

Agenda item 5.2(d)  
For decision

**Council**

**CNL(03)18**

***Report of the Technical Workshop on  
Development of a Framework for Assessing Social and Economic Values  
Related to Wild Atlantic Salmon***

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1. The wild Atlantic salmon has many aspects to its value. There are, of course, the values of the recreational and commercial fisheries to fishermen, owners, and fishery-related businesses. The economic impact of these fisheries on local and national economies may be very significant. There is also the value of subsistence fisheries to the fishermen and local communities. In addition, however, there are other values associated with the salmon itself, a highly prized species and an indicator of environmental quality. The salmon is valued by society in general, not just fishermen. It may be unique among fishes in the wide range of values it generates. It has, perhaps like tigers and leopards, an “existence value” and other values. These values are infrequently assessed, but may greatly exceed the values associated with the salmon fisheries. For example, it has been estimated that Londoners are willing to pay £12 million per year to re-establish a breeding population of salmon in the River Thames. A similar evaluation for the River Wye indicated a value of £43 million per year. In addition, there are other social, cultural and spiritual and psychological values that may not be fully expressed in monetary terms.
2. Some aspects of value are obviously more difficult to measure than others but the Workshop sought to explore all of these values and to give some guidance on how they might each be estimated. A framework or template was developed which could be used to assess the economic and social values of the wild stocks. This gives guidance on all the sources of value and on assessment methodologies to ensure comparability of studies conducted in different countries or regions.
3. The Workshop suggests that the SCPA should, even now, urge administrators and others concerned with decision-making in each country on, for example, habitat, hydroelectric development, road building and aquaculture, to ensure that the difficult-to-measure but long-lasting and widespread values associated with the Atlantic salmon, e.g. “existence value”, are fully incorporated and given due weight in decisions that affect its conservation.
4. The main recommendation of the Workshop is that, as a first step, there should be efforts to significantly improve our knowledge base on all of the social and economic values of wild salmon stocks so as to better inform decision-making. This would mean the Parties using the agreed template to collate comprehensive information on these values and, as resources permit, to fill gaps in knowledge. This should give the Council a much improved picture of the true extent of the value of wild salmon in the North Atlantic. There might need to be a pilot desk study to review available information so as to build this more comprehensive database of the values of the Atlantic salmon. The information obtained should then assist the SCPA in the next step of considering how to incorporate these social and economic values into the Precautionary Approach.

Secretary  
Edinburgh  
7 April, 2003

## **WSEV(03)12**

### ***Report of the Technical Workshop to Develop a Framework for Assessing the Social and Economic Values Related to Wild Salmon***

***Roxburghe Hotel, Edinburgh  
21-24 January 2003***

#### **1. Introduction**

1.1 The Chairman, Dr Malcolm Windsor (Secretary of NASCO), opened the meeting and welcomed participants to Edinburgh. He noted that the two main tasks for the Workshop were to develop a listing of all the social and economic values of Atlantic salmon, including definitions and examples, and an internationally agreed framework/template for assessing these values. He indicated that this would be a challenging task since there are many facets to the salmon's value, probably more so than for most other species of fish, and some of these may not be easy to assess in monetary terms. Better quantification of these values is likely to assist with rational management of the resource. For example, all around the North Atlantic, salmon fisheries generate economic benefits, often to remote rural communities. But this is only one part of the salmon's value, since the salmon serves as an indicator of a healthy environment. Society benefits in many ways from having salmon in rivers and going about their migrations. Such benefits are real and significant even if they are hard to quantify in monetary terms. The Chairman indicated that, so far as he was aware, NASCO was the first international fisheries Commission to consider social and economic aspects in any detail so there is no precedent to guide the Workshop. He stressed the need for the Workshop's recommendations to be clearly formulated and comprehensible not just to economists but also to the managers in NASCO and to interested parties around the Atlantic.

1.2 A list of participants is contained in Annex 1.

#### **2. Nomination of a rapporteur**

2.1 Dr Peter Hutchinson (Assistant Secretary of NASCO) was appointed as rapporteur for the meeting.

#### **3. Adoption of the Agenda**

3.1 The Workshop adopted an agenda for the meeting, WSEV(03)13 (Annex 2).

#### **4. Consideration of the Project Proposal (Terms of Reference)**

4.1 The Workshop reviewed its Terms of Reference, WSEV(03)2, which had been agreed by the Council of NASCO at its Nineteenth Annual Meeting. The Council of NASCO wished to stimulate discussions between social and economic scientists and managers with a view to identifying the various social and economic aspects of the resource and approaches to their assessment. Different views were expressed on the

ability of the Workshop to critically evaluate the methods used to assess the value of Atlantic salmon and on whether there might be a need for a follow-up meeting and use of external expertise. The view was expressed that it would assist the Standing Committee on the Precautionary Approach (SCPA) if the Workshop could integrate biological, social and economic aspects into a framework, which could be used to evaluate management options. However, others felt that though this might well be a desirable longer-term aim it was a large enough task at this Workshop to address items 1 and 2 of the SCPA's Terms of Reference (SCPA(02)17) as described in WSEV(03)2.

## **5. Development of an inventory of available information on social and economic values related to wild Atlantic salmon**

### *Introduction*

5.1 Information which had been compiled and summarised by the Contracting Parties was presented in documents WSEV(03)3, WSEV(03)5, WSEV(03)6, WSEV(03)7, WSEV(03)9 and WSEV(03)10. Using this information as a starting point, the Workshop developed a listing of social and economic values related to Atlantic salmon with definitions, explanations of the values and examples from around the North Atlantic (Table 1). This listing provides information on the values associated with the Atlantic salmon. It does not include values associated with its habitat or other human activities that may have an impact on salmon and their habitat, e.g. aquaculture, hydro-electric development. The Workshop recognized that in considering the value of Atlantic salmon it is important for managers to be aware of the following:

- to whom the value accrues: the listing identifies these groups of people;
- that it is not appropriate to add all of the values together, but it may be possible to add or compare some of the values, depending on the extent of the analysis undertaken (see 5.3 and 5.42);
- that a dollar has different values to individuals of different financial status;
- that the values may change over time in response to changes in stock abundance and other factors.

### *Definitions and measures of economic value*

5.2 A range of economic measures associated with the wild Atlantic salmon and its fisheries are listed in Table 1. Economic terminology has been avoided where possible for simplicity. Paragraphs 5.6 to 5.30 provide brief definitions of these measures (with illustrative examples in boxes). Where the reference is given as a paper number it refers to a paper submitted to the Workshop. The order follows the listing in Table 1. Each section identifies the source of value; to whom it is valuable; and the measures that apply to each of these groups. These measures are of two types, as indicated in Table 1:

- (i) **Economic values:** which indicate the various aspects of value of salmon to different groups of people, arising in a variety of different ways; and

**Table 1: Summary of economic measures associated with the wild Atlantic salmon and its fisheries**

Source of value	To whom	Measure of (i) economic value or (ii) economic impact (shaded in grey)
<b>Recreational fishery</b>	Fishermen	Fishermen's consumers' surplus
	Fishery owners	Market value of fishing rights
	Fishery-related businesses	Producers' surplus (sales minus production costs)
	Economy (Local/Regional/National)	From fishermen's expenditure: net output; impact on GDP
	Economy (Local/Regional/National)	Export earnings (from visiting fishermen)
<b>Commercial fishery</b>	Fishermen	Net yield (sales minus costs)
	Fishermen	Willingness-to-sell the right to fish (includes 'net yield')
	Fishery owners	Market value of fishing rights
	Fishery-related businesses	Producers' surplus (sales minus production costs)
	Economy (Local/Regional/National)	Net output or value added (from all sales after processing)
	Economy (Local/Regional/National)	Export earnings from external sales
<b>Subsistence fishery</b>	Fishermen	Cost of alternative food/goods
	Fishermen/Local community	Willingness-to-sell (the right to fish)
<b>Eco-tourism</b>	Tourists	Tourists' willingness-to-pay (net of expenditure)
	Tourism related businesses	Tourists' expenditure (net of production costs)
	Economy (Local/Regional/National)	From tourists' expenditure: net output; impact on GDP
	Economy (Local/Regional/National)	Export earnings from visiting tourists
<b>All fisheries</b>	General public	Option value
	General public	Existence value
	General public	Bequest value
	General public	Externalities
<b>The salmon itself</b>	General public	Existence value
	General public	Bequest value
<b>Genetic diversity</b>	Aquaculture businesses	Option value

(ii) **Economic impacts** (highlighted in grey): which indicate the impact of salmon on the economy of a specified locality, region or nation.

- 5.3 In general, economic values (which are all net of costs) may be added together to provide a single ‘net economic value’ for wild salmon, insofar as that may be helpful. (Note - in Table 1, some of the measures are different ways of measuring the same value). However, these ‘economic values’ cannot be added to the second category of measures indicating ‘economic impact’.
- 5.4 For the purposes of decision-making it is important to identify who the beneficiaries are for each source of value. Information should, therefore, be collected on a range of characteristics including, for example, the number of people employed or participating in a fishery or fishery-related business; their age, area of residence, social class, availability of alternative activities, and for fishermen, frequency and history of participation.
- 5.5 It is important to recognise the difference between the economic values expressed as annual figures and those, such as willingness-to-sell fishing rights, which often cover a longer period and may be in perpetuity. The two may be made comparable by adjusting streams of annual values using the process of **discounting**. This recognises that a benefit received in a year’s time is less valuable (by a fixed proportion – the discount rate) than one received now. Discount rates are generally between 5 and 10 per cent per year.

*In Norway, the total present economic value of salmon was estimated for the 50 most important rivers, incorporating both fishery-related and other economic values. The annual economic value was estimated as NOK 1 billion; the best estimate of the total present economic value of salmon (a summation of the future stream of value including the current value) in these rivers was NOK 20 billion.*

### **Recreational fishery**

- 5.6 **Fishermen – consumers’ surplus:** The value fishermen place on their recreation is indicated by their willingness-to-pay for it; they are faced with a range of costs including those for licences, travel, accommodation, tackle and their time. Their willingness-to-pay generally exceeds these costs, though in some cases costs and willingness-to-pay may be equal. **Consumers’ surplus** is the difference between fishermen’s willingness-to-pay for salmon fishing and their actual expenditure.

*In Scandinavia, fishermen’s willingness-to-pay for all types of recreational fishing (not just salmon) was estimated as a proportion of their actual expenditures: 148% in Denmark, 141% in Finland, 130% in Iceland, 155% in Norway and 138% in Sweden, WSEV(03)3.*

*In England and Wales, salmon anglers’ net willingness-to-pay is estimated, somewhat crudely, as being similar in magnitude to the market value of salmon fishing rights, £128 million, WSEV(03)7.*

- 5.7 **Fishery owners – market value of fishing rights:** In countries where the right to fish is privately owned, the owners benefit from the income they can obtain from anglers

who pay them for access. The fishery owners can, therefore, extract some of the anglers' net willingness-to-pay for their fishing. Assuming that the fees received exceed any costs incurred by the owners, they derive a net benefit from their fisheries.

*In Iceland, in 2001, annual income from anglers to the river associations (which own the fishing rights) averages between US\$200 and US\$300 per salmon caught, WSEV(03)5.*

- 5.8 While this may be estimated on an annual basis as in Iceland, the **market value of fishing rights**, a capitalised value, represents the future potential stream of benefits, net of costs, to the fishery owners.

*In Scotland (UK), the market value of salmon fishing rights in 1988 was estimated to be between £200 and £300 million, with a best estimate of £255 million, WSEV(03)3. Each salmon in the rod catch was estimated to contribute between £6,000 and £8,000 on average to the market value of fishing rights.*

- 5.9 **Fishery-related businesses – Producers' surplus (sales minus production costs):** Some of the fishermen's expenditure goes to businesses that depend on salmon fishing for a large proportion of their income (such as for guides, ghillies, tackle dealers, boat hire and accommodation). If the fishery closed, the loss to each of these businesses is indicated by the income they receive from fishermen minus the costs of providing the goods or services they offer (including the cost of using their time and facilities in another way to generate income, i.e. **opportunity cost**).

*In 2000, Can\$83 million were spent by anglers fishing for Atlantic salmon in Canada on items related to fishing, including the amounts contributing to different fishing businesses such as lodging, guides, other fishing services, and fishing packages. An additional Can\$81 million were spent by anglers on durable goods such as fishing tackle and boats, WSEV(03)10.*

- 5.10 **Economy (Local/Regional/National) - from fishermen's expenditure: net output; impact on Gross Domestic Product (GDP):** The overall impact of fishermen's expenditure on the economy, whether local, regional or national, can be indicated by the **net output**. This is estimated by deducting the import content of the fishermen's expenditure within the defined area, whilst taking into account multiplier effects.

- 5.11 A **multiplier effect** arises when the impact of fishermen's expenditure is to generate additional expenditure on goods and services within the area under consideration, but excluding goods and services purchased from outside. So, for instance, the income to a fishing guide might enable him to employ a builder to repair his house, who in turn employs a mechanic to repair his van. A multiplier should only be applied if:

- the resources (particularly labour) in the area are less than fully employed; and
- similar expenditure would not be generated in the absence of the fishery.

*In the 1970s, a study by the Economic and Social Research Institute estimated the economic impacts of both angling and commercial fishing for salmon in Ireland. The multiplier used was 1.6, WSEV(03)3 and WSEV(03)7.*

*The expenditure by salmon anglers in Iceland per year was estimated in 2001 to be US\$600 per salmon caught, totalling in excess of US\$15 million. It is not known what the import content of their expenditure was, but it is thought to be small. No multiplier was used in this study, but it is probable that one would have been applicable, WSEV(03)5.*

*In 1988, expenditure by salmon anglers in Scotland was estimated at £34 million and generating the equivalent of 3,400 full-time jobs, WSEV(03)3.*

- 5.12 **Economy (Local/Regional/National) Export earnings – from visiting fishermen:** while the net output considers the impact of all fishermen whether resident or visitors, the **export earnings** relate only to the expenditure within a particular area by visiting fishermen.

*Annually, about 1,500 anglers from 38 countries visit the Kola Peninsula in Russia to fish for salmon. In 2001, 16,321 salmon were caught and released. Overall revenues from fishing tourism were US\$6 million, WSEV(03)3.*

### **Commercial fishery**

- 5.13 **Fishermen – Net yield:** For the fishermen, the profit they derive is simply the difference between the sales value of their catch and the costs they incur, such as equipment, fuel, licence fees. In comparisons of resource use or in estimating the loss that the fishermen would face if their fishery were closed, the opportunity cost of their time should also be considered. In other words, what could they earn if they were not salmon fishing? This should be included as a cost, and the value derived is called the **net yield**.

- 5.14 **Fishermen - Willingness-to-sell:** Even where fishing is primarily a commercial activity, fishing may be worth more to fishermen than their ‘net yield’. This may be because they value the life-style offered by salmon fishing as opposed to, say, working in a factory. This additional value is equivalent to the recreational fishermen’s consumers’ surplus. A way of estimating the total value of fishing to commercial fishermen is to assess their **willingness-to-sell** their right to fish, either temporarily or in perpetuity.

*In recent years, fishermen in both Greenland and the Faroes have agreed not to fish commercially, on a temporary basis, in return for compensation from fisheries interests in other countries. The benefits from the harvest of salmon will therefore be lost to the Faroes and Greenland but fisheries interests elsewhere, by paying compensation, will presumably derive similar or greater benefits.*

- 5.15 **Fishery owners – Market value of fishing rights:** this value is exactly analogous to the value of fishing rights in a recreational fishery, if fishing rights are in private ownership.

- 5.16 **Fisheries-related industries, including processing and marketing – Producers’ surplus (sales less production costs):** Those whose businesses involve the provision of goods or services to fishermen, or who process or market salmon (such as



smokehouses) will also value the salmon. Their **producers' surplus** is analogous to the net yield of the fishermen.

- 5.17 **Economy (Local/Regional/National) – Net output:** For a commercial salmon fishery the contribution to the local, regional or national economy is indicated by deducting the import content of the costs incurred from the income generated from the final sales of fish. As with the net output from a recreational fishery, multiplier effects may be appropriate (see paragraph 5.11).
- 5.18 **Economy (Local/Regional/National) – Export earnings:** These are analogous to the export earnings of the recreational fishery (see paragraph 5.12).

### *Subsistence fishery*

- 5.19 This is a type of fishing different from both recreational and commercial fishing, generally small-scale, that harvests fish for the fisherman and his/her family's own consumption, or where the fish caught are traded for other goods and services in the local community.

*Notwithstanding the temporary closure of the commercial fishery in Greenland, a subsistence fishery still operates which the community is unwilling to forgo.*

*In 1990, the Supreme Court of Canada defined the First Nations' right to fish for food, as well as for social and ceremonial purposes. After conservation goals are met, this fishery takes priority over all other resource uses. Assessing the economic value of Atlantic salmon for Canada's First Nations has proved very difficult, though progress is being made on some aspects, WSEV(03)10.*

- 5.20 **Fishermen – cost of alternative food/goods:** this expresses the replacement cost of the fish, or what it is traded in, if subsistence fishing is no longer possible.
- 5.21 **Fishermen/local community – willingness-to-sell (the right to fish):** In order to preserve a subsistence fishery (as a management goal), the value of the right to conduct subsistence fishing can be expressed or measured as the lost net benefits for other users of the salmon resource.

### *Eco-tourism*

- 5.22 This use of the resource does not involve catching salmon, but involves viewing or otherwise experiencing the life of wild salmon, either at falls, fish ladders or 'information centres'. The activity can be both commercially organised or self-organised.

*In Scotland, the Falls of Shin and the Pitlochry Fish Ladder attract substantial numbers of tourists. In Norway, there are businesses that take tourists on sub-aqua tours down salmon rivers specifically to view the salmon – outside the fishing season. Like whale-watching, it is possible that demand for such eco-tourism could grow, particularly if encouraged.*

- 5.23 **Tourists' willingness-to-pay (net of their expenditure):** the value tourists place on their experience is indicated by their willingness-to-pay for it. Like anglers, they can be faced with a range of costs, including for travel, time, possibly a guide or an access fee. In general, these costs are less than their total willingness-to-pay. The difference between their willingness-to-pay and the tourists' actual costs are a measure of the tourists' consumers' surplus.
- 5.24 **Tourism-related businesses – tourists' expenditure (net of production costs):** Some of the tourists' expenditure goes to businesses that may depend on the salmon for a large proportion of their income such as guides, interpretation centres, transport and accommodation. The benefit to each of these businesses is indicated by the income they receive from tourists net of the costs of providing the goods or services they offer (including the cost of using their time and facilities in another way to generate income).
- 5.25 **Economy (Local/Regional/National) – from tourists' expenditure: net output, impact on GDP/Export earnings:** The net output and export earnings from tourist expenditure may be assessed on a similar basis to that of anglers' expenditure.

*All fisheries (and other participatory activity including eco-tourism)*

- 5.26 **General public – Option/Existence/Bequest values:** Even those who do not currently participate in a fishery may value it continuing. All these may be assessed as a willingness-to-pay, though in some circumstances, such as where the loss of a fishery is being contemplated, it may be more appropriate to estimate the value as a willingness-to-sell. **Option value:** The value derived from having the option to participate in a fishery. **Existence value:** The value of knowing the fishery exists, regardless of any future desire to participate in it. This may be significant where the fishery has strong cultural, social or heritage value. **Bequest value:** The value derived from knowing the fishery will exist for future generations.
- 5.27 **General public – externalities:** The value derived from the beneficial, social effects of others participating in the fishery. These may be manifested through reductions in crime or improvements in health.

*Greenland has been keen to maintain its fishermen and fish processors in occupation, for the beneficial social impacts: simply paying fishermen not to fish and leaving them unemployed is not considered desirable.*

*There is evidence from the UK that recreational fishing helps reduce criminal activity. Activities that help reduce criminal activity can have a very real economic benefit as costs to the State can be substantial, e.g. in the UK it costs up to £160,000 per year of detention. In some countries, salmon angling might produce an economic benefit by reducing criminal activity.*

*The exercise associated with salmon angling may contribute to physical well-being. There may also be benefits in terms of relief of stress and improved productivity in the workplace following fishing trips or salmon-related tourism. Health benefits from consuming fish such as Atlantic salmon that have high Omega-3 fatty acid content are well documented.*

## *The salmon itself*

- 5.28 Regardless of any fishery, the salmon is valuable to society in other ways. It is what has been called a ‘totem’ species and is undoubtedly valued for itself, as part of the native fauna and as an indicator of environmental quality. Its appearance in art, literature, on coins, stamps, hotel signs, and coats-of-arms are a tribute to that interest. **General public - Existence/Bequest values:** These are analogous to the existence and bequest values associated with fisheries. However, their exact definition may depend on the specific management change being evaluated. Information on existence and bequest values is limited.

*In England, the population living in the catchment of the River Thames indicated a willingness-to-pay of £12 million per year to re-establish a breeding population of salmon in the river. A similar evaluation for salmon in the River Wye indicated a value of £43 million per year. These estimates greatly exceed those derived for the fisheries, WSEV(03)7.*

*In the USA, there has been no commercial fishery for Atlantic salmon since 1948 and recreational fishing for sea run Atlantic salmon has been prohibited since 1995, yet the public in New England is supportive of conservation and restoration programmes for Atlantic salmon costing millions of dollars of public funds.*

## *Genetic diversity*

- 5.29 There is a growing recognition of the genetic value of wild Atlantic salmon. So far, it is unclear to what extent the gene pool, and specific elements of it, will become an object for commercial trading. Meanwhile, this value should be possible to measure using non-market techniques.
- 5.30 **Aquaculture businesses – option value of “wild stock genes”:** in establishing its original broodlines, the aquaculture industry utilised the genetic diversity present in the wild stocks to develop strains with desirable characteristics for aquaculture. This industry may wish to use, or preserve the future possibility to use, some genetic feature in wild stocks which might increase the performance of salmon farming strains, such as disease resistance. The value it places on this can be measured by its willingness-to-pay for this possibility, net of their actual expenditure necessary to acquire them.

## *Definitions and measures of values (not fully expressed in monetary terms)*

- 5.31 The Atlantic salmon has a number of social values to humans and their society such as psychological, health/physiological, cultural, historical and spiritual values. These might partly or fully be measured and included in monetary values. For instance, when anglers often state a high willingness-to-pay, one can assume that this high economic value to a large extent represents the multiple values to the angler and his or her surroundings from the activity. Such values include increased personal well-being, happiness and quality of life (psychological values), and opportunities to gather with family or friends (social values). Angling might represent a way of getting back to one’s roots and to learn about Man’s place in the ecosystem (cultural/spiritual

values). Similar arguments can be made for other human uses and interactions with salmon as well.

- 5.32 While many of these values might indirectly be measured through anglers' willingness-to-pay, and fishermen's willingness-to-sell the right to fish, such values might not be adequately described in economic terms. In such matters, there exists a range of other measures and techniques based in the social sciences that are well established and could be of use in decision-making regarding Atlantic salmon.

*Psychological questionnaires developed to measure people's perception of their quality of life can be adapted to measure the change in quality of life experienced by fishermen after they go fishing.*

- 5.33 These techniques could replace economic measures, complement them (to get a better idea of what the values really are) or in some cases they might be the only relevant measures available to express specific human values attached to salmon. In addition, non-economic factors affect the direct economics of the different fisheries. The number of anglers and their desire for good fishing affect river leases/licence prices, as do their preferences (e.g. for fish number and size, environmental quality and services on river).
- 5.34 To assess social and psychological values, standard quantitative techniques from these disciplines such as survey techniques can provide data on user numbers, user group composition, user characteristics (demographic as well as other), and perceived benefits and outcomes. These techniques explore why fishing is important to them, and how they benefit from it, compared to other types of work or recreation, and also how these outcomes might depend on resource management and fish abundance. Possible physiological/health benefits may be measured using methods from medicine/sport research. These are examples of data that mostly will complement economic data about the value of the resource and its use. Surveys can also provide information on how involved interests view alternatives and substitutes to current activities based on salmon. This is as applicable to recreational fishing, commercial fishing and subsistence fishing, as it is to eco-tourism.
- 5.35 There is also a growing body of studies that use sociological, anthropological or other techniques to uncover more complex aspects of the human interaction with natural resources such as Atlantic salmon. Using in-depth interviews and text analysis can provide the only relevant understanding of the value/meaning of Atlantic salmon to indigenous people or to communities dependent on subsistence fishing, or the true spiritual value of a ceremonial fishery. The results of such inquiries are not presented in quantitative terms (numbers), but can often reflect the views of those stakeholders involved more adequately than numbers.

*Natural resources have a very prominent place in indigenous cultures right across Canada. Marine resources, in particular, are important not only as a source of sustenance – food, shelter and other products – but also in the social fabric of many First Nations. For instance, fishing seasons provide opportunities for families to get together, for elders to teach young people their traditional ways. Fish are often an important component in many ceremonies, and are often mentioned in myths and stories that have been handed down through the generations. In short, the fishery is an important element of the cultures in First Nations and that importance is deeply ingrained. These values apply to other indigenous cultures around the North Atlantic.*

- 5.36 Concerning values of historic/heritage character, the scientific traditions of disciplines such as ethnology, architecture and archaeology can be relevant to assess the values of an old fishery. Based on criteria such as uniqueness and age, the value of a fishery may be described and also compared to other types of fisheries or other types of historical values.

### ***Analytical methods and data***

- 5.37 Having described the monetary values associated with wild Atlantic salmon (Table 1), we can now briefly consider the analytical methods and the data that can be used to estimate those values.
- 5.38 The first step in estimating economic values is to conduct **market analysis**, and the first component of this analysis is consumers' surplus. Consumers' surplus is the difference between consumers' (e.g. ecotourists, recreational anglers, consumers of salmon products) willingness-to-pay for a good or service provided by the salmon resource and the actual expenditure required to acquire the good or service. Various analytical approaches have been developed for measuring consumers' surplus, but the most basic approach is to gather data that can be used to estimate demand for the good or service (i.e. the amount of the good or service that would be bought by consumers at different prices). This involves gathering various kinds of market data. The two most important kinds of data are:
- the total quantity of the good or service consumed (e.g. total number of recreational fishing days or fishing trips, quantity of salmon demanded for consumption, total number of visits to a salmon hatchery); and
  - the price paid by consumers for the good or service.

Additional information that might be sought includes:

- total and average disposable income (i.e. after taxes) of consumers;
  - the price of substitute and complementary goods and services; and
  - various consumer characteristics at the aggregate level that help provide information on the social aspects of interest (e.g. ethnic group, education, age, sex, place of residence, and aspects of the good or service that are important to consumers).
- 5.39 The second component of market analysis is producers' surplus. Producers' surplus is the difference between the revenues actually received by firms that supply the good or

service provided by the salmon resource and the cost of producing it (e.g. fishing boats, gear, fuel, wages for fishing guides). As with consumers' surplus, the most basic approach is to gather data that can be used to estimate supply. The most important data are:

- the total quantity of the good or service produced;
- the price received by firms per unit of the good or service;
- the total quantities and costs of inputs to production (including the opportunity cost of labour and capital) and provision for a normal rate of return.

Additional information that might be sought includes:

- various characteristics of firms at the aggregate level (e.g. number of firms in different size or gear categories, or in different locations, as well as the characteristics of these locations).

5.40 The second type of analysis that is needed is **net output analysis**, which can be used to estimate local, regional or national economic impacts. The same kind of data used to calculate consumers' and producers' surplus is needed here, but the data must be collected at the level of individual producers and consumers, rather than at the aggregate level.

In particular, along with the prices for goods and services related to recreational and non-extractive uses of the salmon resource, more specific disposable income data must be collected. Instead of a total or average measure of income for all consumers the wage rate or salary level of the individual needs to be measured to use as a budgetary constraint on consumption. For extractive commercial uses, input and output prices and production levels need to be collected at the individual firm level to ensure an objective estimate of producers' surplus. In both cases, the abundance of the stock is an important explanatory variable that ensures comparability.

5.41 The third type of analysis needed is **analysis of participation**. While this analysis is not necessary for estimating existence and bequest values for different uses, it is necessary for estimating option values and the market value of fishing rights.

Examples of the data to be gathered here include:

- entry and exit behaviour of firms (e.g. number of outfitters that enter or exit the market for recreational fishing or the number of commercial fishing firms that enter or exit the market);
- participation rates in the recreational fishery; and
- participation rates in eco-tourism.

5.42 Finally, to ensure comparability with other surveys over a number of years or areas, the final type of analysis needed is **biological analysis** (e.g. stock assessment), which can be used to link economic values and impacts to the underlying resource. For example, if a survey was conducted in Scotland to estimate recreational value in a particular year and a similar study was conducted in the US the following year, salmon abundance may have changed over time, implying different expected catch rates on the part of the survey respondents. Knowing this allows adjustment of the

monetary estimates in Scotland and the US to make them comparable. However, many other factors may affect the economics.

## **6. Values expressed in monetary terms**

- 6.1 The Workshop recognised that many of the facets of the value of wild salmon could be, and had been, expressed in monetary terms. A list of these values is given in Table 1. The Workshop agreed that a critical examination of estimation methods and consideration of standard methods was not possible here and would need to be undertaken over a longer period of time. However, some general guidance on the analytical methods and the data that could be used in order to assess values that can be assessed in monetary terms is given in paragraphs 5.37 to 5.42 of this report.

## **7. Values that have not been estimated in monetary terms**

- 7.1 The Workshop recognised that some of the facets of the value of wild salmon may not be fully expressed in monetary terms and agreed that consideration of standard methods for assessing these values was not possible here and would need to be undertaken over a longer period of time. However, some general guidance on the approaches that could be used in order to assess these values is given in paragraphs 5.31 to 5.36 of this report.

## **8. Development of an international framework/template for assessing social and economic values**

- 8.1 NASCO has recognised that resolving how social and economic factors can be included in implementation of a Precautionary Approach to salmon conservation, management and exploitation without negating its effectiveness will require careful consideration. The Workshop recognised that management of Atlantic salmon fisheries under a Precautionary Approach to date had focused on the establishment of conservation limits (or other measures of abundance) and management targets. While conservation limits would be determined by biological considerations alone, management targets would also include consideration of social and economic factors. An illustration of the latter would be using social and economic analysis to assist managers in determining an appropriate timeframe for stock rebuilding. Social and economic factors might also provide important arguments in favour of conservation.
- 8.2 An example of a bio-economic model, which had been developed and used in the United States, was presented. This model integrated biological, social and economic aspects so that these could be included in management decisions. The model had been applied to the shrimp fishery and was in the process of being applied to the red snapper fishery. It allows revenues, costs and changes in fishing effort in response to changes in stock abundance to be projected over long time periods (100+ years) and demonstrates the effects of various management options on the fishing fleets and fisheries. The Workshop welcomed this model and agreed that if at some future date it could be adapted to Atlantic salmon, it might assist the SCPA in considering approaches for incorporating social and economic factors in decisions on management of Atlantic salmon fisheries under a Precautionary Approach.

- 8.3 It was recognised that some of NASCO’s Contracting Parties have limited expertise in social and economic assessments and the Workshop recommends that there might, therefore, be benefits from continued cooperation between the Parties on these issues.
- 8.4 The Workshop considers that it has:
- (a) developed a list of all the major elements making up the economic value and economic impact of wild salmon and an indication of who benefits from these values (see Table 1);
  - (b) developed an indication of the data that needs to be collected in order to assess those values that can be expressed in monetary terms (see paragraphs 5.37 to 5.42);
  - (c) developed broad guidelines on the type of economic analyses that would need to be applied to these data in order to produce estimates of these elements of value (see paragraphs 5.37 to 5.42).
  - (d) suggested a number of other elements where salmon bring value to human society but which are difficult or impossible to value monetarily (see paragraphs 5.31 to 5.36).
- 8.5 We consider that, just as NASCO has sought, for example, to ensure that catch statistics are comparable across the Atlantic, it would be extremely valuable to aim to ensure that estimates or assessments of social and economic values produced by each Party are also broadly comparable and are not produced using a completely different set of assumptions or methodologies.
- 8.6 Accordingly, the Workshop believes that the use of all the factors described in paragraphs 8.4(a) to (d) above creates a basis for a framework/template for assessing the economic and social values of wild salmon stocks. It therefore recommends that where NASCO or its Contracting Parties decide to go further into assessing economic and social values (whether Atlantic-wide, nationally, regionally or locally) all of the factors identified in paragraph 8.4 above be considered and taken into account where they apply.
- 8.7 The salmon may be unique among the fishes in the wide range of values it generates. It has a hold on human imagination that covers many sectors of society, even those who never fish and never wish to fish. This is a great asset but it is also a problem because the species can, therefore, be undervalued in some economic contexts where “existence” and “bequest” values are overlooked. We suggest, therefore, that the SCPA urges administrators and others concerned with decision-making on, for example, habitat, aquaculture, road building, hydropower, etc. to ensure that these difficult-to-measure, but very long-lasting and widespread, benefits are fully incorporated in decisions and given due weight.



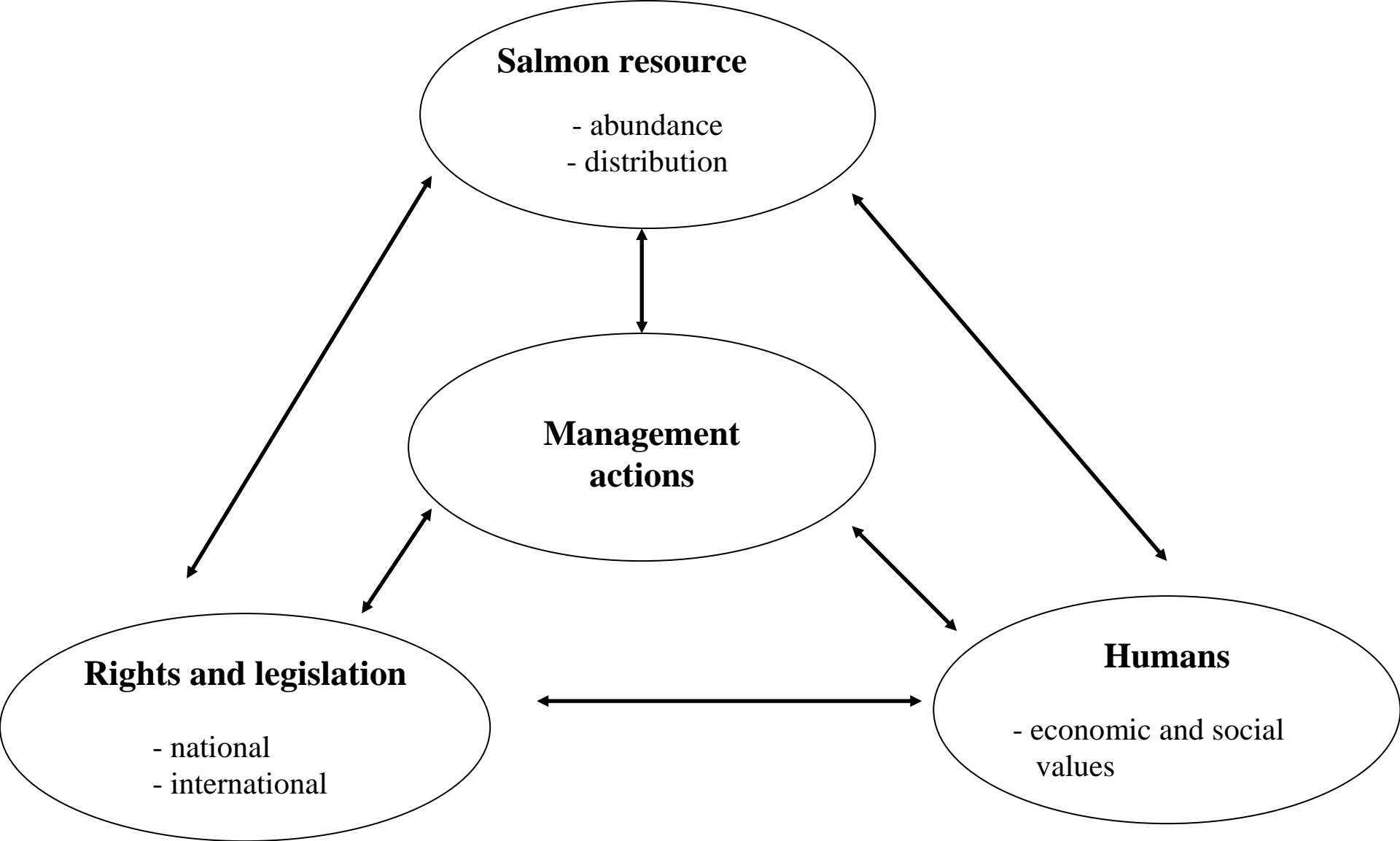
- 8.8 The Workshop notes that although there is a significant amount of economic information in the literature on wild salmon, it has never been integrated into the kind of structure shown in Table 2. The background papers for the Workshop contain much valuable information on the social and economic values of Atlantic salmon and the Workshop commends these papers to the SCPA. Copies of these papers are available from the NASCO Secretariat. However, Table 2 is incomplete and the SCPA may wish to consider whether it wishes to encourage the collection of more complete information on economic and social values, for inclusion in this table, so as to inform decision-making. References to studies conducted to assess these values might also be included in the table. It is particularly noticeable that elements which, because of the widespread human interest in the salmon, may be the greatest contribution to its value, are very poorly represented in the literature. There may be real benefits to developing a better understanding both of the conventional economic impacts and of the “existence” and “bequest” values.
- 8.9 It is important to recognise that an assessment of current economic and social values cannot be taken as a guide to how these values will change as the result of regulatory or other changes. Evaluation of the consequences of such changes will require a greater understanding of the relationships between social and economic values and the abundance of salmon.

### ***In Conclusion***

- 8.10 The Workshop has not attempted to proceed to the next step, to consider how social and economic factors can be incorporated into the Precautionary Approach. We have considered what the elements of value are and how they can be assessed. Nevertheless, we take the view that NASCO and its Contracting Parties should consider aiming at a position where social and economic advice can be merged with biological advice to produce a more informed basis on which to take management decisions. Thus, ways should be found to integrate social and economic information collected in a more conscious and transparent way, so that it becomes more meaningful and can play an increasing role in decisions on salmon management. The Workshop considers that such a management tool would be critical to evaluating management options and noted that a clear articulation of management objectives is essential. A simplified illustration of a salmon management process incorporating social and economic factors is shown in Figure 1.
- 8.11 The timeframe for improving the knowledge base on social and economic issues should be considered by the SCPA. The development of an action plan for conducting such work and reporting the results to NASCO should also be considered. The SCPA might also wish to consider the need for a cooperative pilot study to review the information in Table 2, complete the gaps in the data and, using Table 1 as a basis, build a more comprehensive overview of the economic and social values of the Atlantic salmon. This could be a desk study and need not be expensive.
- 8.12 Finally, we believe that the dialogue which took place in our Workshop between those concerned mainly with the management, administration or biology of the salmon and those more knowledgeable about economics, who brought insights about social and economic values, has been highly instructive. This has been a first step and we hope that the SCPA will decide to further encourage such a dialogue.



**Figure 1 : A simplified illustration of a salmon management process incorporating social and economic values**



8.13 The costs involved in assessing social and economic values should be kept in proportion to the changes in the resource being evaluated. The costs of collecting the relevant data can be minimised by incorporating their collection, as far as possible, into the collection of catch data.

**9. Any other business**

9.1 There was no other business. The Workshop expressed its appreciation to the Chairman for his excellent work and to the economists present for the expertise which they brought to the meeting.

**10. Consideration of the report of the meeting**

10.1 The Workshop agreed a report of the meeting.

***List of Participants***

**Canada**

Dr Gorazd Ruseski                      Department of Fisheries and Oceans, Ottawa

**Denmark (in respect of the Faroe Islands and Greenland)**

Dr Jan Arge Jacobsen                      Fisheries Laboratory of the Faroes, Torshavn

Mr Lars D Madsen                      Greenland Home Rule, Nuuk

Mr Hedin Weihe                      Ministry of Fisheries, Torshavn

**European Union**

Mr David Dunkley                      Scottish Executive Environment and Rural Affairs  
Department, Edinburgh

Dr Guy Mawle                      Environment Agency, Bristol

**Iceland**

Mr Arni Isaksson                      Directorate of Freshwater Fisheries, Reykjavik

**Norway**

Mr Oystein Aas                      Norwegian Institute for Nature Research, Lillehammer

Mr Raoul Bierach                      Directorate for Nature Management, Trondheim

**USA**

Ms Kimberly Blankenbeker                      National Marine Fisheries Service, Silver Spring

Mr John Ward                      National Marine Fisheries Service, Silver Spring

**Secretariat**

Dr Malcolm Windsor (Chairman)                      Secretary

Dr Peter Hutchinson                      Assistant Secretary



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***Technical Workshop to Develop a Framework  
for Assessing the Social and Economic Values Related to Wild Salmon***

***21-24 January, 2003  
Edinburgh, UK***

***Agenda***

1. Introduction
2. Nomination of a rapporteur
3. Adoption of the Agenda
4. Consideration of the Project Proposal (Terms of Reference)
5. Development of an inventory of available information on social and economic values related to wild Atlantic salmon
6. Values expressed in monetary terms:
  - (i) critical examination of the estimation methods used;
  - (ii) consideration of standard methods
7. Values that have not been estimated in monetary terms:
  - (i) consideration of standard methods;
  - (ii) consideration of the need for, and feasibility of, pilot projects to produce monetary estimates
8. Development of an international framework/template for assessing social and economic values
9. Any other business
10. Consideration of the report of the meeting
11. Close of the meeting