

THE ROLE OF RESEARCH IN SUSTAINABLE FISHERY EXPLOITATION, MANAGEMENT
AND DEVELOPMENT

BY

A W KUDHONGANIA

UFFRO - JINJA

ABSTRACT

Fishery resources are very fragile to exploitation if the basic biological intricacies of the available stocks are not taken into account.

Research enables the formulation of sound strategies and practices aimed at sustainable fisheries exploitation, management and development.

The success of research strategies requires complementary mechanisms to enforce specified measures.

1. Introduction

Fishery Resources are inherently renewable so that it is theoretically possible to exploit a given fishery indefinitely. In practice, however, exploited fish stocks are highly emenable to irreparable damage if harvested blindly. Recent dramatic changes in the stocks of Lake Victoria and Kyoga clearly illustrate the fragility of tropical fish stocks. Among the factors commonly causing severe damage to fisheries are: over-exploitation, environmental degradation and ecological interactions. These and/or other factors may act either independently or in association in affecting the fishery. The mode and tempo of change would obviously depend on the magnitude of the factor(s) operating and the resilience of the fish stocks to the challenge(s).

Therefore, for any exploited (or potentially exploitable) fishery it is essential to define and quantify the fish stocks and how they respond to factors which may have direct or indirect effects on them. This is achieved through fishery research which is simply a branch of study dealing with the aquisition of information and methodologies for prudently solving fisheries problems. This paper summarises the importance of research information with reference to four pillars of fishery resource management (Fish stocks, Catch statistics, Water environment and Social economic benefits). For sustainable fishery exploitation, management and development, the following objectives must be fulfilled:-

- (i) To exploit the existing stocks but at the same time effectively perpetuate the resource for future generations. (Sustainable, Management).
- (ii) To enhance the fishery resource base given the demographic trends, and development as a process of change for improvements in production, resource utilization and human skills. (Development).

- (iii) Maintain the viability of the water environment for the fishery as well as other water uses. (Sustainable, Management, Development).
- (iv) Minimize post-harvest losses and improve on the quality of the fish and fish by-products. (Development).

2. Know your Fish Stocks (Stock assessment)

Shortage of accurate stock assessment data is one of the principal limiting factors for proper fisheries exploitation and management. For any planned development activity resource inventory is always necessary in the first instance. Therefore, the first essential for research to support fisheries goals is an inventory of the available stocks.

A. priori any fish stock is finite. But the amount of information sufficient to define fish stocks which are dynamic systems, is quite substantial, time consuming and may not be obtained directly. A number of parameters can be measured almost exactly, some can be calculated to within reasonable estimate limits, while others can only be approached in terms of an intelligent guess. The required data include species composition, indices of abundance, population structures and the principal parameters of fish populations (growth, mortality, recruitment). It is also necessary to know how the fish stocks within an ecosystem may be separated partly by their behaviour to fishing gears, by their trophic diversity, or by their bathymetric preferences, etc. Accurate scientific information allows an assessment of the resilience of specific target stocks to given levels of exploitation. It also provides the scientific basis and methodologies for planned management and development of the resources as good data would be capable of predicting future possibilities for the fishery.

Ultimately scientific data are meant to guide decision makers in wisely choosing the best course among possible alternative strategies. This is particularly true for sustainable development planning where strategies should be implemented within the scope of the resource magnitude and stock resilience. But when little is known about the fishery resources decisions about their exploitation cannot be made prudently.

3. Know your fish Catches (Fishery Catch Statistics)

Catch statistics provide the basic framework reflecting the performance of the fishery. The image of the performance of the fishery is defined by the indices of fishing (fish yield, catch per unit effort, size structure, fishing pressure, etc.). Given stock assessment data, the indices of fishing reveal the qualitative and quantitative impact of exploitation on the stocks, and an understanding of the response of the various fish species to existing exploitation regimes.

Accurate catch statistics data over time are used to show the trend of the fishery, whether the resource could sustain additional production or if any management measures or exploitation regimes need to be modified. Catch records of the past and present give a clue to the prospects for the future and, therefore, the framework for planning. In addition, since fish yield is a function of the entire water system (Goldman and Horne, 1983) catch statistics assist in defining the condition of the ecosystem.

In Uganda it is essential to recognise that tropical fish stocks are easily over-exploited (Crowley, 1983). After all, since any fishery stock is exhaustible no fish stock is unresponsive to excessive exploitation pressure. To sustain the fishery resources, timely research and statistical data collection should go hand in hand with the process of exploitation.

4. Know the Water Environment (Limnology)

Water is the basis of all life and more especially so for aquatic organisms like fish. The water environment is thus the resource base for fishery production. To understand a fishery resource, one must study the physical, chemical and biological characteristics of the water environment including how the fish community structures are influenced by the living and non-living components of the system (de Bernardi, 1981).

It is the totality of the water environmental properties that sets the potential fish yield of a given water body with each environmental variable providing an operational limit on the potential capacity (Goldman and Horne, 1983). The water environment should, therefore, be viewed as a delicately balanced resource base for fish production. And to sustain and develop fish production one must sustain and develop the water environment as a resource base. Substantial changes in the environment will cause significant modifications in the aquatic communities (including fish).

Natural water systems are not closed. They are open to the outside by their permanent contacts with the atmosphere and the land around. Changes in the atmosphere (e.g. air pollution) or land and land use (surface run-off, agriculture, industry) may greatly affect the water environment either directly or indirectly (Bugenyi, 1984). In addition, most water bodies are not used for fish production only. There are other social benefits, too (domestic water supply, transport, irrigation, recreation, sewage disposal, etc). Within the objective to sustain and enhance the water environment as a resource base for fish production, there is the need to monitor the impact of the various water uses in order to maintain or improve upon the water quality as may be desirable. There are models which make it possible for prediction of complex biological phenomena, including fish yield, from simple environmental parameters (Marshall, 1984).

It can be seen that the scope of limnology is quite wide, involving studies on widely spaced parameters and human activities. This clearly shows how fishery management and development has to be a relentless pursuit of shared responsibilities which have to be harmonised through timely, planned and effective research activities. It is when the relevant limnological variables are clearly understood that they can be effective in sustainable fishery management and development strategies.

5. Know your Priorities (Socio-economic benefits)

The ultimate objectives of a fishery resource are its priority benefits to society. These range from recreational (sport fishing) or aesthetic values of certain fish species to the dire requirement for animal protein and employment. The choice among the numerous socio-economic options depends on specific National requirements. In Uganda the most relevant objective as a priority appears to be the perpetuation of the fishery resources for human food and economic activities. And in the context of this Conference the objective should allow for increased fish output per head as well as in the nutritional and economic condition of the society (i.e. sustainable development).

Once the fisheries social objectives have been clearly defined and prioritized research can then be tailored for the fishery resources to fulfill those objectives accordingly. An understanding of social priorities forms the basis for research planning either in support of existing systems or for the establishment of new possibilities, such as aquaculture.

In appreciating the role of fishery research one has to recognise constraints in implementing research recommendations. Capture fishery resources are regarded as common property. As such, there are no incentives for the fishing community to crop the resources wisely, according to research findings. That is why research effort has to be complemented by effective management

enforcement mechanisms within the strategy of sustainable fisheries exploitation and development.

6. Summary

1. Research information is required in order to guide fishery exploitation within the magnitude and characteristics of the available stocks.
2. Accurate stock assessment and catch statistics data serve in monitoring the mode and tempo of the performance of the fishery.
3. Water environment studies are carried out in order to ensure the viability of the water system for its multipurpose uses.
4. Research programmes are planned with priority social objectives for the fishery resources in mind.
5. For sustainable fishery exploitation, management and development, research strategies must be complemented by effective management measures and extension services.

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