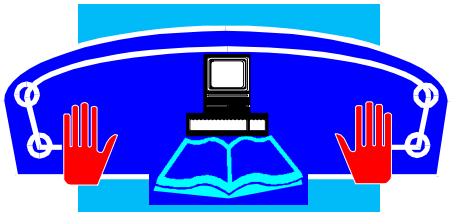

Tools And Measures For Fisheries Evaluation - Draft
Catalogue Number: 3-14-62

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DRAFT

RT & Associates
January 1994

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Introduction

Like most fisheries in Canada, NWT fisheries are expected to fulfill a number of different social, economic, and biological objectives. For example, commercial fishing may be pursued to provide employment, provide a source of cash income, support on-the-land activities, diversify a community's economic base and improve the general well-being of a community. In addition, these objectives must be accomplished in a biologically sustainable and economically efficient and realistic manner. Thus, planning and evaluation of fisheries development can become a complex and difficult process.

This process is made more difficult by the fact that there is often limited information available for planning and evaluating fisheries. In most NWT fisheries, the only data consistently collected are the number of fish harvested commercially and the price received for fish. And even this data is often difficult to get in a consistent format as different agencies use different data collection and analysis methods. Other, more comprehensive studies have been carried out for some fisheries but these tend to be sporadic.

Fisheries development in the NWT is no different from elsewhere in Canada. Most Canadian fisheries suffer from a lack of comprehensive formal planning and evaluation. Indeed, most fisheries planning in Canada has been in response to crisis. For example, the Department of Fisheries and Oceans (DFO) general statement of objectives for the fisheries in "Policy for Canada's Fisheries" resulted from the groundfish crisis of the 1970s. This lack of comprehensive planning and evaluation has led to a number of problems, most of which are exacerbated by the multi-objective nature of fisheries development.

To deal with the complexities of fisheries development, DFO has developed a planning and evaluation framework that allows the fishery manager to examine a wide range of fisheries issues simultaneously and make decisions in full appreciation of the various trade-offs involved in pursuing one option over another. The framework, commonly

referred to as the five-account system, provides an integrated means of applying the various tools and measures appropriate to evaluate multiple fisheries objectives. Initially developed in 1976 to evaluate projects for the Salmon Enhancement Program in B. C., the five-account system has since been further developed and formalized and is now embraced by DFO as an appropriate economic planning framework for fisheries management in the NWT (Topolniski 1991).

In this paper we provide an overview of the five-account planning and evaluation framework developed by DFO and the standard tools and measures that are commonly used to evaluate fisheries initiatives in Canada. In the second part of the paper we illustrate how the five-account system can be applied using the Great Slave Lake fishery as an example.

Development of the Five Account System: Salmon Enhancement in B.C.

Before explaining how the five-account planning framework works, it may be useful to detail the use of the five-account system as it was originally conceived. The B.C. Salmonid Enhancement Program (SEP) was designed to increase the number of salmon in B.C. through a variety of projects which totaled $156 million. The issue facing the program planners was to allocate funds in a way that not only increased the number of salmon but also satisfied a number of other constraints and planning objectives. First, the costs of the program were to be recovered through a cost-recovery landings tax and increased licensing fees therefore projects had to earn a profit. Secondly, certain species had to be increased and certain river systems had to be increased. In addition, native employment was seen as a desirable objective. With this type of multi-objective planning a number of different evaluative criteria were needed.

An iterative planning process was used to select enhancement projects. Initially, an exhaustive list of projects was drawn up based upon biological and engineering criteria. Each project description included a dollar cost and an estimate of the number of salmon the project would produce. Traditional benefit-cost criteria were applied to the projects on this list and candidate projects were ranked. Then the five-account system came into play. In addition to the standard economic criteria of profitability, five separate "accounts" were set up, one for each of the major classes of objectives that were considered important including regional development, native employment and habitat considerations. The projects were then ranked according to criteria appropriate to each account.

This approach enabled managers to incorporate the need to bring back certain species such as chinook in certain streams and to assess recreational fisheries as well as commercial fisheries by presenting the planners with a large ranked candidate list with ranking that included a wide range of different considerations.

The next decision was the allocation of funds for the various projects. In addition to increasing the number of salmon, the program was intended to recover its costs through the imposition of a landings tax, therefore one of the primary objectives for each project was generation of a profit. If a conventional analysis based only on benefit-cost were carried out, only those projects with the highest profits would have been eligible for finding. However, other objectives came into play under the five-account system. Certain projects may have ranked low in profitability but high in habitat development or the recovery of a specific stock of salmon. Using the five-account system, the trade-offs clearly emerged and certain projects got approval because they were highly profitable while others were acceptable because there were total overall benefits available,

Allocation of funds also had to consider political realities. For example, recreational groups were concerned about increasing chinooks and coho while the commercial sector wanted sockeye enhanced, and so on. To help ensure that the program met the needs of a broad range of interest groups, all of the major stakeholders were involved in developing broad program objectives and specific projects. Because all groups were closely involved in the program as it emerged, they could recognize the trade-offs involved in the various allocations of funds and the process was remarkably free from conflict.

In summary, the five account system worked because it had the ability to select projects based on criteria other than simple benefit-cost analysis. Although the five account system was constrained by the need for overall profitability, it provided a rational and effective system for decision making in what could have been a highly subjective process once benefit-cost analysis was no longer the major criteria for investment.

Rationale

The underlying rationale for use of the five-account system lies in the need to develop a consistent approach for evaluation of fisheries projects. In the absence of well-defined processes and criteria for evaluating many of the objectives of fisheries development, the five-account system provides managers and policy makers with a system for detailed and moderately rigorous analysis. The five-account system has the following attributes:

- it provides a consistent approach for evaluation of projects or fisheries;
- it provides explicit dollar costs in some sectors and measurable opportunity costs in others;
- it clearly identifies trade-offs and allows comparisons;
- it provides better management decisions by providing a structure and process for analysis that is not entirely subjective;
- it can be applied to each of the different fisheries sectors: commercial, recreational, subsistence and fish habitat.

The five account system was originally developed for project planning, however the system is flexible enough to also be used for development planning, allocation of existing fish resources and ultimately, evaluation. Indeed, one of the major uses of the five-account system has been to allow rational and politically acceptable allocations among the various fishery sectors: commercial, domestic, recreational and habitat.

The five-account system is also useful in the area of community and regional development because it can integrate community objectives into its analysis through the use of indicators such as employment or cultural significance. As well, the use of a fish habitat account can incorporate environmental considerations. Most importantly, the system can be refined and expanded on a project-by-project basis to incorporate whichever objectives are most appropriate.

The ultimate test of the usefulness of the five account system is whether it can produce politically and administratively acceptable decisions. Decisions will be acceptable if the methodology used is understood and decisions can be explained under some rationale. This is a key feature of the five-account system; all interest groups are given the decision-making rationale. In the SEP program political acceptance was achieved through a series of meetings in which all the interest groups had an opportunity to suggest modifications to projects and finding allocations. This overcame much of the mutual hostility among various user-groups and interest groups.

One result of this process was that some projects were seen to be un-economic and perhaps did not satisfy the criteria under the five-account system but were nonetheless undertaken because of political realities; they were acceptable because they were clearly recognized as political. Projects undertaken purely for economic reasons gained wide acceptance because they were seen as to be **not** political and therefore criticisms were minimal.

The chief benefit of the five-account system to the planners was that each allocation of funds or development decision was the result of a review process that incorporated many economic, biological and political factors. The planners made recommendations based on a rigorous analysis which provided both the planners and the political process with a certain degree of comfort which came from using a successful "state of the art" method which removed much of the inherent subjectivity and was economically and politically defensible.

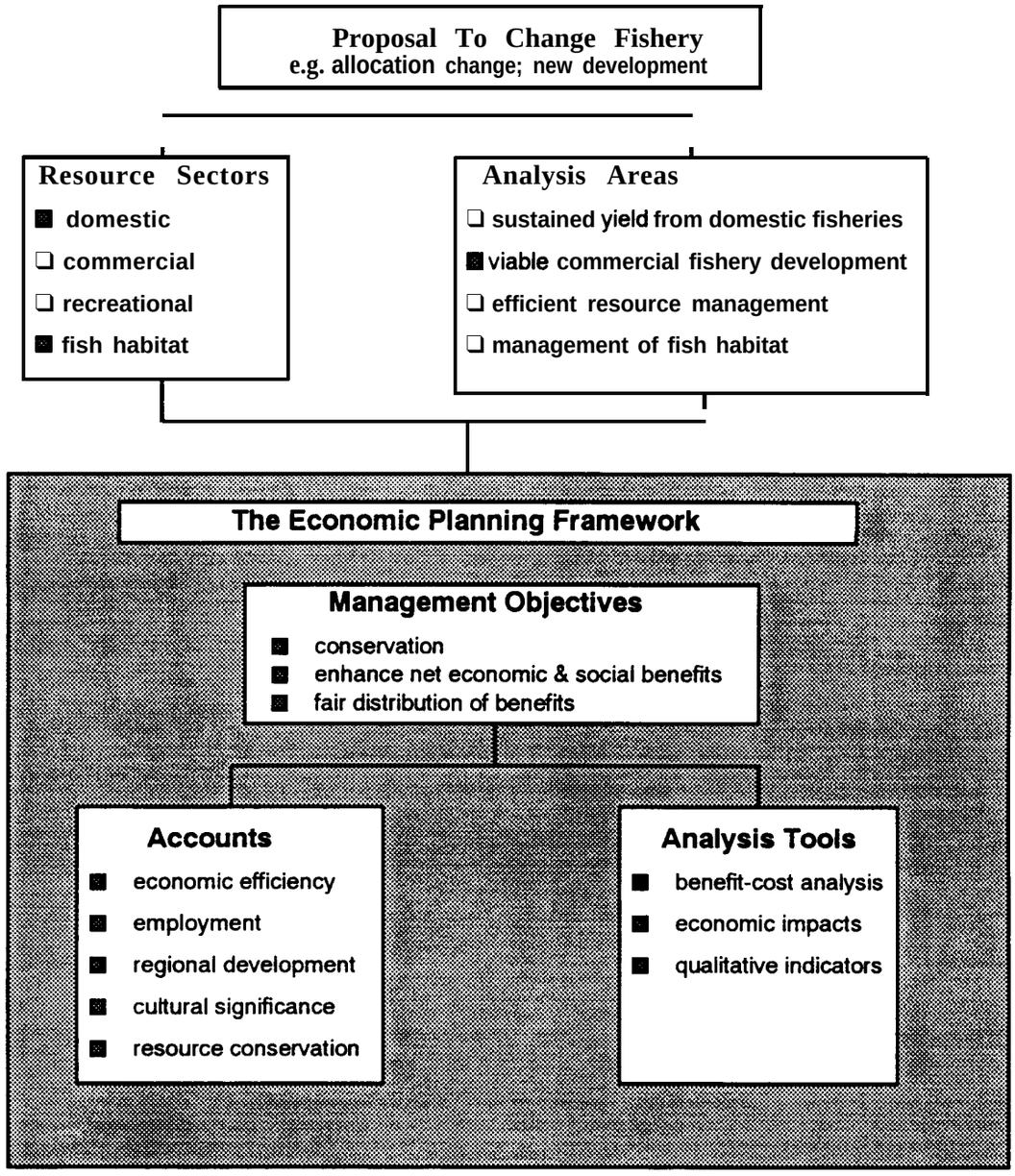
The major drawback to the use of the five account system is that it requires data that may not exist, and planners that have knowledge and expertise in both fisheries and the region to be effective. In addition, planners must be aware of the political realities surrounding development decisions because policy decisions must be made acceptable to the community or region. The SEP planning team had at its disposal large amounts of data on all the fisheries, understood the Native Indian participation in the fisheries and the associated issues, and thoroughly understood the political environment. Coupled with this was the fact that they had many years of experience in economic analysis and policy-

making in the fisheries.

Using the Five Account System

Traditionally the commercial sector has usually been the primary focus of fisheries analysis but increasing recognition of the importance of other sectors, and the emergence of conflicts between various sectors has produced a need for multi-objective planning and the ability to make the necessary management trade-offs in a rational manner. NWT fisheries lend themselves well to the specialized analysis available under the five-account methodology because each of the fisheries developed along different paths and for different reasons. In particular, the use of fish in traditional cultures and within communities means that the conventional benefit-cost analysis used in assessing commercial enterprises is not adequate for a useful evaluation of fisheries initiatives.

The diagram on the following page provides an overview of five-account system planning framework developed by DFO.



Adapted from Topolniski, 1991.

In this planning framework there are four general areas where the five account analysis can be used to support fish and habitat decisions:

- ensuring a sustained yield from domestic fisheries
- fostering viable commercial fishery development
- fostering efficient resource management
- maintaining habitat productivity

For each of these areas, the specific accounts setup and the type of analysis required will depend on the goals and objectives of fisheries development. Therefore, the first step in effective fisheries planning and evaluation is the identification of clear, specific goals and objectives. Generally the goals of fishery development include the following:

- maximizing the yield from a fishery on a sustainable basis (MSY);
- enhancing developmental, social and economic benefits;
- "best use" or efficient resource use
- maintaining and restoring the stock and habitat of the fishery

Once the goals and objectives of fisheries development are determined, the five accounts are set up such that each objective fits into one of the accounts. Generally, there are two standard tests applied to fisheries: economic efficiency and economic impact. Economic efficiency is a measure of the difference between the value of the output generated and the costs of production while economic impact is a measure of the effects of the fishery on income, employment and other indicators, and the distribution of these benefits. The five account system expands these criteria, particularly the economic impact criteria, to assess fisheries in terms of their contribution to:

- economic efficiency
- employment
- regional development
- cultural significance
- resource conservation

Specific indicators that can be specified or quantified are developed for each objective and tools for analysis are developed that allow the indicators to be measurable or have measurable aspects (such as ranking criteria).

The choice of ***appropriate*** objectives and indicators is crucial to ensuring the goals of fisheries management are met. Inappropriate or ambiguous objectives and indicators can actually lead to development that contradicts or undermines the goals of fishery development.

As an example of this potential problem, we can look at the goals and objectives laid out in the ED&T Economic Development Strategy "Renewable Resources: Building on a Tradition". The three primary aims of the Renewable Resources Strategy are to:

- ***reduce the employment and income disparities between and within communities and regions;***
- ***strengthen our economy through growth and diversification;***
- ***ensure Northerners receive a greater share of the benefits of economic development within the NWT.***

Commercial fishing is seen as one way of achieving these goals, however the targets identified as critical to industry development do not reflect these aims, but rather focus primarily on increasing fish production. As a result fisheries initiatives and data collection tend to focus on the number of fish harvested rather than on the impact fisheries projects have on community economic development.

Increased production may indeed help fulfill the three primary aims, but not necessarily. For example, one of the fishery sector targets listed in the strategy is to increase turbot production by 50% from 180,000 kg to 270,000 kg valued at $.8 million. However, analysis of the Pangnirtung fishery (Ashley 1993) indicates that the single minded pursuit of achieving $1 million in sales during 1990 left the Cumberland Sound Fisheries facing bankruptcy.

In addition, an increase in production does not necessarily reflect increased benefits accruing to fishermen or the community. Increased production may result from a large increase in the number of fishermen participating, resulting in benefits being spread out among so many fishermen that each fishing unit actually suffers a decline in income. Alternatively, increased production may result from increased efficiency in those few fishermen that have enough money to invest in new technologies. If this results in a concentration of benefits in the hands of a few people, particularly those who were already better off financially, then increased production actually increases income disparity within the community.

Using fish production levels or total gross income as indicators would not reveal any of these problems. Therefore objectives and indicators must be carefully chosen and worded so they accurately reflect the underlying goals of fisheries development. If economic development is one of the goals of the fishery then explicit development objectives and indicators must be included in the planning and evaluation process.

Accounts and Tools

Tables 1,2 and 3 summarize the five accounts, indicators, and tools outlined by DFO (Topolniski 1991) for analyzing the commercial, subsistence and recreational fisheries. The tables also include proposed methods for generating the required data and suggested agencies that would be responsible for data collection and administering the tools. The requirement for more specific descriptions will depend on the application and needs for the analysis.

Table 1 Commercial Fishing Planning Framework

Account	Indicator	Tools	Method	Agency
1. Economic Efficiency	• Net Economic Value of Production	• Costs and Earnings survey	• Annual Survey	DFO
	• Dollar values	• Consumer Surveys	• Survey	ED&T
		• Agency Surveys of Revenue and Costs	• Department Budgets and Fees Received	DFO, ED&T
2. Employment	• Direct Employment	• Costs and Earnings	• Annual Survey	DFO
	• Total Employment	• Local Income Analysis	• Local Survey	ED&T
	• Ranking	• Qualitative Assessment	• Review Committee	ED&T
3. Regional Development	• Direct Economic Impact	• Local Income Analysis	• Local Survey	ED&T
	• Total Economic Impact			
4. Cultural Significance	• Ranking	• Qualitative Assessment	• Community Survey	ED&T and DIAND
5. Resource Conservation	• Ranking	• Qualitative Assessment	• Exploratory Fishing	DFO

Table 2 Domestic Fishing Planning Framework

Account	Indicator	Tools	Method	Agency
1. Economic Efficiency	• Net Economic Value of Production	• Local User Survey	• Annual Survey	DFO
	• Dollar values	• Consumer Surveys	• Survey	ED&T
		• Agency Surveys of Revenue and Costs	• Department Budgets and Fees Received	DFO, ED&T
2. Employment	• Direct Employment	• Local Income Analysis	• Annual Survey	DFO
	• Total Employment	• Regional Income Analysis	• Local Survey	ED&T
	• Ranking	• Qualitative Assessment	• Review committee	ED&T
3. Regional Development	• Direct Economic Impact	• Local Income Analysis	• Local Survey	ED&T
	• Total Economic Impact			
4. Cultural Significance	• Ranking	. Qualitative Assessment	• Community Survey	ED&T and DIAND
5. Resource Conservation	• Ranking	• Qualitative Assessment	• Exploratory Fishing	DFO

Table 3 Recreational Fishing Planning Framework

Account	Indicator	Tools	Method	Proposed Agency
1. Economic Efficiency	• Net Economic Value of Production	• Angler Survey	• Annual Survey	DFO, ED&T
	• Dollar Values	• Service Sector Surveys	• Survey	ED&T
		• Agency Surveys of Revenue and Costs	• Department Budgets and Fees Received	DFO, ED&T
2. Employment	• Direct Employment	• Community survey	• Annual Survey	DFO
	• Total Employment	• Local Income Analysis	• Local Survey	ED&T
	• Ranking	• Qualitative Assessment	• Review Committee	ED&T
3. Regional Development	• Direct Economic Impact	• Regional Income Analysis	• Local Survey	ED&T
	• Total Economic Impact			
4. Cultural Significance	• Ranking .	• Qualitative Assessment	• Community Survey	ED&T and DIAND
5. Resource Conservation	• Ranking	. Qualitative Assessment	• Exploratory Fishing	DFO

A brief review of the major indicators, tools and methods follows:

Commercial Fishing

1. Economic Efficiency

Economic efficiency analysis measures the value of outputs compared to the costs of inputs. When the value of outputs exceed the costs of inputs, a net economic benefit is created. When the net economic benefit is maximized, economic efficiency is achieved. Each potential change to a fishery has its own set of costs and outputs therefore net economic benefits of different fisheries development options can be compared to determine which option provides the greatest economic efficiency.

The major indicator of economic efficiency is the "net economic value of production" from the fishery sector which can be defined as the gross value of final products minus the amount paid by consumers, plus the wholesale value of production minus the costs of marketing and processing, plus the landed value to fishermen minus the harvesting costs, plus management revenues, minus the costs of management.

The data for this indicator is usually collected through "costs and earnings" surveys which have a long history in fisheries management (B. C., Atlantic, etc.) and a standardized methodology. A copy of the Great Slave Lake costs and earnings survey form is presented in Appendix 1 as an example of the methodology used for data collection. Cost and earnings surveys typically capture the net return to the enterprise (usually the vessel) and the earnings of crew and captains/owners. Data for the processing sector is not usually collected but is usually available.

Analysis of economic efficiency uses a traditional benefit-cost analysis and sometimes includes the costs of management. The standard methodology used "is the Federal Treasury Board "Benefit-Cost Analysis Guide" and analysis is generally quite rigorous and detailed but need not necessarily be so. It should be noted however, that a benefit-

cost analysis is not just a financial accounting of the costs and revenues generated by a commercial fishery initiative, Carrying out a proper benefit-cost analysis requires specific training and therefore, even though it is an extremely useful economic tool, it is rarely used properly.

Employment

The major indicators in the employment account are direct and total employment generated by the fishery. Direct employment refers to employment that is directly related to fishing activities including harvesting, processing, marketing and supplying the industry. Total employment includes direct employment as well as indirect employment (employment in those sectors which are suppliers to the direct suppliers to the fishery) and induced employment (employment created through the resending of income earned through fishing activities). Employment generated, even direct employment generated, is not always surveyed although it is sometimes a residual of costs and earnings studies. Employment is usually measured in fill-time equivalents (FTEs).

Ranking the relative importance of the employment generated by the fishery is also a useful indicator. Employment is usually ranked as very important, important or not important based on the proportion of total annual income participants derive from the fishery. Data required to complete this analysis is annual income by source which is usually derived from a local income analysis.

In subsidized fisheries, an additional indicator that is very useful is the cost-per-job generated.

The level of employment generated also has significance in the “regional development” and “cultural significance” accounts.

Regional Development

Indicators for the Regional (or Community) Development account include both direct and total economic impact. Direct economic impact is a measure of the value added to the local economy as a result of commercial fishing operations and the value added by direct suppliers to the fishery sector such as vendors of fuel, bait, nets, and food. Total economic impact includes direct economic impact as well as indirect economic impact (value added to the local economy as a result of the purchases of all industries which produce goods and services for direct suppliers to the fishery sector e.g. inputs to the food and energy producing sectors) and induced economic impact (value added to the local economy through the resending of income earned from commercial fishing activities).

In addition to conventional economic impact analysis, other objectives of regional or community development could be included in this account. For example, the goal of decreased community dependence and increased local control could be assessed using qualitative ranking - high, medium or low.

Usually the consultative and/or political process details the regional and community development needs and advisory boards to the fisheries are set up to allow these needs to surface and allocations to be made.

Cultural Significance

The cultural significance account provides a qualitative ranking of the importance of the commercial fishery to the maintenance of traditions and lifestyle. The ranking system used is usually very important, important, or not important.

Resource Conservation

Ranking of high, medium or low would provide a qualitative statement of the stock management status of the resources being harvested by the commercial fishery.

Domestic Fisheries

Analysis of domestic fisheries uses indicators and tools similar to those used for evaluating the commercial fishery, however analysis of domestic fisheries present some specific problems because of the difficulties involved in quantifying the benefits of a domestic fishery. There are only a few methods for evaluating benefits and risks in the decisions affecting domestic fisheries. Usually, those making development decisions have an interest in the benefits that may accrue from commercial fisheries development but bear none of the costs if development results in a reduction in the domestic fishery. Therefore development decisions may be made that produce commercial benefits at the cost of domestic fisheries. This conflict between commercial and domestic use of a fishery has been pronounced in the B.C. salmon fisheries where the recognition of the need for fish for food and ceremonial purposes has been a part of land claims for Natives.

The "import substitution" value is one accepted method of quantifying the economic benefits of a domestic fishery. In this context the cash needs of the community need to be measured as a domestic fishery supplies food that would otherwise have to be imported resulting in large cash needs.

Although the net economic efficiency account can also be useful in assessing domestic fisheries, in many cases the most important indicator in this sector is the cultural significance of the fishery. The cultural significance account has a special meaning in the B.C. salmon industry. Certain native Bands are allowed allocations under Supreme Court decisions (Sparrow case) for food and ceremonial purposes. This has usually been arrived at by negotiation. This may seine as a model for assessments in the NWT.

The other important indicator for domestic fisheries is the "employment" indicator. The contribution of "employment" in the domestic fishery to the cash needs of the community, and the impact upon the social fabric of the community is at times difficult to specify but judgments and assessments can be made. The information requirement for this assessment is perhaps subjective but community and economic development personnel

can quickly develop a number of "rules of thumb" that are useful. For example, "each fishing job can support the cash needs of an family of five" would be the sort of rule-of-thumb indicator that could be developed.

Recreational Fisheries

The major tools used to analyze recreational fisheries are angler surveys and the economic impact on the region through the service industry. Often conflicts arise among various user groups in a recreational fishery and economic analysis becomes difficult because the benefits of recreational fisheries to the service industry are clear but the value of the fishery to local anglers is difficult to quantify in dollar terms. While methods of analysis that seek to allocate value to recreational fisheries based upon angler satisfaction are being developed, it remains a difficult exercise and conflicts are usually resolved based on biological considerations and political decisions.

The reader should note that one of the limitations of the five-account system is that it does not explicitly address the issue of cross-sectoral impacts. In other words, the system does not necessarily assess the impacts that development in one fisheries sector may have on other fisheries sectors. This limitation can be overcome in at least two different ways. First, the benefit-cost analysis can be made more comprehensive to include the impacts on other sectors. For example, in assessing a commercial fishery initiative that would reduce the value of a recreational fishery, the net loss to the recreational fishery could be included as a cost. Alternatively, an additional five-account analysis could be carried out for each affected sector and added to the original assessment.

Five Accounts and the Great Slave Lake Fishery

Great Slave Lake fisheries have been reviewed many times however the five-account system has never been applied. In the following section we use Great Slave Lake as an example of how the five account system could be applied to NWT fisheries. Perhaps surprisingly, many of the features of the current management regime can withstand an evaluation under the five account system.

The planning or evaluation process begins with the economic planning framework. In a sense the planning framework is a checklist of how to proceed. The major areas that can be examined are:

Resource Sectors:

- domestic fisheries
- commercial fisheries
- recreational fisheries
- fish habitat

Analysis areas:

- sustained yield from domestic fisheries
- viable commercial fisheries
- efficient resource management
- management of the fish habitat

In the case of ED&T, the primary area for analysis in the Great Slave Lake fishery would be viable commercial fisheries development.

The Management Objectives that can effectively be analyzed using the five account system include:

- conservation
- enhance net economic and social benefits
- fair distribution of benefits

and the five accounts that can be set up to evaluate whether these management objectives are being met are:

- economic efficiency
- employment
- regional development
- cultural significance
- resource conservation

Management Objectives for Great Slave Lake

1. Conservation

The objective of conservation is clear. DFO has considerable experience in setting quotas and managing the Great Slave Lake fishery to ensure stocks are not over exploited. Information needs to ensure conservation can be substantial but in the case of the biology of fish stocks it is usually, although not always, available before fill-scale commercial fishing begins. This information is crucial because it can be the basis for all further decisions about planning and evaluation.

RULE: Biological information may force a management decision and allocate fish to a specific resource sector.

EXAMPLE: The depletion of trout stocks in the East Arm of Great Slave Lake forced a decision to allocate trout to the recreational fishery as stocks could not withstand commercial pressure.

The management objective of conservation tends to take precedence over other objectives because the mandate of fisheries managers is to maintain stocks. DFO regards this objective as paramount and conservation can be considered the one objective that will be achieved. Thus, in the case of Great Slave Lake, the biological factors related to trout stocks push the planners to examine the various accounts in more or less detail depending upon their importance. The amount of funds allocated to trout stocks would depend upon the economic benefits that accrue from recreational trout fisheries and the value local residents place upon the availability of fishing opportunities.

2. Enhance net economic and social benefits

a) Net economic benefits.

Analysis of net economic benefits usually involves traditional cost/benefit analysis based on costs and earnings studies. In practice, this is rarely carried out because it requires time-series data collected in a consistent manner and few fisheries have this type of data available.

RULE: To calculate net economic benefits time series data is needed that is collected in a consistent manner.

EXAMPLE: For Great Slave Lake, benefits and costs of each job can be calculated based on the costs and earnings study carried out in 1991, however to be statistically valid costs and earnings studies should be repeated at fixed intervals.

According to the 1991 costs and earnings study, the Great Slave Lake whitefish fishery provides no net economic benefits therefore the employment account is necessary to analyze the rationale for continued subsidies. The regional development account is also useful in coming to grips with the subsidy program. The level of regional development that flows from the subsidy may help justify continued subsidization.

The Great Slave Lake fishery can be reviewed in each of the accounts but it is the net economic benefit of the fishery that provides the "acid test" of successful fishery management. However, attempts to increase net economic benefits in the fishery may prove difficult if not impossible to accomplish. For example, attempts to increase profits to fishermen through licensing regimes may create political backlash and developing local markets face stiff competition on price and product form from southern producers. Thus, because the fishery provides no net economic benefits in the economic efficiency account, the other accounts in the five account system take on more significance.

RULE: **If there are no net economic benefits in the fishery there should be substantial benefits in the other accounts.**

Other benefits usually appear in the employment and regional development accounts, however data needs increase as linkages among elements of the fishery and the region are brought into the analysis therefore further analysis requires additional expertise or knowledge on the part of the planners,

b) Social Benefits

The social benefits from a fishery are outside the net economic analysis but there is a link between the two, primarily through the employment account. The amount, and in particular the *type*, of employment is central to analysis here. Employment may fit into the seasonal cycle of activity, be a family enterprise, or simply provide the cash needed to sustain certain social activities.

It appears that one of the major factors in the Great Slave Lake fishery is the social nature of the fishery in which crews have a defined fishing activity which produces little cash but seems to satisfy other needs. The difficulty in evaluating this activity is that it is largely unmeasurable. That is not to say that it is not important; many fishing activities are pursued because they satisfy social needs. For example, the Newfoundland seal hunt provided little cash but satisfied an important social need.

Also closely linked to social benefits are factors related to “cultural significance”. Certain aspects of fishing may have importance in the culture. For example, salmon is important to the coastal natives of B.C. where fish is an integral part of the culture. Thus, salmon allocations are made for “food and ceremonial purposes”. This is not exactly the case in Great Slave Lake but because of the role of Natives and Metis in the fishery it is obviously a factor that should be considered.

Social benefits are also important in the recreational fishery. The direct benefits of a

recreational fishery to the tourism industry can be easily measured, however the importance of the recreational fishery to the NWT resident is recognized but there is always difficulty in measuring it. Various techniques have been used by economists but they have not been standardized.

Nonetheless, in the Great Slave Lake fishery recreational aspects may become more important as population increases or as tourism increases. The advantage of the social benefit objective is that it allows planners to consider larger issues that are outside a purely economic analysis.

3. **Fair Distribution of Benefits Objective**

The objective of fair distribution of benefits has its foundations in economic theory but its major purpose lies in the political aspects of fisheries management. The need for justice to be done, and to be seen to be done, requires a means of transmitting information about fishery decisions to various interest groups. DFO has long used Advisory Boards, Management Committees, Task Forces and so onto provide interest groups with a forum for input into management decisions. In Great Slave Lake the Advisory Committee appears to work very well, however each interest group seeks to maximize the benefits it receives therefore a fair distribution of benefits can be difficult to achieve because the definition of "fair" is not clear.

A fair distribution of benefits requires a planning framework with measurable objectives as a first step. The second step in the process is a means of allocating these benefits. This mean Advisory Groups should be quasi-political in making the necessary trade-offs

Rule: The distribution of benefits is political as well as economic. Therefore Advisory Groups are necessary to facilitate the process. The interests of the taxpayer is a new element in the process.

Traditionally, fisheries have been managed for conservation and the allocation of benefits to user groups. However, a new element in fisheries management is emerging that relates

to the concept of economic rent. Simply put, the taxpayers of Canada, as owners of the resource, may feel that some of the benefits should flow to them. This means a royalty on landings to cover the costs of management is an option although not a likely course at present.

A more immediate option is the desire to reduce the level of subsidy to fisheries. In short, interest groups in the fisheries are being confronted with a new interest group - the taxpayer - seeking to see some benefit from the fisheries. The implication for the Great Slave Lake fishery is that the level of subsidy it receives will come under increasing scrutiny. The advantage of the five account system is that it provides a method to specify, if not quantify, the benefits from the fishery thereby helping to justify the subsidy,

Analysis Tools for Great Slave Lake

The five account system uses a number of tools to measure each of the indicators in the five accounts. The three major tools are:

1. Benefit-cost analysis
2. Economic impacts
3. Qualitative indicators.

Benefit-cost analysis is used in the economic efficiency, employment and regional development accounts. Data from costs and earnings surveys and other surveys supply the information needed. Economic impact analysis also supplies data for these accounts, These tools are part of the standard toolbox of economists but must be tailored to the specific analysis. Benefit-cost analysis has specific data needs and has a defined process. The tools to measure economic impacts are not as well defined and different approaches have been used by different analysts.

Qualitative indicators differ from the other two tools in that they require judgment based

upon experience and knowledge. This is especially true for the cultural significance account. Qualitative indicators can be enhanced by the use of interest groups or community political associations.

For a five account analysis of the Great Slave Lake fisheries the information required for the economic efficiency, employment and regional development accounts would be:

1. In the Commercial Fishery:

- costs and earning data (plant and fishermen)
- costs of production data (FFMC and subsidies)
- employment data (employment survey)
- community survey data on family income and expenditures
- regional development data

2. In the Recreational Fishery:

- angler surveys (tourists)
- lodge data
- tourism surveys (service sector)
- resident angler surveys

3. In the Domestic Fishery:

- community surveys of imported goods and the use of fish in diet
- income surveys (done above)
- employment surveys (done above)

For the cultural significance and resource conservation accounts, special tools are necessary for analysis. Because of their qualitative nature they require experience and expertise. For the cultural significance account, knowledge of the culture is necessary but, as noted earlier, the use of advisory or community groups may supply the

information for assessment under this account.

The resource conservation account relies primarily upon the expertise of DFO for estimates of fish populations and upon conservation officers for specific information about the habitat. Again, community interest groups may assist here.

CONCLUSION: The analysis tools and data base need to be further developed for a full review of the Great Slave Lake fisheries under the five account system.

Although a rigorous analysis cannot be done given the limited data available, the five account system can still be used to provide a "rough and ready" analysis that is useful for comparing different fisheries initiatives and making planning decisions. The following is a brief review of the Great Slave Lake commercial fisheries and some preliminary conclusions.

The various accounts are:

1. Economic Efficiency

The Great Slave Lake fisheries do not provide any net economic benefits. This is borne out by the level of subsidy required. Attempts have been made to minimize costs in the fishing sector which may increase incomes to some fishermen but provides no net economic benefits.

2. **Employment**

The Great Slave Lake fishery does provide jobs and preliminary estimates are that each job in the fishery costs approximately $10,000 (Eggers 1992). This at least provides a benchmark for comparing costs ofjobs in other sectors or fisheries.

3. **Regional Development**

The regional development aspects of Great Slave Lake fisheries must take into consideration the employment at Hay River and the tourism sector. The value of recreational fishing to local residents is not known. The value of import substitution derived from domestic consumption is also not known. Overall, the impact of the fisheries on regional development is not known but is estimated to be small.

4. **Cultural Significance**

No analysis has been done for this account. A preliminary estimate is that the fishery has some cultural significance to fishermen however only anecdotal evidence is available.

5. **Resource Conservation**

There seems to be adequate data on the fish stocks and the habitat of Great Slave Lake to assume that present quotas are sustainable.

Conclusions

The five-account system provides a useful means of evaluating fisheries initiatives in the NWT however the data required to use it effectively is not readily available. Some data is available for some fisheries (for example the costs and earnings data for Great Slave Lake provide much of the required information) however there are critical pieces missing, particularly with respect to the linkages between commercial fishing, domestic fishing and regional development. Because, in many cases, the economic and social benefits resulting from these linkages outweigh the net economic value of commercial fishing in the NWT, a fuller understanding of these linkages is critical to a comprehensive evaluation of commercial fisheries development. Therefore, more time and resources should be committed to developing a comprehensive evaluation framework and collecting the necessary data to implement it.

The five-account system would allow the GNWT to evaluate the impact of each of its fisheries initiatives in an objective yet comprehensive way. The five-account framework can be tailored to meet the specific needs and objectives of NWT fisheries development and adapted so that data collection and analysis is relatively straight forward. In addition, it provides a method of evaluation that allows comparison among various fisheries initiatives. By ranking each of the NWT commercial fisheries initiatives in terms of total benefits, the five-account system would enable the GNWT to evaluate which initiatives provide the greatest benefits per level of investment. As government finding becomes increasingly scarce, this ability to clearly specify and rank the benefits of development will become more and more important.

References

Ashley, B. D. 1993. Community Economic Impact of Commercial Fisheries Development in Canada's Eastern Arctic: The Pangnirtung Winter Turbot Fishery. Simon Fraser Univeristy, School of Resource and Environmental Management Report No. 133.

Eggers, D. 1992. ED&T, Natural Resources Section. Report on Employment and Income from NWT's Commercial Fisheries, Winter 1990/91 - Summer 1991.

Topolniski, D. E. 1991. Economic Planning Framework for Fishery and Habitat Management in the Northwest Territories and Yukon North Slope. Department of Fisheries and Oceans, Economic and Commercial Analysis Report 85.

Appendix 1

Northwest Territories

Great Slave Lake Fishery Survey
Costs & Earnings

As a follow-up to the questionnaire on subsidies completed this fall by the GNWT Department of Economic Development & Tourism. this questionnaire is intended to provide additional information on fishing operations on Great Slave Lake m order to fully assess the subsidy program. The information collected on this questionnaire is critical in the assessment of the impact of any changes m the subsidy program and your cooperation is vital and appreciated. All responses should relate to your fishing operation in the winter of 1989-90 and the summer of 1990. All responses will remain confidential.

License Information

		Class A	Class B
Summer:	(1)	_____	_____
	(2)	_____	_____
	(3)	_____	_____
Winter:	(1)	_____	_____
	(2)	_____	_____
	(3)	_____	_____

Earnings

1. What percentage of your total catch is sold 10 the Freshwater Fish Marketing Corporation (FFMC)?

_____ (percent)

2. Other than the sale of your catch, did you receive income from your fishing operation for any of the following? If yes, how much?

a)	Freighting for Other Fishermen	•I No	•I Yes	$ _____
b)	Rental of Equipment to other Fishermen	❑ No	❑ fYes	$ _____
c)	Working for Other Fishermen	•I No	❑ Yes	$ _____
d)	Unemployment Insurance Benefits	❑ No	❑ Yes	$ _____

3. *Were* any of *your* fish sales recorded under another parson's license?

❑ Yes ❑ No

3. a) If yes, approximately how much fish (in pounds) and what was the value of the fish sold under other person's licenses?

Amount _____ (lbs.) value _____ ($)

4. What percent of your *gross* income (before expenses) from your fishing operation do you spend in Northwest Territories (include both business and personal expenses)?

❑ Less than 25% ❑ 26% to 50%
❑ *51%* to 75% ❑ 76% to 100%

5. What percent does your fishing operation contribute to your total family income?

❑ Lass than 25% •I 26% to 50%
❑ 51 % to 75% ❑ 76% to 100%

costs

6. What percent of the expenses identified on your FFMC amount statement are personal expenses, i.e., not directly related to your fishing operation?

_____ (percent)

7. What percent of your total fishing expenses are not included on *your* FFMC amount statement, i.e.. are paid out personally by you?

_____ (percent)

8. Please complete the following section *on* the rests of your fishing operation?

To try to assess the overall rests of operating on Great Slave Lake, it is important that as accurate information as possible is provided in this section. Use your tax form, FFMC statement or other records if necessary. Costs are broken into major categories to help you identify all your expanses.

	Total	Summer	Winter
Wages 8 Salaries			
Your Wage or Salary			
Helpers Wages			
Benefits on Wages (e.g. UIC, CPP, Workers Comp.)			
fishing Operation Expenses			
Food			
Net Replacement			
Freight			
Misc. Fishing Gear			
Drydock, Storage & Launch			
Equipment Expenses			
Fuel, Grease, Propane, ale.			
Repair & Maintenance			
Motor Vehicle Expenses			
Purchase of Small Tools			
Business Expenses			
insurance			
Licenses			
Accounting			
Telephone			
Rental (Equipment or Space)			
Interest Charges			
Other Expenses			
Travel			
Expediting			
Other (Specify) _____			

9. Have you been making payments on loans relating to your fishing operation during the past year?

☐ No ☐ Yes If yes, what is your total monthly loan payment? $ _____

10. Please indicate any purchase of equipment relating to your fishing operation; for example boats, motors, snowmobiles, bombadiers or trucks; that you have made in the past year?

	Type 01 Equipment	Model	Age	Purchase Price
a)				
b)				
c)				
d)				

11 Please indicate any sales of equipment relating to your fishing operation; for example boats, motors, snowmobiles, bombadiers or trucks; that you have made in the past year?

	Type of Equipment	Model	Age	Sale Price
a)				
b)				
c)				

12. Please complete the following section on the type of equipment owned by your fishing operation.

Summer

Boats		Length	Size of Motor	Age
Whitefish Boat	(1)			
	(2)			
Skiff	(1)			
	(2)			
	(3)			
Yawl Inboard	(1)			
	(2)			
Yawl Outboard	(1)			
	(2)			
Outboard Motors	(1)			
	(2)			
	(3)			
Other: _____	(1)			
_____	(2)			

Winter

		Modal	Size of Motor	Age
Bombadier	(1)			
	(2)			
	(3)			

Bombadier Motor	(1)			
	(2)			
	(3)			
Snowmobile	(1)			
	(2)			
	(3)			
Power Auger	(1)			
	(2)			
	(3)			
Other: _____	(1)			
_____	(2)			

Other *Equipment*

	Model	Size of Motor	Age
Motor Vehicles			
Trucks (1)			
(2)			
(3)			

	Number Owned	Age No. 1	Age
Miscellaneous Fishing ***Equipment***			
Depth Sounder			
Radio Phone			
Radar			
Generator			
Net Lifter			
Fish Finder			
CB Radio			
Refrigeration			
Cabooses			
sleds			
Camps			

	Number Owned	Number Used in *Summer*	Number Used in Winter
Nets			
Nylon Nets			
Twistad Mono Nets			
Other (Specify) _____			

No. 2

"****" THANK YOU FOR YOUR TIME IN COMPLETING THIS SURVEY ******