Development Potential and Constraints of a Fishing Industry in the Okavango Delta

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Background
The nominal catch of inland fisheries for the continent of Africa for 1974 was estimated to be 14,108.9 metric tons per annum (FAO, 1975). Botswana's contribution to this is approximately $8.3 \times 10^{-4} \text{c}$ or 120 metric tons per annum. Although this figure may not be accurate, it serves to demonstrate Botswana's position relative to other countries in fisheries resource development and potential. Botswana's fisheries resource is small, isolated and underdeveloped. Its greatest potential lies within the 10,000 km² area of the Okavango River Delta. This paper discusses the development of this resource from its present state to an ideal situation where both the biological and economic potential are realised.

Introduction
Since independence, Botswana has sought to develop the fisheries potential of the Okavango River Delta. In 1964, under a grant from OXFAM, a survey was conducted to determine those species of fish exploitable, the magnitude of the stocks, and the annual sustainable yield (Maar, 1965). Data generated from this study was translated into a programme based on a series of recommendations realistic for the times. The main objective was to stimulate the artisanal fishery through the introduction of improved methods of catching and processing at the village level. A Fisheries Section was established within the Ministry of Agriculture under the leadership of a Fisheries Officer. Staff were recruited and trained, and a programme initiated. By 1973 thirteen fisheries extension centres were operating throughout the Delta in many of the major villages. Activities at these centres consisted primarily of sales of fisheries' requisites and training in the use of gill nets for local fishermen. The programme also attempted to stimulate commercial fishing through subsidised processing and marketing.

Progress along these lines was minimal, and in 1974 the Fisheries Section was disbanded with its staff, and infrastructure was amalgamated into a newly-formed department within the Ministry.

Resource potential, fish
The Okavango resource with respect to fish production has never been accurately assessed. Systematic collection of catch statistics has never been seriously undertaken for reasons including a lack of available funds, expertise, absence of commercial activities, and the elusive nature of the artisanal fishery. Productivity estimates have been made, but these are considered unreliable.

Most southern African rivers are of low chemical status, but the Okavango appears to be exceptionally so (Thompson, 1974), thus making the Okavango oligotrophic in nature. It has been believed that fish production in the Okavango system is high. Although there is no evidence to the contrary, a review of available information on electrical conductivity, chemistry of the inflow, and aquatic vegetation (Thompson, 1974) indicates that fish production may be lower than in similar systems such as the Kafue Flats in Zambia. There the standing crop is estimated to range from 350-500 kg/ha (Lagler et al, 1971). Estimates obtained from selected areas of the Okavango (Fox, this Symposium) place standing crops ranging from between 10-700
kg/ha. It can be expected that productivity will change with habitat and flood regime, the higher figure being obtained from nutrient-enriched *naudus* (lagoon) frequented by cattle. These estimates apply only to floodplain areas. Lake Ngami, on the other hand, is an unique part of the Okavango system, and must be considered separate. Its area fluctuates from 0-200 km², has no outlet, and can remain dry for years at a time (Wilson and Dinter, this Symposium). With respect to fish, Lake Ngami is very productive. Fish enter the lake with each flooding, and grow to a catchable size within 6 months. Because of constraints due to the available methodologies, estimates of standing crop are very difficult to obtain, and unbiased data is unavailable.

**Potential, socio-economic**

The total population of Ngamiland is estimated to be 35,870 inhabitants. Of these, 32,851 reside in villages of less than 500 people (Guide to the Villages in Botswana, 1973). The average income per family is estimated to be R80 per annum (Hubbard, personal communication). The number of active fishermen in the Okavango River Delta is unknown; although most of the catch is taken through the artisanal fishery located along the eastern and southern fringes. Fishing within the Delta is largely prohibited by the presence of tsetse fly, a deterrent to human habitation, lack of access by road, and poor communications. It is known that fishing activities are greater among certain tribal groups, notably the Bayei and Hambukushu.

The consumption of fish in Ngamiland is related not only to the above constraints but to the size of the resource available for exploitation. The current offtake is about 400 metric tons per annum, and may reflect the small area actually available for fishing. This is further complicated by the fact that the exploitable area fluctuates with the annual flood cycle; thus making fishing a seasonal occupation throughout much of the Delta.

**Development strategy**

Development of the Okavango fish resource has always been problematical and controversial. One of the early investigators, J. L. Dibbs (in Maar, 1954) concluded:

“The major problem is production. The biologist (Maar) says that there is a major untouched resource in a sparsely populated area where cattle production is the major occupation. The inhabitants have no knowledge of fishing, and naturally no equipment, and have only recently become interested, very much at the village level, in fish as a supplement to the local diet. This has only been when it is supplied free from experimental catches.”

If the above is truly the case, as it may have been, how can Botswana develop the fisheries resource?

Development should begin with a fisheries policy, and proceed through an administration whose ultimate purpose is to provide a service to both artisanal and commercial interests. However, development must be considered in its proper context with management. Fisheries management should be based on long-range multiple objectives that embrace the total interdisciplinary spectrum, e.g., economic as well as biological. This is because development must be considered in relation to the complex decision-making environment that is often overlooked in the more traditional muddling through approach that disregards a total system appreciation.

It follows that the problems of development are wide-reaching and that strict biological, economic or technical inputs into policy and decision-making are inadequate as a means of achieving real advances. Decision-making in fisheries development should be framed in a strategic not tactical context. The differences between tactical and strategic decision making are (from Gros, in Rothechild, 1973):

**Strategic approach**

- Broad scope
- Long-term horizon
- Formulates problem
- Systems-oriented
- Considers problems in relation to others
- Examines desirability

**Tactical approach**

- Narrow approach
- Short-term horizon
- Seeks objective answer to problems formulated by others
- Operations-oriented
- Considers only solution of particular problems
- Examines feasibility

The strategic approach views fisheries as a system or a collection of systems. The methodology begins by formulating objectives, and then ways and alternatives of reaching these. The strategic approach is a systems analysis approach which not only formulates the problem but dissolves it into comprehensible elements.

A strategy for fisheries development must consider the following points as beginning priorities:

(i) National policy on fisheries
(ii) Resource investigations
(iii) Training

Although these may not be the only priorities, they are the most apparent.

**Policy**

The formation of a national policy on fisheries is the first step in the development of the resource. Without a well defined policy there can be no guidelines for the fisheries administration, and development will stagnate, or 'muddle through.'

**Resource investigations:**

Resource investigations are essentially a means of gathering base-line data upon which to formulate a strategy. Some will argue that resource investigations come before policy. However, investigations are the tactical component of fisheries development. To begin with, a general resource survey is needed to estimate some of the more important: biological parameters, e.g., location and size of the stocks, biomass and species composition. Secondly, feasibility studies may be conducted to stimulate commercial activities. Marketing analysis would be included in this and utilise interdisciplinary expertise from other ministries, e.g., Ministry of Commerce and Industry. Thirdly, investigations would have to examine more closely the socio-economic potential within the Ngamiland area. This is perhaps the most important, although often neglected, aspect of development. A strategy's success or failure rests on understanding and interpreting the social and economic realities of the community which is the target for a development programme. For example, it is generally believed that artisanal fishermen in Ngamiland are among the poorest inhabitants. It is also held that fishing may be regarded as the lowest occupation, taken up only as a last resort. It may oversimplify the case, but certainly the present situation must be carefully analysed before new developments are considered.

It is not really important which of the investigations is initiated first. Ideally, all phases would commence together; unfortunately, the expertise will be greater in some areas than others. Answers provided by the surveys need not be too refined, and should be addressed to the needs of the strategy's objectives as they are formulated or restated as further information is known.
Training:

Of paramount importance in the developing countries of the Third World is training of personnel, along with its allied component, education. Administrations responsible for a particular resource's development acknowledge this; unfortunately, it can be a most frustrating area. For fisheries development to be successful, training must be included in the list of initial priorities. At the present time much of the development work is guided by expatriates. For the long-range objectives to be meaningful they must include the training of an efficient and capable cadre of staff. This commitment must be initially expressed in the policy. Projected staff requirements should be outlined and a programme of in-service and overseas training be initiated. The requirements need not be rigid, for the strategy must account for the reiteration of goals and objectives.

Discussion

In discussing the development of fisheries in the Okavango River Delta in relation to the present constraints, I have brought together several concepts that focus on some of the immediate problem areas. The most important of these concerns itself with the physical nature of the resource itself. It is recognised that the Okavango, although vast, is relatively isolated, uninhabited, and oligotrophic. This should be a challenge, not a deterrent to development. Future land-use patterns will affect fisheries development to an unpredictable degree. Habitation of the Delta will probably enhance utilisation. More information is needed on the fish biology and ecology before a strategy can be developed.

Another and equally important constraint concerns itself with the present state of utilisation. This cannot be separated from the physical parameters that inhibit development, e.g. lack of communications and supportive infrastructure in Ngamiland. However, our knowledge of the social-economic factors that relate to present resources use is incomplete. It is assumed that development will begin with the present core of active artisanal fishermen, but questions of how many there are and how they fish are unanswered.

Finally we must consider the development of a strategy that can formulate and attack the problems that inhibit advancement. The main objective is to utilise the fish resource. An investment will have to be made in an institutionalised approach. This concept has been presented. Initially a fisheries policy is needed to serve as a guideline for an administration vested with the role of initiator. From investigations information can then be obtained and translated into a programme of development. The objectives embodied in this will be refined and reiterated with subsequent knowledge. At the time of writing, the strategy has not been finalised; and hence, not presented in this paper. However, the formulation of goals and objectives is the first step and unless this step is taken, real achievements will be far from optimal.

REFERENCES