions that bring fish unconsciously towards higher potentials of the electric field, at the centre of which is the anode of the assemble which serves as the fish collector. Further exposure to the electric field brings about tetanic effect which leads to narcosis. The electric pulse character recommended is similar to the systolic and diastolic current pattern of the heart whose effect is different from that produced by alternating current or D.C. generators. For, while the former allows the fish to recover normalcy the latter electrocutes the fish immediately and, as such has come under sanction in developed countries.

One fishing sub-system that is effective in any aquatic environment, but serving as complement of other major fishing systems is light fishing. The major components of this assembly are light bulbs of very high wattage which help in the attraction or concentration of fish, particularly pelagic fish stocks. In this case, the main fishing system could be purse-seining or gill-netting.

For fish communities inhabiting the mid-water, the following fishing systems have been developed, viz: mid-water trawling and long-lining. The mid-water trawling could be done by a pair of boats, the relative positions and towing speed of which collectively determine the depth of operation of the trawl, as well as the horizontal opening of the trawl. the trawling system could be done over the stern of a single vessel, using hydrodynamic otterboards referred to as subcrube doors. Because this fishing system is aimed at shoals of fish, the catchability of this gear is enchanced by the use of "Kites" on the upper pannel of the square of the trawl, which increases the vertical opening of the gear much more than can be attained through the conventional float/sinker arrangement.

On the other hand, the long-lining system uses the hook assembly aimed at fair-sized shoals of fish that can be caught individually by individual hooks. These hooks may be baited with live-fish preferred by the target fish; they may be baited with mimetic fish and they may not be baited at all. This fishing system is effective for fish inhabiting the cold water region below the thermocline, about 200 metres deep.

For fish communities inhabiting the surface of the ecosystem i.e. pelagic fish species, the following fishing systems have been developed, viz: mid-water trawling, purse-seining and pole-lining. The most effective of these systems is the purse-seining and it is the most expensive and most sophisticated. The sophistication lies in the substitution of natural fish finding indicators by aircraft which is appurtenant to the purse-seiner, and in the Advanced utilization of portable echo-sounders for locating shoals of fish at close range. Importantly, the effectiveness of the purse-seining system lies in the ability of the purse-seine gear to reach at the depth of the thermocline as well as surface waters, where such thermal stratification occurs in the tropics.

With regard to the mid-water trawling, its effectiveness in the exploitation of the surface fish communities lies in the ability of vessels to raise and lower the trawl by increasing or decreasing the speed of tow.

As for the pole-lining, it is very effective for shoaling fish above the thermocline. This is labour-intensive and, it is dependent on the availability of live-baits, mainly sardinella and anchovy.

Fish pumps with hoses laced with electric wire network are used as complements of some purse-seining operations whose target fish naturally occur in hundreds of thousands. This group includes, but not limited to, *Trachurus* spp and *Scomber* spp. This appurtenance is to expedite storage, assure high quality product and prevent a surge of the fish shoal that could affect the stability of the fishing vessel.

FISHING SYSTEMS THAT ARE VIABLE IN NIGERIA

Viability of fishing systems in Nigeria should be discussed in the context of the fish resources and the different ecological zones.

Because of the nature of the bottom of Lakes, Rivers and the Estuary, Gill-netting has been found to be most effective. This system has been perfected by the local canoe fishermen over the years. Although the returns on investment by small fishermen groups remain low, the large numbers of fishermen engaged in this fishing system account for the seemingly appreciable fish landings at the various ecological zones. Attempts have been made to introduce the trawling system (particularly mid-water trawling) at the major lakes such as Lake Chad and Kainji Lake, but all these efforts have yielded insignificant results in as far as economically important fish species are concerned. Nevertheless, catchability could be enhanced if the area fished is expanded by increased investment in fishing gear and by complementing the gear with light attraction, particularly for semi-pelagic species.

In the marine environment Gill-netting is viable. At areas of the continental shelf that are close to shore, canoe fishermen adopt bottomset gill nets to exploit demersal stocks. At deep areas down to 100 metres mid-water-set gill-nets are used for off-bottom or semi-pelagic species. The latter has proved most profitable because of the large schools of pelagic species such as Bonga encountered at mid-water and at the surface. In this fishery, Bonga remains the major catch, although what is caught through gill-netting because of the passive nature of the fishing operation. Since the last one year, commercial exploitation of Bonga resources is being undertaken with the use of small purse-seiners by Russian Vessels. Appreciable quantity of fresh-frozen Bonga is being landed at Lagos Fisheries Terminal with the result that a new fresh Bonga market has developed. Given the potential of this resources, more purse-seining activities should be encouraged. Mid-water trawling for Bonga is equally effective, although the system is yet to be adopted in Nigeria.

As regards demersal fish stock, bottom trawling has been found most effective with proven economic viability. Different modes such as stern trawling, side trawling and double-rigged trawling had been adopted, although most fishing enterprises are now sticking to double-rigged trawling because of the wider trawlable area covered by the two nets towed simultaneously, and because of the mixed fish communities of the benthic region of Nigeria's continental shelf.

Beam trawling is viable for demersal fishing as well. This system is particularly effective in muddy bottom in and around the river mouths where flat fish species and crustaceans embed, because the gear mouth digs deep enough to push them out into open waters and into the bag of the net. This system is yet to be adopted in Nigerian waters.

For the off-shore pelagic resources of the sea down to the ocean such as the tunas and tuna-like fishes of the scombridae and carangidae families, the purse-seining system is the most viable. Second to it is the pole-lining system. These two systems have been adopted successfully in the Nigerian Exclusive Economic Zone. In principle, the long-lining systems should be effective for tuna fish species such as the big-eye (*Thunnus obesus*) that inhabit deep colder layers of the ocean, although a survey of this resource is yet to be made to determine its potential. Because almost 0.3% to 0.5% of purse-seine and pole-line catches comprise the Big-eye, it is surmised that more of them could have been landed if one used a gear such as long-line that could reach at them at their deep locations.

Generally, because of their propensity to be attracted to light, light gear assemblies can complement pole and long-lining systems for higher fish production from these areas.