ECONOMIC VALUE OF RECREATIONAL FISHERIES IN THE NORDIC COUNTRIES

Economic value of recreational fisheries in the Nordic countries

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TemaNord 2000:604

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ISBN 92-893-0551-7
ISSN 0908-6692
Cover printed with approval from the National Bank of Denmark
Print: Ekspressen Tryk & Kopicenter
Copies: 600
Printed on paper approved by the Nordic Environmental Labelling.
This publication may be purchased from any of the agents listed on the last page.

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Nordic fishery co-operation
The first Nordic Fisheries Conference was established in 1949. Since then, a comprehensive co-operation has been established involving politicians, management, scientists, trades and industries and other interest groups. The fishery sectors of the Nordic countries have numerous features in common. Fishery co-operation within the Nordic area involves co-operation, financed by the Council of Ministers, on issues and problems of broad interest in the Nordic countries. The steady flow of knowledge and information characterising Nordic fishery co-operation thus becomes a vital tool in ensuring a balanced development of fisheries. The motive of co-operation is thus to contribute to a sustainable and rational use of the living, marine resources.

The Nordic Council of Ministers
was established in 1971. It submits proposals on cooperation between the governments of the five Nordic countries to the Nordic Council, implements the Council's recommendations and reports on results, while directing the work carried out in the targeted areas. The Prime Ministers of the five Nordic countries assume overall responsibility for the cooperation measures, which are co-ordinated by the ministers for cooperation and the Nordic Cooperation committee. The composition of the Council of Ministers varies, depending on the nature of the issue to be treated.

The Nordic Council
was formed in 1952 to promote cooperation between the parliaments and governments of Denmark, Iceland, Norway and Sweden. Finland joined in 1955. At the sessions held by the Council, representatives from the Faroe Islands and Greenland form part of the Danish delegation, while Åland is represented on the Finnish delegation. The Council consists of 87 elected members – all of whom are members of parliament. The Nordic Council takes initiatives, acts in a consultative capacity and monitors co-operation measures. The Council operates via its institutions: the Plenary Assembly, the Presidium and standing committees.

Contents

Abstract

Both the total expenditure used for recreational fishing and the market value of the catch have previously often been used as measures of the economic value of recreational fisheries. However, these are both incorrect measures of the social benefits that freshwater fish stocks provide. In this study, we aim at providing a correct estimate of the annual, total economic value (TEV) of recreational fisheries and the non-use value that the overall population (both fishermen and non-fishermen) attach to preserving the existence of the current Nordic fish stocks and the possibility of passing on this existence to future generations.

A questionnaire using the Contingent Valuation (CV) method was used to measure TEV by estimating the willingness-to-pay (WTP) for recreational fisheries and the preservation of fish stocks. The survey included questions concerning: attitudes towards the environment and outdoor recreation; which category of recreational fishermen they belonged to; recreational fishing activities and preferences; fishing expenditures; WTP for three scenarios of new recreational fisheries; WTP for a fish stock preservation scenario; and socio-economic variables. The same CV mail survey was conducted simultaneously in all five Nordic countries: Denmark, Finland, Iceland, Norway and Sweden. National population registers were used as sampling frames. The sample size was 25 000 Nordic citizens between ages 18 and 69. After three contacts the final response rate was 45.8 %.

Results show that "occasional anglers" form the largest category of recreational fishermen in all Nordic countries; except Sweden where this category is not used. In Sweden the largest category (81 %) is sports fishermen i.e. those who only use rod and line. The selected age group (18-69) spends over 77 million fishing days annually in the Nordic countries, and on average 14 fishing days per recreational fisherman. Recreational fishing on the coast is the preferred style in Norway, Denmark and Sweden, while Icelanders and Finns prefer rivers and lakes, respectively.

The annual economic values of recreational fisheries (use value), expressed as the WTP of recreational fishermen for their fishing experience over and above their actual expenditures during the last 12 months, are (expressed as a percentage of actual expenditures): Denmark 48 %, Finland 41 %, Iceland 30 %, Norway 55 % and Sweden 38 %. TEV expressed as a percentage of the actual expenditures of recreational fishermen are: Denmark 415 %, Finland 79 %, Iceland 100 %, Norway 95 % and Sweden 92 %. These results clearly show the importance of including the WTP of both recreational fishermen and non-users of fish stocks when calculating the economic value of recreational fisheries and fish stocks. The results can be used in cost-benefit analyses (CBAs) of alternative uses of water flow, projects effecting water flow and CBAs of measures to restore and protect recreational fisheries and fish stocks. They can also be used to calculate compensation payment after pollution accidents affecting fish stocks, and as inputs in models for optimal fisheries management. Results on expenditures by fishermen can be used in models to calculate the local economic impact of tourism based recreational fishing.

Key words: recreational fisheries, economic valuation, contingent valuation, Nordic countries

Sammanfattning

Såväl fritidsfiskets totala utgifter som fiskfångstens marknadsvärde har tidigare ofta använts som mått på det ekonomiska värdet av fritidsfisket. Dessa måttstockar är dock båda inadekvata om avsikten är att mäta den sociala nytta som fritidsfisket och fiskfaunan kan erbjuda. I denna studie är syftet att presentera en korrekt beräkning av det årliga totala ekonomiska värdet (TEV, total economic value) av fritidsfisket samt det icke-användarvärde som hela befolkningen (både fiskare och icke-fiskare) tillerkänner ett bevarande av den nuvarande nordiska fiskfaunan och av möjligheten att bevara dess existens för kommande generationer.

Ett frågeformulär, där Contingent Valuation (CV) -metoden tillämpas, används i studien för att mäta TEV genom att skatta betalningsviljan (WTP, willingness-to-pay) för fritidsfisket och bevarandet av fiskfaunan. Undersökningen inkluderar frågor som berör attityder till naturmiljö och friluftsliv, vilken kategori av fritidsfiskare man tillhör, fritidsfiskeaktivitet och preferenser, utgifter för fisket, WTP för tre scenarier med nya fisken, WTP för bevarande av nuvarande fiskfauna samt socioekonomiska variabler. Enkätundersökningen genomfördes i de nordiska länderna, Danmark, Finland, Island, Norge och Sverige, samtidigt och med samma metodik. Vid urvalsförfarandet användes de nationella befolkningsregistren. Urvalet uppgick till sammanlagt 25 000 nordiska medborgare i åldersintervallet 18 till 69 år. Efter tre kontakter blev den slutgiltiga svarsfrekvensen 45.8 %.

Resultaten visar att tillfälliga fiskare, occasional angler, är den största kategorin av fritidsfiskare inom Norden (om man undantar Sverige, där denna benämning inte använts). I Sverige utgörs den största gruppen av sportfiskare, dvs. de som bara fiskar med handredskap (81 %). Den utvalda åldersgruppen (18-69) genererar sammantaget 77 miljoner fiskedagar årligen i Norden. I genomsnitt blir detta 14 fiskedagar per fritidsfiskare. Kustfiske sätts i första rummet av fiskare i Norge, Danmark och Sverige. Islänningar prefererar fiske i åar och älvar, medan finska fritidsfiskare helst fiskar i sjöar.

Det årliga ekonomiska värdet av fritidsfisket (användarvärdet) uttryckt som fritidsfiskarnas WTP för sitt eget befintliga fiske, utöver vad de årligen betalar är (uttryckt som procent av de faktiska utgifterna) för Danmark 48 %, Finland 41 %, Island 30 %, Norge 55 % och för Sverige 38 %. TEV uttryckt som procent av de faktiska utgifterna för fritidsfiske är för Danmark 415 %, Finland 79 %, Island 100 %, Norge 95 % och Sverige 92 %. Dessa resultat visar tydligt vikten av att inkludera WTP både för fritidsfiskare och för icke-användare av fiskfaunan när man kalkylerar fritidsfiskets och fiskfaunans ekonomiska värde.

Resultaten kan användas i kostnads-intäkts analyser (CBA, cost-benefit analysis) av alternativa nyttjanden av vattendrag och projekt som påverkar vattendrag, och för åtgärder som syftar till att restaurera, skydda och bevara fritidsfiske och fiskfauna. De kan också användas för uträkning av ekonomisk kompensation vid sådan miljöförstöring som påverkar fiskfaunan, och som ingångsvärden i modeller för förvaltnings-optimering. Resultaten avseende fritidsfiskarnas befintliga utgifter kan användas i kalkylmodeller över lokalekonomiska effekter av ett turistbaserat fritidsfiske.

Key words: fritidsfiske, ekonomisk värdering, contingent valuation, nordiska länder

Tiivistelmä

Vapaa-ajankalastukseen käytettyjä kustannuksia sekä saaliin arvoa on aikaisemmin usein käytetty mittaamaan vapaa-ajankalastuksen taloudellista arvoa. Nämä ovat kuitenkin kummatkin vääriä mittareita niistä yhteiskunnallisista hyödyistä, joita saadaan kalavaroista. Tämä raportti pyrkii esittämään taloustieteellisesti kestävin perustein lasketut estimaatit vapaa-ajankalastuksen vuosittaisesta kokonaisarvosta (total economic value, TEV) sekä siitä olemassaoloarvosta, jonka koko väestö, kalastavat ja kalastamattomat, asettavat vapaa-ajankalastukselle ja nykyisten kalakantojen säilyttämiselle sekä mahdollisuudelle niiden säilyttämisestä edelleen tuleville sukupolville.

Vapaa-ajankalastuksen taloudellista arvoa mitattiin ehdollisen arvottamisen menetelmään (contingent valuation, CV) perustuvalla kyselylomakkeella arvioimalla maksuhalukkuutta (willingness-to-pay, WTP) vapaa-ajankalastuksesta ja kalakantojen säilyttämisestä. Kysymysten aiheita olivat asenteet luontoon, ympäristöön ja vapaa-aikaan, mihin kalastaryhmään vastaajat tunsivat kuuluvansa, vapaa-ajankalastustottumukset ja -mieltymykset, kalastuskustannukset, maksuhalukkuus kolmesta vapaa-ajankalastusskenaariosta, maksuhalukkuus kalakantojen säilyttämisskenaariosta sekä yhteiskunnallis-taloudelliset taustatiedot. Kyselytutkimus toteutettiin samanlaisena ja samaan aikaan kaikissa viidessä Pohjoismaassa, Islannissa, Norjassa, Ruotsissa, Suomessa ja Tanskassa. Väestörekistereitä käytettiin otantakehikkoina. Otoskoko oli 25 000 pohjoismaista, 18-69 -vuotiasta kansalaista. Lopullinen vastausprosentti oli 45,8 kolmen kontaktin jälkeen.

Tulokset osoittavat, että “satunnaiset onkijat” ovat suurin vapaa-ajankalastajaryhmä muualla paitsi Ruotsissa, missä heidät lasketaan urheilukalastajiin. Kyselyssä mukana ollut ikäryhmä viettää yhteensä 77 miljoonaa kalastuspäivää ja keskimäärin 14 kalastuspäivää harrastajaa kohti vuosittain. Norjalaiset, tanskalaiset ja ruotsalaiset kalastavat mieluiten rannikolla, Islantilaiset pitävät eniten jokikalastuksesta ja suomalaiset haluavat kalastaa järvellä.

Vapaa-ajankalastajien vuosittainen ylimääräinen maksuhalukkuus viimeisen 12 kuukauden kalastuksesta jo maksettujen kulujen lisäksi prosentteina maksetuista kuluista oli Islannissa 30 %, Norjassa 55 %, Ruotsissa 38 %, Suomessa 41 % ja Tanskassa 48 %. Koko väestön, sekä kalastavien että kalastamattomien, maksuhalukkuus kalakantojen nykytilan ja vapaa-ajankalastuksen nykyisen tason säilyttämisestä prosentteina vapaa-ajankalastajien maksamista todellisista kustannuksista oli Islannissa 100 %, Norjassa 95 %, Ruotsissa 92 %, Suomessa 79 % ja Tanskassa 415 %. Tulokset osoittavat, että vapaa-ajankalastuksen ja kalakantojen taloudellista arvoa laskettaessa kyselytutkimuksen avulla, otokseen on tärkeää ottaa sekä kalastajia että kalastusta harrastamattomia. Tuloksia voidaan käyttää vesialueiden vaihtoehtoisten käyttötarkoitusten ja vesialueisiin vaikuttavien hankkeiden sekä vapaa-ajankalastuksen ja kalakantojen entisöinti- ja suojeluhankkeiden kustannus-hyötyanalyyseihin (cost-benefit analysis, CBA). Tuloksia voidaan käyttää myös kalakantoihin vaikuttaneiden ympäristövahinkojen korvauslaskelmiin sekä kalastuksen hoidon optimaaliseen mallintamiseen. Tietoja kalastajien maksamista kustannuksista voidaan käyttää turismipohjaisen kalastusmatkailun paikallisten taloudellisten vaikutusten mallintamiseen.

Asiasanat: vapaa-ajankalastus, taloudellinen arvottaminen, maksuhalukkuuskysely, Pohjoismaat

List of tables

Table 4.10. Recreational fishermen's annual willingness to pay for an exclusive fishing right to a good quality lake with perch, pike and pike-perch.

Table 4.11. Recreational fishermen's annual willingness to pay for an exclusive fishing right to a good quality lake with grayling, brown trout and arctic char.

Table 4.12.1. Population's (recreational fishermen and non-fishermen) annual willingness to pay for preserving the current natural fish stocks and current quality of recreational fishing.

Table 4.12.2. Recreational fishermen's annual willingness to pay for preserving the current natural fish stocks and current quality of recreational fishing.

Table 4.12.3. Non-fishermen's annual willingness to pay for preserving the current natural fish stocks and current quality of recreational fishing.

Table 4.12.4. Non-fishermen's with "somebody else in the family fishing" annual willingness to pay for preserving the current natural fish stocks and current quality of recreational fishing.

Table 4.12.5. Non-fishermen's with "nobody in the family fishing" annual willingness to pay for preserving the current natural fish stocks and current quality of recreational fishing.

Table 4.12.6. Total economic value of recreational fisheries, two estimates. When CVM analysis is used ‘Total economic value’ measures only ‘Net social benefit’ and excludes the ‘Actual expenditures’.

Table 4.13. Mean age of fishermen and non-fishermen.

Table 4.14. Sex distribution of recreational fishermen.

Table 4.15. Mean number of persons in the household.

Table 4.16. Mean number of fishermen (persons who have fishing as a hobby) in the household.

Table 4.17. Residential environment of the population and of recreational fishermen, percentage.

Table 4.18. Years of education of the population and of recreational fishermen, percentage.

Table 4.19. Mean income of population and of fishermen.

List of definitions

Angling is fishing with a simple rod and line with a short operating distance.

Arctic char *(Salvelinus alpinus* L.*)*

Brown trout is a resident trout *(Salmo trutta* L.*)*

Fishing day is a day when fishing takes place irrespective of the duration.

Generalist is a recreational fisherman who uses all sorts of gear available.

Grayling *(Thymallus thymallus* L.*)*

Household is a group of people living at the same address and using the same refrigerator.

Household fisherman is a recreational fisherman who uses a limited number of gill nets or other standing gear.

Occasional angler is a recreational fisherman whose participation is sporadic.

Perch *(Perca fluvialitis* L.*)*

Pike *(Esox lucius* L.*)*

Pike-perch *(Stizostedion lucioperca* L.*)*

Recreational fisherman is a fisherman who fishes during leisure time and does not sell the catch.

Rod and line is any fishing tackle with a rod and a line.

Salmon is Atlantic salmon *(Salmo salar* L.*)*

Sea trout is migrating trout *(Salmo trutta* L.*)*

Spinning rod is a fishing tackle with a long line and a lure that is casted further off using a spinning reel.

Sports fisherman is a recreational fisherman who mainly uses rod and line.

Subsistence fisherman is a recreational fisherman who mainly uses gill nets or other standing gear.

List of forthcoming publications

Roth, E., Toivonen, A-L., Navrud, S., Bengtsson, B., Gudbergsson, G., Tuunainen, P., Appelblad, H. and Weissglas, G 2000. Methodological, conceptual and sampling practices in surveying recreational fishery in the Nordic countries - experiences of a valuation survey. Paper presented in the Eifac Symposium on Fisheries and Society, Hungary 1-3 June 2000. Publication in Fisheries Management and Ecology.

Roth & al. 2000. Economic valuation of recreational fishery in the Nordic countries. Presented in an AFS Symposium - Economics of recreational Fishing, St. Louis, MO, USA, August 20-24, 2000. Publication in a peer-reviewed AFS journal.

Toivonen, Tuunainen & al. "Economic value of recreational fishery in the Nordic countries". Comparisons between countries, analytical approach. Will be submitted to AMBIO.

Appelblad, Weissglas & al. "Geographic differentation in recreational fishery and WTP in the Nordic countries". A GIS application, impact analysis.

Roth, & al. "Economic impact analysis". Impact of RF to formal economy, input-output model, consequences to society, employment, export etc.

Roth, Toivonen & al. "Case studies on applications of WTP". Site specific studies of wtp_9, wtp_10 and wtp_11 questions. Applied articles on national data, how these results can be applied to management.

Appelblad, Bostedt, & al. The preference uncertainty of Swedish recreational fishermen concerning the use value of three different hypothetical fishing sites.

Toivonen 2002. “Price of the survey, price of information, sample size”. A chapter in a book. Pitcher, T. and Hollingworth, C. (Eds.) Evaluating Recreational Fisheries: an Ecological, Economic and Social Balance Sheet. Fish and Aquatic Resources. Blackwell Sciences.

Kristofferson and Navrud 2000: “Can Contingent Valuation Estimates for Freshwater Fish Stocks be transferred across countries - a comparative study of Iceland, Norway and Sweden”. Will be submitted to "Environmental and Resource Economics".

Navrud, Roth, Kristofersson & al. Benefit transfer. Includes all countries, an extended analysis.

Toivonen & al. Analysis of zero willingness to pay.

Foreword

This report concludes the work that has been a continuum of both separate and linked processes aiming at acquiring comparable socio-economic data on recreational fisheries in the Nordic countries. The research collaboration was initiated through two Nordic Council of Ministers sponsored workshops. The "Nordic conference on recreational and tourism fisheries resource management and socio-economics" was arranged in Östersund, Sweden (Petersson 1994) and the "Socio-economics of recreational fishery" workshop (Toivonen and Tuunainen 1997) in Vaasa, Finland.

This report presents descriptive data from the mail survey that was conducted in all five Nordic countries through October 1999 - January 2000. The data, both national and the complete five-country data set, will serve as the basis for several planned publications.

The study has been financed by the Nordic Council of Ministers that has also been the recurrent institution in all communication with the public. The following participating institutions have supported the survey: Finnish Game and Fisheries Research Institute; University of Southern Denmark; Danish Institute for Fisheries Research; Institute of Freshwater Fisheries (Iceland); Agricultural University of Norway; Directorate for Nature Management (Norway); National Board of Fisheries (Sweden) and Umeå University (Sweden). Additionally, contributions have been received from the Ministry of Agriculture and Forestry (Finland) and the Agricultural Productivity Fund (Iceland).

The execution of the survey and collecting of such a huge amount of data required substantial economic effort. The data enables further work in more analytical and comparable measures. The working group intends to arrange an evaluation seminar at the end of the project.

1. Introduction

1.1. Background

Fishing is among the most popular recreational activities in all the Nordic countries. The segmentation of recreational fishermen differs somewhat between the countries. These segments can be defined, for example, by the type of gear used, the level of specialisation, the target catch or by the type of waters they fish in. Despite the differences in segmentation, however, the hypothesis is that the Nordic people share an appreciation and a common set of attitudes and economic values towards their inherent fishing resources.

People are not used to paying for outdoor recreation, and in most Nordic countries no fee or only a moderate fee is charged for most types of recreational fishing, with the exception of salmon fishing. While the economic value of commercial fisheries can be estimated in a relatively straight-forward way, utilising statistics on catch and efforts and corresponding market prices, the economic value of recreational and household fisheries is not directly reflected in the market price for fish and fishing licences. The economic value of recreational fisheries is the difference between the most the angler would be willing to pay to have this recreational experience and the expenditure she or he has had to make in order to enjoy this recreational experience. Thus, techniques other than market price are needed to measure the economic value of recreational fishing. Other outdoor recreation activities (e.g. hunting, hiking. skiing and swimming) and other environmental goods like biodiversity and the quality of air and water need the same type of techniques. Development of environmental valuation techniques started in the USA more than 50 years ago, and has since spread to Europe and other parts of the world; see Navrud (1992) for a review of European valuation studies. The few existing Nordic studies valuing freshwater fish stocks (e.g. Navrud 1988, Navrud 1990, Navrud 1993, Bengtsson and Bogelius 1995) have been used to show, for example, that the benefits of liming acidified rivers and lakes by far exceed the liming and restoration costs (see also Navrud 2000).

The increased use of cost-benefit analysis as a decision making tool in government planning in the Nordic countries has further strengthened the importance of finding the economic value of fish resources. However, in conflicting situations the recreational fisheries has not been treated equally because its total value in monetary terms has not been known. There exists a need in all of the Nordic countries for up-to-date and consistent estimates of the economic value of recreational and household fisheries and the value attached to fish stocks also by those who do not fish.

Parallel surveys in several countries of the same environmental good create a unique starting point for benefit (or damage) transfer studies, i.e. using an estimate for one kind of fishery in a particular geographical area to predict the economic value of the same or a different type of recreational fishery in a different country or location.

Parallel surveys also enable us to test the reliability and validity of benefit transfer. Increased use of cost benefit analysis and economic instruments in fisheries and environmental management will increase the need for benefit transfer since, in most cases, there will be no time nor financial resources for conducting new site specific valuation studies.

1.2. Aim of the survey

The aim of the research is to estimate the economic value of fish stocks utilised for recreational fisheries. Different segments of recreational fishermen hold different attitudes and values towards their hobby, even non-fishermen attach an economic value to preserving these fish stocks. The main goal of the research is to estimate the total economic value (TEV), i.e. the use and non-use values of fish stocks that recreational fisheries give rise to, simultaneously, in all the Nordic countries.

The high costs of reducing environmental problems like acid rain, marine pollution and oil spills has made it increasingly important to document the social benefits of restoring and preserving the fish stocks. The results of the survey can be used in environmental cost-benefit analyses, models for optimal fisheries management, and damage assessments where compensation payments from pollution accidents, for example, are to be made. The estimates of the economic value of recreational fisheries can also be used as input in models for the social optimal management of fish stocks in terms of the distribution of catch volume between different, and often conflicting uses, of a fish stock. The results will provide insights into the magnitude of damages from pollution incidents, and thus, improve the estimation of compensation payments. Smith (2000) reports on cases where non-market environmental valuation techniques have been applied.

1.3. Fishing rights and access

In **Denmark**, the right to fish in lakes and streams generally belongs to the landowner. Nearly all stream fisheries are privately owned, and only 25% of the lakes are owned by the state. Half of the state lakes are accessible to recreational fisheries, very often through fishery associations. Less than half of the privately owned lakes are accessible to recreational fisheries. In the inland waters, the demand is high and the capacity is fully exploited. There are only 700 lakes of 4 hectares or more in Denmark (Henriksen & al. 1997). The long national coastline is less crowded and offers high quality fishing opportunities. No land owner's licence is required when fishing in the sea. In Denmark, recreational fishing is licenced by the state. Recreational fishermen aged 18 - 67 using rod and line must pay an angling licence (100 DKK) and recreational fishermen aged 12 – 67 using standing gear must purchase another type of licence (250 DKK), unless they have fishing rights based on riparian ownership. The amount of standing gear is limited to six. In addition, fishermen using inland waters have to obtain the landowner's permission.

In recent years, significant changes in the licensing policy have taken place in **Finland**, excluding Åland. According to the Fisheries Law (286/82) and Fisheries Act (886/82), the right to fish belongs to the landowner and he can sell fishing licences. Angling with rod and line became an everyman's right in 1993. Similarly, in 1982 ice-fishing was first allowed in any county in Finland, for a special fee. Eventually, ice fishing became an everyman's right in 1996. Beginning from 1997, the right to fish with a spinning rod was separated from the landowners' licence system. Fishing licences for spinning rod can now be bought for any county regardless of the landowner. Gill net fishing requires a licence from the landowner. Waterways with salmon, brown trout or whitefish populations are special cases. All 18 - 64 year-olds who fish must pay a separate annual fishery fee (90 FIM in 1999) to the state if they conduct other fishing forms besides angling or ice fishing. For household and recreational fishing outside the private waters in the sea, only the state fishery fee is needed. These rules apply to all Nordic citizens and most of the rules to EU citizens, too. Privately owned waters are managed by statutory fishery associations.

The accessibility to fishing sites is excellent. There are close to 30 000 lakes larger than 4 hectares in Finland (Henriksen & al. 1997), distributed all over the country.

In **Iceland**, the freshwater fishing rights are privately owned. Fishing rights go with the land adjacent to rivers and lakes. Landowners have to form a fisheries association that manages the fishing rights within the framework of the law, and they usually lease the rights for rod and line fishery. The leasing of fishing rights is limited to rod and line, other gear types can only be operated by the landowners. The price of fishing licences is decided on an open market, with licences going to anglers or angling clubs paying the highest bid. No fishing fee is paid to the state. Fishing rights in coastal waters go with land out to a distance of 120 m from the shore. Fishing with rod and line, for own consumption, is free in the sea. No salmon fishery is allowed in the sea or in coastal waters.

Recreational fishery is a popular sport in Iceland and there are various opportunities to fish in either expensive salmon rivers or inexpensive char and trout lakes. The number of lakes over 4 hectares is close to 450 (Adalsteinsson *et al.* 1989).

In **Norway**, the right to fish in *freshwater* belongs to the landowner, who normally gives permission to individual fishermen throuhg the sale of fishing licences. Access to fish with rod and line on state owned land is good and a fishing licence is needed. The state owns about 50% of the Norwegian area, particularly large areas in the north. There can be public regulations concerning gear, fishing times etc. particularly for salmon fishing.

Access to freshwater fishing on privately owned land is also generally good, although the most attractive salmon fishing sites can be expensive. There can also be both private and public regulations concerning gear, fishing times etc, particularly for salmon fishing.

All fishermen aged 16 and over must pay a fishing fee for freshwater fishing (90 NOK in 1999) to the national fishing fund. An additional fee is needed for the licence to fish salmon, sea trout and arctic char (90 NOK). In addition, the fisherman needs to

purchase a licence from the owner of the fishing rights in the watercourses they select to fish in. The price level of these local fishing licences is relatively low to moderate, except for attractive salmon rivers. Generally, a variety of fishing opportunities is offered in the inland waters, although there are regional differences. In Norway, there are close to 40 000 lakes over 4 hectares (Henriksen & al. 1997).

People are free to fish with rod and line in the *sea*. For other gear there is a set of rules and regulations. These rules set limitations for gear type and gear size for the recreational fishermen. Recreational fishermen are not allowed to fish salmon with gill nets. The long coastline offers good opportunities for fishing.

In **Sweden**, the fishing rights are private in principle, and therefore you cannot go fishing anywhere without being either the fishing right owner or having bought or been given the right to fish by the owner. Fishing is commonly organised by an association of fishing right owners, i.e. fishing management units. In Sweden, there is no fishing fee to be paid to the state unlike in Denmark, Finland and Norway.

Fishing in coastal waters using rod and line only is free of charge and so is the case in the five major lakes, Vänern, Vättern, Mälaren, Hjälmaren and Storsjön. A licence is compulsory when fishing in any other private waters.

Sweden has more lakes than any other Nordic country, 60 000 lakes over 4 hectares in area (Henriksen & al. 1997). In addition to the so called free fishing right as described above, there is also the general right of free access - the everyman's right - to any land or water area as long as you behave carefully and respect the rules established over time, even if not written in the Book of Statutes of Sweden.

2. Methods

2.1. Total Economic Value (TEV)

The purpose of economics is to increase the well-being or welfare (utility) of the individuals in society, and each individual is the best judge of how well-off he or she is in a given situation. We assume that each individual will maximise his or her utility by spending income on purchasing private goods like milk and cars and public goods like roads, public health care services and most aspects of our environment including fish stocks. Private goods are excludable, rival in consumption and are traded in the market. Moreover, private goods have market prices that reflect their economic value. Conversely, pure public goods, like clean water and clean air, are non-excludable and non-rival in consumption. Consequently, they are not traded in the market, have no market price and require use of environmental valuation techniques to derive their economic value.

Zero price does not mean zero economic value. Individuals derive welfare from having clean air, clean water, fish stocks and having access to recreational fishing. However, recreational fisheries can be considered a quasi-private good, since individuals can be excluded from fishing in a river or lake, and consumption is rival at high levels of consumption, i.e. if there are many fishermen in a river (congestion) one individual's consumption of a unit of the good (e.g. a day of recreational fishing with high quality) diminishes the amount of the good available for others to consume. Recreational fishing (with the exception of recreational fishing for salmonids) in the Nordic countries can be considered a public good due to the public policy of securing access to recreational fisheries either for free or for a modest fee, as well as for having angling activity levels which, at most fishing sites, do not create a congestion of anglers.

Individuals derive utility from recreational fishing that is not fully reflected in fees, travel and time, among other costs. Since utility cannot be observed, the applied economist can at best observe income and consumption decisions at different prices (or costs) and try to compute some money-based measures of welfare effects. 'Consumer surplus' is the vehicle most often used in empirical work to measure (net) consumer welfare. The ordinary (Marshallian) consumer surplus is defined as the difference between the maximum individuals are willing-to-pay for a good and what they actually pay (i.e. the market price). However, this consumer surplus measure is a measure of the net welfare only under very strict assumptions. The environmental valuation technique, known as the Travel Cost (TC) method, utilises the information on the number of visits and travel costs to a fishing site to calculate the ordinary consumer surplus of this recreational activity. The alternative consumer surplus measures of equivalent variation (EV) and compensating variation (CV) are defined as income adjustments, i.e. money given (willingness-to-accept compensation - WTA) or taken away (willingness-to-pay - WTP) from consumers which maintain the consumer

at particular levels of welfare. CV and EV focus on the initial and subsequent levels of welfare, either from an increase or decrease in supply of e.g. recreational fisheries. The individuals' willingness-to-pay to obtain an increase or avoid a decrease in the consumption of a good is used to measure the change in utility that results when the consumption of goods changes. For private goods, which are traded in a market, market prices can be seen as an expression of the utility of consuming one unit of the good (under the assumptions of perfect competition in the market for the good, and in the case of marginal changes in the demand for the good). Our freshwater fish stocks are a public good, since they are available for everybody to enjoy and (up to a certain extent) one person's use of the good does not affect the utility of the other goods. No economic value for recreational fisheries is generally needed unless it is a scarce resource and competes with other uses of land and water habitats. If a situation occurs where recreational fishery is valued against or suffering from other interests regarding the resource, economic value becomes very important, since welfare economic properties might aid the management decisions in a consistent and rational way.

The Total Economic Value (TEV) of a marginal change in a fish stock is what people are willing-to-pay (WTP) to obtain either an increased fish stock or to avoid having a reduced one. TEV can be divided into two main components based on what motivates people's WTP: a) use value and b) non-use value.

The use value of a fish stock can be divided into i) consumptive and ii) non-consumptive use. Consumptive use includes the net income from commercial fisheries (i.e. income from fish sales minus the cost of input factors) and the recreational value of fishing. Non-consumptive use includes the viewing and photographing of fish stocks, e.g. salmon jumping up a waterfall to spawn in their native river.

The non-use value can be divided into an option, existence and bequest value. The option value can be considered as being similar to an insurance premium people are willing-to-pay in order to have the option of consumptive and/or non-consumptive use of the fish stock in the future even if they do not use or plan to use the resource now. People are also willing-to-pay to know that the fish stocks exist (existence value), and to be able to deliver the existence of the fish stock to future generations (bequest or preservation value).

2.2. The Contingent Valuation (CV) method

A Contingent Valuation (CV**)** survey constructs scenarios that offer different possible future government actions. Under the simplest and most commonly used CV question format, the respondent is offered a binary choice between two alternatives, one being the status quo policy, the other being an alternative policy having a cost greater than maintaining the status quo. The respondent is told that the government will impose the stated cost (e.g. increased taxes, higher prices associated with regulation, or user fees) if the non status quo alternative is accepted. The key elements here are that the respondent provides a 'favour / not in favour answer' with respect to the alternative policy (versus the status quo); what the alternative policy will provide; and how it will be provided. Furthermore, how much it will cost, and how it will be charged for (i.e.

payment vehicle) will be clearly specified. This way of eliciting willingness-to-pay is termed binary *discrete choice* (or *closed-ended)*. An alternative elicitation method is through asking *open-ended* questions where respondents are asked directly about the most they would be willing-to-pay to get the alternative policy (with or without the visual aid of a payment card, i.e. randomly chosen amounts ranging from zero to some expected upper amount). One of the latest innovations is a Multiple Bounded Discrete Choice Table (MBDCT) (Welsh and Poe 1998). In an MBDCT the respondent expresses the certainty level of the WTP in addition to the 'yes / no' bidding routine of the dichotomous choice.

One of the main challenges in a CV study is to describe the change the alternative policy will provide to the environmental good in a way that is understandable to the respondent while being scientifically correct.

Concerns raised by CV critics over the reliability of the CV approach led the US National Oceanic and Atmospheric Administration (NOAA) to convene a panel of eminent experts, co-chaired by Nobel Prize winners Kenneth Arrow and Robert Solow, to examine the issue. In January 1993, the panel, after lengthy public hearing and reviewing many written submissions, issued a report which concluded that 'CV studies can produce estimates reliable enough to be the starting point for a judicial or administrative determination of natural resources damages – including lost passive use value (i.e. non-use value)' (Arrow *et al.* 1993). The panel suggested guidelines for use in Natural Resource Damage Assessment (NRDA) legal cases to help ensure the reliability of CV surveys on passive use values. These guidelines demanded the use of in-person interviews; a binary discrete choice question; a careful description of the good and its substitutes; and that several different tests should be included in the report on the survey results. Many empirical tests have been conducted and several key theoretical issues have been clarified since the panel has issued the report. The simplest test corresponds to a well-known economic maxim, the higher the cost the lower the demand. This price sensitivity test can easily be tested in the binary discrete choice format, by observing whether the percentage favouring the project falls as the randomly assigned cost of the project increases, which rarely fails in empirical applications. The test that has attracted the most attention in recent years is whether the WTP estimates from CV studies increase in a plausible manner with the quantity or scope of the good being provided. CV critics often argue that insensitivity to scope results from what they term 'warm-glow', by which they mean obtaining moral satisfaction from the act of paying for the good independent of the characteristics of the actual environmental good. There have now been a considerable number of tests of the scope insensitivity hypothesis (also termed 'embedding'), and a recent review of the empirical evidence suggests that the hypothesis is rejected in a large majority of the tests performed (Carson 1997).

Producing a good CV survey instrument requires substantial development work; typically including focus groups, in-depth interviews, pre-test and pilot studies to help determine how plausible and understandable the good and the scenario are. The task of translating technical material into a form understood by the general public is often a difficult one. Adding to the high costs of CV surveys is the recommended mode of survey administration, i.e. in-person interviews (Arrow et al 1993). Mail and telephone surveys are dramatically cheaper, but mail surveys suffer from sample

selection bias (i.e. those returning the survey are typically more interested in the issue than those who do not), and phone surveys have severe drawbacks if the good is complicated or visual aids are needed. Moreover, CV results can be quite sensitive to the treatment of potential outliers. Open-ended survey questions typically elicit a large number of so-called protest zeros and a small number of extremely high responses. In discrete choice CV questions, econometric modelling assumptions can often have a substantial influence on the results obtained. Any careful analysis will involve a series of judgmental decisions about how to handle specific issues involving the data, and these decisions should be clearly noted.

According to Carson (2000), the recent debate surrounding CV use is, to some degree, simply a reflection of the large sums at stake in major environmental decisions involving non-use and the general distrust that some economists have for information collected from surveys. However, the theoretical foundations and limits that the CV method brings to its users are now better understood. The CV method has still not reached the routine application stage though, and all CV surveys should include new research and tests. Carson (2000) concludes that perhaps the most pressing need is on how to reduce the costs of CV surveys while still maintaining a high degree of reliability. He suggests combination telephone-mail-telephone surveys to reduce survey administration costs as well as implementation of research programs designed for solving some of the more generic representation issues such as low level risk and large scale ecosystems.

Carson *et al.* (1995) provide a comprehensive bibliography over CV studies and Navrud (1992) presents a review of applications and policy use of the CV and other environmental valuation techniques in Europe. Mäntymaa (1997) tests and suggests new methodological approaches aimed at increasing the reliability of the CV method. Navrud and Prucner (1997) compare the policy use of valuation techniques in the US versus Europe.

Net willingness-to-pay, or consumer surplus, has been recommended as the preferred measure of the economic benefits of outdoor recreation programs by an interagency committee of the US government (US Water Resources Council 1980, US Department of the Interior 1986). For public outdoor recreation programs, the benefit-cost ratio is defined as the consumer surplus (net benefits) of individual users divided by the sum of the agency's operating and opportunity costs (Loomis and Walsh 1997 p. 63). Data on the expenditures that fishermen spend at a fishing site is a useful starting point for analysis of the economic impacts of visitor expenditures on the local economy (Roth and Jensen 1997). However, this is a cost to the fishermen and not a social benefit.

The economic value of fish stocks consists of both a use value and a non-use value. One of the scenarios in our CV survey was designed in order to capture the non-use value of fishermen and non-fishermen (Question 12). Those people who do not fish at least once a year constitute the majority of the population in the Nordic countries. An interesting question concerns how large their aggregate willingness-to-pay (WTP) is compared to the corresponding aggregate value for the users of this environmental good (Figure 2.1.). The non-users may sum up a larger amount even though the

average WTP per person or household is higher among the users. Therefore, it is important to include both users and non-users in the survey.

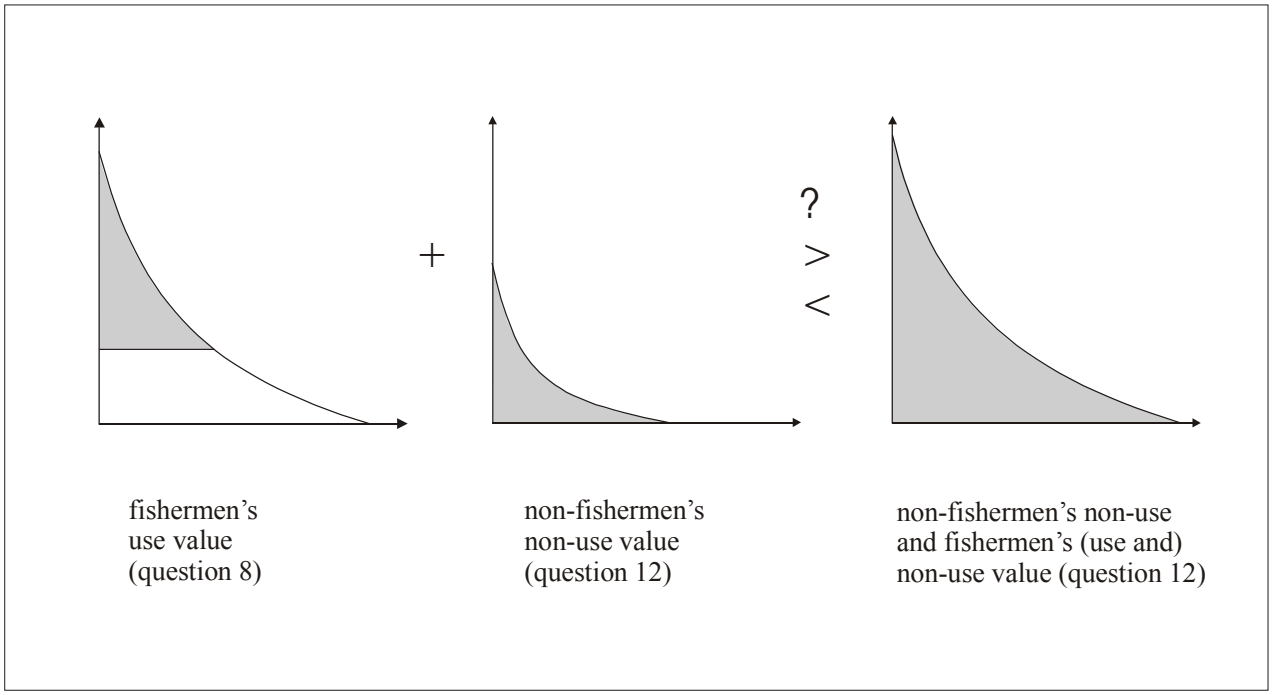

Figure 2.1. Use and non-use values

Intuitively recreational fishermen value both the use and non-use value of their spare time activity. The non-fishing part of the population value the non-use properties which may be the option, existence and bequest value. The way the questions are phrased always leaves a doubt as to how the respondents have perceived the questions.

Question 8 does not leave much doubt.

Think about the experience you have had undertaking recreational fishing during the last 12 months, and what it is worth to you to have this experience. Do you think your experience is worth more to you than you paid? What is the ***most*** *you would almost certainly pay* ***in addition to*** *what you now spend (see the previous question) before you would stop going to the fishing sites you now use?*

The experience of fishing is well defined and hardly leaves any doubt as to what the respondents perceive.

On the other hand, question 12 may give rise to discussion.

Natural fish stocks in the Nordic countries are threatened in several ways. Low water quality, regulation of water level, barriers to fish and other fauna migration (weirs, dams etc.), reduced water flow due to hydro power development, eutrophication due to emissions of nutrients from agriculture, industry and household sewage, acid rain,

fish parasites and diseases; all these factors influence the state of fish stocks. If no action is taken, we will lose our natural freshwater fish stocks.

International agreements to reduce transboundary pollution and national programs have been designed to combat the threats specific to each country. These initiatives will cost money. Part of the costs will have to be paid by the taxpayers in each country as an additional income tax. Think what it is worth to you to preserve the natural fish stocks we now have.

The costs are uncertain. The table below lists some possible annual costs to you. What is the most you are willing to pay annually as an increase in income taxes to finance the programs that would preserve the current fish stocks and current quality of recreational fishing in the Nordic countries?

This question may be perceived as intended, i.e. capturing the non-use value of the habitat and the fish sustained by this same habitat. But it may also be perceived as a necessary condition for future recreational fishing and thereby include some or all the use value for both fishermen and non-fishermen.

To illustrate the sensitivity of the results due to this uncertainty in interpretation of the estimates from these two questions, two different ways of calculating total economic value of fish stocks used for recreational fishing is presented.

3. Sampling procedures and survey

3.1. Sampling methods and practices

The sampling procedure was planned to be as similar in each country as possible. Several principles were agreed upon and followed. Due to national differences, however, some exceptions to the principle of identicality had to be tolerated.

The national population register frame was used for sampling and the sampling unit was the individual person, not just anybody in the household. Because locality affects fishing habits, the sample was taken at even intervals from a geographically sorted register to obtain the same geographical distribution as the basic population. All useful background information, like age, sex and municipality were included in the sample data set, if possible.

When a population register frame is used, the sample size is negligible compared to the basic population. Then, in general, a sample of 1100 will provide a result with a confidence limit of ±3 % at 95% confidence probability even with the most unfavourable standard error (Cochran 1977). Afterwards, when the data is collected and the deviation in each case is known, the adequate number of records and the confidence limit for any estimate can be calculated more precisely. To ensure the necessary amount of data, the sample size was selected in respect to the total population in each country and the assumed response activity (Table 3.1.). In order to obtain the true sample size, unreachable samples were deleted.

An age limit of 18 - 69 years-old was applied to the sample. The subject area of the survey was willingness-to-pay. Therefore, the target group had to be old enough to have control of its own expenses.

Table 3.1. Sample size, sampling interval and response rate by country.

	N (population of 18 - 69) * (1)	Sample (2)	True sample (3)	Sampling interval (4)=(1)/(2)	Number of replies (5)	True interval (6)=(1)/(5)	Response rate (%) (7)=(5)/(3)
Denmark	3 607 221	5 192	5 181	695	2 376	1 518	45.86
Finland	3 479 082	5 000	4 969	696	2 550	1 364	51.32
Iceland	179 952	2 500	2 456	72	840	214	34.20
Norway	2 889 494	5 000	4 892	578	2 182	1 324	44.60
Sweden	5 753 834	7 500	7 402	767	3 456	1 665	46.69
total	15 909 583	25 192	24 900	632	11 404	1 395	45.80

* Source: SAB 1999

The response rate of the mail survey was 45.8 %, Iceland having the lowest percentage of 34.2 and Finland the highest of 51.3. The result was moderate but acceptable for a CVM survey (Dalecki & al. 1993, Loomis 1987). For a longer period the response rates, in general, have had a decreasing tendency (Jones 1996). To ascertain the further ability to generalise the data, the representativeness of the sample was checked (see Chapter 3.2.). The relatively low response rate in Iceland has at least two explanations. The timing of the survey was unfortunate because there had been strong public criticism against gathering information on private persons. This was after a plan was revealed to collect people's health information in a central database. Another reason may just have been mistrust at sending information to a far-away foreign country like Finland. Both Finland and Denmark seemed to have gained from the domestic set-up.

The **Danish** sample
The Danish national population register is maintained by the CPR-kontoret, Central Person Register. Samples from the register can be drawn for specific research purposes. The system is not able to draw random samples. All records that fulfil the selection criteria are included in the data set. A sampling algorithm was created. A birthday (day and month) was chosen. All males and females who had this birthday were selected (excluding citizens of Greenland and the Faeroe Islands). Year of birth was selected evenly between 1930 and 1981 to fulfil the criteria of 5 000 persons. After including 28 age groups out of 51, the final sample size was 5 192 persons. The sex ratio criterion was met. No geographical stratification could be provided. No background information was accessible for the research due to the legislation. As a consequence, some of the representativeness studies could not be performed.

The **Finnish** sample
The Population Information System in Finland, Väestötietojärjestelmä, provides samples from the population register. The source register is sorted geographically and a random sample results in a similar geographical stratification as in the basic population. Random sampling is enabled. Background variables like age, sex, municipality and language are available. The Åland islands were excluded from the sample due to the economic constraints of the survey.

The **Icelandic** sample
The Icelandic sample was drawn from the national population register in the Hagstofa Íslands. Random sampling was enabled. Year of birth was available as background information. The municipality code was reconstructed from the zip-codes.

The **Norwegian** sample
The national population register is available for research purposes but the addresses may not be exported to a foreign country for mailing. The vendor of the Norwegian sample was DM-Huset AS, which is a private company. The sample was drawn from the telephone catalogue, which claims to cover 99.5 % of the households in Norway. The geographical distribution was secured by drawing a proportional sample from each of the 20 counties of Norway in respect of the sex ratio and three age groups. The actual age of the people in the register is not available, only the respective age group, 18 - 30, 31 - 50 and 51 - 69 year-olds.

The **Swedish** sample
The National Tax Board, Riksskatteverket, keeps the population register in Sweden. A random sample cannot be drawn from it. Instead, private companies like Sema Group InfoData AB and PAR Adressregistret AB sell addresses from the same register and can also draw random samples. The Swedish addresses were bought from Sema Group Infodata. The register is called SPAR (Statliga Person- och Adress Registret). Random sampling was enabled. Sex, age and municipality and county codes were available as background variables. The sample was stratified geographically in accordance with the basic population.

3.2. Representativeness of the sample

In cases where there is a relatively low response rate, a considerable doubt is raised that the response may be biased. In model based surveys, where a sample is randomly drawn from an infinite population, the response results are generalised as estimates of the whole population. Therefore, all significant deviations between population, sample and response ought to be detected and neutralised. The representativeness was improved by calibrating the weights.

Both demographic and case specific background variables were tested. Age distribution and gender ratio imply to the quality of the sampling method. Geographical distribution has a connection to response activity. Personal interest in the topic of the research leads to overrepresentation of fishermen. Willingness-to-pay is known to be dependent on the income of the households to some extent (Mäntymaa 1997, p. 60).

The differences of age distributions and gender ratios were computed and the sample group and the response group were compared to the basic population. Mean income data were compared to official national statistics. Statistical Year Books of respective countries were consulted. The significance of the geographical response activity was tested by the chi square test.

There were clear signs of the sampling frame and the sampling method on the age distribution of the respondents (Figure 3.1.). Finland, Iceland and Sweden followed the age distribution of the population well. The sampling method is reflected in the Danish distribution, as only 28 out of 51 age groups are included in the sample. The Norwegian data is problematic. The sampling system has omitted the limiting ages of the three age intervals available. Additionally, the sample had been drawn in three equal portions. Therefore the share of 24-29 years-old respondents is very much over represented since the younger ones do not possess traditional telephones.

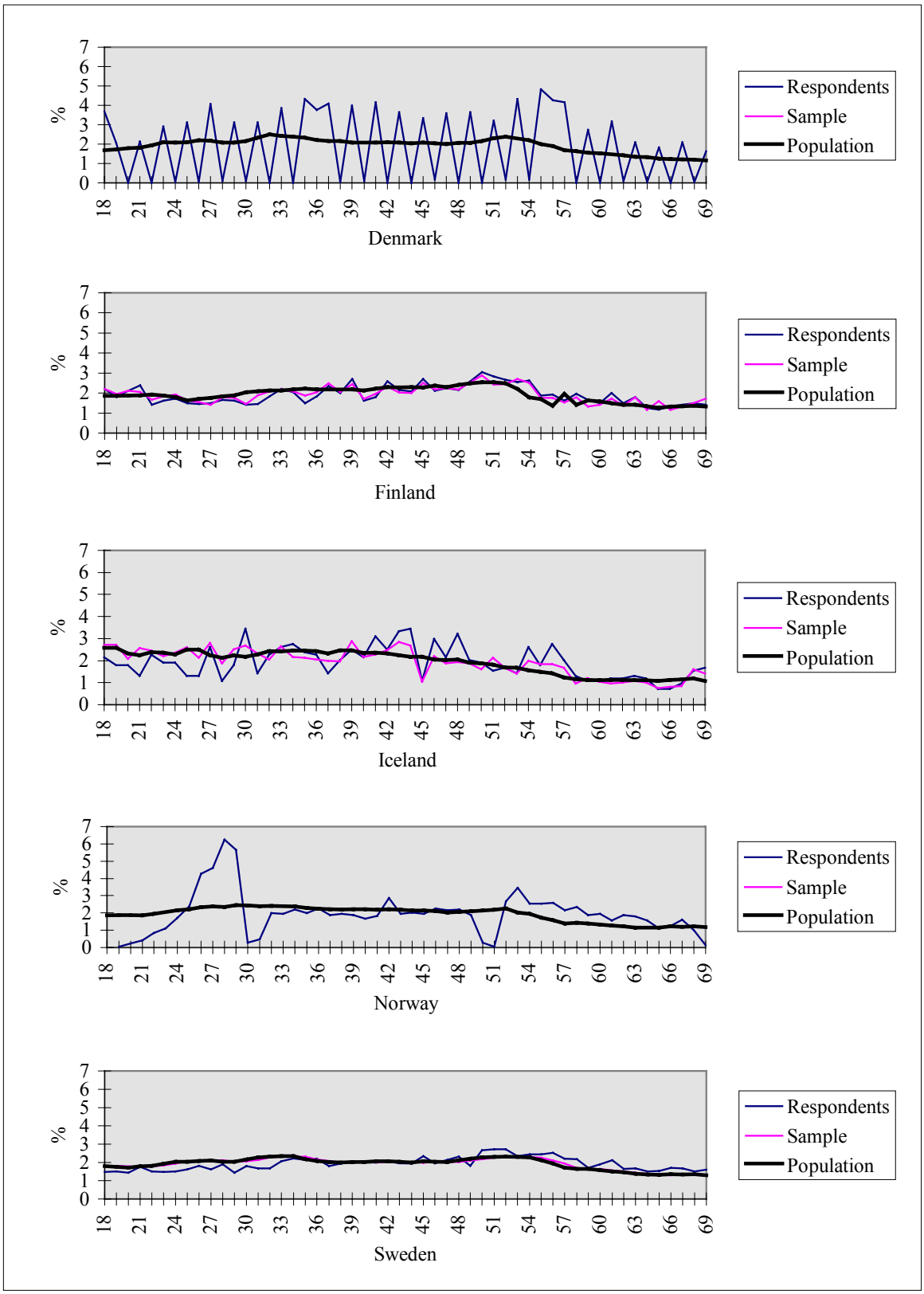

Figure 3.1. Age distributions of 18-69 years-old, population, sample and respondents.

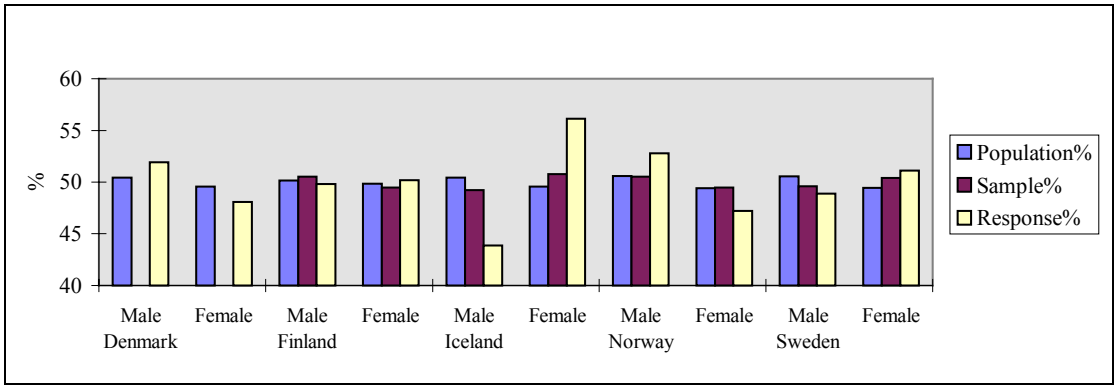

Figure 3.2. Sex distribution of 18-69 years-old, population, sample and respondents

In Iceland there is a clear over-representation of female respondents and in Norway and Denmark men are somewhat over represented (Figure 3.2.).

There is no background information available about the Danish sample because of the legislation. Therefore Denmark is not included in testing the geographical distributions. In Finland, the population, sample and respondents were divided into five counties. The response activity was significantly lower in densely populated areas like Southern and Western Finland compared to Eastern, Mid-Finland (Oulu) and Northern Finland. The same pattern also applied to Sweden. In Sweden, too, in the major statistical regions of large populations like Stockholm, Southern Sweden and Western Sweden, the response activity was significantly lower than in the other five more rural regions. The outcome is in accordance with the results obtained by Jones (1996). In Iceland, there was no difference between the response from the capital area and from other areas. In Norway, the pattern was exactly opposite to Finland and Sweden. In densely populated regions like the Oslo Fjord Area and Western Norway, the response activity was significantly higher than in other parts of Norway. This survey does not provide any reliable explanation for the difference in the Norwegian response activity.

There were quite substantial differences in the mean income data compared to the national statistics (Table 3.2.). In this respect the table can only provide very basic information because the mean income data is very much dependent on the size and structure of household. The variation is considerable both in the survey and in the statistical data.

Table 3.2. Mean annual gross income of households (national currency) in 1999.

source	Denmark	Finland	Iceland*	Norway	Sweden
respondents	414 000	191 000	1 784 000	415 000	355 000
national statistics	358 000	191 000	1 683 000	331 000	308 000
year	1996	1997	1998	1997	1997

* personal income

The differences between the share of recreational fishermen in the response as compared to the share of recreational fishermen in the population from two different sources of information are also considerable (Table 3.3.). The figures are not directly comparable. The percentages in the EIFAC report (1998) are given in relation to the total population, and in some cases probably for freshwater fishermen only. If those who have most of their fishing days by the sea are classified as saltwater fishermen and the others for freshwater fishermen, the percentages converge the EIFAC figures. The Swedish statistics refers to age group 16-74 and the Danish figures are drawn from a telephone interview covering the 18-66 year-olds. The Icelandic figure originates from Gallup Iceland's omnibus inquiry where 835 informants aged 16-75 years were interviewed by telephone in April 2000. The age group of the respondents of this survey is 18-69.

Table 3.3. Percentage of recreational fishermen in the population.

%	Denmark	Finland	Iceland	Norway	Sweden
respondents	23.0	49.5	31.9	53.2	37.2
EIFAC	4.8	42.0	-	21.4	26.5
latest statistics *	12.5	40.0	31.5	50.0	35.0
this survey sea+freshwater	7.4 + 5.1	8.4 + 31.6	7.3 + 24.2	31.1 + 18.9	14.2 + 20.8

* Source: Denmark: Bohn & Roth 1997. Finland: Official Statistics of Finland 2000. Iceland: Gallup 2000. Norway: Statistisk sentralbyrå 1999, Levekårsundersøkelsen 1997, Oslo-Kongsvinger. Sweden: Fiske 2000.

3.3. Mail survey

The details of the survey are described in Toivonen *et al.* (1999). The survey was based on three contacts according to the Total Design Method documented by Dillman (1978). First the questionnaire, a cover letter and a prepaid return mail envelope, was sent to all recipients. The second contact was a simple reminder and the third contact included the questionnaire once more.

Finland Post Ltd conducted the mailings of the survey. The return mail was directed to Finland. Nordic Printmail Ltd printed the questionnaires using the print-on-demand technique, POD. That enabled printing the recipients' names and addresses on the first page of the questionnaire and the record numbers on each page. The returned questionnaires were collected in Finland and the print house stored the answers optically.

The most serious difficulties were encountered with the export regulations of addresses drawn from the population registers in Denmark and Norway. That is why the survey was carried out nationally in Denmark. The return mail was routed to Post

Danmark. Only the data storage was made in Finland. In Norway, the problem concerning exporting the addresses was settled by using the telephone book frame. This resulted in inequality. All others except the Danes returned the questionnaires to Finland. The return mail was therefore domestic both in Denmark and Finland.

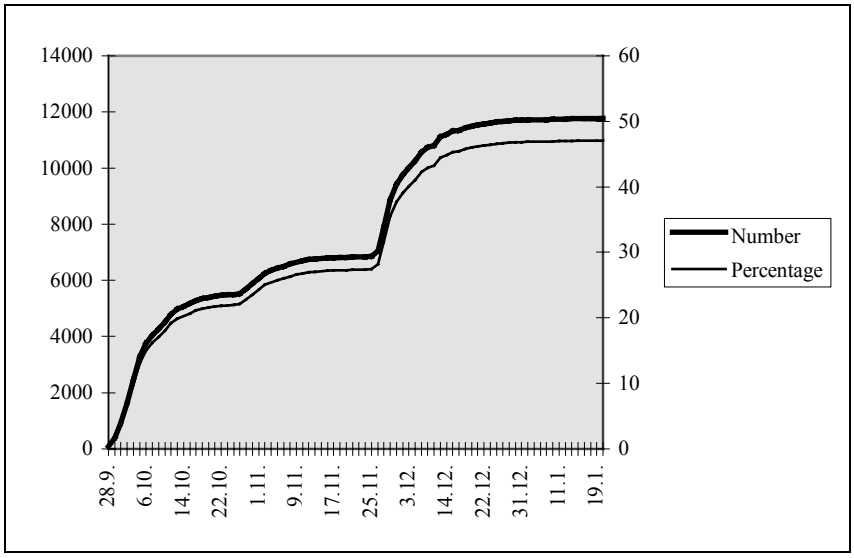

Figure 3.3. Accumulation of the response.

During the second wave it seemed obvious that the response rate would not be as high as expected (Figure 3.3). Therefore a lottery was included in the third contact to motivate the respondents. One travel gift card worth 3 500 FIM, 45 000 ISK, 4 700 NOK and 5 000 SEK was drawn among all respondents in each country. The lottery could not be arranged in Denmark because the cover letters had already been printed. The lottery eventually encouraged the respondents because the third wave was very successful.

3.4. Questionnaire

The questionnaire is in Appendix 1. The English version of the questionnaire was never used, instead it was translated into Danish, Finnish, Icelandic, Norwegian and Swedish. The questionnaire and subsequently the first and second reminder were sent out in the autumn months of 1999. The questionnaire comprised eight A4-pages of which non-fishermen were to answer only three pages. The aim of the questionnaire was to cover several major fields of interest.

The first question aimed at establishing the general personal perception of nature and relationship to outdoor recreation through four questions on a Likert type scale (Question 1: 1.1-1.4).

In the second question it was established whether the respondent fishes, any other person in the household fishes, or nobody in the household takes part in recreational fishing activities (Question 2: 2.1-2.3).

Those who fish were then asked what kind of recreational fisherman they consider themselves to be and the activity level of fishing in days and types of fishing areas. They were also asked to rank their fishing experience for the three different types of areas normally considered: coastal and sea area, rivers and lakes. This kind of stratification is normally used, as the fauna differs and so does both the access rights and property rights in most of the Nordic countries (Question 4, Question 5: 5.1-5.3, Question 6: 6.1-6.3).

Those who fish were asked to account for their fishing expenses during the last 12 months. This information is a precondition for directly establishing the net social benefits in the next question, but may also be utilised for economic impact analysis of recreational fisheries on the formal economy, i.e. income, employment and tax receipts (Question 7: 7.1-7.8).

The next five questions were the core input data for this contingent valuation survey, capturing the net social benefit or consumer surplus of present day recreational fisheries (Question 8) and establishing the use value of three different hypothetical fishing sites (Question 9, Question 10 and Question 11). The questions primarily aimed to capture differences in value of lake versus stream fisheries, rod and line versus gillnet fisheries and traditional high value targeted species versus low value target species.

The last hypothetical question aimed at establishing the total economic value for both fishermen and non-fishermen towards the present quality of recreational fishing and the present state of fish stocks (Question 12).

Questions 13-19 were included to provide personal background information on the respondents (Questions 13-19).

3.5. Data processing

The stored data was checked. Logical mistakes and storage errors were corrected after running basic statistics. The multiple bounded discrete choice tables (questions 9-12) which were not completely filled or had several ticks on the same row were corrected, question 12 for every respondent, questions 9-11 for fishermen only. A SAS code that filled the empty rows and checked multiple ticks was written. It always chose the most negative choice for the confidence level, not to overestimate the WTP. For example, if there was only one tick in the whole table (which was very usual), say somebody had only ticked “I would almost definitely pay” for 700 and nothing else. Our loop would give “I would almost definitely pay” to all smaller amounts and “I would definitely not pay” to all bigger amounts.

When calculating the descriptive estimates, classical weighting was applied (Cochran 1977). The basic weight in each country was calculated by post stratifying the response into six strata: three age groups following the Norwegian sample (18-30, 31-50, 51-69) and gender groups within the age groups. The total number of people in the respective age and gender group was drawn from SAB (1999). The basic weight was the ratio of population / respondents. Any survey will attract more respondents who consider the subject personally interesting (Dalecki & al. 1993). Over representation of fishermen in the response was corrected with calibration. The basic weight was calibrated to return the participation percentage of recreational fishermen in each country according to the latest statistics (see Table 3.3.) (van Goor and Stuiver 1998). By calibrating the weights, no assumptions on the non-respondents were considered necessary.

Table 3.4. Properties of the weights.

	n	Mean	Min	Max
Denmark	2 376	1 516	641	2 042
Finland	2 550	1 364	951	1 832
Iceland	840	209	148	303
Norway	2 182	1 327	582	9 153
Sweden	3 456	1 665	1 225	2 410

Confidence limits were calculated for the monetary estimates. Standard errors of means were multiplied by 1.96 to obtain the 95 % confidence limits. Estimates for willingness-to-pay WTP from the scenarios in questions 9 - 12 were calculated by three different methods. Means were computed from the open ended OE questions by SAS proc means. The multiple bounded discrete choice MBDC questions were processed in two methods. Means were drawn from the maximum WTPs of first and second certainty levels (“I would certainly pay”, “I would almost certainly pay”) including zero bids from the equivalent open ended question. Means were also calculated according to Welsh and Poe (1998) from the first and second certainty level MBDC tables using SAS proc logit where

$$\log \text{mean} = -(\log(1 + e^{\text{intercep}}) / \text{bid}).$$

The probability distributions of willingness-to-pay for the different monetary bids of the MBDC tables (Appendix 2) were drawn for maximums of the first and second certainty level. The diagrams show how fast or slow the respondents' willingness to pay fade away as the bid increases.

The issue of zero willingness to pay is twofold. Motives for not wanting to pay anything can be divided into protests and other motives (Söderqvist 1998). True zero willingness to pay consists of those who do not feel the offered scenario is worth paying anything for, or who have a budget constraint that does not allow them to pay. All others are protesters. The protesters were analysed from the questionnaires. We have taken the conservative approach of including the protest answers when calculating mean WTP. Since these respondents state zero WTP to protest the CV

scenario, they could have a real WTP for the improvement in recreational fisheries and fish stocks larger than zero. Thus , including them as zeros will lead to underestimation of mean WTP. Excluding the protest answers means that we would have implicitly assumed the protesters to have a mean WTP equal to the rest of our sample. Such a procedure could lead to both under- or overestimation. With the approach we have chosen, we know that we get an underestimate of stated WTP.

4. Results and discussion

The main results of the survey are given in the following tables. The respective question number is given in the table title in parenthesis and the questionnaire is in Appendix 1. The English version of the questionnaire was never used, instead it was translated into Danish, Finnish, Icelandic, Norwegian and Swedish. The results were computed by weighting each value with a weight that is specific to each respondent. Each respondent represents several persons depending on the country, sex, age and participation in recreational fisheries (see Chapter 3.5. Data processing). The number of observations, n, that the result is based on, is given in the tables. The estimates are usually given with the precision of three significant numbers.

4.1. Recreational fisheries in the Nordic countries

Table 4.1. The whole population's attitude towards nature and outdoor recreation. (Question 1)

%		n	Fully agree	Somewhat agree	Somewhat disagree	Fully disagree	Don't know	
I like outdoor recreation	Denmark	2 344	78	18	2	1	1	100
	Finland	2 509	77	18	3	1	1	100
	Iceland	811	53	37	7	2	1	100
	Norway	2 165	73	23	2	1	1	100
	Sweden	3 406	66	30	3	1	0	100
Nature and environ-ment are important issues to me								
	Denmark	2 342	80	18	1	1	0	100
	Finland	2 512	84	14	1	0	1	100
	Iceland	819	75	23	2	0	0	100
	Norway	2 126	71	26	3	1	0	100
	Sweden	3 412	75	22	2	1	0	100
I prefer to do things other than outdoor recreation during my free time								
	Denmark	2 272	6	29	36	27	2	100
	Finland	2 458	7	20	45	27	1	100
	Iceland	783	7	16	37	36	4	100
	Norway	2 050	8	41	31	19	1	100
	Sweden	3 344	8	49	21	21	1	100
Man can be well off without ever going out to the nature								
	Denmark	2 287	7	16	20	54	3	100
	Finland	2 458	4	7	19	68	2	100
	Iceland	786	4	7	16	72	1	100
	Norway	2 093	9	21	26	41	3	100
	Sweden	3 339	2	5	12	80	1	100

Peoples' personal attitudes towards nature and outdoor recreation seem to be very similar in the Nordic countries in general (Table 4.1). The Danes and the Finns state very clearly that they like outdoor recreation while the Icelanders are somewhat more doubtful than the others. The outcome probably reflects the climatological differences. In Norway in particular, other forms of recreation compete with outdoor life. The Swedes consider nature as an inevitable part of their life while a part of the Norwegians could be fairly well off without ever going out to the nature.

Table 4.2. Percentage of recreational fishermen by country (participation percentage). (Question 2)

%	n	Recreational fishermen	Non-fishermen		
		% of 18-69 years old population (statistics)	Somebody else in the family fishes	Nobody in the family fishes	
Denmark	2 376	12.5	14.5	73.0	100
Finland	2 550	40.0	17.5	42.5	100
Iceland	840	31.5	17.5	51.0	100
Norway	2 182	50.0	15.3	34.7	100
Sweden	3 456	35.0	18.6	46.4	100

The data has been calibrated to correspond to the true participation percentage (Table 4.2.). In Denmark and Finland there was a clear over-representation of recreational fishermen among the respondents. A considerable part of the non-fishing population has a living contact with recreational fisheries through a fishing family member.

Table 4.3. Categories of recreational fishermen. (Question 3)

%	n	Sports fishermen	Household fishermen	Generalists	Occasional anglers	
Denmark	546	13	4	7	76	100
Finland	1 263	20	13	11	56	100
Iceland	268	38	4	11	47	100
Norway	1 161	25	5	14	56	100
Sweden	1 286	81	5	14	-	100

Categories of recreational fishermen were stratified by the fishing gear used (Table 4.3.). Sports fishermen mainly use spinning rods, household fishermen mainly use nets and other standing gear and generalists use all sorts of gear available. A category of occasional anglers was introduced to encourage those respondents who find it hard to consider themselves fishermen at all due to very sporadic participation. The Swedes are, however, aware of being sports fishermen (using rod and line only) regardless of the frequency and therefore this category was not applied to Sweden. If the percentages of occasional anglers are summed up with sports fishermen, the level is very similar in all countries. There are more household fishermen in Finland than in the other countries. In Iceland the percentage of sports fishermen is relatively high.

Table 4.4.1. Number of recreational fishermen (age group 18-69) and fishermen who do ice fishing. (Questions 2 and 4)

Persons	n	Recreational fishermen	n	Recreational ice fishermen
Denmark	546	451 000	23	18 000
Finland	1 263	1 390 000	575	632 000
Iceland	268	55 000	28	6 000
Norway	1 161	1 450 000	215	263 000
Sweden	1 286	2 020 000	454	710 000
Total	4 524	5 360 000	1 295	1 630 000

Note: The Danish figure for total recreational ice fishermen indicate a different perception of ice-fishing than intended. They may have included all fishing on days when ice was present in Danish waters and not the actual ice fishing method where fish are caught through a drilled hole in the ice.

Table 4.4.2. Number of annual fishing days of recreational fishermen (age group 18-69) by country. Ice fishing days are included in the recreational fishing days. (Question 4)

Days	n	Recreational fishing days Mean	Recreational fishing days Estimated sum	n	Recreational ice fishing days Mean	Recreational ice fishing days Estimated sum
Denmark	546	12.1	5 440 000	546	0.1	44 000
Finland	1 263	18.8	26 200 000	1 263	3.7	5 120 000
Iceland	268	7.9	436 000	268	0.2	12 000
Norway	1 161	12.9	18 700 000	1 161	0.9	1 350 000
Sweden	1 286	13.2	26 700 000	1 286	2.2	4 470 000
Total	4 524	14.4	77 400 000	4 524	2.1	11 000 000

In Denmark the estimate of recreational fishermen (18-66 years-old) in 1996 was 425 000 (Bohn & Roth 1997) which is very close to 451 000 (18-69 years-old) (Table 4.4.1). Number of recreational fishermen (Table 4.4.1) and number of fishing days (Table 4.4.2) give lower figures than the official statistics in Finland and in Sweden. In Finland 2.1 million fishermen (OSF 2000) against 1.39 million is explained by the research unit (household / personal) and age group (all / 18-69). The same goes for Sweden where 2.8 million people aged 16-74 (Fiske 2000) fish against 2.02 million aged 18-69. The number of fishing days for all Finns is 39.3 million (OSF 1998b) against 26.2 million for the age group of 18-69 and for the Swedes 35.4 million (Fiske 2000) against 26.7 million for the age group of 18-69. The number of fishing days in Denmark was estimated to be 5 million in 1996 (Bohn & Roth 1997) compared to 5.44 million in 1999. Most of the total of 77.4 million fishing days (about 71.6 million days) are spent in Sweden, Finland and Norway.

In all the Nordic countries there are more than 5 million recreational fishermen in the age group of 18-69 and 1.63 million of those go ice fishing. The keenest fishermen are those in Finland where recreational fishermen spend on average nearly 19 days fishing for recreation annually. Ice fishing is popular in Finland where fishermen spend on

average close to four days ice fishing. The number of ice fishing days in Denmark seems biased. The figure is based on 23 respondents only and they may have misunderstood the question since the concept of ice fishing is rare in Denmark.

Table 4.4.3. Total number of fishing days by category of fishermen. (Questions 3 and 4)

Days	n	Sports fishermen	Household fishermen	Generalists	Occasional anglers	Total
Denmark	546	1 210 000	508 000	839 000	2 880 000	5 440 000
Finland	1 263	7 570 000	5 990 000	6 290 000	6 320 000	26 200 000
Iceland	268	229 000	12 000	95 000	100 000	436 000
Norway	1 161	7 690 000	1 300 000	4 090 000	5 630 000	18 700 000
Sweden	1 286	20 000 000	1 010 000	5 800 000	-	26 700 000

Table 4.4.4. Mean number of fishing days by category of fishermen. (Questions 3 and 4)

Days	n	Sports fishermen	Household fishermen	Generalists	Occasional anglers
Denmark	546	21.0	28.4	27.4	8.4
Finland	1 263	27.3	33.7	41.0	8.1
Iceland	268	10.8	5.8	15.6	3.9
Norway	1 161	21.1	16.9	20.2	7.0
Sweden	1 286	12.1	10.7	20.4	-
Total	4 524	15.5	23.9	25.3	7.6

In Denmark half of the fishing days are gathered by occasional anglers (Table 4.4.3.). In Finland the distribution is very even between the categories. In Iceland sports fishermen outnumber the fishing days of the other categories and in Norway, too, the biggest share of fishing days is spent by the sports fishermen. The Swedish figure is not directly comparable because of the stratification. The mean number of fishing days of occasional anglers is significantly lower than in the other categories, except in Iceland where household fishermen also have a very low mean number of fishing days (Table 4.4.4.). The generalists seem to be very active fishermen in every country as they spend more days fishing than the other categories do except in Norway. The total percentages imply that occasional anglers can also be distinguished by the frequency of their activity. The Nordic mean fishing days would have been more even between the rest of the categories if Sweden would not be included (sports fishermen 23.1, household fishermen 28.5 and generalists 28.9 fishing days). The all-over Nordic mean of annual recreational fishing days is 14.4.

In Norway and Denmark coast or sea is the most common fishing site while in the other countries most of the fishing days are spent on lakes (Table 4.5.). The percentage of Danish salt water angling days, 48 %, is the same as in the 1996 survey (Bohn & Roth 1997). In Denmark and Norway the prevailing practice best corresponds to the preferences of the fishermen (Table 4.6.). In Denmark in particular, the coastline is easier accessible and less costly for a fishing site than lakes or rivers in general. In Iceland the fishermen would more often prefer rivers for their fishing site but will have

to settle with lakes. The reason for the discrepancy probably lies in the difference of the licence fees.

Table 4.5. Type of fishing area, % of fishing days spent at different sites. (Question 5)

%	n	Sea or coast	River	Lake	
Denmark	546	48	27	25	100
Finland	1 263	20	15	65	100
Iceland	268	13	39	48	100
Norway	1 161	56	18	26	100
Sweden	1 286	33	21	46	100

Table 4.6. Ranking of fishing area types according to the preferences of fishermen. (Question 6)

%	n	1. Sea 2. River 3. Lake	1. Sea 2. Lake 3. River	1. River 2. Sea 3. Lake	1. River 2. Lake 3. Sea	1. Lake 2. Sea 3. River	1. Lake 2. River 3. Sea	
Denmark	390	25	24	12	12	12	15	100
Finland	1 026	8	16	4	14	18	40	100
Iceland	209	5	3	11	50	5	26	100
Norway	816	19	32	9	15	12	13	100
Sweden	1 056	18	20	7	19	12	24	100

4.2. Economic value of recreational fisheries

The estimates of the monetary variables are presented in the following tables. The reliability of the estimates can be judged with confidence limits. The 95 % confidence limits are given in percentages. The upper limit is the estimate plus the percentage and the lower limit is the estimate minus the percentage. In 95 cases out of 100, the real value hits between the lower and the upper limit. For example, the mean annual expenditure of the Swedish recreational fisherman is 1 470 SEK and the confidence limit is ± 13%. The probability is 95 % that the mean expenditure is between 1 280 and 1 664 SEK.

The calculation of the estimates is based on weights. The multiplication of n and the mean does not provide the estimate, because each n represents different numbers of persons in the whole population.

The figures are given in national currencies. Comparison between countries is possible using either direct exchange rates or purchasing power parities (PPP). Since exchange rates do not reflect the relative prices of goods and services purchased by consumers in each country, the use of purchasing power parities is preferred. PPPs eliminate the differences in price levels between countries. The USD serves as the index currency. For example, if a bottle of Coke costs 19.20 NOK in Norway and 2 USD in the United

States, the purchasing power parity is 19.20 / 2 = 9.60 between USD and NOK. Likewise, 1 170 DKK spent in Denmark means 1 170 / 8.65 = 135 USD spent in the United States.

Table 4.7.0. Purchasing Power Parities (PPP) for Gross Domestic Production (GDP) in 1999.

	Denmark	Finland	Iceland	Norway	Sweden
USD	8.65	6.09	85.7	9.60	9.70

Source: http://www.oecd.org

Table 4.7.1. Total annual fishing expenditures in national currencies, excluding long-lasting equipment like fishing tackle and boats. (Question 7)

Money national currency	n	Money spent on recreational fishing	95 % confidence limit	Money annually spent on recreational fishing
		Mean / fisherman	%	Estimated total
Denmark DKK	534	1 170	± 26	517 000 000
Finland FIM	1 183	930	± 11	1 220 000 000
Iceland ISK	262	35 900	± 18	1 950 000 000
Norway NOK	1 108	1 340	± 9	1 850 000 000
Sweden SEK	1 179	1 470	± 13	2 730 000 000

The money that recreational fishermen spend on their hobby includes both variable costs and investments. This survey only measures the variable costs because the definition as allocation of the investments as annual costs for recreational fisheries is difficult. It was anticipated that the respondents would not interpret the costs of their investments consistently. In comparing the estimated totals, 1.22 million FIM in Finland (Table 4.7.1) versus 1.28 million FIM in the statistics (OSF 1998a), the result can once again be explained by the research unit (household / personal) and age group (all / 18-69). Additionally, the 1.28 million FIM also included investments like fishing tackle and boats. The estimated total of 2.73 million SEK in Sweden against the 3.34 million SEK of the Fiske 2000 survey seems to be comparable considering the smaller age group (18-69 / 16-74). This survey did not include investments which the Fiske 2000 survey did. The detailed expenses are polarized to transportation and licences (Table 4.7.2). In Iceland the major cost comes from licences whereas in the other countries the fishing hobbyist suffers most from high transportation costs.

Table 4.7.2. Percentage distribution of detailed fishing expenditures. (Question 7)

%	Denmark	Finland	Iceland	Norway	Sweden
n	546	1 263	268	1 161	1 286
Automobile transportation	27	35	25	30	39
Boating	17	19	3	22	17
Other transportation	13	3	1	4	6
Lodging	8	8	8	8	13
Licences	20	15	43	12	13
Journals, books, films	4	3	2	4	3
Extra food and drinks	8	13	15	16	5
Other (no tackle, clothes etc.)	3	3	3	3	4
	100	100	100	100	100

Table 4.7.3. Actual mean annual expenditure by different segments of recreational fishermen. (Questions 3 and 7)

Money national currency	n	Sports fishermen	Household fishermen	Generalists	Occasional anglers
Denmark DKK	534	2 650	1 790	3 040	732
Finland FIM	1 183	1 720	904	2 090	412
Iceland ISK	262	62 900	15 600	24 000	17 400
Norway NOK	1 108	2 060	2 000	2 050	760
Sweden SEK	1 179	1 400	1 510	1 910	-

In Denmark, Finland and Norway occasional anglers spend the least money on their hobby (Table 4.7.3). On the other hand, they are the majority so their contribution to the total amounts is considerable. In Denmark, Finland and Sweden it is the generalists who show the highest variable costs per person. The high price of licences is reflected in the expenses of sports fishermen in Iceland. In Norway the spendings are very uniform in all other groups but the occasional anglers. In Sweden the differences between the groups are not pronounced either. The generalists really seem to invest in their hobby. They spend a lot of time fishing and use money on it, too.

Table 4.8.1. Willingness to pay for the same fishing experiences in addition to the true expenditures in national currencies. (Question 8)

Money national currency	n	Willingness to pay in addition	95 % confidence limit	Willingness to pay in addition
		Mean / fisherman	%	Estimated total
Denmark DKK	484	616	± 27	248 000 000
Finland FIM	1 013	446	± 11	501 000 000
Iceland ISK	237	12 000	± 23	591 000 000
Norway NOK	1 026	791	± 13	1 021 000 000
Sweden SEK	1 192	548	± 21	1 025 000 000

The estimated total of additional willingness to pay for the same experience over and above the actual total costs (Table 4.7.1) is as follows, Denmark 48 %, Finland 41 %, Iceland 30 %, Norway 55 % and Sweden 38 % (Table 4.8.1.). The relatively lower net social benefit of Icelandic recreational fishermen may be explained by the price formation on privately owned fishing sites. Prices, i.e. licence fees paid by anglers, are set in a competitive market and it is possible to segment the market (price each fishing site separately) and thereby capture a larger part of the consumer surplus. This strictly market-based price determination is most pronounced in Iceland and is therefore clearly supported by the finding of relatively lower net social benefits of recreational fishing in Iceland compared to the other Nordic countries (Roth et al 2000).

Table 4.8.2. Mean additional willingness to pay (net social benefit) for recreational fisheries by different segments of recreational fishermen. (Questions 3 and 8)

Money national currency	n	Sports fishermen	Household fishermen	Generalists	Occasional anglers
Denmark DKK	484	1 320	222	1 360	459
Finland FIM	1 013	817	359	748	262
Iceland ISK	237	16 000	9 140	15 200	8 240
Norway NOK	1 026	1 240	1 150	1 140	462
Sweden SEK	1 192	522	194	814	-

Sports fishermen and generalists have the strongest willingness to pay more for their fishing in every country (Table 4.8.2.). Thereby their net social benefit is highest. The household fishermen in Denmark and Sweden are least willing to pay i.e. gain the lowest net social benefit. The occasional anglers are the least willing to pay in Finland, Iceland and in Norway.

In Denmark it is the occasional anglers who spend the most on recreational fisheries and have the highest net social benefit, too (Table 4.8.3.). In Finland, Iceland and Norway the pattern is similar, the sports fishermen are the primary and the occasional anglers are the second important group economically.

Table 4.8.3. Percentages of actual expenditures and additional willingness to pay by different segments of recreational fishermen. (Questions 3, 7 and 8)

%	Percentages of estimated total	
	Actual expenditure	Additional WTP
Denmark		
Sports fishermen	29	27
Household fishermen	5	1
Generalists	16	14
Occasional anglers	51	57
	100	100
Finland		
Sports fishermen	38	38
Household fishermen	11	9
Generalists	24	20
Occasional anglers	27	33
	100	100
Iceland		
Sports fishermen	65	52
Household fishermen	2	3
Generalists	9	13
Occasional anglers	25	33
	100	100
Norway		
Sports fishermen	39	40
Household fishermen	7	7
Generalists	22	21
Occasional anglers	32	32
	100	100
Sweden		
Sports fishermen	77	77
Household fishermen	4	2
Generalists	19	21
	100	100

For eliciting the willingness to pay for different types of fishing sites three scenarios were designed (Questions 9, 10 and 11). In presenting the scenarios to the respondents, there were minor differences between the countries (Table 4.9.0.). The scenario in question number 9, i.e. a good quality stream with salmon and sea trout, was identical in each country. The scenario in question number 10, i.e. a good quality lake with perch, pike and pike-perch, included gillnet fishing in Finland. In Iceland pike, perch and pike-perch do not exist, so therefore the scenario was left unanswered by the majority of fishermen and was thus excluded from the results. The scenario number 11, i.e. a good quality lake with brown trout and arctic char, included gillnet fishing in Denmark and grayling as a target species in Denmark and Finland.

Table 4.9.0. Principle components of fishing site scenarios.

	Question 9	Question 10	Question 11
Site	Stream	Lake	Lake
Species	Salmon Sea trout	Pike Perch Pike-perch	Brown trout Arctic char Grayling (Denmark, Finland)
Tackle	Rod and line	Rod and line Gillnet (Finland)	Rod and line Gillnet (Denmark, Sweden)

When the respondents were asked to state their willingness to pay for the scenarios, the WTP was allowed to be given in a Multiple Bounded Discrete Choice (MBDC) table with a certainty level for each bid and / or by answering an open ended question. The estimated means from the MBDC tables were computed using the highest value that the respondents gave as 'would certainly pay' (first certainty level) or 'would almost certainly pay' (second certainty level). In general, the open ended question was found to generate higher means than the MBDC tables which is in accordance to what Welsh and Poe (1998) found. Within the MBDC tables the first and second level maxims generally gave a higher means with a simple proc means procedure than with the proc logistic model.

Zero willingness to pay can be either true zero willingness to pay or a protest. The zero WTP answers were analyzed but the possible protestors were not excluded from the figures. The reason for the decision was due to the fact that there will always be protestors in the population and the final mean willingness to pay will be lower due to the protestors in real life, too.

Table 4.9. Recreational fishermen's annual willingness to pay for an exclusive fishing right to a good quality stream with salmon and sea trout. (Question 9)

Money	Multiple bounded discrete choice question				Open-ended question		
national currency	n	WTP-PM*	95% cl	WTP-PL**	n	WTP-PM*	95% cl
		Mean	%	Mean		Mean	%
Denmark DKK	493	809	± 16	550	514	921	± 17
Finland FIM	1 161	364	± 9	280	1 187	415	± 10
Iceland ISK	245	29 700	± 18	20 800	244	33 100	± 14
Norway NOK	1 049	873	± 10	528	1 080	902	± 11
Sweden SEK	1 145	742	± 9	514	1 169	639	± 8

* means produced by SAS proc means
** means produced by SAS proc logistic

A good quality river with salmon and sea trout (Table 4.9) elicited a willingness to pay that was higher than the additional WTP for the whole year's experience (Table 4.8.1.) in all other countries but in Finland. A good quality stream is valued highly in Iceland.

The mean bid was nearly tripled compared to the additional WTP of the whole year's experience.

Table 4.10. Recreational fishermen's annual willingness to pay for an exclusive fishing right to a good quality lake with perch, pike and pike-perch. (Question 10)

Money	Multiple bounded discrete choice question				Open-ended question		
national currency	n	WTP-PM*	95% cl	WTP-PL**	n	WTP-PM*	95% cl
		Mean	%	Mean		Mean	%
Denmark DKK	484	648	± 15	438	506	734	± 22
Finland FIM	1 158	364	± 9	282	1 166	359	± 9
Iceland ISK		-		-		-	
Norway NOK	1 011	535	± 10	338	1 063	544	± 10
Sweden SEK	1 147	511	± 8	408	1 179	457	± 8

* means produced by SAS proc means
** means produced by SAS proc logistic

Table 4.11. Recreational fishermen's annual willingness to pay for an exclusive fishing right to a good quality lake with grayling, brown trout and arctic char. (Question 11)

Money	Multiple bounded discrete choice question				Open-ended question		
national currency	n	WTP-PM*	95% cl	WTP-PL**	n	WTP-PM*	95% cl
		Mean	%	Mean		Mean	%
Denmark DKK	470	889	± 17	498	490	860	± 21
Finland FIM	1 136	423	± 8	304	1 121	422	± 9
Iceland ISK	234	22 000	± 16	16 000	229	21 500	± 16
Norway NOK	1 021	860	± 9	598	1 021	875	± 9
Sweden SEK	1 130	730	± 10	509	1 102	634	± 8

* means produced by SAS proc means
** means produced by SAS proc logistic

The salmon and sea trout river (Scenario 9) was valued highest among the three fishing site scenarios (Tables 4.9, 4.10 and 4.11) in all other countries but Finland where a typical arctic lake (Scenario 11) was valued highest. A typical Nordic lake (elsewhere but in Iceland), a lake with perch, pike and pike-perch (Scenario 10), was valued lowest but still reasonably highly.

The fourth scenario (Scenario 12) dealt with preserving the current natural fish stocks and current quality level of recreational fisheries. It was directed to all respondents. The payment vehicle in the scenario was taxation. This awoke extra protesting. The protest zeroes were, however, included in the estimates.

Table 4.12.1. Population's (recreational fishermen and non-fishermen) annual willingness to pay for preserving the current natural fish stocks and current quality of recreational fishing. (Question 12)

Money	Multiple bounded discrete choice question				Open ended question			
national currency	n	WTP-PM*	95% cl	WTP-PL**	n	WTP-PM*	95% cl	WTP
		Mean	± %	Mean		Mean	± %	Estimated total (millions)
Denmark DKK	2 007	1 080	10	535	1 897	751	11	2 140
Finland FIM	2 233	327	8	211	2 163	329	8	967
Iceland ISK	704	13 200	18	5 770	725	12 700	25	1 950
Norway NOK	1 880	699	9	436	1 930	682	9	1 750
Sweden SEK	2 928	614	7	358	2 935	510	8	2 500

* means produced by SAS proc means
** means produced by SAS proc logistic

Table 4.12.2. Recreational fishermen's annual willingness to pay for preserving the current natural fish stocks and current quality of recreational fishing. (Question 12)

Money	Multiple bounded discrete choice question				Open ended question			
national currency	n	WTP-PM*	95% cl	WTP-PL**	n	WTP-PM*	95% cl	WTP
		Mean	± %	Mean		Mean	± %	Estimated total (millions)
Denmark DKK	482	1 470	18	732	464	1 280	22	494
Finland FIM	1 135	401	9	275	1 105	388	9	474
Iceland ISK	239	14 700	21	9 150	233	15 500	22	755
Norway NOK	1 007	791	11	505	1 037	765	11	988
Sweden SEK	1 122	786	12	472	1 124	623	12	1 100

* means produced by SAS proc means
** means produced by SAS proc logistic

Recreational fishermen's mean WTP (Table 4.12.2) is expectedly higher than the whole population's (18-69 years-old) WTP (Table 4.12.1.). Fishermen may see potential use value in the fish stocks. The aim of question 12 was to capture the non-use value of recreational fisheries of both fishermen and non-fishermen. If we compare recreational fishermen's annual willingness to pay for preserving the current natural fish stocks and current quality of recreational fishing (Table 4.12.2.) to recreational fishermen's willingness to pay for their fishing experiences over and above the actual expenditures (Table 4.8.1.), we cannot deduct from the results whether the recreational fishermen have perceived question 12 as it was intended. In Denmark the fishermen's WTP for preserving the current natural fish stocks and current quality of recreational fishing is 199 % of the WTP for their fishing experiences over and above the actual expenditures. In Iceland the respective figure is 128 %. In the other countries, fishermen's WTP for

preserving the current natural fish stocks and current quality of recreational fishing is about the same as WTP for their fishing experiences over and above the actual expenditures, Finland 95 %, Norway 97 % and Sweden 107 %.

Table 4.12.3. Non-fishermen's annual willingness to pay for preserving the current natural fish stocks and current quality of recreational fishing. (Question 12)

Money	Multiple bounded discrete choice question				Open ended question			
national currency	n	WTP-PM*	95% cl	WTP-PL**	n	WTP-PM*	95% cl	WTP
		Mean	± %	Mean		Mean	± %	Estimated total (millions)
Denmark DKK	1 525	1 025	11	512	1 433	668	12	1 650
Finland FIM	1 098	275	13	177	1 058	287	14	493
Iceland ISK	465	12 400	26	4 570	492	11 400	39	1 190
Norway NOK	873	605	14	377	893	598	13	761
Sweden SEK	1 806	518	9	307	1 811	447	10	1 400

* means produced by SAS proc means
** means produced by SAS proc logistic

Table 4.12.4. Non-fishermen's with "somebody else in the family fishing" annual willingness to pay for preserving the current natural fish stocks and current quality of recreational fishing. (Question 12)

Money	Multiple bounded discrete choice question				Open ended question			
national currency	n	WTP-PM*	95% cl	WTP-PL**	n	WTP-PM*	95% cl	WTP
		Mean	± %	Mean		Mean	± %	Estimated total (millions)
Denmark DKK	267	851	24	482	254	554	19	248
Finland FIM	331	277	24	192	320	277	19	145
Iceland ISK	136	11 400	33	6 440	129	8 620	27	229
Norway NOK	269	663	28	429	270	595	19	234
Sweden SEK	541	485	14	334	528	510	21	467

* means produced by SAS proc means
** means produced by SAS proc logistic

The non-fishermen's mean WTP (Table 4.12.3) is more than half of the fishermen's mean WTP in every country. Whether the non-fishermen have a close contact or not to recreational fisheries through a fishing family member does not seem to have an effect on the mean WTP (Tables 4.12.4. and 4.12.5.). On the contrary, if there is a fishing family member the WTP is lower in all other countries but in Sweden, than if there is no fishing family member.

Table 4.12.5. Non-fishermen's with "nobody in the family fishing" annual willingness to pay for preserving the current natural fish stocks and current quality of recreational fishing. (Question 12)

Money	Multiple bounded discrete choice question				Open ended question			
national currency	n	WTP-PM*	95% cl	WTP-PL**	n	WTP-PM*	95% cl	WTP
		Mean	± %	Mean		Mean	± %	Estimated total (millions)
Denmark DKK	1 258	1 063	12	519	1 179	693	14	1 400
Finland FIM	767	274	15	170	738	291	18	348
Iceland ISK	329	12 800	33	4 000	363	12 400	48	963
Norway NOK	604	578	16	355	623	600	16	527
Sweden SEK	1 265	532	12	296	1 283	421	11	935

* means produced by SAS proc means
** means produced by SAS proc logistic

Figures in Appendix 2. illustrate the probability that a certain group will pay the bid from the scale. Note that the scales are in national currencies and not linear so the countries cannot be compared to each other.

The total economic value, TEV, has been calculated in two ways (Table 4.12.6.). One estimate is drawn from the sum of fishermen's use value (column 1) and the non-fishermen's non-use value (column 2), willingness-to-pay for preservation of natural fish stocks and present quality of recreational fishing. The other approach is to compare the latter estimate with the willingness-to-pay (column 4) for preservation of natural fish stocks and present quality of recreational fishing for the whole population, fishermen included. Both of these estimates for TEV are underestimates. The figures in column (3) do not include fishermen's non-use value at all and the figures in column (4) do not include fishermen's use value, at least not all of it.

The figures in columns (3) and (4) (Table 4.12.6.) come relatively close to one another. The use value of the fishermen and the non-use value of the non-fishermen, the value that the whole population including fishermen and non-fishermen puts on the current state of fish stocks and current quality of recreational fisheries (Table 4.12.6. column 4), compared to the actual expenditures of recreational fishermen (Table 4.7.1.) is as follows: Denmark 415 %, Finland 79 %, Iceland 100 %, Norway 95 % and Sweden 92 %.

Table 4.12.6. Total economic value of recreational fisheries, two estimates. When CVM analysis is used 'Total economic value' measures only 'Net social benefit' and excludes the 'Actual expenditures'. (Questions 8 and 12)

Money millions, national currency	Use value (1) (millions) Fishermen's extra WTP for their fishing experience	Non-use value (2) (millions) Non-fishermen's WTP for current state of fish stocks and current quality of recreational fisheries	Total economic value (3)=(1)+(2) (millions)	Total economic value (4) (millions) Fishermen's and non-fishermen's WTP for current state of fish stocks and current quality of recreational fisheries
Denmark DKK	248	1 650	1 900	2 150
Finland FIM	501	493	994	967
Iceland ISK	591	1 190	1 780	1 950
Norway NOK	1 020	761	1 780	1 750
Sweden SEK	1 030	1 400	2 430	2 500

4.3. Socio-economic background variables of the respondents

The age distribution of the population, sample and respondents is presented in connection with the representativeness of the data (see Figure 3.1.). The mean age of fishermen lies between 40 and 42 and that of non-fishermen between 40 and 43 in all countries (Table 4.13).

Table 4.13. Mean age of fishermen and non-fishermen (Question 13)

Years	n	Fishermen	n	Non-fishermen
Denmark	541	40	1 799	42
Finland	1 263	42	1 287	42
Iceland	268	40	572	40
Norway	1 157	40	1 014	42
Sweden	1 286	41	2 170	43

Table 4.14. Sex distribution of recreational fishermen. (Question 14)

%	n	Males	Females	
Denmark	544	79	21	100
Finland	1 263	65	35	100
Iceland	268	75	25	100
Norway	1 161	64	36	100
Sweden	1 286	71	29	100

Recreational fishery is a male dominated hobby. In Finland and Norway, though, one third of fishermen are female (Table 4.14). Fishermen tend to be family people, since the family size is just somewhat larger in fishermen's households than generally (Table 4.15). There is a fisherman in every household except in Denmark where there is a fisherman in every second household on average (Table 4.16). Additionally, fishermanship seems to run in the family: there are close to two fishermen in every fisherman's household.

Table 4.15. Mean number of persons in the household. (Question 15)

Persons	All households		Fishermen's households	
	n	Mean	n	Mean
Denmark	2 335	2.72	538	2.92
Finland	2 491	2.66	1 241	2.71
Iceland	832	3.36	267	3.47
Norway	2 152	2.73	1 149	2.91
Sweden	3 420	2.74	1 278	2.85

Table 4.16. Mean number of fishermen (persons who have fishing as a hobby) in the household. (Question 16)

Persons	All households		Fishermen's households	
	n	Mean	n	Mean
Denmark	2 376	0.45	538	1.69
Finland	2 550	1.15	1 241	1.86
Iceland	840	0.90	267	1.99
Norway	2 182	1.19	1 149	1.95
Sweden	3 456	0.98	1 278	1.94

On average, fishermen seem to be just slightly more country people (Table 4.17) than the whole population. Only in Iceland is there no difference compared to the whole population. The differences in the educational level of fishermen and the whole population is even more marginal than the differences in residential environment (Table 4.18). No big differences in the income level of recreational fishermen and of the whole population can be detected either (Table 4.19.).

Table 4.17. Residential environment of the population and of recreational fishermen, percentage. (Question 17)

%	Population					Recreational fishermen				
	n	Urban	Semi-urban	Rural		n	Urban	Semi-urban	Rural	
Denmark	2 344	24	50	26	100	541	23	49	28	100
Finland	2 528	46	29	25	100	1 258	45	28	27	100
Iceland	835	60	27	13	100	267	61	27	12	100
Norway	2 165	45	30	25	100	1 153	41	30	29	100
Sweden	3 430	49	27	24	100	1 281	44	27	29	100

Table 4.18. Years of education of the population and of recreational fishermen, percentage. (Question 18)

%	Population					Recreational fishermen				
	n	10 or less	11-13	14 or more		n	10 or less	11-13	14 or more	
Denmark	2 271	39	27	34	100	531	40	27	33	100
Finland	2 501	27	36	37	100	1 248	29	37	34	100
Iceland	830	18	31	51	100	265	19	31	50	100
Norway	2 160	28	33	39	100	1 151	26	34	40	100
Sweden	3 428	25	41	34	100	1 277	24	44	32	100

Table 4.19. Mean income of population and of fishermen. (Question 19)

Money	Annual gross income of all households (thousands)				Annual gross income of recreational fishermen (thousands)			
thousands, national currency	n	House hold	n	Personal	n	House hold	n	Personal
Denmark DKK	2 200	414	2 165	213	521	424	513	232
Finland FIM	2 391	191	2 351	101	1 206	196	1 185	108
Iceland ISK	785	3 711	768	1 784	253	3 926	245	2 212
Norway NOK	2 099	415	2 050	250	1 127	432	1 102	264
Sweden SEK	3 221	355	3 211	188	1 226	355	1 208	201

5. Conclusions

Valuing catch at prices paid to professional fishermen has also been used to value recreational fisheries. The value of recreational fishermen's catch in Finland was estimated to 320 million FIM in 1998 for a total of 48 million kg (Official Statistics of Finland 2000). In our survey we found that the recreational fishermen in Finland actually spent 1 220 million FIM catching this amount of fish, and they would have been willing to pay another 501 million FIM. In Sweden, the corresponding numbers were a total catch of 79 million kg in 1995 valued at 240 million SEK (Bengtsson 1997). For a lower catch of 58 million kg in 1999, we found that recreational fishermen spent 2 730 million SEK and would have been willing-to-pay (WTP) another 1 030 SEK. This additional WTP represents the use value of recreational fisheries, and clearly shows the need to use environmental valuation techniques to document the full use value of recreational fisheries.

The estimated economic values of recreational fisheries and non-use values of fish stocks can be used in cost-benefit analyses (CBAs) of alternative uses of aquatic environments, e.g. water level regulation, dredging, damming and embankmenting, and measures to restore and preserve fish stocks. Large scale water trade is one of the latest threats to recreational fisheries.

These estimates can also be used to motivate further investments for fishery tourism, since the observed use values are consumer surplus that can be converted into producer surplus. The data can also be used as input to green national accounts.

Assessments of economic damages to recreational fisheries and freshwater fish stocks from pollution incidents, for example, are used to estimate compensation payments. In the USA, environmental valuation techniques have been approved in the Oil Pollution Act (OPA) and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) for calculating the impact on fish stocks in Natural Resource Damage Assessments (NRDA). The European Commission is now looking into the possibility for legal use of environmental valuation techniques to assess damage to biodiversity within the European Union.

6. Acknowledgements

The writers wish to express their gratitude to several persons whose contribution has been greatly acknowledged during the process of the survey. Professor Juhani Kettunen has provided both guidance and optimal circumstances for the work. Kalevi Leinonen has consulted the sampling and budgeting phase. Pentti Moilanen has been consulted about the statistical details. Rauno Yrjölä from Ympäristötutkimus Yrjölä Oy has been invaluable in helping out with the data processing. The prjoject has had a Finnish follow-up group that has had annual meetings in the course of the project and the members have been available for consulting.

The survey would not have been possible to carry out without the financial support of several institutes. The authors are grateful to the Nordic Council of Ministers, Ministry of Agriculture and Forestry (Finland), The Agricultural Productivity Fund (Iceland) and to the participating institutions, University of Southern Denmark, Danish Institute for Fisheries Research, Finnish Game and Fisheries Research Institute, Institute of Freshwater Fisheries (Iceland), Agricultural University of Norway, Directorate for Nature Management (Norway), National Board of Fisheries (Sweden) and Umeå University (Sweden).

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Appendix 1

Nordiska Ministerrådet
Pohjoismaiden ministerineuvosto
Norræna ráðherranefndin

Questionnaire

"Economic value of recreational fishery in the Nordic countries"

NATURE AND ENVIRONMENT

1. What is your personal attitude to nature and outdoor recreation? Please, tick your choice.

		Fully agree	Somewhat agree	Somewhat disagree	Fully disagree	Don't know
1.1.	I like outdoor recreation	☐	☐	☐	☐	☐
1.2.	Nature and environment are important issues to me	☐	☐	☐	☐	☐
1.3.	I prefer to do other things than outdoor recreation during my free time	☐	☐	☐	☐	☐
1.4.	Man can be well off without ever going out into the natural environment	☐	☐	☐	☐	☐

ARE YOU A RECREATIONAL FISHERMAN ?

2. Did you go fishing for recreation at least once during the last 12 months? Tick your choice.

☐ 2.1. Yes. **Continue with question 3.**
☐ 2.2. No, but someone else in our household did. **Please, go to question number 12.**
☐ 2.3. No and neither did anyone in our household. **Please, go to question number 12.**

WHAT KIND OF A FISHERMAN ARE YOU ?

3. How would you describe your hobby? Would you consider yourself to be a / an (only one choice!)

☐ 3.1. Sports fisherman (use mainly rod and line)
☐ 3.2. Subsistence fisherman (use mainly gill nets or other standing gear)
☐ 3.3. Generalist (use all sorts of gear)
☐ 3.4. Occasional angler (This not for Sweden!!)

FISHING AREA AND ACTIVITY

4. If we define a fishing day "a day when you carry out fishing activities, regardless of how many hours per day". Approximately how many fishing days did you make during the last 12 months?

_____ days. How many of these days were you ice-fishing? _____days.

5. How many of these fishing days did you spend in coastal and sea areas, rivers and lakes? Write “0” for the types of fishing you did not perform.

5.1. Coastal and sea area _____ fishing days

5.2. Rivers _____ fishing days

5.3. Lakes _____ fishing days

6. Thinking back to the fishing experience you have had in these three areas; how would you rank them (1 is the one you like the most and 3 the one you like the least)?

6.1. Coastal and sea area Rank ☐

6.2. Rivers Rank ☐

6.3. Lakes Rank ☐

FISHING EXPENSES

7. Approximately how much money did you spend during the last 12 months on recreational fishing? Please fill in the form below. If you had no expense on an item, please write "0" Kr. DO NOT count the cost of items that last for many years, e.g. gear (rods, nets), fishing clothes and boats.

7.1. Automobile transportation to fishing site (fuel, rental cars, road tolls) _____ Kr.

7.2. Boating (fuel, other operating expenses, rental costs etc.) _____ Kr.

7.3. Other transportation to fishing site (ferry, air plane, train etc.) _____ Kr.

7.4. Lodging _____ Kr.

7.5. Licences and annual membership fees _____ Kr.

7.6. Fishing journals, books, videos, CD-roms ... _____ Kr.

7.7. Extraordinary food and drink expenses _____ Kr.
(above what you would have spent anyway)

7.8. Other expenses _____ Kr.

please, specify _____

Please add up your fishing expenses for the last 12 months, and write the total below:

TOTAL _____ Kr.

THE NEXT QUESTIONS ARE IMPORTANT TO US - PLEASE, THINK CAREFULLY

The next questions may be difficult to answer and they will certainly require careful consideration. We ask them in order to get some insight into the Nordic people's attitudes towards and valuation of recreational fisheries. In giving your reply, please consider the income of your household. Remember that if you use money on this, you will have less money to use for other things.

8.

Think about the experience you have had undertaking recreational fishing during the last 12 months, and what it is worth to you to have this experience. Do you think your experience is worth more to you than you paid? What is the **most** you would almost certainly pay **over and above** of what you now spend (see question 7) before you would stop going to the fishing sites you now use? By "almost certain" we mean that the amount you are 95 % certain you would pay

_____ Kr / year **in addition to** what I already pay to have the same recreational fishing experience I have had during the last 12 months.

9.

Imagine that there was a **stream** near your home which for many years had been closed for recreational fishing. It is a clean, scenic and quiet area with a stream with high water quality. The stream has a natural stock of **salmon and sea trout**, which allows for an above average chance of catching these fish species.

Imagine that the stream is opened up for recreational fishing with rod and line. Due to the sensitivity of the area, the number of anglers / sports fishermen will be restricted. To get access you will have to pay a rent that would grant you a 12 month right to fish in this stream. This money is needed to maintain the stream in its current condition.

The rental scheme will be administered through a local fund in your local county council. A board where you are represented by one of the participating anglers/fishermen will take the day to day decisions on the maintenance plan for the stream.

Think of what it is worth to you to be able to fish in this stream. What is the most you would be willing to pay as an annual rent to be granted access to fish in the stream?

The table below lists some amounts. Start at the top of the table by asking yourself: Would I *certainly pay, almost certainly pay, not sure, almost certainly not pay* or *certainly not pay* 100 Kr., and tick the alternative that best represents your answer. Ask the same question for 300 Kr etc., and continue all the way down the list to the highest amount (20.000 Kr). Only *one* tick for *each* amount is allowed.

	I would certainly pay	I would almost certainly pay	I am not sure	I would almost certainly not pay	I would certainly not pay
100 Kr.	☐	☐	☐	☐	☐
300 Kr.	☐	☐	☐	☐	☐
500 Kr.	☐	☐	☐	☐	☐
700 Kr.	☐	☐	☐	☐	☐
1 000 Kr.	☐	☐	☐	☐	☐
3 000 Kr.	☐	☐	☐	☐	☐
5 000 Kr.	☐	☐	☐	☐	☐
8 000 Kr.	☐	☐	☐	☐	☐
12 000 Kr.	☐	☐	☐	☐	☐
20 000 Kr.	☐	☐	☐	☐	☐

What is the most you would *almost certainly* pay as an annual rent before you would decide not to go fishing in this "new" river? _____ Kr./ year

Write "0" Kr. if you are not willing to pay anything. If you said"0 Kr.", please explain why?

_____

10.

Now, **instead** imagine there was a **lake** near your home which for many years had been closed for recreational fishery. It is a clean, scenic and quiet area with a lake with high water quality. The lake has a natural stock of **pike, perch and pike-perch**, which allows for an above average chance of catching these fish species.

Imagine that the lake is opened up for recreational fishing with rod and line. Due to the sensitivity of the area, the number of anglers / sports fishermen will be restricted. To get access you will have to pay a rent which would grant you a 12 month exclusive right to fish in this lake. This money is needed to maintain the lake in its current condition.

The rental scheme will be administered by a local fund in your local county council. A board where you are represented by one of the participating anglers / fishermen will take the day to day decisions regarding the maintenance plan for the lake.

Think of what it is worth to you to be able to fish in this lake. What is the most you would be willing to pay as an annual rent to be granted access to fish in this lake?

	I would certainly pay	I would almost certainly pay	I am not sure	I would almost certainly not pay	I would certainly not pay
100 Kr.	☐	☐	☐	☐	☐
300 Kr.	☐	☐	☐	☐	☐
500 Kr.	☐	☐	☐	☐	☐
700 Kr.	☐	☐	☐	☐	☐
1 000 Kr.	☐	☐	☐	☐	☐
3 000 Kr.	☐	☐	☐	☐	☐
5 000 Kr.	☐	☐	☐	☐	☐
8 000 Kr.	☐	☐	☐	☐	☐
12 000 Kr.	☐	☐	☐	☐	☐
20 000 Kr.	☐	☐	☐	☐	☐

What is the most you would *almost certainly* pay as an annual rent before you would decide not to go fishing in this "new" lake? _____ Kr/ year
Write "0" Kr if you are not willing to pay anything. If you said "0 Kr" , please explain why?

_____

11.

Now, **instead** imagine there was a **lake** near your home which for many years had been closed for recreational fishery. It is a clean, scenic and quiet area with a lake with high water quality. The lake has a natural stock of **grayling, brown trout and arctic char**, which allows for an above average chance of catching these fish species.

Imagine that the lake is opened up for recreational fishing with rod and line. Due to the sensitivity of the area, the number of anglers / sports fishermen will be restricted. To get access you will have to pay a rent which would grant you a 12 month exclusive right to fish in this lake. This money is needed to maintain the lake in its current condition

The rental scheme will be administered by a local fund in your local county council. A board where you are represented by one of the participating anglers / fishermen will take the day to day decisions regarding the maintenance plan for the lake.

Think of what it is worth to you to be able to fish in this lake. What is the most you would be willing to pay as an annual rent to be granted access to fish in this lake?

Fill in the table below, in the same way you filled in the table in the previous two questions

	I would certainly pay	I would almost certainly pay	I am not sure	I would almost certainly not pay	I would certainly not pay
100 Kr.	☐	☐	☐	☐	☐
300 Kr.	☐	☐	☐	☐	☐
500 Kr.	☐	☐	☐	☐	☐
700 Kr.	☐	☐	☐	☐	☐
1 000 Kr.	☐	☐	☐	☐	☐
3 000 Kr.	☐	☐	☐	☐	☐
5 000 Kr.	☐	☐	☐	☐	☐
8 000 Kr.	☐	☐	☐	☐	☐
12 000 Kr.	☐	☐	☐	☐	☐
20 000 Kr.	☐	☐	☐	☐	☐

What is the most you would *almost certainly* pay as an annual rent before you would decide not to go fishing in this "new" lake? _____ Kr. / year

Write "0" Kr. if you are not willing to pay anything. If you said "0 Kr." , please explain why?

_____

12. We would like you to answer the next questions **even if you did not fish yourself**. If you did fish during the last 12 months you should still answer the questions.

Natural fish stocks in the Nordic countries are threathened in several ways. Low water quality, regulation of water level, barriers to fish and other fauna migration (weirs, dams etc.), reduced water flow due to hydro power development, eutrophication due to emissions of nutrients from agriculture, industry and household sewage, acid rain, fish parasites and diseases; all these factors influence the state of fish stocks. If no action is taken, we will lose our natural freshwater fish stocks.

International agreements to reduce transboundary pollution and national programs have been designed to combat the threats specific to each country. These initiatives will cost money. Part of the costs will have to be paid by the taxpayers in each country as an additional income tax. Think what it is worth to you to preserve the natural fish stocks we now have.

The costs are uncertain.The table below lists some possible annual costs to you. What is the most you are willing to pay annually as an increase in income taxes to finance the programs that would preserve the current fish stocks and current quality of recreational fishing in the Nordic countries?

The table below lists some amounts. Start at the top of the table by asking yourself: Would I *certainly pay, almost certainly pay, almost certainly not pay or certainly not pay* 100 Kr., and tick the alternative that best represents your answer. Ask the same question for 300 Kr. etc., and continue all the way down the list to the highest amount (20.000 Kr). Only *one* tick for *each* amount is allowed.

	I would certainly pay	I would almost certainly pay	I am not sure	I would almost certainly not pay	I would certainly not pay
100 Kr.	☐	☐	☐	☐	☐
300 Kr.	☐	☐	☐	☐	☐
500 Kr.	☐	☐	☐	☐	☐
700 Kr.	☐	☐	☐	☐	☐
1 000 Kr.	☐	☐	☐	☐	☐
3 000 Kr.	☐	☐	☐	☐	☐
5 000 Kr.	☐	☐	☐	☐	☐
8 000 Kr.	☐	☐	☐	☐	☐
12 000 Kr.	☐	☐	☐	☐	☐
20 000 Kr.	☐	☐	☐	☐	☐

What is the most you would *almost certainly* pay as an additional annual income tax to preserve the current natural fish stocks in the Nordic countries? _____kr/ year
Write "0" Kr if you are not willing to pay anything. If you said "0 Kr" , please explain why?

_____

BACKGROUND INFORMATION

This background information will only be used for statistical purposes and will be kept strictly confidential. We need this information in order to explain how the Nordic people´s attitude and value of their fish stocks and recreactional fishing vary between and within the countries.

13. Year of birth? 19 ☐☐

14. Gender? 1. ☐ male 2. ☐ female

15. How many persons are there in your household including yourself? ☐ persons

A household is a group of people living in the same address and using the same refrigerator

16. How many of your household members (including yourself) fish for recreation? ☐ persons

17. What is your residental environment like. Would you discribe it as

1. ☐ urban 2. ☐ semi-urban 3. ☐ rural

18. How many years of education do you have?

1. ☐ 10 years or less 2. ☐ 11 - 13 years 3. ☐ 14 years or more

19. Approximately how much will you and your household earn in gross income (i.e. before income taxes) in 1999. Please state the expected income to the nearest 10 000 Kr.?

In 1999 my household (including myself) will earn about _____ Kr.

My personal income in 1999 will be about _____ Kr.

In case you do not want to state the amount, please tick the proper interval for

Household income	Personal income
☐ 0 - 200 000 Kr.	☐ 0 - 100 000 Kr.
☐ 200 000 - 400 000 Kr.	☐ 100 000 - 200 000 Kr.
☐ 400 000 - 700 000 Kr.	☐ 200 000 - 300 000 Kr.
☐ 700 000 - 1 000 000 Kr.	☐ 300 000 - 500 000 Kr.
☐ 1 000 000 - Kr.	☐ 500 000 - Kr.

THANK YOU VERY MUCH FOR YOUR PARTICIPATION IN THIS SURVEY.

If you have further comments and/or questions, you can use the space below:

Probability distributions of willinngness-to-pay for the different monetary bids of the MBDC tables

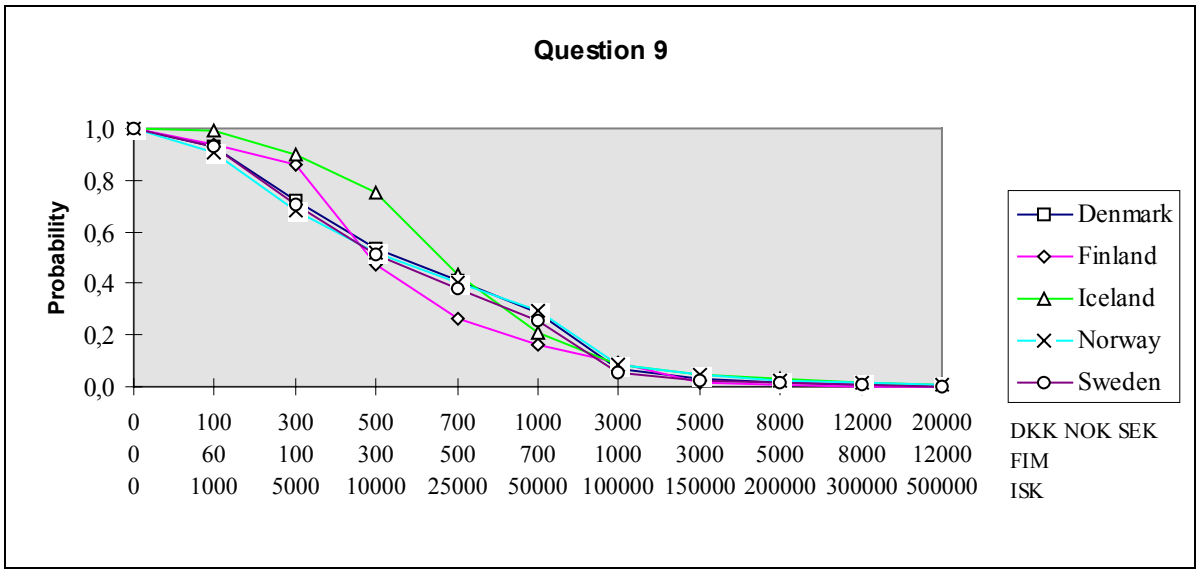

Figure A.9. Probability of recreational fishermen's annual willingness to pay for an exclusive fishing right to a good quality stream with salmon and sea trout. (Question 9)

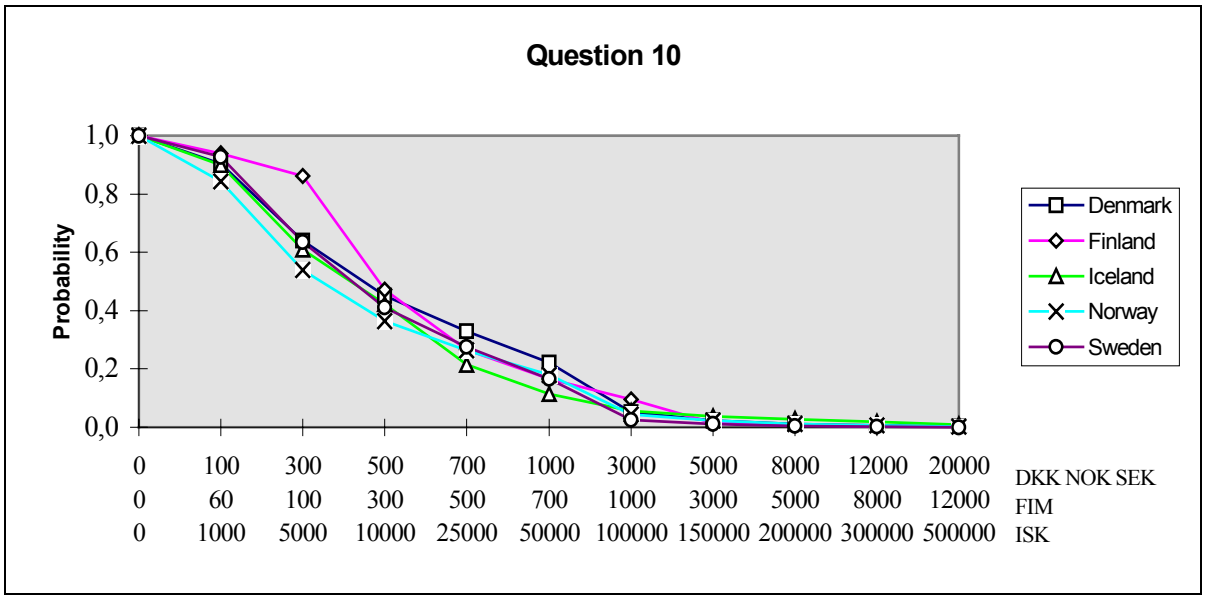

Figure A.10. Probability of recreational fishermen's annual willingness to pay for an exclusive fishing right to a good quality lake with perch, pike and pike-perch. (Question 10)

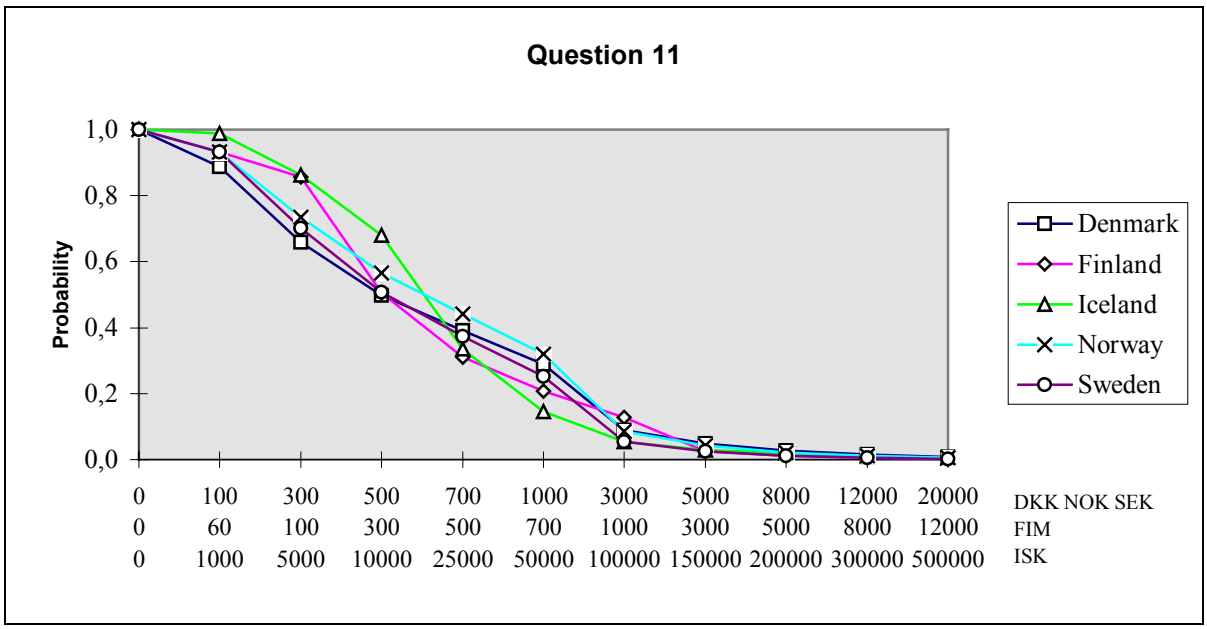

Figure A.11. Probability of recreational fishermen's annual willingness to pay for an exclusive fishing right to a good quality lake with grayling, brown trout and arctic char. (Question 11)

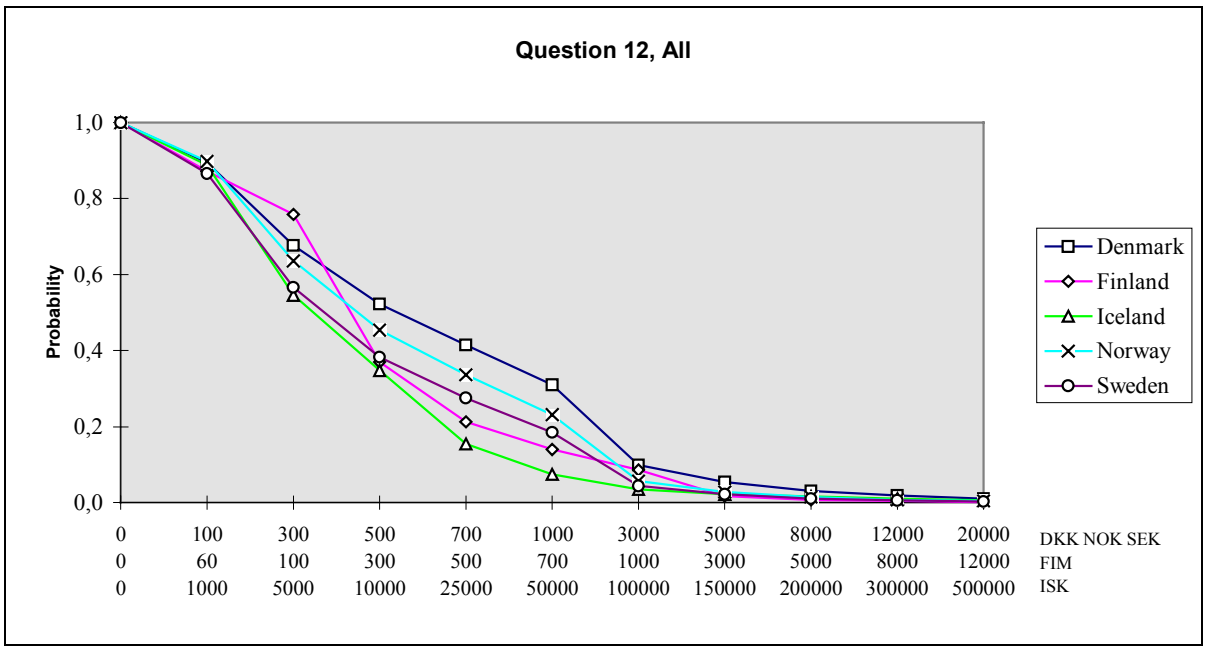

Figure A.12.1. Probability of population's (recreational fishermen and non-fishermen) annual willingness to pay for preserving the current natural fish stocks and current quality of recreational fishing. (Question 12)

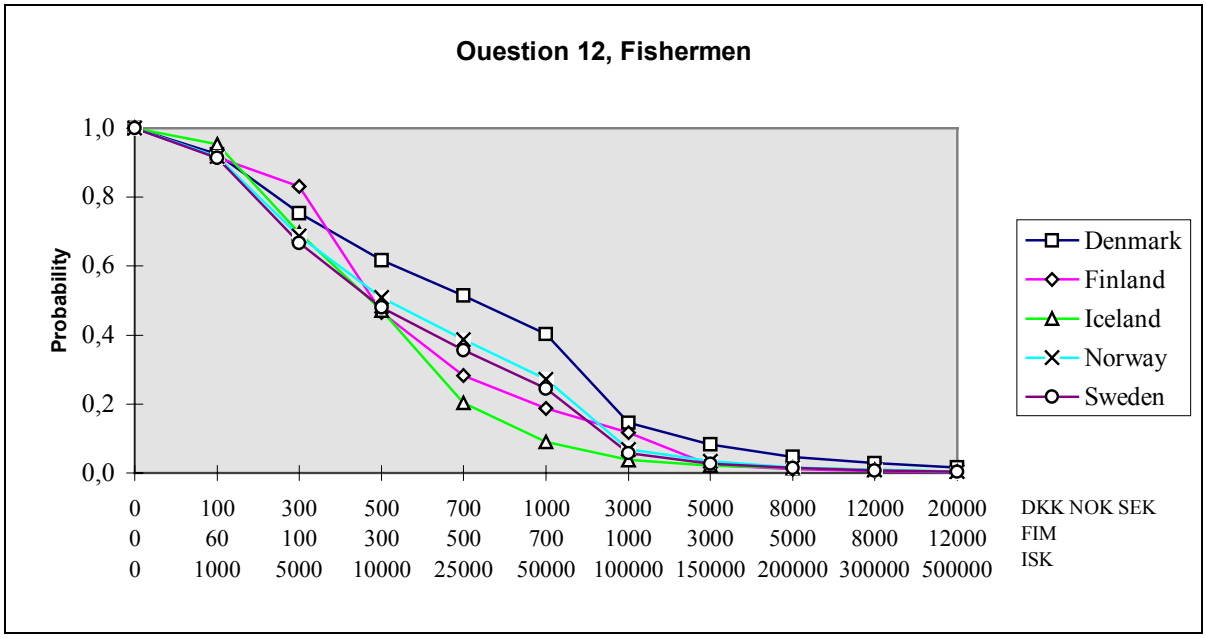

Figure A.12.2. Probability of recreational fishermen's annual willingness to pay for preserving the current natural fish stocks and current quality of recreational fishing. (Question 12)

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