Norwegian University of Life Sciences • Universitetet for miljø- og biovitenskap
Department of Ecology and Natural Resource Management
Philosophiae Doctor (PhD) Thesis 2011:26

Angling Tourism and Landowner Based Management of Atlantic Salmon Stocks in the Trondheim Fjord Region of Norway

Fisketurisme og lokal grunneierstyrt forvaltning av laks i Trondheimsfjordelvene

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Ås 2011

Thesis number 2011: 26
ISSN 1503-1667
ISBN 978-82-575-0990-3

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Hvorfra jeg får lyst til at skrive? – Ja de kan ikke tro, hvor det i grunnen morer mig. Når jeg begynder et kapittel, som jeg har riktig varmt i hovedet, er det så morsomt – ja jeg vil ikke påstå at det er fullt så morsomt som at have en laks på stangen, men i alle fall som en stor ørret.

Alexander L. Kielland, 19.11.1879, letter to Edvard Brandes

Preface

This thesis is submitted as a partial fulfillment of the requirements for the doctoral degree Philosophiae Doctor (PhD) at the Norwegian University of Life Sciences. The study was funded by the Research Council of Norway (grant no.173869/I10) and was part of the research project "Laks og verdiskaping rundt Trondheimsfjorden [Salmon and economic development in the Trondheim fjord region]" owned by the landowner organization The Trondheim Fjord Rivers. Verdal Vekst contributed financially to the project also. I thank the US-Norway Fulbright Foundation for accepting me as a Fulbright Scholar and funding me during my 2009 stay at the University of Alaska Fairbanks.

My thanks to everybody that has helped me complete this thesis. A few names should be mentioned specifically: My supervisors Sjur Baardsen and Øystein Aas at the Norwegian University of Life Sciences - thanks for guiding me through the rough river and all the way to the spawning grounds. I hope I can make it from here on my own. Professor Ole Hofstad for fruitful discussions and comments about my work and which flies to use. Birger Vennesland, Fredrik Ingemarson, Torvald Tangeland, Jan Vidar Haukeland and Erlend Nybakk for helpful comments. Professors Gary Kofinas and Terry Chapin, and fellow PhD students at the Resilience and Adaptation program at University of Alaska Fairbanks for a remarkable year and lots of salmon to eat. Landowners and staff at Norwegian Salmon Rivers and the river owner organizations in the Trondheim fjord region: John Olav Oldren, Liv and Ivar Lerfald, Kjell Norum, Hågen Einang, Jon Kjelden, Vegard Heggem, Rune Krogdahl, Torstein Rognes, Arne Nielsen, Finn Erlend Ødegård, and Torfinn Evensen. My family and in-laws for understanding why I was working a lot. Anton Bjartnes at Origokart for kindly providing me with maps for the articles.

Finally, to Maria, my wife, thank you for being kind and patient, for cheering on me, and encouraging me to work hard!

Stian Stensland

Ås/Oslo, March 2011

Summary

Angling for Atlantic salmon (*Salmo salar* L.) is a popular recreational activity and provides income for Norwegian landowners holding fishing rights. Abundance and distribution of salmon have however declined markedly during the last 30 years. The recreational salmon fishery is a highly interesting meeting place for natural resources management, delegation of rights and responsibilities, and economic development in rural areas. Landowners are key actors in this regard by having a wide range of roles being farm owners, holders of fishing rights, suppliers of angling, tourist hosts, owners and managers of salmon habitat, and co-managers of salmon stocks through statuary river owner organizations. Landowners have limited angling tourism resources, and share salmon management responsibilities, making collective-action by the landowner group important. The recreational salmon fishery which both salmon and landowners are parts of can be viewed as a social-ecological system where there is reciprocity between salmon as a resource and landowners regarding angling tourism, management and conservation of salmon stocks.

The main objectives of the thesis were 1) to identify constraints and 2) make recommendations about management of salmon stocks and development of angling tourism in Norway with an emphasis on private small scale landowners. Secondary objectives were to: a) reveal landowners' objectives and which variables influence these objectives; b) analyze landowners' profit efficiency; c) analyze risk sources in angling tourism and landowners' risk management strategies; d) identify different types of landowners, their priority of management actions to strengthen salmon stocks and attitudes to river owner organizations' work. The objectives were addressed through a study of the recreational salmon fishery in four major salmon rivers in the Trondheim fjord region of mid-Norway.

Empirical results were based on a postal questionnaire survey sent landowners in the Gaula, Orkla, Stjørdal and Verdal rivers. Data analyses included use of multiple regressions, factor analysis, binary logistic regression, cluster analysis, and a stochastic profit frontier function.

The study revealed a heterogeneous landowner group regarding quality of the fishing rights, farm and landowner characteristics, and objectives about the fishing right. Heterogeneity is generally a problem for cooperation and coordination. Several distinct landowner types were identified: the passive owner, the recreationist, the multiobjective owner, and the economist. Marginalization of angling income reduces profit efficiency in supply of angling tourism. The ongoing trend with more landowners taking off-farm work or not living on the farm may lead to future landowners emphasizing the recreational function of

the fishing right and other farm resources rather than the business function. Thereby, profit efficiency would decrease and less fishing could be available for anglers and have consequences for rural tourism. Policies should therefore facilitate development of specialized fishing tourism enterprises by making it easier to rent and acquire fishing rights. Thus could be done by e.g. legislating a minimum period for lease of rights. Mandatory organization of landowners in river owner organizations and introducing a minimum size for beats could also reduce some of the problems caused by heterogeneity in the landowner group.

Reduced angling season and changes in strength of salmon runs salmon were seen as having the largest impact on future income from salmon angling tourism. Measures to strengthen salmon stocks might therefore be the most important measure to promote angling tourism, as this ensures that angling can take place and reduces landowners' investment risk. Landowners used a multiple of strategies to secure household income. Salmon related strategies were least important probably because of the overall limited profit from angling (average NOK 30,000 per landowner), and the top risk sources being beyond individual landowner control. Reduce problems from salmon farming and stop the spread of the Gyrodactylus salaris (Malmberg) parasite were seen as the biggest threats to salmon stocks. The river owner organizations have little influence over unfavorable conditions in the ocean. Landowners could maximize natural smolt production in the rivers to mitigate these effects and show that they take their share of salmon conservation. Management of habitat and regulation of the fishery to ensure enough spawners are key issues. The high priority of stocking and low priority of catch and release show the apparently irrationality of landowners in prioritizing management actions to secure stocks. This demonstrates a need for knowledge building in the landowner group and for improved communication between scientists, government, river owner organizations and landowners about the effects of stocking and other management actions.

The many landowners being negative to the net fishery lease might be due to a lack of information from the river owner organization but also the unfamiliarity with paying for conservation, a concept being new for landowners that historically may have taken salmon for granted.

The results from this study might be useful also for understanding how landowners view other natural resources on their farm and the effects on resource management, conservation and economic development.

Sammendrag

Sportsfiske etter laks (*Salmo salar* L.) er en populær fritidsaktivitet og skaffer også inntekter for norske fiskerettshavere (elveeiere). Mengden og utbredelsen av laks har imidlertid gått merkbart ned de siste 30 år. Laksefiskeriet er en svært interessant arena i skjæringspunktet mellom naturforvaltning, delegering av rettigheter og plikter, og næringsutvikling i distriktene. Elveeierne er nøkkelpersoner i så måte, fordi de har en rekke ulike roller som grunneiere, tilbydere av fiske, turistverter, eiere og forvaltere av laksens leveområder, og forvaltere av laksestammene og fisket gjennom elveeierlaget. Elveeierne har hver for seg begrensede ressurser for fisketurisme, og deler også ansvaret for forvaltning av laksen. Dette gjør at samarbeid mellom elveeiere er viktig. Laksefiskeriet kan bli sett på som et sosial-økologisk system der det er en avhengighet mellom laksen som ressurs og elveeierne vedrørende fisketurisme, lakseforvaltning og bevaring av laksestammene.

Hovedmålsettingene med denne doktorgradsavhandlingen har vært 1) å identifisere hindringer og 2) foreslå anbefalinger for forvaltning av laksen og utvikling av fisketurisme i Norge med spesiell fokus på private elveeiere. Delmålsettinger var å: a) avdekke elveeiernes mål med fiskeretten og hvilke variabler som påvirker disse målene; b) analysere elveeiernes profitteffektivitet; c) analysere risikokilder i fisketurismen og elveeiernes bruk av risikostrategier; d) identifisere ulike typer elveeiere, deres prioritering av forvaltningstiltak for å styrke laksestammene, og deres holdninger til elveeierlagets arbeid. Målsettingene i avhandlingen ble gjennomført ved en studie av laksefiskeriet i fire store lakseelver i Trondheimsfjorden.

Empiriske resultater baseres på en spørreundersøkelse sendt elveeierne i Gaula, Orkla, Stjørdalselva og Verdalselva. Dataanalysene inneholdt bruk av multippel regresjonsanalyse, faktoranalyse, binær logistisk regresjonsanalyse, klusteranalyse, og en stokastisk profitt grenseverdifunksjon.

Studiet avdekket en elveeiergruppe med stor variasjon angående kvalitet på fiskeretten, eiendoms- og elveeierkarakteristika, og mål med fiskeretten. Slik heterogenitet er vanligvis et problem for samarbeid og koordinering. Flere distinkte typer elveeiere kunne identifiseres: den passive eieren, rekreasjonisten, flerbrukeren, og økonomen. Marginalisering av inntekt fra laksefiske reduserer elveeiernes profitteffektiviteten som tilbydere av laksefiske. Den vedvarende trenden med at en stadig større andel av inntekta hentes utenfor gårdsbruket og at flere har bosted utenfor gårdsbruket, kan føre til at flere elveeiere og andre bosatt på landbrukseiendommer heller vektlegger fritidsfunksjonen til fiskeretten og brukets ressurser, enn foretaksfunksjonen. I så fall, vil profitteffektiviteten

synke, og færre fiskevald vil bli tilgjengelig for sportsfiskere i et åpent marked. Dette vil også ha uheldige konsekvenser for turismeutvikling. Politikkutformingen bør derfor oppmuntre en profesjonalisering av fisketurismenæringa ved å gjøre det lettere å eie eller leie fiskeretter. Dette kan gjøres ved å lovhjemle en minimumsperiode for utleie av fiskeretter. Tvungen organisering av elveeiere i elveeierlag, og innføring av en minimumsstørrelse for vald kan motvirke noen av de problemene en heterogen elveeiergruppe skaper for lakseforvaltning og utvikling av fisketurisme.

Redusert fiskesesong og endringer i lakseoppgangen ble av elveeierne ansett å ha størst innvirkning på deres framtidige inntjening fra laksefisket. Tiltak for å styrke laksebestandene kan derfor være det viktigste tiltaket for å fremme lakseturismen, ettersom dette opprettholder laksefisket og samtidig reduserer elveeiernes investeringsrisiko. Elveeierne brukte en rekke strategier for å sikre husholdningens inntekter. Lakserelaterte strategier var minst viktig av disse, sannsynligvis fordi at nettoinntektene fra laksefikset utgjør en begrenset del av husholdningens inntekter med et gjennomsnitt på ca 30.000 kroner per elveeier. Samtidig blir nok også de faktorene som hadde størst innvirkning på inntjeningen ansett for å være utenfor den enkelte elveeiers kontroll. Å redusere problemene som oppdrettsnæringen forårsaker, samt stoppe spredningen av lakseparasitten Gyrodactylus, ble av elveeierne vurdert til å være de viktigste tiltakene for å styrke laksebestanden i sine vassdrag. Elveeierlagene kan gjøre lite med de ugunstige forholdene som laksen møter i havet. Derimot kan de maksimere den naturlige smoltproduksjon i elva for å motvirke disse effektene, og samtidig vise at de tar ansvar for laksebestandene. Forvaltning av laksens leveområder og regulering av elvefisket for å sikre nok gytere er viktige virkemidler som elveeierne rår over. Elveeierne ga høy prioritet til utsetting av lakseunger – et tiltak som forskere anser som skadelig eller i beste fall uten effekt, mens fang-og-slipp fiske var lavt prioritert. Denne forskjellen i syn på forvaltningstiltak viser et behov for kompetanseheving blant elveeierne, og for bedre kommunikasjon mellom forskere, offentlig forvaltning, elveeierlag og elveeiere om effektene av fiskeutsettinger og andre forvaltningstiltak.

Mange elveeiere var negative til oppleia av kilenøter i Trondheimsfjorden, og dette kan skyldes at de syntes at de hadde fått for lite informasjon fra elveeierlaget. Å betale for forvaltning og vern av laksen er også nytt og uvant for elveeierne som historisk sett kan ha tatt laksen for gitt.

Resultatene fra dette studiet kan også være nyttig for å forstå hvordan eiere av landbrukseiendommer ser på bruken av andre naturressurser, og hvilke følger dette får for ressursforvaltning, vern og næringsutvikling.

Contents

Appended papers I-IV

I. Stensland, S. (2010). Fishing rights and supply of salmon angling tourism in mid-Norway. Scandinavian Journal of Hospitality and Tourism, 10, 207 - 230.

II. Stensland, S. & Baardsen, S. Effects of property and landowner characteristics on profit efficiency in salmon angling tourism in Norway. Submitted to Journal of Sustainable Tourism.

III. Stensland, S. Landowners' perception of risk sources and risk management in Norwegian salmon angling tourism. Manuscript.

IV. Stensland, S. A typology of landowners in Norwegian salmon angling: Attitudes towards river owner organizations and management actions. **S**ubmitted to Fisheries Management and Ecology.

Appendix 1-8: Main survey instrument

Appendix 1. Questionnaire in English

Appendix 2. Questionnaire in Norwegian (original)

Appendix 3. First contact. Pre-notice letter

Appendix 4. Second contact. Cover letter for questionnaire package

Appendix 5. Third contact. Postcard reminder

Appendix 6. Fourth contact. Cover letter for replacement questionnaire package

Appendix 7. Fifth contact. Telephone call reminder

Appendix 8. Non-response study by telephone

Synopsis

Introduction

A radical restructuring of the agriculture sector has taken place during the two last decades, and has changed rural Europe from a place of primarily food and fiber production towards a place also associated with recreation and consumption (Burton & Wilson, 2006). Both the European Union and Norwegian governmental authorities encourage farm diversification into business activities beyond agricultural and forestry primary production, such as tourism, other services and local food products (European Commission, 2004; Landbruksdepartementet, 1999).

Commodification of landowners' hunting and fishing rights[1] has been particularly emphasized in Norway as a mean to maintain employment and income in rural areas (Landbruksdepartementet, 1999, 2007; Reiselivsbedriftenes Landsforening & Norges Skogeierforbund, 2004). Diminishing margins in traditional agriculture and forestry combined with good opportunities for work outside the farm have however lead to a heterogeneous landowner group with differing and varying degrees of interest in and objectives about farm resources (Sevatdal, 2006).

Over the last decades there has been a gradual change in governance with delegation of power and responsibility from government to local level institutions (Goodwin, 1998; Moseley, 2003). Following the Biodiversity Convention of 1992 (UN, 1992) and Ostrom's (1990) work on management of common-pool resources, there has been a shift from governmental control and conservation towards sustainable use of natural resources and local stakeholder involvement in management decisions. This "sharing of power and responsibility between governmental authorities and local resource users" is known as co-management (Berkes, George, & Preston, 1991).

In Norway delegation of power and responsibility to local stakeholders has been especially profound in the management of fish and wildlife game species following a governmental proposal to parliament in 1995 (Dervo, Andersen, & Aas, 2006; Miljøverndepartementet, 1995). The recreational Atlantic salmon (*Salmo salar* L.) fishery in Norwegian rivers shows the mutual dependency between natural resources management, delegation of rights and responsibilities, and economic development in rural areas. Landowner collaboration is a key aspect in this respect. Landowners[2] have many and important roles being owners of riparian and river habitat, suppliers of fishing, tourist hosts offering accommodation, meal service and guiding to anglers, and also jointly manage the

river fishery through a statuary river owner organization within the institutional framework set by governmental authorities.

The annual spending from around 100,000-150,000 salmon anglers contributes to a turnover of approximately NOK 1.1-1.3 billion (€1= NOK 7.90. March 22 2011) into local communities (Reiselivsbedriftenes Landsforening & Norges Skogeierforbund, 2004; Norges Skogeierforbund, 2010). According to a recent estimate by the Norwegian Federation of Forest Owners there is a potential to reach a turnover of NOK 2.0 billion by 2020 (Norges Skogeierforbund, 2010). It is however believed that Norway since the mid-1990s has lost shares in the international angling tourism market to destinations such as Iceland, Russia and Scotland (Aas, 2004). Angling tourism experts argue that Norwegian landowners should cooperate to offer longer fishing beat[3] with fewer anglers, integrate guiding and lodging in the angling product, strengthen salmon stocks, and have a more pro-active attitude to catch and release, and conservation of stocks (Millington-Drake, 2002; M. Hayes, personal communication, January 16, 2006).

Research on recreational fishing and fisheries management has primarily focused around anglers, angler groups and management agencies (see e.g. Hickley & Tompkins, 1998; Pitcher & Hollingworth, 2002; Aas, 2008) despite the important roles of landowners. Research on angling tourism is generally limited (Borch, Policansky, & Aas, 2008). Fredman and Tyrväinen (2010) reviewed the literature of nature-based tourism which angling tourism can be considered a part of, and pointed to a shortage of studies investigating the supply side of nature-based tourism.

Objectives of the thesis

The main objectives of the thesis are 1) to identify constraints and 2) make recommendations about management of salmon stocks and development of angling tourism in Norway with an emphasis on landowners. This is done through a study of landowners' management of the recreational salmon fishery in four major salmon rivers in the Trondheim fjord region of mid-Norway. Empirical results are based on a survey of landowners in the Gaula, Orkla, Stjørdal and Verdal rivers. Papers I-IV contribute to the main objective by analyzing these issues. The results from Papers I-IV are analyzed and discussed in this thesis. I also make recommendation for managers and policy makers regarding management of salmon stocks and development of angling tourism. Implications for rural development and agricultural policy are further discussed.

The objectives of the papers presented in the thesis are:

- Paper I. Get insight into the objectives of landowners about use of the fishing right and which variables influence these objectives. Investigate in what form and to what extent landowners supply the market with angling services.

- Paper II. Analyze how different farm (property) and landowner characteristics and other factors affect landowners' profit efficiency in salmon fishing tourism. Recommend ways landowners may improve their profit efficiency, and interpret the results in an angling tourism policy setting.

- Paper III. Investigate landowner and farm characteristics, objectives regarding the fishing right, landowner perception of risk sources in angling tourism, landowner risk management, and how marginalization of farm income affects these relationships. On the basis of the results make recommendations for policy makers and advisors trying to make landowners diversify into angling tourism.

- Paper IV. Identify types of Norwegian landowners and quantify their objectives about the fishing right. Investigate landowners' prioritization of management actions to strengthen salmon stocks, and their attitudes towards river owner organizations' work (e.g. management of stocks, maintenance of landowner interests and information provison). Recommend policy measures that could improve cooperation in salmon fisheries management and conservation, and angling tourism for each type of landownwer.

The empirical research is based on a questionnaire survey of landowners in four salmon rivers of Mid-Norway.

The Atlantic salmon

The Atlantic salmon is native to the rivers of the North Atlantic Ocean from Portugal to Northwest Russia, from Northeast USA to Canada and Greenland. It spends the first 1-8 years in freshwater usually growing to a size of 10-20 cm before migrating to sea as smolt in the spring. After feeding one to four years over large areas in the North Atlantc Ocean, it returns to the stream it was born to spawn, typically being 1-25 kg of size. Mortality is high

for all stages from egg to smolt. Between one and ten percent of the migrating smolts return from the ocean to spawn (Thorstad, Whoriskey, Rikardsen, & Aarestrup, 2011).

A nomadic lifestyle over such a great area implies many dangers of both natural and human origin. Historically the Atlantic salmon was found in 2600 watersheds (WWF, 2001:6) Abundance and distribution of have declined markedly during the last 30 years, and the current status is probably an all time low (Hindar, Hutchings, Diserud, & Fiske, 2011). Around 90% of the healthy populations are found in Norway, Iceland, Scotland and Ireland. In the rest of the range 85% of populations are classified as vulnerable, endangered or critical (WWF, 2001:6).

Norwegian catches have declined the two last decades (Liu et al., 2011). Fishing seasons both at sea and in rivers have gradually been administratively reduced or closed the last ten years and stricter quotas have been introduced in the rivers. Around 120 of Norway's 400 salmon rivers were closed for angling in 2010 due to concern of the stocks.

Humans have severely affected salmon stocks, particularly by building dams on rivers, modifying river flow, habitat destruction and deterioration, pollution, acid rain, spread of the parasite *Gyrodactylus salaris* (Malmberg), salmon farming (salmon louse *Lepeophtheirus salmonis* (Krøyer) and escapees), and harvest (NOU, 1999; WWF, 2001). Reduced growth and increased mortality in the ocean from 1980 up till now are major factors for the reduction seen in overall abundance and productivity of salmon (Anon, 2010; ICES, 2009). Some influences such as fishing mortality and sea lice are easy to address, while others like predation or ocean conditions are difficult or even impossible to control (Aas, Policansky, Einum, & Skurdal, 2011). Maximizing natural smolt production in the rivers through harvest management, habitat management and habitat improvement are important conservation measures even if one perceives the major problems to be at sea. Climate change could further cause challenges for evolutionary adaptations and future survival of salmon stocks (Todd, Friedland, MacLean, Hazon, & Jensen, 2011). Expanding habitat opportunities in freshwater so that salmon stocks can express their maximum evolutionary life-history variation and better respond to climate changes, strengthens resilience and survival of the stocks (Bottom, Jones, Simenstad, & Smith, 2009). Landowners are key actors in this regard as they are owners of salmon habitat and managers of the stocks through their collective work in river owner organizations.

Salmon fishing in Norway

From early on, most fishing took place in rivers and estuaries with hook, spear, and traps. Regulation of the fishery and private ownership of fishing rights is mentioned already in the Gulating law from approximately 1200 AD which states that salmon passage to the upper parts of the river was not to be hindered, because proprietors upstream also needed access to fish. Similar arrangements were carried on in the national laws of Magnus Lagabøte of 1274, and Kristian V of 1687 (Berg, 1986:15).

Wealthy Britons introduced river angling in the 1830s. Prior to their arrival salmon was caught by traps, nets, hooks and gaffs in a subsistence fishery. Providing the foreigners with accommodation, food, guiding and fishing gave employment and income for rural people. Fixed fishing gear was sometimes leased or bought out so that more salmon would be available in the rod fishery (Berg, 1986). The arrival of British anglers started modern tourism in Norway. Angling techniques were soon copied by Norwegians, whereby the Norwegian Association of Hunter and Anglers was founded in 1872. Angling gradually gained importance compared to net fishing in the rivers. The British era ended after World War II, and rich Norwegians gradually took over (NOU, 1999; Aas, 2001).

The first National Salmon Acts which came in 1848 and 1857 were inspired by British laws, and closed the fixed gear fishery on Sundays and introduced "no fishing" zones in some estuaries to protect salmon stocks. A later Act of 1863 brought up organization of landowners in river owner organizations and establishments of bailiffs to enforce fishery rules and protect spawners. Rivers where rules were enforced experienced an increase in salmon abundance (Berg, 1986:28). New laws and regulations up to date have further restricted length of the season and which gear is allowed to use both for sea and river fishing .

Bag nets were introduced from Scotland around 1840-50. This fishery was economically important and targeted salmon in the fjords and along the coast. The number of bag nets stayed around 8,000 to the mid 1960s. The introduction of better fishing vessels, drift nets, long lines, and new knowledge about salmon feeding grounds from the late 1950s on, opened up for a major international salmon fishery in the open ocean. By 1980 more than half of Norwegian catches were by driftnets. NASCO member states ended this fishery in 1989 to protect stocks (NOU, 1999). Over the last three decades fishing at sea has gradually decreased both in size and in economic importance (Liu, Olaussen, & Skonhoft, 2011). Norway's harvest of wild salmon was 700 tons in 2010, where 260 tons were caught at sea by

869 fishermen and the rest in rivers (A.T. Baklien, Statistics Norway, personal comment, Feb 9 2011; SSB, 2011a).

River fishing changed markedly after 1950. New technology and economic growth gave increase in income, longer vacation, and easier traveling. Salmon angling became a sport for the general public. Net fishing in rivers lost importance and was banned in 1978 (NOU, 1999). Angler participation was halved from 1989 to 1997 parallel with reaching by then an all time low harvest (Aas, 2001). A temporary catch peak in the early 2000s was followed by weaker years. This combined with implications of new and higher conservation limits (Hindar et al., 2007) has implied strong regulatory measures such as closed rivers, shorter season, and individual catch quotas for anglers. Catch and release of salmon both as voluntary and regulatory measures is increasing (SSB, 2011b; Tangeland, Andersen, Aas, & Fiske, 2010).

The angling product

The salmon angling season in Norway typically runs for three months, from June 1 to August 31. Fishing conditions can vary greatly in time and space for a single river depending on snow melt, water temperature, water level and size of the salmon runs.

A good beat is qualified by several pools, have double river bank fishing, and can be fished under various water level conditions (Ianssen & Johansen, 2007), and therefore usually about one km or longer in length. Most beats in Norwegian rivers are however relatively short, and landowner collaboration is needed to provide a good beat. In the study area 55% of private property landowners own 400 m or less (Stensland, 2010).

The overall structure in Norwegian rivers with many beats being short or offering unrestricted permit sale are probably not optimal for providing good angling experiences, income for landowners or tourism development (Aas, 2004). Unrestricted permit sale can lead to a "boom and bust" fishery where all anglers flock to the area at the same peak time thereby lowering every angler's satisfaction. Other parts of the season the fishing beat can be almost empty. Some of the reason for such permit sale is that the river and the salmon are perceived to be local resources that the community has a share in. Landowners thus face pressure to provide easy access and cheap fishing to resident anglers, a case being known as the public angling issue and especially promoted by the Norwegian Association of Hunters and Fishers (NJFF, 2010). Local groups of the association often rent fishing from landowners

and can administer angling on large parts of the river. Resident anglers know the river and could choose to fish when conditions are good, thereby they might be satisfied with the short beats. Visiting anglers however are often locked to a particular time, and need a longer fishing with more variation to catch fish.

Landowners are encouraged to develop their angling product by offering longer fishing beats, improve catch statistics and integrate guiding, accommodation and other services in order to get a larger share of angler expenditures and make more profit from angling tourism (Norges Bondelag & Norges Skogeierforbund, 2005; Reiselivsbedriftenes Landsforening & Norges Skogeierforbund, 2004).

Catch of fish is a key factor for angling tourism. In the study area, a visiting angler to the river Orkla needs an average of four days to catch a salmon (Fiske & Aas, 2001) whereas Icelandic rivers are managed to yield one fish per rod per day (Agnarsson, Radford, & Riddington, 2008). Catch probability could be improved by making beats longer, allowing fewer anglers per beat, and using guides to help inexperienced anglers. Other measures would also help such as limiting the allowable harvest per angler (bag limit), introducing gear restrictions (such as those that might facilitate live release of fish, reduce catch efficiency in certain areas and time, and by highly skilled anglers), and increasing stock size.

Study area

The Trondheim Fjord region is an interesting area for studying the objectives outlined in this thesis. The area was chosen because 1) angling tourism has for a long time been important to local communities and landowners; 2) it has a large part of the angling effort in Norway; 3) the larger river owner organizations are relatively well functioning with rights and responsibilities delegated; 4) river owner organizations have been proactive in management of the fishery by e.g. setting strict angling regulations and paying bag net fishermen at sea for not using their nets; 5) it is an important farming area where the sector is going through structural changes and landowners are increasingly taking work outside the farm.

Six major and around thirty medium and small salmon streams drain into the Trondheim Fjord of Mid-Norway. Every year approximately 30,000 salmon anglers spend an average of ten days fishing in this region summing up to about one third of all salmon angling in the country (Tangeland, et al., 2010). The four rivers in the study region - Gaula, Orkla, Stjørdal and Verdal (Figure 1) - are the top salmon rivers in the region. Salmon migrates 110 km up the main stem of the Gaula. In addition, salmon run up several tributaries leading to a

total stretch of 200 km owned by 501 landowners. The Orkla has 88 km of fishable river controlled by 378 landowners. On the Stjørdal 135 landowners share rights to the main stem with a length of 50 km and another 19 km of tributaries. The 52 km in the Verdal are divided between 147 landowners.

Anglers in these rivers caught 10,000 – 22,000 fish (91% salmon; 9% sea trout *Salmo trutta* L.) averaging 4-5 kg each, every year in the period 2006-2010 (A.T. Baklien, Statistics Norway, personal comment, March 17 2011). Angler expenditures are estimated to generate a turnover of about NOK 338 million annually into the local economies (Kjelden et al., 2010). The Orkla and Gaula Rivers are among the top five Norwegian salmon rivers, whereas the Stjørdal and the Verdal rivers are among the top 20 and 25 in terms of number of fish caught per year in the period of 1997-2007 (Norske Lakseelver, n.d.). The three best rivers have a 150-year history of international angling tourism, whereas the Verdal became an angling destination 25-30 years ago. The average landowner had a profit from salmon angling tourism of NOK 29,896 in the 2007 season, but income was unevenly distributed with one of three landowners having no profit (Stensland, 2010).

Each of the four river valleys is inhabited by 14,000-22,000 people, and the total region of Eastern Trondheim Fjord has a population of about 350,000 inhabitants. Availability of wage earning jobs are good as the regional unemployment rate has varied between two and five percent in the period of 2000-2010. The major economic center in the region is Trondheim (population 150,000), but there are also local labor markets each with a few thousand jobs within one hour driving distance for most landowners.

From 2003 to 2009 the percentage of farms in Mid-Norway (which the study area is a part of) with more than half of their net household income from the farm decreased from 43% to 34% (Logstein & Blekesaune, 2010; Storstad, Rye, & Almås, 2004), due to a combination of falling margins in the agriculture and forestry sectors, and the many opportunities for wage earning and off-farm business. As of 2009 fifty-nine percent of farms in the region have income from other farm activities than traditional forestry and agriculture. Lease of fishing and hunting rights was done by 35%. Their interest in farming, independence, and living a rural life were main reasons for being a farmer, whereas lack of other income sources and receiving good pay were given low priority. The need for more income and using idle resources were the most important motivations for farm diversification (Logstein & Blekesaune, 2010).

Figure 1. The Trondheim Fjord Region of Mid-Norway with the Verdal, Stjørdal, Gaula and Orkla Rivers. Map by Origokart.

Theory

Literature about landowners as holders of fishing right and their role in angling tourism, management and conservation of salmon stocks is scarce. However, studies about natural resources management, property rights and landowners as farmers or forest owners are of relevance for this thesis.

Property rights and natural resources management

The fishing right

Property rights define who can access benefit streams or resources and under what conditions (Vatn, 2005:253). The salmon fishing right is a property right and in Norway it cannot be separated from the land itself and thereby belongs to the landowner[4] according to The Salmonids and Fresh-water Fish Act of 1992. Salmon fishing rights exists both for those who owns land in freshwater (angling) and at sea (use of bag nets), and in case of private ownership is almost exclusively tied to farms. Landowners have an exclusive right to fishing on their farm, but most sell angling permits or lease out their right on a long term basis[5].

Salmon fishing rights in Norway are associated with three kinds of ownership or *property regimes* (Vatn, 2007) which govern the use and transfer of the property right. Public property ownership is limited, except for in the three northernmost counties. In a private individual property regime the individual landowner owns and decides how to use the fishing right. In a private common property regime the fishing right is owned jointly by a group of farms[6], where the majority of co-owners decide how fishing is to be organized and sold.

Transfer of landownership is regulated and complicated. Norwegian farms[7] have an "allodial" right[8] (*odelsrett*) which gives relatives of the owner first priority to claim the farm. If sold to a third person relatives can claim "allodial" right and buy the farm within a year of the sale. The price of a farm and who gets to buy it are regulated to secure cultivated land for continued agriculture production and an owner- and farm arrangement of greatest value to society (The Allodial Rights Act of 1974; The Concession Act of 2003).

Salmon stocks - a common-pool resource

Salmon stocks, like most natural resources, are common-pool resources sharing the common attributes that it is (1) difficult (but not impossible) to exclude individuals from benefitting from the resource, and (2) that subtraction of the resource affect other resource users (Ostrom, 1990:30). Common-pool resources have wrongly been looked upon as open access property regimes, owned or regulated by no one thereby bringing resource depletion (or suboptimal use) to all stakeholders. The standard solution to this "tragedy of the commons" (Hardin, 1968) was for a long time privatization (market solution) or governmental control of the resource. Central to this belief were three influential models all with the free-rider problem at the core: The tragedy of the commons (Hardin, 1968), the logic of collective

action (Olsson, 1965) and the prisoner's dilemma game[9]. Ostrom (1990) challenged the prevailing "market or state view" on natural resources management, and showed that also local resource users or commons collectively can manage resources sustainably if a proper institutional framework is established.

Co-management of Norwegian salmon stocks

No single unifying definition of co-management exists since the term itself covers a broad continuum of power sharing. Most definitions do however agree that co-management involves at least one strong vertical linkage between government and user groups, and that there exists some kind of formalized arrangement for sharing power and responsibility (Armitage, Berkes, & Doubleday, 2007). Co-management has many faces and includes power sharing, institution building, trust and social capital, process, problem solving, governance, innovation, conflict resolution, knowledge generation and social learning (Berkes, 2009). It is therefore clear that co-management is not only about managing the resource, but also about managing *relations* (Natcher, Davis, & Hickey, 2005).

Landowners in each river collectively manage salmon stocks in the river phase of a salmon's life cycle through a statuary river owner organization. According to present Norwegian law the river owner organization sets and enforces fishing regulations (e.g. gear restrictions, bag limits/quotas, length of season) for the whole river, and also conducts management actions (e.g. stocking, habitat improvement), provides catch statistics, and monitors stocks, all within the wider framework set by the regional county government. Advocating and lobbying for wild salmon interests, and protecting salmon habitat are also major tasks.

Governmental delegation of power and responsibility to local river owner organizations is dependent on a suitable organization of landowners with legal and economic responsibility for management, and establishment of river-based management plans (Dervo et al., 2006; Norske Lakseelver, 2006). To reach 100% participation of landowners by voluntarily means, and thereby bind all landowners legally and financially regarding management of the fishery, has however proven difficult due to disagreement about each landowners' share in the fishery (cf. § 25, The Salmonids and Fresh-water Fish Act). Mandatory organization is therefore under consideration in the current revision of the Act (T. Evensen, Norwegian Salmon Rivers, personal communication, Feb 25 2011).

The river owner association has its own board elected at the annual meeting where each landowner is allowed to vote. Each river also has its own salmon management advisory board with representatives from landowners, anglers' association and local government. In addition the Trondheim fjord region has its own advisory board with representatives from the local advisory boards, landowner organizations, angler's association, the salmon net fishermen organization, local – and regional government. The advisory boards have no formal authority but is a key place for lobby work towards regional government through contact, coordination and discussion of salmon management issues.

Cooperation and the Coase theorem in salmon management

The co-management process in the recreational salmon fishery built stronger landowner institutions (i.e. river owner organizations) opening up for new and innovative partnerships (cf. Kofinas et al., 2007). The Trondheim Fjord Rivers was founded by the river owner organizations and negotiated an agreement with right holders in the fjord about paying a compensation for not using their nets during 2005-2009. Similar net leases from Iceland, Scotland, and by the North Atlantic Salmon Fund served as inspiration for the agreement (Einarsson & Gudbergsson, 2003; McLay & Gordon-Rogers, 1997). This private agreement between The Trondheim Fjord Rivers represented around 1500 landowners and 65 net fishermen in the fjord, and came about partly because property rights were clearly defined (cf. regulating access to harvest) and partly because willingness to pay in the recreational salmon fishery is higher than in the semi-commercial net fishery. The costs to landowners were supposed to be offset by more salmon in the rivers and thereby increased demand from anglers. Net fishermen were expected to gain by getting a better price for their fish, and also being able to use their newly acquired time on other income generating activities. An evaluation report showed that all parties gained from the lease, sharing an annual net income of NOK 26 million, far outweighing costs of around NOK 4 million every year (Kjelden, et al., 2010). The lease also illustrates the relevance of the Coase Theorem (Coase, 1960) in natural resources management, where two private parties can allocate resources efficiently without government intervention if property rights are clearly defined and the right holder is compensated for giving up his right. Olaussen (2007) claims that such arrangements are few due to incentives for free-riding. Nevertheless, the lease shows that appropriate institutional setting could overcome major free-riding problems and cooperation could take place. A similar system for trade of fishing rights is established for several marine fisheries. Individual

transferable quotas that are designated to fishermen to avoid overfishing and provide a reasonable economic return to participants, can be traded and end up where they create the highest economic value (Gordon, 1954; Grafton, 1996).

Salmon management policy documents

The political objectives for management of salmon stocks are set in the Salmonids and Fresh-Water Fish Act of 1992. The Act regulates fishing in sea and freshwater, and its objectives are to "maintain natural diversity and productivity", and within these frames "provide a basis for development of stocks and increase yield for the benefit of fishing right holders and anglers".

Additional main policy documents governing salmon management in Norway are The Agreement on Adaption of a Precautionary Approach by the inter-governmental North Atlantic Salmon Conservation Organization (NASCO, 1998) and the governmental White paper on Protection of Wild Salmon and Completion of National Salmon Rivers and Salmon Fjords (Miljøverndepartementet, 2006). Harvest regulations in sea and rivers are based on a river by river assessment worked out by the Norwegian Scientific Advisory Committee for Atlantic Salmon Management (Anon, 2010), which in turn builds its advices within the frames of NASCO's precautionary approach, guidelines from ICES (International Council for the Exploration of the Sea) and national salmon policy. River owner organizations are supposed to set harvest regulations that ensure the established conservation limit for each river (Hindar et al., 2007), defined as the minimum number of spawners needed to achieve maximum sustainable yield (Anon, 2010).

The political power for management, use and protection of salmon stocks and its habitat is split between several ministries with different goals. The Ministry of the Environment is responsible for the protection and management of salmon stocks through direct actions such as regulating harvest, gene banks, liming of rivers, and fighting the parasite *Gyrodactylus salaris,* but is also responsible for general planning and land use. The Ministry of Fisheries and Coastal Affairs is in charge of fish farming. The Ministry of Petroleum and Energy deals with hydro-power plants, while the Ministry of Agriculture and Food looks are concerned with rural development and angling tourism. Such a fragmentation of responsibility is unfortunate for conservation and management of Norwegian salmon (Liu, et al., 2011; NOU, 1999), but not unique as the same problem is evident in countries where

the recreational salmon fishery is in publicly owned and administrated, e.g. North America (Hanna, 2008).

Changing views on management

Management of renewable natural resources (e.g. fish and wildlife resources, marine fisheries, forestry) has evolved in a society context and is thereby a product of the ideas, beliefs, values and goals of the larger society. The industrial revolution in the 18th and 19th centuries brought progress where industry and technology were seen to solve almost any problem. Nature was to be conquered and domesticated for human use and enhancement (Bottom, 1997).

This optimism was profound in fisheries science and management from the start on in the 1800s. Fish and waters were seen in an agricultural utilitarian view with great potential for improvement and increased yields. Fisheries science therefore got more of an applied approach than e.g. ecology. New technology for artificial propagation of fish arose around 1850. Hatcheries yielded a much higher egg survival rate than natural waters, which gave "evidence" of an engineering superiority with unlimited potential to restore depleted fisheries and feed an increasing human population. Fish could be bred without spawning stocks or habitat. Unpopular proposals about harvest restrictions and habitat protection (cf. dam building) were thus abandoned (Bottom, 1997; Lichatowich, 1999).) From its establishment in 1855 and up to around 1992 important goals of the Norwegian freshwater fishery division were to promote fish propagation and expand salmon freshwater habitat through building fish ladders (Berg, 1986; Skurdal, 1995).

The concept of maximum sustainable yield (MSY) of renewable natural resources originated in the 1920s and soon got a strong position in fisheries management (Larkin, 1977). MSY emphasizes principles of scientific management whereby technical experts determines the optimal stocking and harvest level. MSY sees ecosystems as stable where one can harvest a maximum sustained yield of a resource every year as long overharvest is avoided (Field, 2001). Public agencies have commonly managed to meet the demand from hunter and angler groups or other interest groups, and have for a long time had such maximum biological production as a goal to please the greatest number of users (Field 2001, Bottom, 1997). Resource economics also incorporate harvest (or production) costs, and the management goal here is to produce where the marginal cost equals the marginal benefit of harvesting one extra unit, called maximum economic yield (MEY). MEY is typically at a

lower harvest level than MSY (Field, 2001). A study on how economic and biological conditions influence a recreational salmon fishery in Norway is found in Olaussen and Skonhoft (2008).

Changes in Norwegian salmon fishery management are reflected in the goals of the Salmon Acts of 1964 and 1992. In the 1964 Act fisheries were to be managed to the "greatest benefit for society and individual landowners" (Skurdal, 1995). From the 1960s on stocking increased because the effects of hydropower development and acidification were to be compensated for. Increased knowledge about salmon ecology, the lack of evidence for benefit of stocking, and the fear of spreading parasites resulted in stricter regulations in the Act of 1992 (Anon., 2010). By 1992 the primary goal emphasized that natural stocks and their habitats were to be managed in such a way that they sustained productivity and biodiversity. Within those frames, the Act shall facilitate increased yields for landowners and anglers. The changes from 1964 to 1992, reflects a paradigmatic shift in fisheries management from a single resource utilitarian view, to a more holistic ecosystem management view. Landowners went from being harvesters to managers following the Act of 1992 and the delegation of power and responsibility to river owner organizations.

Recent advances in natural resources management recognize the failure of governmental agencies to handle the complexity of managing natural resources under increased demand, population growth, uncertainty and change (e.g. Chapin et al., 2009; Jentoft et al., 1998). The concept of resilience, a systems ability "to absorb changes of state variables, driving variables, and parameters, and still persist" originating from Holling (1973), is central to this changing view. Chapin et al. (2009:5) argue for a shift from "steady-state resource management" and "ecosystem management" to "resilience-based ecosystem stewardship" where *change* is embraced as a basic feature of how the world work and used to shape sustainability, rather than being prevented and reduced. They emphasize *ecosystems* providing a range of ecosystem services rather than single resource yield. Further they direct *stewardship* that implies accepting managers as a part of the system they manage, and humans having a responsibility for state of the system. Co-management arrangements, involving local stakeholders whose livelihood shape and are shaped by the resource, are a central part of this new view.

Rural areas: From production to consumption and recreation

Several policies dealing with rural development and tourism have implications for angling tourism. Current agriculture policy in Norway and the EU stresses the multifunctionality, or the diversity of production lines, services and collective goods, provided by farming (European Commission, 2004; Landbruksdepartementet, 1999, 2005). Several ministries are directly or indirectly involved in rural development. Norway's tourism strategy focuses especially on sustainability, nature-based tourism and rural areas (Nærings- og handelsdepartementet, 2007). Allowing people to work and settle even in geographical peripheries is one of the objectives of the broad and narrow regional policy of Norway (Kommunal- og regionaldepartementet, 2009). Landowner organizations have interest in rural tourism, and their involvement include national projects and specified goals about income generation from hunting, angling and nature-based tourism (Norges Bondelag & Norges Skogeierforbund, 2005; Norges Skogeierforbund, 2010; Reiselivsbedriftenes Landsforening & Norges Skogeierforbund, 2004).

The countryside is changing from a place primarily for production towards also integrating and partly being replaced by consumption and recreation (Burton & Wilson, 2006). This shift has implications for daily life in rural areas, but also for rural policy and how natural resources are looked upon by landowners. Murdoch and Pratt (1993) note that rural communities have taken advantage of new technologies, new markets, and being able to work from home or commute thereby blurring the boundaries between the urban and the rural.

Structural changes in farming have opened up for alternative use of human, natural and man-made capital. Farm diversification and entrepreneurial activity is greatly encouraged as one of the means for achieving agricultural and regional policy goals, but wage earning is also an alternative to secure household income. Combining agriculture and forestry with income from other businesses or wage earning is sometimes called *pluriactivity* (Eikeland & Lie, 1999), and is a common strategy by farm households in Norway (Eikeland, 1999; Rønning & Kolvereid, 2006). Availability of jobs is greatest near large population centers, but so is also the market for tourism, services and specialized food products. Studies show that there are both ideological (e.g. independence, interest) and economic reasons for choosing farm diversification when wage earning opportunities exist (Eikeland, 1999; Rønning & Kolvereid, 2006).

In general a farm household might have a range of farm objectives and reasons for diversifying into tourism and other businesses, these again impact economic behavior. Findings from the literature include autonomy, life-style motives, use of the resource base, recreation, conservation, family connections and economic objectives (Barbieri & Mahoney, 2009; Follo, Forbord, Almås, Blekesaune, & Rye, 2006; Getz & Carlsen, 2005; Ingemarson, Lindhagen, & Eriksson, 2006; Koesling et al., 2004; Lien et al., 2006; Nilsson, 2002; Ollenburg & Buckley, 2007; Schmitt, 2010; Sharpley & Vass, 2006; van der Ploeg, 2010).

Economic behavior of the landowner

A landowner's economic behavior is defined by how he uses his scarce resources and land in particular. Economic decisions are defined as "the set of processes and acts of sacrificing scarce resources (money, time and effort) in order to acquire products and services that provide desired benefits and end states" (van Raaij, 1999).

Van Raaij (1981) groups the factors that facilitate or constrain economic decisions into: personal factors, situational factors and general economic factors. Personal factors include: personality characteristics of the landowner (e.g. risk-adversity, entrepreneurial, cognitive style, mental strength), life-style characteristics of the household (e.g. wage earners vs. farm income, life-style vs. profit orientation), and the institutions (rules, norms and values) of a society or a subculture (e.g. local community). Cultural norms and values regarding involvement in angling tourism, one's own angling, and profit orientation differ between landowners due to traditions or social pressure from neighboring landowners, family and the local community. Household income, farm resources, size of the salmon runs, and market situation are examples of situational factors in a landowner and angling tourism perspective. General economic factors describe the larger scale (macro) economic environment in which decisions are being made, such as unemployment rate, income distribution, and the general government economic policy. Landowners' perception of the economic environment and their consequential economic behavior may shift depending on these three factors.

Elements of van Raaij's (1981) model of economic behavior (Figure 2) are suitable for analyzing the relationship between farm and landowner characteristics, perception of the economic environment, and behavior for securing household income and livelihood (cf. Lien et al., 2006; Wilson et al., 1993).

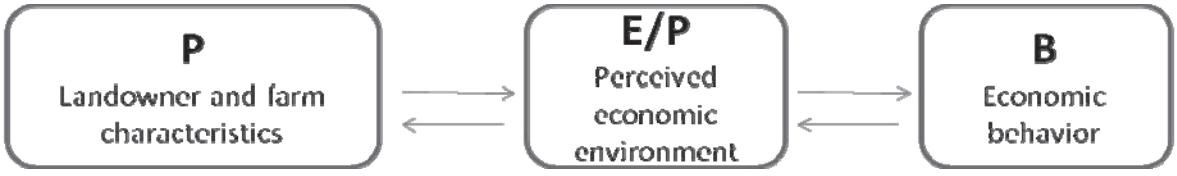

Figure 2. Elements of Van Raaij's (1981) model of the landowner's decision-making environment

The figure presents groups of variables being used in the research design of paper III. *P*→ E/*P* describes how farm, landowners' (households') objectives, and other personal variables (*P*) impact landowner's perceptions of the economic environment (E/*P*). The relationship *P*→ E/*P*→ B shows how farm/landowner variables and landowners' perceptions of the economic environment influence economic behavior (B). Off-farm work or diversifying farm activities are personal characteristics (i.e. *P*), but are also behavior or strategies to handle the economic environment (i.e. B). A personal variable (e.g. income from on or off the farm) influences economic behavior and thereby how a fishing right is used. However, a decision about where to derive income from also alters the personal characteristics. Thus, the impact could also be *P*⇆ E/*P*⇆ B, and it can be impossible to prove which way the causation flows.

A standard assumption of *Homo economicus* is that he tries to maximize his utility (Marshall, 1920). The landowner as a rational economic actor has a portfolio of activities to allocate his time to. Spending time on organizing landowner collaboration, selling angling and angling products might not be compatible with the combination of time and activities that yields the highest utility. The landowner will allocate his resources such that the marginal utility derived from each of the activities will be equal, in line with Johansson and Löfgren's (1985:140) behavior model of the self-employed forest farmer.

Having a portfolio of income sources is also a risk management strategy and reduces household exposure to risk, and thereby secure household income and livelihood. Knight (1921) defined risk as the case in which there is an underlying (objective) probability distribution of outcomes, whereas for the related term uncertainty no such probability distribution exits. Keynes (1937) put it in simpler words and defined uncertainty as "we simply do not know". Kostov and Lindgard (2003) argue that risk from a decision-making perspective must be seen as a subjective measure. In that way actors can improve their performance by changing the environment or changing their perception of it, that is risk management. Huber (2007) claims that when decision-makers face risky situations, their first reaction is not to evaluate values and probabilities, but rather search for measures that can alter the perceived economic environment and reduce the risk, and in that way gain control of

the situation. These risk management strategies can broadly be classified into new alternatives, control, precautions and worst-case plans (Kostov & Lingard, 2003).

Methods

Questionnaire development

Development of the questionnaire was based on the objectives of the PhD project and the LOVIT research project. Several actions were taken to reduce *measurement error* (i.e. questions being misunderstood or incorrectly answered cf., Dillman (2007:197); Needham & Vaske (2008:177)). Studies of farmers and forest owners (Follo, et al., 2006; Koesling, et al., 2004; Lien, et al., 2006; Størdal, Lien, & Baardsen, 2006; Størdal, Lien, & Hardaker, 2007), national reports on landowners (Birkeland, Lein, & Aas, 2000; Fiske & Aas, 2001), discussions with colleagues and managers of the four river owner associations served as input and quality assurance of the questionnaire. Dillman (2007) was used for design and question construction. A pre-test of the questionnaire (face-to-face meeting with eight landowners) and a small pilot study (n=18) were done as recommended by Dillman (2007). In addition the questionnaire was revised by river owner organizations and project researchers. Comments from testing and internal revising were incorporated into the final questionnaire. The final questionnaire is shown in Appendix 1.

Sample and Data collection

The Verdal, Stjørdal, Gaula and Orkla were chosen as study rivers because they are the most important angling destinations in the region and had well functioning river owner organizations with many management responsibilities in the salmon fishery. Address lists to all landowners were available and this also allowed them to have the same chance of being included in the survey, and thus reduced *coverage error* (Dillman, 2007:197; Needham & Vaske, 2008:176). Due to much debate about the net fishery lease and current changes in river owner organization responsibility, the researchers and the river owner organizations jointly decided to send the survey to all landowners. This measure was meant to build trust through letting each and everyone have the ability to express their opinion.

Dillman's (2007) Tailored Design Method for Surveys including five direct contacts with respondents was used to achieve a high response rate. Use of official university labels, a cover letter signed by the river owner organizations, and a token of appreciation were also

measures used as recommended by Dillman (2007). In addition newsletters from the river owner organizations to its members, and four article series in local newspapers in each of the four river valleys created attention about the survey. The first four direct contacts with landowners were by mail (prenotification letter, questionnaire mail out, postcard reminder, replacement questionnaire). The fifth and last contact was done by telephone. The telephone mode was also helpful for checking whether the correct respondent had received the questionnaire, if the landowner was capable of completing the questionnaire (e.g. due to old age) and check reasons for non-response. Seven percent of the 580 persons in the telephone reminder could not be reached and never received a fifth contact. Data collection started in June 2008 and ended in January 2009. The survey yielded 712 answers out of a valid sample of 1161, a response rate of 61%.

Non-response error occurs if landowners not responding to the survey differ from respondents. Such errors might be present even in surveys with high response rates (Needham & Vaske, 2008:178). A non-response study was therefore conducted by telephone in February 2009 to check the validity of the sample. Thirty of 37 landowners (81%) answered the non-response phone survey where they were asked twelve questions from the questionnaire. The survey did not give reasons to expect presence of major non-response bias. Further detail about the data collection is given in Paper I.

Data analysis

Survey questions about fishing right objectives, risk sources, risk management, management actions and river owner organizations' work used seven point semantic differential items ("Likert type item") where only the endpoints one and seven were given verbal labels. When numbers of categories are seven or more and the underlying scale is thought to be continuous the variables can be treated as continuous with use of parametric analysis even though the actual measure scale or item is ordinal, as long as the data meet other assumptions of the analysis (Tabachnick & Fidel, 2007:7). In general a pairwise deletion approach was used for missing values.

Paper I. One-way analysis of variance (ANOVA) with subsequent multiple comparison method (posthoc test) was used to test differences in means of the four rivers regarding landowner, farm and fishing right characteristics, and also objectives about the fishing right. Chi-square tests were used to test differences in frequency of how the fishing rights were used and arranged between rivers. To investigate which and how different

landowner, farm and fishing right characteristics influenced objectives about the fishing right, I ran three multiple regression analyses with respectively the objectives "preserve fish stocks", "maximize income", and "reliable and stable income" as dependent variables.

Paper II. In this paper we analyzed how different farm and landowner characteristics and other factors affected landowners' profit efficiency in salmon angling tourism. A stochastic profit frontier function with an inefficiency module was estimated in line with Kumbhakar et al. (1991). We employed the same basic model as Baardsen et al. (2009) applied to analyze timber supply efficiency, but for a single cross-section rather than for a panel.

Paper III. Landowners were divided into two groups based on the ratio of farm income to gross household income. Landowners having a ratio of 0.25 or less were seen as dependent on "external income", whereas those landowners with a higher ratio were "farm-dependent" ANOVA tests and subsequent multiple comparisons were used to check for mean differences between groups regarding objectives about the fishing right, risk sources and risk management strategies. Common factor analyses (principal axis factoring) with orthogonal rotation (varimax) were used to summarize the information about fishing right objectives, risk sources and risk management strategies into a reduced number of factors. Regression factor scores from the factor analyses were saved for each respondent and used together with landowner and fishing right characteristics in a binary logistic regression model with the landowner groups as dependent variables. A regression approach was used to get a more complete view of the differences between the two landowners groups, because the combined effects of variables may be overlooked in a variable by variable comparison of the two groups. The study followed a similar design as Lien et al's (2006) study of risk sources and risk management strategies among Norwegian farmers.

Paper IV. A typology of landowners was developed through use of cluster analysis. A combination of Ward's method, and the non-hierarchical K-means clustering method (Hair, Anderson, Tatham, & Black, 1998) decided the best number of clusters. Segmentation of landowners into mutually exclusive groups was based on priority of eight objectives about their fishing right. Such a segmentation based on objectives about the resource has been used for forest owners in Sweden and Denmark (Boon, Meilby, & Thorsen, 2004; Ingemarson, et al., 2006). ANOVA with Tamhane's posthoc tests or chisquare tests were used to detect differences between groups in landowner and farm characteristics. Landowner groups' scores on ten management actions to secure fish stocks were compared using a series of ANOVA, repeated-measures ANOVA and posthoc tests. Finally, a new series of ANOVA, posthoc

tests and t-tests were used to reveal landowner groups' attitudes to statements concerning the lease of bag nets and the work of the river owner organization.

Results

Landowner, farm and fishing right characteristics

Eighty-five percent of the landowners in this study had their permanent place of residence on the farm (Table 1). Sixty-four percent of the landowners had at least some work outside the farm, but it was not known how many hours they or the 36% with no off-farm work spent working on their farm. Net self-employment income from the farm was on average 25% of the gross household income. There were however differences[10] between the averages of the four rivers on workload outside the farm with landowners in Verdal having the largest off-farm workload (64% of a man-labor year) and Orkla landowners the smallest (45%). Also net self-employment income from the farm varied with a difference between Gaula being lowest (NOK 109,000) and Orkla highest (NOK 145,000).

Table 1. Landowner and farm characteristics in the four rivers and total.

Landowner characteristics	Verdal	Stjørdal	Gaula	Orkla	Total
Age, mean (SD)	51 (13)	52 (12)	53 (13)	54 (12)	53 (13)
Proportion male	80%	86%	81%	83 %	82 %
Attended College /University	34 %	32 %	33 %	32 %	33 %
Residency on farm	84 %	91 %	85 %	82 %	85 %
[ab] Net self-employment income from the farm in 1000 NOK, mean (SD)	131 (142)	147 (127)	109*[O] (113)	145*[G] (131)	130 (126)
Gross household income in 1000 NOK, mean (SD)	505 (246)	564 (252)	490 (247)	514 (245)	511 (247)
[c] Owners' off-farm workload, mean (SD) in % of a man-labor year	64*[O] (45)	53 (45)	59*[O] (45)	45*[VG] (46)	54 (46)
Ratio with off-farm work, owner*	70%	64%	68%	56%	64%
Ratio with off-farm work, partner	71%	78 %	74 %	76 %	75 %

Note. NOK numbers have 2007-value. €1 = NOK 7.90. March 22 2011.
[a] Net self-employment income from the farm is the sum of self-employment income in agriculture, forestry and fishing and self-employment income from other industries on the farm received during the calendar year, less any losses.
[b] Comparing means between all rivers were tested using one-way analysis of variance (ANOVA) ($F=4,0$, $p<0.01$). River by river compared using Tamhane's T2 multiple comparison method.
[c] Comparing means between all rivers tested using ANOVA ($F=5.3$, $p<0.01$). River by river compared using Bonferoni multiple comparison method.
*[0] $p<0.05$. The mean for this river was significantly different from the mean in river O (Orkla). (G=Gaula, V=Verdal, S=Stjordal).
* $p<0.05$. Chi-square.

One third of all landowners owned their fishing right as part of a private common property. The individual property landowner owned on average 644 m of river bank, but variation was large (SD=810 m) and fifty-five percent owned 400 m or less (Table 2). The common property group owned shares in a fishing right that on average had a river bank length of 1,476 m, being longer than what private property landowners owned. Eighteen percent of all landowners had non-sale of fishing on their farm, 29% offered unrestricted permit sale, 12% sold fishing packages with restricted number of rods and additional services, and long term lease was done by 43%. The type of use varied between rivers with 31% of landowners in Verdal not selling fishing on their farm. Verdal landowners had an average profit from salmon angling tourism of NOK 7,794, which was lower than landowners in Stjørdal (NOK 34,855), Gaula (NOK 37,493), and Orkla (NOK 28,290). Overall variation in profit from salmon fishing was large with a median of NOK 7,000 and one in three landowners having no profit.

Individual property landowners offering fishing packages with restricted number of rods and additional services had an average profit from salmon fishing tourism of NOK 84,414 which was higher ($p<0.05$) than the average profit annual associated with long term lease (NOK 33,554) or unrestricted permit sale (NOK 8,945). Individual property landowners offering fishing packages had on average longer river banks than those offering long-term lease or having no sale of fishing. Landowners offering sale of fishing packages had a mean yield of 991 NOK per kg salmon caught. The mean yield per kg salmon differed between the four use types. However, the subsequent Tamhane's T2 post-hoc test only revealed difference at an 8%-level, between the use types "unrestricted permit sale" and "packages", indicating a possible difference between these groups. Further details about farm and fishing right characteristics are given in Paper I. Main findings from papers I-IV are presented in the following sections.

Table 2. Key figures of landowner - fishing right characteristics.

	Verdal	Stjørdal	Gaula	Orkla	Total
1[a]. Length of fishing right per owner (m)					
- private property, mean (SD)	600 (616)	729 (851)	691 (1 058)	578 (550)	644 (810)
- common property, mean (SD)**	559 (395)	753 (823)	2 122 (1 848)	986 (920)	1 476 (1 546)
N	91	98	248	219	656
2[b]. Arrangement of fishing right**, percentage of landowners with					
- single farm only	35	62	46	59	51
- several farms merged	45	18	41	27	33
- other arrangement (no fishing, other)	22	25	15	19	19
N	87	96	258	228	669
3[b]. Use of fishing right**,. percentage of landowners with					
- no sale of fishing	31	18	16	16	18
- unrestricted permit sale	33	7	34	31	29
- long term lease (≥ 1 year)	23	53	51	39	43
- packages: restricted number of rods with more services	10	17	8	15	12
- other arrangement	9	11	3	7	6
N	88	98	263	231	680
4. Profit from salmon fishing tourism per landowner in NOK, mean, (SD),	7 794*[SGO] (25 586)	34 855*[V] (55 630)	37 493*[V] (77 500)	28 290*[V] (43 448)	29 896 (59 759)
median	0	15 800	10 000	8 000	7 000
Landowners with no profit from salmon fishing tourism	68%	29%	26%	23%	34%
N	75	58	223	202	558

Note.
[a] There are several co-owners per fishing right in a common property. Comparing number of meters per owner between property regimes is therefore no good indication of recourses per landowner.
[b] Frequencies added up to more than 100 % because landowners could arrange the fishing right and sale in more than one way per farm.
*[SGO] $p<0.05$, Tamhane's T2 multiple comparison method. The mean for this river was significantly different from the mean in river S (Stjørdal), G (Gaula) and O (Orkla). V=Verdal. ANOVA for comparing all rivers $F=4.9$, $p<0.01$.
** Chi-square, $p< 0.01$.

Paper I. The landowner group was heterogeneous in respect to involvement in angling, salmon management issues and priority of eight stated objectives about their fishing right. About one in three landowners fished for salmon. Most (72%) landowners reported being interested in salmon management issues, while 28% showed little interest.

On average the objectives "preserve fish stocks", "have good fishing on the farm", and "influence management of the river" received top three priorities by landowners. Getting a "reliable and stable income" and "maximize income" were fourth and sixth respectively, but with large standard deviations, showing a particular disagreement between landowners on these specific objectives. Also "recreation and fishing for me, family and friends" which was

ranked seventh, showed large variation between landowners. Provide salmon fishing to local anglers and social contact with anglers were fifth and last respectively. There was a positive correlation between the income objectives and the two top scored "preserve fish stocks" and "have good fishing on the farm". A negative relationship was found between scoring of the income objectives and "recreation and fishing for me, family and friends".

Differences in fishing right, farm and landowner characteristics explained some of the large variation in how landowners prioritized different objectives about use of their fishing right. On average there were positive correlations between the variables "interest in salmon management", "quality of fishing right", and "profit from salmon angling" and the objectives "preserve stocks", "reliable and stable income", and "maximize income". Number of own angling days was negatively correlated with the income objectives, but positively with protecting the stocks. An increasing workload outside the farm decreased the priority of the income objectives. Residency on the farm increased score of income objectives. Net farm income was positively correlated with maximize income.

Paper II. The average landowner had a profit efficiency of 87%. Landowners' profit efficiency decreased as the revenues from off-farm and on-farm activities increased relative to angling tourism. Factors increasing efficiency were long term rent of fishing instead of permit sale or selling fishing packages with additional services, and common property ownership instead of simple fee ownership. Cooperation, through merging several fishing rights into one beat instead of offering fishing on a single farm basis, decreased efficiency. Other factors decreasing efficiency were increasing fishing right quality, scoring income objectives or own angling objective high, increasing age and education.

Paper III. External income landowners ranked the recreational objective of the fishing right before the income objective. Farm-dependent landowners on the other hand had income objectives ranked before recreation. "Salmon stock variability", "reduced angling season", "riverflow variability", "angling demand variability", and "landowner engagement in the salmon resource" were the sources of risk perceived to have the largest impact on future income from salmon angling tourism. Fishery regulations such as "bag limits" and "gear restrictions" got a medium score. The remaining risk sources dealing with public angling issues, sale and organization of fishing got a medium to low priority. Farm-dependent landowners scored the top four risk sources significantly higher than the external income landowners

In order to secure household income farm-dependent landowners gave highest priority to insurance strategies ("buy farm insurance", "liquidity", and "personal insurance") and

agriculture strategies ("forestry and agriculture on the farm", "keep costs low" and "combination of farm activities"). External income landowners gave "off-farm work" highest priority, but also gave insurance high priority. Agriculture strategies were less important than for farm-dependent landowners. Both groups gave a medium to low priority to risk strategies dealing with salmon and tourism aspects. These strategies were more important to farm-dependent landowners than external income landowners. "Work to strengthen fish stocks" and "long-term lease of the fishing right" was the two most important salmon related strategies.

Paper IV. A cluster analysis of the landowner groups yielded four distinctive clusters named after how they prioritized their fishing right, "the passive owner" (14.5% of all landowners), "the recreationist" (20.3%), "the multiobjective owner" (29%), and "the economist" (36.2%). The passive owner and the recreationist gave very low priority to income from their fishing right, and also had lower quality fishing to offer and lower profit from salmon angling than the two other groups.

Landowners saw "reduce the threats from fish farming" and "disinfect fishing tackle" (against spread of the parasite *Gyrodactylus salaris* as the two most important management actions to strengthen fish stocks. "Habitat improvement", "stocking of salmon", and "reduced season for bag net fishermen at sea" were also given high priority. "Extend the lease of bag nets beyond 2009" received a medium score, and a lower priority than "reduced net season" despite a similar effect on fish stocks. "Reduce river harvest" and "build salmon ladders" got a medium score, while "catch and release" was perceived to be the least important action by all groups.

Landowner groups were overall agreeing that their river owner organizations worked in ways that protected landowner interests regarding salmon management issues and also set fishing regulations that protected stocks. Overall the multiobjective owner and the economist agreed stronger on these two statements than the passive owner and the recreationist. Landowners overall slightly disagreed or were close to neutral about receiving too little information about salmon management issues from the river owner organizations. Regarding the lease agreement landowners slightly agreed or were neutral about receiving enough information from the river owner organizations. Landowners slightly agreed that net fishermen got paid too well for not fishing. Responses to "the net lease yields no economic benefit to landowners" were neutral or slightly agreeing.

Discussion

The main objectives of the thesis are 1) to identify constraints and 2) make recommendations about management of salmon stocks and development of angling tourism in Norway with an emphasis on landowners.

The results show that the landowner group is heterogeneous in respect to landowner and farm characteristics, and which objectives they have about their fishing right. Landowner and farm characteristics explained some of the variation in landowners' objectives about their fishing right, and are important for landowners' relationship to the farm and how they involve in angling tourism and management of salmon stocks. Several landowner typologies can be indentified based on objectives about the fishing right: the passive owner, the recreationist, the multiobjective owner, and the economist. An increasing number of farmers take off-farm work (Logstein & Blekesaune, 2010; Storstad, et al., 2004) and these figures are assumed to be valid for landowners in this study too. As illustrated in van Raaij's model (1981) (Figure 2) this situation also changes landowners' relationship to the farm with the recreational function gaining importance compared to the traditional production or business orientation. Marginalization of salmon angling income, seem to be a good example of such a change, as profit efficiency decreased with increased marginalization. Decreasing profit efficiency is probably caused by less resource input, interest and competence about a marginalized resource. Baardsen et al. (2009) reported similar results from the forestry sector where forest owner profit efficiency from timber supply decreased with increased marginalization.

The recreationist and passive owner groups which currently constitute 36% of all landowners are generally disinterested in income from angling. Around 40% of the passive owners and recreationists do not sell fishing on their farm implying that with increased marginalization, less angling could be available for tourism development and local anglers. Lack of angling opportunities could potentially limit recruitment to salmon angling and furthermore have implications for local involvement in salmon conservation. The consequences of marginalization and off-farm activities on the recreational salmon fishery are issues for further research.

The revealed heterogeneity in the landowner group is generally a problem for cooperation and coordination (Bardhan & Dayton-Johnson, 2000; Schlager & Blomquist, 1998). Resource users are more likely to adopt rules that improve joint welfare if users will be affected in similar ways by the rule change; implying a homogenous user group (Ostrom, 1990:211). Olson (1965:2) argued that "unless the number of individuals is quite small, or

unless there is coercion or some other device to make individuals act in their common interest, *rational, self-interested individuals will not act to achieve their common or group interest."* Preserving stocks is more of a common objective than deriving income from the fishing right and will thus engage a larger amount of landowners. In addition, the institutional framework with most landowners being members of a river owner organization makes it easier to achieve collective action in management of stocks than in angling tourism.

Long term lease of the fishing right was the most frequent and profit efficient use type. However, governmental agencies and landowner organizations want to spur development of angling products that integrates e.g. accommodation, meal service or guiding. Such packages are sold by 12% of landowners and require the landowner to put in more labor, competence, a longer fishing beat, and capital than for long term rent. Those selling packages are probably less efficient because they put in too much labor and resources in their angling product compared to long term lease. The capital value of the fishing right can be high. Landowners have a portfolio of activities to choose from, and allocating their limited resources to a different activity than angling tourism might yield higher overall profit. Some landowners probably accept less profit because they are more life-style than profit oriented (e.g. Getz and Carlsen, 2005), and thereby compensated by the utility they derive from own angling or running an angling tourism business.

Offering fishing based on one single fishing right was surprisingly more profit efficient than when landowners pooled their river banks into one beat. Private common property ownership which can be seen as mandatory cooperation was more efficient than individual ownership however. Landowners have different objectives and probably different reasons for cooperating about beat arrangements. This study did not try to distinguish between the different forms of cooperation. Two main forms of cooperation can be distinguished (Norske Lakseelver, 2006). In some areas e.g. often upper reaches or tributaries, landowners cooperate primarily to offer fishing to locals and typically combine this with unrestricted permit sale. At the other extreme a beat is organized to provide profits. Studies of rural tourism and nature-based tourism enterprises in Norway have found collaboration, networking, and competence to be important antecedence to economic growth and innovative capacity (Dervo, Aas, Kaltenborn, & Andersen, 2003; Kvam & Stræte, 2010; Nybakk, Vennesland, Hansen, & Lunnan, 2008; Rønningen, 2010). Results from this study seem non-conclusive about cooperation in angling tourism, and partly contradict related studies. Further research about cooperation between landowners is needed.

Landowners saw demand, resource and conservation issues as having the largest impact on future income from angling tourism, whereas landowners' own sale and organization of fishing was downplayed. In a study of Swedish fishing tourism companies, fisheries management was seen as an important policy measure to develop angling tourism, but ranked second behind the need for marketing assistance (Paulrud & Waldo, 2010). Results from Finland are similar to those found in Sweden (Toivonen, 2008). The results of my study might be explained by worries among landowners about the health of the Norwegian salmon stocks and the future of salmon angling. Furthermore, the landowner group in the Trondheim fjord region is less specialized towards angling tourism than the Swedish and Finnish companies.

Insurance strategies, work on farm, and off-farm work were the most important strategies to secure household income and show that landowners have a portfolio of activities to choose from when they allocate their time and resources. Use of multiple strategies is also known from farming and forestry (Harwood, Heifner, Coble, Perry, & Somwaru, 1999; Lien, et al., 2006; Meuwissen, Huirne, & Hardaker, 2001; Størdal, et al., 2007). Salmon related strategies were downplayed and this is probably a result of angling income being marginal for most landowners. However, the two top risk sources "salmon stock variability" and "reduced angling season" are beyond the control of individual landowners and probably seen as difficult to influence. The two top rated salmon strategies "work to strengthen fish stocks" and "long term lease of the fishing right" target the top risk sources by protecting the resource, and minimizing potential loss by reducing work and effort involved with use of the fishing right.

Landowners considered a reduction of the threat from salmon farming (escapes, salmon louse) and disinfecting fishing tackle (to stop spread of the parasite *Gyrodactylus salaris*) as the two top management actions to strengthen fish stocks. The Norwegian Scientific Advisory Committee for Atlantic Salmon Management (NOSACASM) also sees salmon farming and Gyrodactylus as the major threats to Norwegian salmon stocks (Anon, 2010). Salmon farming is beyond landowner control, and so is eradicating Gyrodactylus. However, it is the river owner organization that coordinates and performs disinfection of fishing tackle which could hinder spreading of Gyrodactylus. The importance of a well functioning river owner organization and landowner cooperation was also expressed by the high ranking of "landowner engagement in the salmon resource" as a risk source for future income.

River owner organizations have influence primarily on management actions within the river system such as the highly ranked “stocking of fish” and “habitat improvements”. NOSACASM reviews the literature on effects of stocking and concludes that stocking generally have had negative or in best case no effect on the health and conservation of salmon stocks (Anon, 2010). Instead, recommendations for both Atlantic salmon and Pacific salmon emphasize sound ecological principles of strengthening natural reproduction e.g. through habitat improvement and reduced harvest (Bottom, et al., 2009; Todd, et al., 2011). The reason for stocking being so highly acclaimed by landowners probably goes way back in time. Fishery sciences and management have had an agrarian utilitarian view on fish and waters; whereby hatchery fish was seen as a way to improve nature (Bottom, 1997; Lichatowich, 1999). The governmental fishery division in Norway dedicated historically much of its time and resources to stocking and building fish ladders as way of increasing production (Berg, 1986; NOU, 1999; Skurdal, 1995). Voluntary stocking activity by landowner and angler groups was widespread and peaked in many rivers in the 1970s and 1980s. Marine survival in this period was much higher than today. Landowners and anglers might therefore have difficulties to distinguish between the effects of stocking and increased marine survival, and see the good salmon runs as proof for the effects of stocking. No evaluation of these voluntary stocking efforts has been conducted (Anon, 2010). What landowners were taught by employees in the fishery division often made lasting impressions and is not easily replaced by new knowledge according to Skurdal (1995). Another aspect in this respect is that many landowners are farmers and already from the start on have a view compatible with the MSY-agricultural view on fisheries management. Arlinghaus and Mehner (2005) make a comparable finding in a study of German anglers. They point out that volunteer fishery managers often do not accept that some of their traditional management strategies (e.g. stocking) are unsustainable, and give poor knowledge about fishery science as an explanation why managers prefer actions that give immediate results on catch (e.g. stocking of catchable fish) instead of long-term, more sustainable actions (e.g. habitat improvement).

Activities that could be perceived to restrict own activity or gain, such as “extend the net lease”, “reduce river harvest”, and “catch and release” were given lower priority than other actions. These findings are similar to those found for German anglers by Arlinghaus and Mehner (2005), and Tangeland et al. (2010) who found salmon anglers in Norwegian rivers to oppose management actions restricting their activity.

Thorstad et al. (2008) conclude that catch and release might be a successful tool to protect declining salmon stocks. It was not until 2006 governmental authorities indicated that catch and release could be an important and legal management tool in the Norwegian salmon fisheries (Miljøverndepartementet, 2006). A strong subsistence orientation to angling in Norway (Aas, Thailing, & Ditton, 2002), combined with unfamiliarity and lack of knowledge about catch and release probably explains why many landowners gave this management action a low priority. Widespread use of catch and release for salmon in Europe emerged in the 1990s. Today it is practiced both as a regulatory and voluntary measure to protect stocks in e.g. United Kingdom, Iceland, and Russia (Thorstad, Næsje, Mawle, & Policansky, 2008). A similar development might be seen in Norway as the number of salmon being released is growing year by year (SSB, 2011b). One of four anglers voluntarily released salmon in 2008 (Tangeland et al., 2010). In 2010 twelve percent of the nationwide catch was released; within the four study rivers 25% to 34%. (J. O. Oldren, Verdal river owner organization, personal comment, March 18 2011; Morten Welde, Stjørdal hunter and angler association, March 18 2011; SSB, 2011b). The increasing use of catch and release is likely to influence landowner attitudes. A potential polarization of the landowner group between proponents and opponents of catch and release might emerge. In a review of the catch and release literature Arlinghaus et al. (2007) call for research to understand the role of catch and release as a source of conflict between stakeholders, but also as facilitator for a conservation ethic in recreational fisheries. Landowner and angler groups often argue that closed rivers will lead to less interest in salmon conservation, and that maintaining a caring angling constituency is in itself a good reason to open for fishing. In these circumstances catch and release might be the only alternative to a reduced or closed season. Documentation of the effects on conservation work of such arrangements is scarce (Arlinghaus et al., 2007). Research on the issues discussed could give valuable insight about how conflicts emerge and learning occurs in the landowner group, and thereby has implications for designing policy instruments to facilitate cooperation among stakeholders regarding salmon management and conservation.

According to landowners, river owner organizations were in general doing a good job protecting landowner interest and setting fishing regulations that protected stocks. Based on the findings about priority of management actions and relatively many landowners being disinterested in salmon issues, one could question if landowners have the competence to know this for sure. The results also show a potential for improving the communication and information flow between river owner organizations and their members, as landowners wanted more general information from the river owner organization and especially about the

net fishery lease. Asymmetric information between the landowner group and the river owner organization is an example of principal-agent problems (e.g. Stevens, 1993:281) and could cause distrust and conflicts. Berkes (2009) remarks that newly emerged co-management arrangements tend to be captured by the local elite, and could be a source of conflict and disempowerment.

There are several plausible reasons why the net lease ended after 2009. The reduced net fishery season from 2008 on probably contributed to landowners seeing other management actions as more important to strengthen salmon stocks. In addition, landowners seemingly wanted to transfer the costs of reducing the net fishery to the government, as "reduce net fishery season" was given higher priority than "extend the net lease" despite its similar effects on stocks. Although the evaluation report showed a considerable net economic gain from the net fishery lease (Kjelden et al., 2010), the average landowner perception was that net fishermen were paid too well and that economic benefits to landowners were missing or limited. This disparity might origin from a lack of information to landowners during the lease period, but also lower return of salmon to the coast camouflaging the biological effects of the lease. For many landowners paying towards management and conservation of stocks is a new concept, which came as a result of delegation of responsibilities in the 1990s and the weak salmon returns in many of the following years. Previous experience, based on favorable ocean conditions, might have given the impression that salmon will come back regardless of whether management actions were taken. Salmon may therefore have been taken for granted, and paying to the lease could be perceived as causing nothing but expenses. Landowners have incentives for not paying to the lease and free-ride because more salmon will appear on their beat as long as enough landowners contribute to the lease. Olaussen (2007) makes a game theoretical analysis of the net fishery lease and concludes that the stochastic ecology of the salmon which brings uncertainty about strength of the salmon runs, gives landowners additional incentives to free-ride on their paying colleagues. Because landowners set their permit prices before the strength of the salmon runs are predicted, they will not be able to set an optimal price reflecting anglers' willingness to pay for the actual quality of fishing. However, the institutional arrangement with almost all landowners being members of river owner organizations and partly legally bound to finance management actions reduces the possibilities of free-riding and facilitates cooperation.

Current and potential changes regarding structural rationalization of the farm sector, opportunities for off-farm work and strength of salmon stocks work together and influence angling tourism, conservation, and management of salmon stocks. The Trondheim fjord

recreational salmon fishery is thus a "social-ecological system" with interaction between interdependent physical, ecological, cultural and economic factors (Chapin et al., 2009:6). Regulations and rules about farm ownership and structure, work of the river owner organizations, and governmental engagement in salmon conservation are important in this regard because they shape and facilitate landowner behavior. The river owner organization is the link between government, landowners and the salmon resource in this co-management arrangement. Thereby it influences development of angling tourism, management and conservation of salmon stocks. Several of the management actions to strengthen salmon stocks are beyond landowner or river owner organization control, and are as such important risk sources influencing landowners' economic behavior in varying degrees. Although marine mortality is currently high, the best measure landowners could do to protect stocks and angling income is to maximize natural smolt production in the rivers through habitat management and restoration, and ensure enough spawners by regulating the fishery. Information flow, competence building, and engagement in the landowner group are important factors for meeting the future challenges in the recreational salmon fishery.

Implications for policy

The findings in this study have several implications for policy makers and managers working with development of angling tourism and management of salmon stocks. Landowners with different objectives may however respond differently to specific policy issues. A common classification of public policy instruments is (1) economic means, (2) regulations, and (3) information (Vedung, 1998).

Van Raaij's (1981) conceptual model (Figure 2) shows how landowner and farm characteristics influence use of farm resources including the fishing right (economic behavior), but also a reciprocity as the influence goes both ways. Sevatdal (2006) argues that in a long-term perspective farm characteristics and property rights tend to change to reflect the intensity and types of land use. He claims that current farm structure and use is not optimal and regulations put further hindrance for business activities base on natural resources. So, in the short run farm characteristics and property rights are given and actors adapt their economic activity accordingly.

Use of long term lease and decreasing marginalization of angling income increases profit efficiency in supply of angling tourism. An increasing amount of landowners generate

most of their income off-farm. This is probably changing their relationship to the farm so that the recreational function of the fishing right gets a higher priority than before. Landowners have a portfolio of economic activities and other interests to pursue. Receiving no income from the fishing right might be an optimal adaptation for many landowners regardless of own angling interest. In a society perspective it might be a suboptimal solution as total welfare could be increased if another landowner were able to acquire the right for angling tourism purposes; i.e. a potential pareto improvement. These findings suggest that fishing tourism policies should encourage a specialization where angling tourism is made an important income source for some landowners or entrepreneurs, by renting fishing rights from other landowners.

The heterogeneity of the landowner group and the farms makes cooperation both a necessity and a challenge in management of stocks and angling tourism. Although this study was non-conclusive about profit efficiency and cooperation in angling tourism, several other studies have suggested cooperation to be important. The attitudes towards stocking and catch and release show the apparently irrationality of landowners in prioritizing management actions. It does however demonstrate a need for knowledge building and improved communication targeting the landowner group. River owner organizations have a potential to inform their landowners better about management issues and what effects management actions that may have on stocks. The latter point here is also a task for governmental authorities and scientists who should disseminate new knowledge through the co-management arrangement. Information and learning could increase trust and facilitate cooperation among landowners. Establishing advisory services as in the agriculture sector could spur angling tourism development.

Information might not affect all groups of landowners, whereas regulatory measures will. Forcing landowners to become members of the river owner organization and thereby making them responsible for payments towards management of the stocks would eliminate free-riders, and is considered in the current revision of The Salmonids and Freshwater Fish Act (T. Evensen, Norwegian Salmon Rivers, personal communication, Feb 25 2011). Such mandatory organization of landowners already exists in Iceland (Gudjonsson & Scarnecchia, 2009).

Iceland has mandatory organization of the fishing, where the whole river is leased as one unit and managed by a firm or an angling club (which can be owned or run by the landowners) (Gudjonsson & Scarnecchia, 2009). Requiring a certain minimum size for a beat to be opened for fishing could ensure beats better suited for angling tourism and more angling

available in an open market. Landowners holding back fishing for themselves would in many cases have to cooperate with neighboring farms. A legal minimum size for hunting areas is in effect for allocating harvest quotas of moose, and is such a concept familiar to many landowners.

Making it easier for specialists to acquire fishing rights would provide stability and reduce risk. Detaching the fishing right from landownership as is done in e.g. Scotland is a measure that ensures that the fishing rights are held by the most efficient owners, similar to the market for individual transferable quotas in the marine fisheries. It might however have negative implications for salmon management as ownership and responsibility for the riparian habitat would no longer be attached to the fishing right.

As of today fishing rights can be rented for up to 10 years at a time. Fishing tourism entrepreneurs however have problems convincing landowners to lease out their fishing rights for more than one to two years at a time (V. Heggem, Aunan Lodge, personal communication, Feb 22 2011). There is a legal disparity between rent of land for agriculture production and rent of the fishing right. The Land Act of 1995 requires rent of agriculture land to last a minimum of 10 years and further ensure rational farm units. A similar legal rule concerning fishing rights would provide more stability for fishing tourism entrepreneurs, reduce risk and encourage investments and professionalization.

The disparity in use of policy instruments between "new" farm activities (e.g. fishing tourism) and traditional agriculture and forestry is unfortunate and might signal a classification of respectively "inferior" and "superior" farm activities. Forestry and agriculture have economic incentives such as tax incentives, subsidies, insurance options, and natural damage funds. Free advisory services exist to a large degree. There are no such arrangements for fishing tourism. In order to buy a farm the new owner needs to get a concession[11] from governmental authorities. A condition is that the new owner should have competence in agriculture. Even when the income potential could be greater from angling, no authority requires the new owner to be able to run the angling tourism part of the farm.

A final message to policy makers is that all the above policy measures are of little use if salmon stocks disappears or are strongly weakened as already seen in some parts of Norway. Without healthy stocks there is no salmon angling in the long run. Landowners saw salmon stock variability and reduced angling season as the top sources of risk regarding future income from salmon angling. Protecting the stocks not only sustains a recreational salmon fishery, but also provide a more stable economic environment and thereby incentives for landowners investments in salmon conservation and angling tourism.

Landowner types may respond differently to policy instruments. The multiobjective owner would be the easiest to influence using all three policy instruments, whereas the *passive owner* could be difficult to affect. Seen in a top-down management perspective the technically most effective instrument to affect all groups is regulations. This is probably the most targeted measure to make the recreationist and the passive owner cooperate about angling tourism, since deriving income from the fishing right is a low priority objective for them. Landowners asked for more information from river owner organizations and in addition gave top or high priority to preservation of stocks. Information has some effect on all groups in achieving cooperation in management of stocks. Economic incentives should facilitate acquisition of fishing rights by entrepreneurs, and would mainly target the economist and the multiobjective owner

Conclusions and future research

Conclusions

The recreational salmon fishery is a highly interesting meeting place for natural resources management, delegation of rights and responsibilities, and economic development in rural areas. Landowners are key actors in this regard by having a wide range of roles like being farmers, holders of fishing rights, suppliers of angling, tourist hosts, managers of salmon stocks through the river owner organization, and owner and managers of salmon habitat. Landowners have limited angling tourism resources, and share salmon management responsibilities, making collective-action by the landowner group important. The recreational salmon fishery which both salmon and landowners are parts of can be viewed as a social-ecological system where there is reciprocity between salmon as a resource and landowners regarding angling tourism, management and conservation of salmon stocks.

The study revealed a heterogeneous landowner group regarding quality of the fishing rights, farm and landowner characteristics, and objectives about the fishing right. Heterogeneity is generally a problem for cooperation and coordination. Several distinct landowner types were identified. Marginalization of angling income reduces profit efficiency in supply of angling tourism. The ongoing trend with more landowners taking off-farm work or not living on the farm may lead to future landowners emphasizing the recreational function of the fishing right and other farm resources rather than the business function. Thereby, profit efficiency would decrease and less fishing could be available for anglers and have

consequences for rural tourism. Policies should therefore facilitate development of specialized fishing tourism enterprises by making it easier to rent and acquire fishing rights. This could be done by e.g. legislating a minimum period for lease of rights. Mandatory organization of landowners in river owner organizations and introducing a minimum size for beats could also reduce some of the problems caused by heterogeneity in the landowner group.

Measures to strengthen salmon stocks might be the most important measure to promote angling tourism, as this ensures that angling can take place and reduces landowners' investment risk. Landowners have little influence over salmon farming and ocean conditions, but could maximize smolt production in the rivers to mitigate these effects and show that they take their share of salmon conservation. Habitat and harvest management are key issues. The attitudes towards stocking and catch and release show the apparently irrationality of landowners in prioritizing management actions. This demonstrates a need for knowledge building in the landowner group and for improved communication between scientist, government, river owner organizations and landowners about the effects of stocking and other management actions.

The many landowners being negative to the net fishery lease might be due to a lack of information from the river owner organizations but also the unfamiliarity with paying for conservation, a concept being new for landowners that historically may have taken salmon for granted.

The results from this study might be useful also for understanding how landowners view other natural resources on their farm and the effects on resource management, conservation and economic development.

Some suggestions for future research

The finding in this study points to further research needs about the recreational salmon fishery. The consequences of marginalization and off-farm activities on angling tourism and management and conservation of salmon stocks should be investigated further. Some possible research questions are: Does landowners' changing relationship to the farm and the fishing right lead to less angling being available in a market? What are the motivations of fishing tourism entrepreneurs for running their business? What opportunities and constraints do they see for angling tourism development and landowner cooperation? An approach using

qualitative interviews and focus groups coupled with behavioral economics theory could yield valuable insight into these aspects.

The agrarian-maximim sustained yield view of many landowners regarding fisheries management coupled with a strong harvest orientation is an interesting departure for further studies. Catch and release is increasingly gaining popularity in Norway and is an issue in this regard. Arlinghaus et al. (2007) call for research to understand the role of catch and release as a source of conflict, but also as a facilitator for conservation ethics in recreational fisheries. Co-management arrangements are considered knowledge partnerships and bridge knowledge from different organizations and levels (Berkes et al., 2009). Social learning is one of the tasks essential for cooperation. The mentioned research could give valuable insight into how conflicts emerge and social learning occurs in the landowner group, and thereby has implications for management. Psychology, sociology and anthropology might all be relevant theoretical approaches to these issues.

The rapid changes seen and anticipated in the recreational salmon fishery call for research to assess the resilience or robustness of this social-ecological system. The design principles for successful management of a commons (Dietz et al. 2003; Ostrom 1990), coupled with the Institutional Analysis and Development (IAD) framework (Imperial, 1999)) is a relevant departure for analysis. The IAD framework is widely used for exploring different aspects of sustainability, common-pool resources and institutions in political science and institutional economics (e.g. Rudd, 2004).

Footnotes

1. A fishing right is a legal property right. The physical or land part of the right is referred to as a *river bank.*
2. In a Norwegian setting the fishing right belongs to whoever owns the land adjacent to the water, cf. The Salmonids and Freshwater Fish Act of 1992. Landowners in this article refer to owners of fishing rights, being small scale private riparian landowners, unless otherwise stated. This is equivalent to small scale forest owners, sometimes referred to as non-industrial or family forest owners (Harrison et al., 2002).
3. A *beat* is defined as a length of river or bank, let or fished as a unit by angling (McLay & Gordon-Rogers, 1997). Landowners often pool several short beats to make a single, long beat.
4. This is similar to e.g. Iceland, but different from Scotland, for example, where fishing rights and landownership are separate, and North America where hunting and fishing rights belong to the public (state) regardless of landownership.
5. Salmon fishing rights can be leased out for a maximum of 10 years at a time according to The Salmonids and Fresh-water Fish Act of 1992.
6. Regulated according to The Law of Common Property of 1965 (Sameigelova).

7. A farm has minimum 2,5 hectare of agricultural fields or 100 hectare total according to The Allodial Rights Act of 1974 (Odelsloven) and The Concession Act of 2003 (Konsesjonsloven).
8. Laws of "allodial" rights (odelslovgivning) have existed for more than 1000 years in Norway and are also found in Faroe Islands, Iceland, Austria, Switzerland and Germany. Reasons for such an arrangement have been to give farmers a free and independent position as self owners, and avoid acquisition by pure capital interests (Forbord, 2006).
9. The Prisoner's Dilemma game was invented in 1950 by Merril Flood and Melvin Dresher, and later formalized and given the name by Albert W. Tucker. Retrieved March 15 2011 from http://plato.stanford.edu/entries/prisoner-dilemma
10. Note that when I write "different" or "higher"/"lower" regarding the results, statistical tests have shown a significant difference between groups. If no *statistical* difference, one could not claim any differences.
11. Governmental concession is needed for third person who wants to buy a farm. The Concession Act submits claims to the buyer. Concession is granted if the acquisition achieves a protection of land for agriculture production and an owner- and farm arrangement of greatest gain to society. Concession can be denied if the acquisition is meant for leisure purposes.

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Paper I

Du springende laks, jeg erindrer dig vel, I strømmende Elve du legges i Lig, Hvor grummeste Fosser de bruser; Hvor blinker din Skiorte som Sølvet i Søm, Hvad tvinger dig til at frem-ile mod Strøm, Og Fængsles i Maskbunden Ruse. Men ingen passer dig saa snedelig paa, Om Nætternes Skygge, som Bonden hin graa, Med liusende Næver og Lyster: Han veed meget vel om din' Passer og Gang, Thi han kommer med den treforkede Stang, Og Piken igjennem dig kryster.

Petter Dass, around 1670, Nordlands Trompet

Scandinavian Journal of Hospitality and Tourism,
Vol. 10, No. 3, 207–230, 2010

Fishing Rights and Supply of Salmon Angling Tourism in Mid-Norway

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ABSTRACT *A limited number of studies have focused on angling from a tourism perspective. The objective of this study was to investigate the objectives of landowners regarding their rights for salmon fishing, including landowners' supply of fishing services to the tourism market. The data originate from a questionnaire survey of 712 landowners in four rivers in the Trondheim Fjord region of Norway. The heterogeneity of the landowner group with differences in fishing right and property characteristics, as well as landowner characteristics seemed to explain some of the large variation in objective scores about use of the fishing right as indicated by the standard regression models. This study also indicated that how landowners use their fishing rights affected yield per kg of salmon caught, with landowners selling angling as packages with a restricted number of rods and with additional services on average having the highest mean net income per kg of salmon with 991 NOK. The results tell policy makers that successful cooperation in salmon fishing management and conservation of salmon stocks must be based on an understanding of the multiple objectives of the heterogeneous landowner group.*

KEY WORDS: Salmon angling, landowner, nature tourism, fishing rights, objectives

Introduction

Angling is a popular recreational activity on every continent, and has thus received attention in the scientific literature (see e.g. Pitcher & Hollingworth, 2002; Aas, 2008). Most studies focus on estimates of the socio-economic value of different recreational fisheries and analysis of anglers' behavior and preferences (for reviews see e.g. Navrud, 2001; Paulrud, 2004; Toivonen, Roth, Navrud, Gudbergsson, Appelblad, Bengtsson, et al. 2004). Olaussen's (2007) game theoretic study on salmon policy, decision-making processes and free-riding among landowner with salmon fishing rights in mid-Norway is however one exception to this. There has been limited research focusing on angling from a tourism perspective (Borch, Policansky, & Aas, 2008), but some recent studies on angling tourism and fishing tourism entrepreneurs

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1502-2250 Print/1502-2269 Online/10/030207–24 © 2010 Taylor & Francis
DOI: 10.1080/15022250.2010.495483

in Finland, Sweden, and Norway have been published as national reports (Fiske & Aas, 2001; Fiskeriverket, 2008; Toivonen, 2008).

There is a particular need for research investigating the supply-side of the fishing tourism market. In a Nordic setting riparian landowners are suppliers of angling opportunities, due to ownership of fishing rights. Private landowners can also be tourist hosts providing accommodation, meal services, guiding and other activities and services to anglers. Finally, landowners in several countries manage fish stocks by setting local fishing regulations, protecting and restoring stocks and river habitats.

Throughout Europe private landowners are strongly encouraged by governmental authorities to diversify into tourism and other property-based non-agricultural or non-forestry activities (Sharpley & Vass, 2006). This aims to strengthen on-farm employment and to maintain a populated countryside at a time when the agriculture and forestry sectors face diminishing returns. In the Nordic countries there is a particular focus on turning landowners' hunting and fishing rights into tourism products (Landbruksdepartementet, 1999; Landbruks- og matdepartementet, 2007; Naturvårdsverket & Fiskeriverket, 2005; Turistdelegationen, 2003). The most successful commercialization of such rights in a Nordic context is perhaps salmon angling tourism in Norway and Iceland.

The wild Atlantic salmon (*Salmo salar*) has attracted angling tourists to some of Norway's 400 salmon streams since the mid-1800s. It is estimated that a total of 100,000–150,000 anglers including around 35,000 foreign anglers fish in Norwegian salmon rivers every year. In three summer months these anglers spend an estimated 1.3 billion NOK (1 Euro = 8.34 NOK) on fishing permits, accommodation, meal services and guiding, thus contributing substantially to the economy of landowners and local river communities (Reiselivsbedriftenes Landsforening & Norges Skogeierforbund, 2004). There is, however, a consensus that Norway has potential for further development of salmon fishing tourism (Millington-Drake, 2002; Reiselivsbedriftenes Landsforening & Norges Skogeierforbund, 2004). Such a development is highly dependent on landowners' decisions about use of their fishing rights and their interest and ability to commercialize this resource by improving the angling product. The landowner group is also becoming more diverse; the majority of farmers have at least some work outside their properties (Storstad, Rye, & Almås, 2004), and an increasing number of owners do not live on the property (Sevatdal, 2006). Sevatdal (2006) points out that this leads to a fragmentation of interest, implying that there are different and often conflicting objectives among landowners about use of their fishing rights.

This study looks at the salmon fishing right from a tourism perspective. The main objective of the paper is to gain insight into what objectives non-industrial private riparian landowners[1] have about use of the fishing right and what variables influence these objectives. In addition I investigate in what form and to what extent landowners supply the market with fishing services. Empirical results are based on a postal questionnaire sent to landowners in the rivers Orkla, Gaula, Stjørdal and Verdal of mid-Norway.

The Fishing Right and Property Regimes

In Norway fishing rights are indivisible from the property and cannot be sold without selling the land itself according to §19 in The Salmonids and Fresh-water Fish Act of

1992. Farms or properties that historically acquired most of the good farmland next to the rivers are therefore the main holders of salmon fishing rights. The fishing right is a property right and thus defines who has access to the resource and under what conditions. Vatn (2005) stresses that "Even a property right is a social relation. It is a relationship between the right holders and the rights regarders under a specific authority structure…". Landowners have exclusive access to fishing on their own property, but most let other people fish there, either for free, by buying a permit, or renting the whole beat for a period.

There are several types of ownership, or property regimes, to fishing rights. Bromley (1991) refers to property regimes as the structure of rights to resources and the set rules for how these rights are exercised. Types of property regimes in the literature are private property, common property, public property and open access (Vatn, 2005). Ownership to freshwater fishing rights in Norway is associated with the first three. Non-industrial private landowners own by far most of the salmon fishing rights in rivers, either as private property or common property. In the case of a *private property* regime the fishing right belongs to a single property[2] or an individual landowner. A *common property* regime is also a private property, with the difference that the fishing right is owned by a group of property units or co-owners (Bromley, 1991). Each co-owner has shares in the fishing right and the majority decides how the resource is used. Sometimes there are conflicting objectives among co-owners whether the right should be used for maximizing profit, angling for the co-owners and their families, or a combination of these and other objectives. The individual landowner on the other hand can decide by himself how he wants to use his beat based on what objectives he has for the fishing right. There are however formal and informal institutions influencing his decision.

The access or business part of the fishing right is run by the individual landowner or a group of landowners. The fish stocks are managed collectively by all landowners in the river through a corporate body – the river owner association. The rationale behind this is that salmon stocks use most of the river system as spawning and nursing grounds and cannot be managed on an individual property basis. The river owner association sets fishing regulations (e.g. personal quotas, length of season, equipment restrictions etc.) for the whole river and also does fish enhancement projects, all within the frameworks set by governmental authorities.

The Salmon Angling Product

Fishing conditions vary throughout the season and also temporarily due to factors such as water level, temperature and size of the fish run. That is why the demand for good fishing beats, those that yield catch opportunities even when river conditions vary, is high. A good salmon beat typically extends 1 km and contains several holding pools split by shallower or faster flowing water. Because of the small-scale property structure in Norway many fishing rights are shorter than this. This implies that a good fishing beat often requires cooperation between landowners.

The overall beat structure and the high number of beats with unrestricted permit sale seen in many Norwegian rivers are not optimal for tourism development, provision of good angling experiences or for providing income for landowners (Aas,

2004). That Norway in the 1990s lost shares in the international salmon angling market to destinations such as Iceland, Russia, Alaska, and Canada (Aas, 2004) could be a consequence of this. To match these countries Norway has to improve the angling product by offering longer beats with a restricted number of rods, but also integrate lodging and other services in the product to a greater extent (Millington-Drake, 2002; Norges Bondelag & Norges Skogeierforbund, 2005). Catch probability is a key factor in angling tourism and can be enhanced by improving beat arrangement, increasing stock size or limiting the allowable harvest per angler (bag limit), but also the use of guides for inexperienced anglers might improve catches. To illustrate this problem; the average visiting angler to Orkla needs about four days to catch a salmon (Fiske & Aas, 2001), whereas salmon fishing in Iceland yields about one fish per rod per day (Agnarsson, Radford, & Riddington, 2008). Dervo, Aas, Kaltenborn and Andersen (2003) pinpoint competence and cooperation as the main requirements for growth and development of landowner-anchored, nature-based tourism in Norway. These factors are important for improvement of the angling product as well as management of the salmon resource.

Landowner's Utility and Relationship to the Property

The landowner's relationship to the property influences his behavior with regard to the fishing right. In neoclassical economic terms the landowner is a producer or supplier of fishing with profit-maximization as his objective. However, the landowner also has preferences or objectives in addition to profit and will instead try to maximize utility (benefits) from the fishing right. Landowners may have different individual utility functions, meaning they have different preferences about what is important to their household and how they value their fishing right. A household production function is often being used in economics to explain how different input factors of the household (leisure activities, time, salary, etc.) contribute to the utility (output) of the household.

The conceptual model in Figure 1 shows which variables influence landowner's objectives for use of the fishing right. Property characteristics include information about the fishing right and other property-based resources. The length and the quality of the fishing right, and also type of property regime tell about the income potential from angling tourism. Other natural resources and income generating businesses on the property such as agriculture, forestry, tourism facilities and hunting rights could influence the way the landowner thinks about the fishing rights as well. Landowner characteristics consist both of background information such as age of landowner, household income and education level, but also what preferences and values the landowner has about his fishing right. North (1991) defines institutions as "the humanly devised constraints that structure political, economic and social interaction", which can be further divided into formal rules (constitutions, laws, property rights) and informal constraints (sanctions, taboos, customs, traditions, and codes of conduct). Fishing regulations, lease contracts, and fishing rights are examples of the former, whereas informal constraints could be custom or tradition among a group of landowners for merging the fishing rights to one unit, or social pressure from family or community to have unrestricted permit sale instead of maximizing income. The demand for salmon

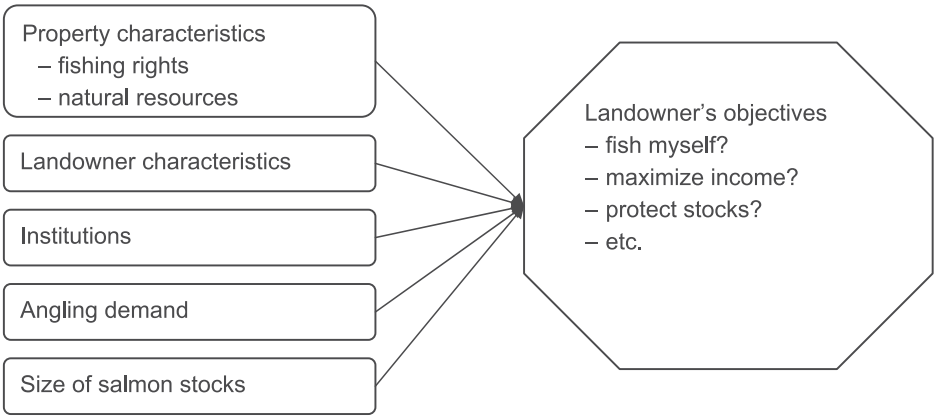

Figure 1. Conceptual model showing which factors influence a landowner's objectives about use of the fishing rights.

angling and size of the salmon stocks affect the income potential from salmon angling and ultimately influence landowner's objectives too. Landowner's objectives again influence to what extent and how fishing is being supplied to the market.

Data and Methods

Study Area

The Trondheim Fjord region of mid-Norway has six major rivers and around 30 middle- and small-sized salmon streams, making it an important region for the wild Atlantic salmon. Around 15–20% (50,000–80,000 kilograms) of the Norwegian rod catches comes from this region. The Orkla, Gaula, Stjørdal and Verdal rivers are the four top salmon rivers in the Trondheim Fjord (Figure 2). The total annual catch in the four rivers for the period 2006–2008 was 12,000 to 18,000 salmon averaging around 4 kilograms each. For the period 1997–2007 Gaula and Orkla have been in the top five Norwegian rivers in terms of numbers of salmon caught per year, whereas the Stjørdal and Verdal are among the top 20 and top 25 respectively (Norske Lakseelver, n.d). The three best rivers have a 100-year history of fishing tourism, while the Verdal first got some attention as an angling destination 25–30 years ago.

The Orkla has 378 landowners and a salmon bearing stretch of 88 km with no major tributaries. The main stem of Gaula transports salmon up to 110 km from the sea; several tributaries add up to a total of 200 km owned by 502 landowners. The Stjørdal has 135 landowners, and a main river stem of 50 km, with fishing in tributaries adding 19 km to this. The 52 km of the Verdal are split between 147 landowners. The main stem of the rivers receives the bulk of the fishing effort. The few kilometers nearest the sea and the very upper parts of the rivers get less attention from anglers.

Farming and forestry are important income sources for many landowners in the region, especially in the mid and lower areas of the river valleys. Thirty-eight percent of mid-Norwegian farmers had working hours outside the property in 2003 (Storstad et al.,

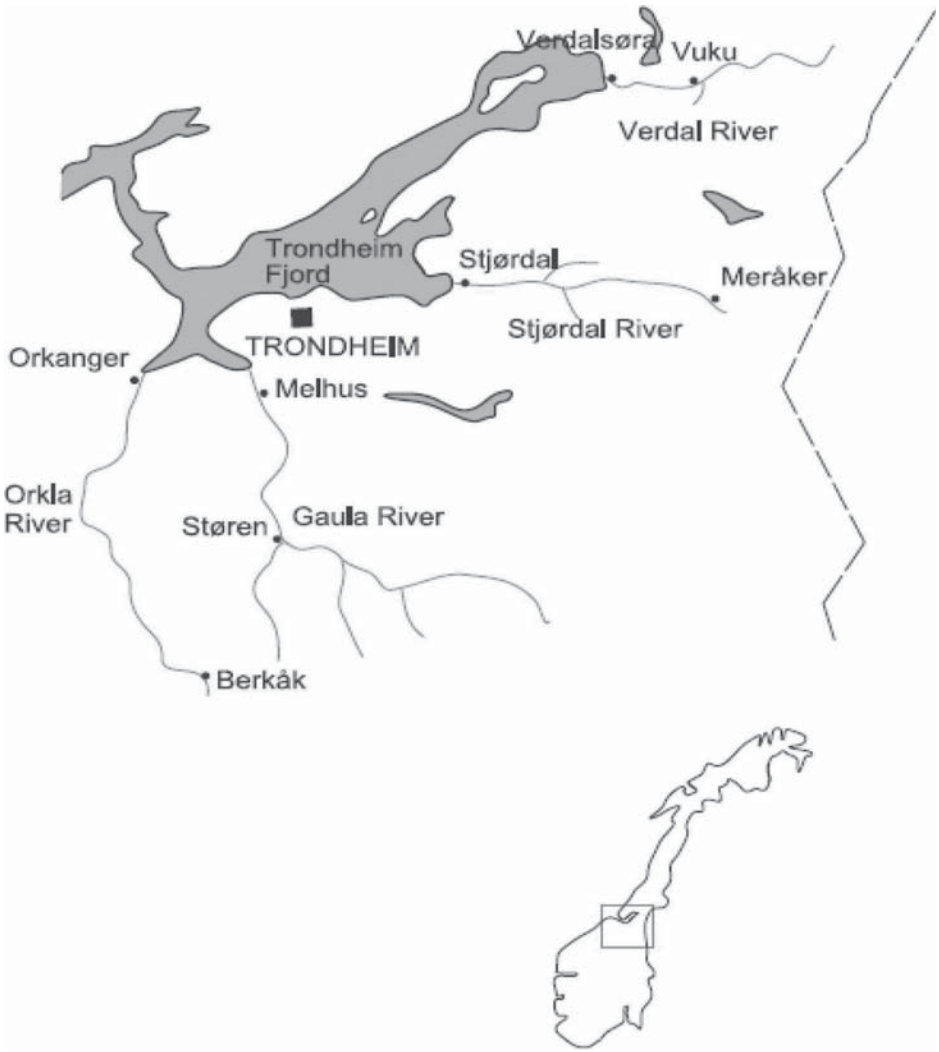

Figure 2. The Trondheim Fjord Region of Mid-Norway showing the Verdal, Stjørdal, Gaula and Orkla Rivers. (Map by Origokart).

2004). Each of the four river valleys is inhabited by 14,000–22,000 people, and the total region of eastern Trondheim Fjord has a population of about 350,000 inhabitants.

Questionnaire Development

A pre-test of the questionnaire (face-to-face meeting with eight landowners) and a small pilot study (n = 18) were done as recommended by Dillman (2007) before finishing the questionnaire development.

Questions were given as tick-the-box, four point ordered-category items or a seven-point semantic differential item with only the endpoints one and seven given verbal labels, fill-in-the-number and a final open-ended question for any comments. Major topics in the questionnaire were fishing rights and property characteristics, objectives concerning use of the fishing right, interest in salmon angling and salmon management issues. Background information about the household such as income, education level and off-property work was also collected.

Data Collection and Sample

The rivers in the survey are the four largest rivers in the study area and were chosen due to the overall importance of salmon angling there, and because the river owner associations had address lists of all landowners. The survey was sent to all individual private properties, but for the 45 common properties only the contact person for each property was included. This exclusion of the other co-owners was done because detailed economic questions for the whole common property, information they often would not have, potentially could cause frustration and high non-response rates. This main survey included a total of 943 landowners (Table 1).

To achieve a high response rate Dillman's (2007) Tailored Design Method for surveys incorporating up to five direct contacts with the respondents was followed. The first contact, a pre-notice letter with information about the survey, was mailed in early June 2008. Four days later landowners received a questionnaire package where confidentiality issues were specifically addressed. A postcard with a reminder and a thank you was sent all landowners 10 days after the questionnaire mail out. A replacement questionnaire and a new cover letter were sent in late August. Around 10–20 days after receiving the replacement questionnaires landowners would get a telephone call reminder as a fifth contact. The telephone mode was also useful for checking whether the correct respondent had received the questionnaire. Data collection ended in October 2008.

Table 1. Sample numbers and response numbers of landowners in the two surveys and the non-response study.

	Main survey	Co-owner survey	Non-response phone study
Initially contacted	943	262	40
Returned blank; would not participate	32	8	7
Ineligible[ab]	8	6	3
Ineligible[c]	19	11	
Valid sample size[d]	916	245	37
Responses	561	151	30
Response rate	61 %	62 %	81%

[a]Respondents were either dead or too old to complete the survey or correct address was not found.
[b]Three persons in the non-response study could not be reached.
[c]Respondents reported owning no fishing right or the property was sold to person included in the survey.
[d]Valid sample size = number of people initially contacted – ineligible.

A survey of the 262 remaining co-owners in the 45 common properties started early in November 2008, and followed the same survey design and number of contacts as the main survey. These co-owners were sent a modified questionnaire lacking all economic questions about salmon fishing, but including one about net economic income from salmon fishing tourism. The last questionnaire was returned in January 2009. A total of 7% of the 580 persons in the two telephone call reminders (i.e. main survey and co-owner survey) could not be reached in any way and never received a fifth contact. Overall response rate for the two surveys was 61% (Table 1). Response rates varied between rivers with 76% (102 of 135 landowners responded) in Stjørdal, 63% (92 of 147) in Verdal, 63% (243 of 378) in Orkla, and 55% (275 of 502) in Gaula. In addition to these five contacts, information was printed in the newsletters from the local river owner associations and a total of about 20 articles in local newspapers to create attention about the survey.

Non-response Study

Not being able to generalize the results of a survey beyond your sample is a concern in all survey research, even with high response rates (Needham & Vaske, 2008). A method for investigating non-response bias is to contact non-respondents and ask some questions from the questionnaire (Needham & Vaske, 2008). The fifth contact by telephone gave indications of non-response reasons, whereby 12 questions were included in a non-response study. In February 2009, 30 out of 37 random non-respondents answered the non-response phone survey, a response rate of 81% (Table 1).

Variables and Data Analysis

Monetary data and responses about use of the fishing rights were collected for the year 2007. For data analysis NOK values were stated as reported in the questionnaire. The number of cases used in different analyses varied because of missing answers on some questions. Basic parametric and non-parametric statistics were used to test differences between groups. Pearson correlation, with a pairwise deletion of missing values, was estimated to study the relationship between the eight different objectives about the fishing rights.

Three standard multiple regression analyses were run with scores on the specific objective about the fishing right as dependent variables, and predicted by eight independent variables based on the conceptual model in Figure 1. A pairwise deletion of variables approach was used to get a larger sample size for the regression analysis than by using a listwise deletion. Sample size was 451 with no missing values on the variables used.

Dependent variable (DV): Landowners were asked how they prioritized each objective about their fishing rights. Scores on the objective were assigned from one to seven on a seven-point semantic differential item with only the endpoints one (*very low priority*) and seven (*very high priority*) given verbal labels. The item was meant to be understood as a continuum with equal intervals between the numbers.

When numbers of categories are seven or more and the underlying scale is thought to be continuous the variables can be treated as continuous even though the actual

measure scale or item is ordinal, and data meet other assumptions of the analysis (Tabachnick & Fidell, 2007, p. 7). The fact that ordinal data often more closely resembles interval scales than nominal scales and thus can be used in parametric analysis such as Pearson correlation and multiple regression is also pinpointed by others (Agresti & Finlay, 2009, p. 13; Carifio & Perla, 2007).

Regression analyses were run with each of the three objectives; maximize income, reliable and stable income, and preserve fish stocks, respectively, as a dependent variable in three separate regression models. The observed value of DV was calculated using the mean value of all the scores on the individual objective. The two income objectives were chosen because of their evident connection to business and tourism, and due to the difference in saliency in the wording of these related objectives. The preserve fish stocks objective was the top ranked objective among landowners, and also had a relatively strong correlation (> 0.60) with the two next ranked objectives which were also resource management objectives. The resulting objectives were considered less important for the tourism approach of this paper.

The eight independent variables used for estimating all models were:

- *Interest in salmon management*: A four point ordered-category item with answer options *very interested, somewhat interested, a little interested, not interested*. For model input the answers were transformed to a binary variable with the two last answer categories given the value 0 and the two first ones 1.
- *Own fishing days*: Number of own fishing days in 2007. Continuous variable; open-ended question.
- *Length of fishing right*[3]: In meters. Continuous variable; open ended question. In 1000 m for model input.
- *Catch possibility*: A seven-point semantic differential item with only the endpoints one (*very low*), four (*medium*) and seven (*very high*) given verbal labels. The item was meant to be understood as a continuum with equal intervals between the numbers.
- *Residency on property*: Binary variable where no = 0 and yes = 1.
- *Off-property workload*: Ratio in percent of a full man-labor year. Continuous variable; open-ended question.
- *Net income from salmon fishing tourism*: In NOK. Continuous variable based on open-ended questions. In 1000 NOK for model input. Net income from salmon fishing tourism in the co-owner survey for those that did not answer this question, were estimated by assigning them the mean net income for co-owners in their common property. In the main survey net income from salmon fishing tourism was calculated by taking the gross income from salmon fishing tourism (rent of fishing plus any additional services supplied to the anglers) and subtracting fishing tourism costs, and management fees paid to the river owner association. The 78 respondents that came out with less than negative 500 NOK in net income were assigned a missing value on this question, based on discussing with Jon Kjelden in Gaula Fiskeforvaltning whether such outcomes where likely to exist (personal communication, 6 April 2009).
- *Net self-employment income from the property*: Ordered item with six answer categories on a continuum of NOK, 0–50,000; 50,001–100,000; 100,001–200,000;

200,001–300,000; 300,001–400,000; more than 400,000. Respondents were assigned mean value of their category for use in the model. Last category value set to 400,001. Variable divided by 10,000 for model input.

Results

Non-response Study

In the non-response group 83% reported not fishing themselves, compared to 64% of respondents. There were significant differences between the groups on how many days they had been fishing with the non-responders fishing the least (Mann-Whitney's U = 8198, z = –2.25, $p = 0.02$). The number of co-owners in each common property was significantly higher for the non-response group with a median of 10 vs. 5 people (U = 720, z = –2.70, $p < 0.01$). There were no differences between the two groups on the questions of interest in salmon management issues, a statement about how well the local river owner association worked, type of property regime, length of fishing right, ownership on both banks of the river, catch possibility on their fishing right, net income from salmon fishing, sex, age, or education level. The tests suggest a possible underrepresentation in the response by landowners in those common properties with many co-owners. Given only 12 answers from landowners in common properties and the possibility of measurement error in this question[4], the results are discussed with potential bias in mind.

Landowner and Property Characteristics

Eighty-five percent of the landowners had their permanent place of residence on the property of the fishing right (Table 2). Sixty-four percent of the landowners had at least some work outside the property, but it was not known how many hours they or the 36% with no off-property work spent working on their property. Net self-employment income from the property was on average 25% of the gross household income. There was however significant differences between the averages of the four rivers on workload outside property with landowners in Verdal having the largest off-property workload (64% of a man-labor year) and Orkla landowners the smallest (45%). Also net self-employment income from the property varied with a significant difference between Gaula, the lowest (109,000 NOK), and Orkla, the highest (145,000 NOK). These numbers indicate that work on the property was more important to Orkla landowners than for the other groups.

Fishing Rights Characteristics and Supply of Fishing Tourism

Numbers of landowners in the different property regimes varied significantly between rivers, but with an overall average of 33% of landowners in common properties (Table 3). The private property landowner owned on average 644 m of fishing right, but variation was large (SD = 810) and 55% owned 400 m or less. The common property group owned shares in a fishing right that on average was 1,476 m, being significantly longer than that owned by private property landowners (U = 29,807, z = –7.35,

Table 2. Landowner characteristics from the four rivers and total.

Landowner characteristics	Verdal	Stjørdal	Gaula	Orkla	Total
Age, mean (SD)	51 (13)	52 (12)	53 (13)	54 (12)	53 (13)
Proportion male	80%	86%	81%	83%	82%
Attended College/University	34%	32%	33%	32%	33%
Residency on property	84%	91%	85%	82%	85%
[ab]Net self-employment income from property in 1000 NOK, mean (SD)	131 (142)	147 (127)	109*^{O} (113)	145*^{G} (131)	130 (126)
Gross household income in 1000 NOK, mean (SD)	505 (246)	564 (252)	490 (247)	514 (245)	511 (247)
[c]Owners' off-property workload, mean (SD) in % of a man-labor year	64*^{O} (45)	53 (45)	59*^{O} (45)	45*^{VG} (46)	54 (46)
Ratio with off-property work, owner*	70%	64%	68%	56%	64%
Ratio with off-property work, partner	71%	78%	74%	76%	75%

Note: NOK numbers have 2007-value. 1 Euro = 8.34 NOK

[a]Net self-employment income from the property is the sum of self-employment income in agriculture, forestry and fishing and self-employment income from other industries on the property received during the calendar year, less any losses.

[b]Comparing means between all rivers were tested using one-way analysis of variance (ANOVA) ($F = 4,0$, $p < 0.01$). River by river compared using Tamhane's T2 multiple comparison method.

[c]Comparing means between all rivers tested using ANOVA ($F = 5.3$, $p < 0.01$). River by river compared using Bonferoni multiple comparison method.

*$^{0}p < 0.05$. The mean for this river was significantly different from the mean in river O (Orkla). (G = Gaula, V = Verdal, S = Stjordal).

*$p < 0.05$. Chi-square.

$p < 0.01$). Co-owners reported on average to be sharing the fishing right with 6 other persons (SD = 5), but variation was large with up to 22 people reported in one common property. Eighteen percent of all landowners had no sale of fishing on their property, 29% offered unrestricted permit sale, 12% sold fishing packages with a restricted number of rods and additional services, and long term lease was offered by 43%. The type of use varied significantly between rivers (Table 3) with 31% of landowners in the Verdal river not selling fishing on their property. Sixty-eight percent of landowners in Verdal reported no net income from salmon fishing and on average they had 7794 NOK in net income, which was significantly lower than landowners in Stjørdal (34,855), Gaula (37,493) and Orkla (28,290). Overall variation in net income from salmon fishing was large with a median of 7000 NOK. A number of respondents in the main survey also reported offering guiding ($n = 21$), rent of fishing equipment ($n = 20$), and kiosk sale ($n = 19$) to anglers, but the income from these activities was not known by the landowners.

Individual property landowners offering fishing packages with a restricted number of rods and additional services had an average net income from salmon fishing tourism of 84,414 NOK, which was significantly higher than the average income associated with a long-term lease (33,554 NOK) or unrestricted permit sale (8945 NOK) (Table 4). The individual property landowners offering fishing packages

Table 3. Key figures of landowner-fishing right characteristics.

	Verdal	Stjørdal	Gaula	Orkla	Total
1[a]. Property regime, % of landowners in**					
– private property	89%	73%	60%	64%	67%
– common property	11%	27%	40%	36%	33%
n	89	99	268	236	695
2. Length of fishing rights per owner (m)					
– private property, mean (SD)	600 (616)	729 (851)	691 (1 058)	578 (550)	644 10)
– common property, mean (SD)**	559 (395)	753 (823)	2 122 (1 848)	986 (920)	1 476 (1 546)
n	91	98	248	219	656
3[b]. Arrangement of fishing rights**, percentage of landowners with					
– single property only	35	62	46	59	51
– several properties merged	45	18	41	27	33
– other arrangement (no fishing, other)	22	25	15	19	19
n	87	96	258	228	669
4[b]. Use of fishing rights**, percentage of landowners with					
– no sale of fishing	31	18	16	16	18
– unrestricted permit sale	33	7	34	31	29
– long term lease (≥ 1 year)	23	53	51	39	43
– packages: Restricted number of rods with additional services	10	17	8	15	12
– other arrangement	9	11	3	7	6
n	88	98	263	231	680
5. Net income from salmon fishing tourism per landowner in NOK, mean, (SD), median	7794*[SGO] (25,586) 0	34,855*[V] (55,630) 15,800	37,493*[V] (77,500) 10,000	28,290*[V] (43,448) 8000	29,896 (59,759) 7000
[c] Landowners with zero or negative net income from salmon fishing tourism	68%	29%	26%	23%	34%

Table 3. Continued.

	Verdal	Stjørdal	Gaula	Orkla	Total
n	75	58	223	202	558
6[d]. Gross income from lodging in NOK, mean (SD)	89,000 (58,000)	70,082 (113,200)	61,537 (56,416)	56,337 (67,544)	62,402 (75,636)
n	4	19	27	38	88
7[e]. Gross income from meal service in NOK, mean (SD)					26,438 (18,364)
n					8
8[f]. Catch possibility on own fishing rights, mean (SD)	3.78 (1.60)	4.26 (1.38)	4.09 (1.67)	4.09 (1.51)	4.07 (1.57)
n	90	100	265	234	689

[a]There are several co-owners per fishing right in a common property. Comparing number of meters per owner between property regimes is therefore no good indication of resources per landowner.
[b]Frequencies added up to more than 100% because landowners could arrange the fishing right and sale in more than one way per property.
[c]Negative income existed when landowners paid a management fee to the river owner association but reported no income from salmon fishing. Respondents with less than negative 500 NOK in net income were given a missing value on this question. See also methods part.
[d]Another 40 persons reported offering lodging, but did not know the gross income from it. This question appeared only in the main survey.
[e]Another 18 persons reported offering meal service, but did not know the gross income from it. This question appeared only in the main survey.
[f]Landowners were asked on an item from one to seven to evaluate the catch possibility on their property compared to other properties in the river. 1 = very low catch possibility, 7 = very high catch possibility.
*[SGO]$p < 0.05$, Tamhane's T2 multiple comparison method. The mean for this river was significantly different from the mean in river S (Stjørdal), G (Gaula) and O (Orkla). V = Verdal. ANOVA for comparing all rivers $F = 4.9$, $p < 0.01$.
**Chi-square, $p < 0.01$.

Table 4. Characteristics of how landowners use the fishing right.

Use type:	1. Unrestricted permit sale	2. Long-term lease (≥ 1 year)	3. Packages: Restricted number of rods with additional services	4. Other arrangement	5. No sale of fishing
Individual property (IP)	$n = 75$	$n = 176$	$n = 62$	$n = 25$	$n = 98$
Length of fishing right, mean (SD) in m	846 (1347)	599*[35] (580)	950*[25] (725)	638 (665)	391*[23] (553)
Sum of lengths, in m	63,450	105,424	58,900	15,950	38,318
Percent of total length of IP fishing	22%	37%	21%	6%	14%
Net income IP landowners, mean (SD) in NOK	8945*[23] (16,550) $n = 65$	33,554*[13] (65,646) $n = 140$	98,572*[124] (102,521) $n = 52$	19,796*[3] (31,279) $n = 18$	
Net income all landowners, mean (SD) in NOK	15,157 (31,484)	36,940 (63,388)	84,414 (94,144)	20,730 (30,312)	
[a]Net income per kg salmon caught, mean of all beats (SD) in NOK	336 (754) $n = 40$	480 (505) $n = 97$	991 (1461) $n = 40$	944 (612) $n = 5$	Total: 573 (886) $n = 182$

*$p < 0.05$. Tamhane's T2 multiple comparison method.
[23]different from use type 2 and 3.
1=use type 1; 4=use type 4, 5=use type 5.
[a]ANOVA $F_{3,178} = 4.86$, $p=0.003$. Tamhane's T2 multiple comparison method with a value of $p=0.084$ between use type 1 and 3 indicates a tendency of difference between the two.

had, on average, longer fishing rights than the group's long-term lease, and no sale of fishing, suggesting that a long fishing right is favored for offering such type of fishing. Landowners offering sale of fishing packages had a mean net income of 991 NOK per kg salmon caught. The income per kg salmon differed significantly between the five different use types (ANOVA $F_{3,178}$= 4.86, p=0.003). The subsequent Tamhane's T2 post-hoc test indicated a possible difference (p=0.084) between the use types unrestricted permit sale and packages.

Landowners' Involvement in Angling and Salmon Management

Sixty-four percent of landowners did not fish for salmon in 2007. Twenty-seven percent never went to check their beat and/or the anglers during the season. Landowners in Stjørdal fished the most with 47% fishing at least once, and 86% checked their beat and/or anglers. In Verdal only 58% of the landowners checked their beat and/or anglers. Gaula and Orkla both had numbers of 72%. Interest in salmon management issues in their own river did not differ between rivers, and 72% of all landowners expressed being *somewhat interested* or *very interested* in this. Twenty-eight percent were *a little interested* or *not interested*.

Landowners' Objectives about Use of the Fishing Right

The three related objectives of preserving fish stocks, having good fishing on the property, and influencing management of the river received overall top priority by landowners (Table 5). Getting a reliable and stable income from the fishing right was placed fourth overall, but with a relatively large standard deviation (2.16) within the total landowner group indicating large disagreement about the importance of this objective. Significant differences between rivers were found in six of the eight objectives.

Landowners in Verdal scored four of eight objectives significantly lower than all other rivers. The two income objectives – reliable and stable income and maximize income – were given the lowest priority by Verdal landowners, whereas other rivers had the reliable and stable income objective as high as third and fourth place. Verdal landowners had the same top two objectives as in other rivers. Compared to other rivers they gave these objectives significantly lower scores, and this was partly explained by the overall correlations between the objectives that shows a positive and relatively strong correlation between the two income-related objectives and the two top scored *preserve fish stocks*, and *have good fishing on the property*. Landowners in Verdal had significantly less net income from salmon fishing tourism than other landowners (Table 3), and subsequently scored income-related objectives lower. Landowners who saw the objective *recreation and fishing, for me, family and friends* as important seemed overall to downplay the priority of the income objectives as indicated by the weak negative correlation relationship between these objectives.

Influencing Landowners' Objectives

A standard multiple regression analysis was run between score on the objective about the fishing right as the dependent variable, and eight independent variables based on

Table 5. Landowners' objectives about use of the fishing rights. Comparison of mean scores for each objective, river by river and total for all rivers.

Landowners' objectives[a]	Verdal	Stjørdal	Gaula	Orkla	Total
Preserve fish stocks	4.86*^{SGO} (1.70)	5.49*^{V} (1.47)	5.56*^{V} (1.54)	5.58*^{V} (1.40)	5.47 (1.52)
Have good fishing on the property	4.38*^{SGO} (1.85)	5.22*^{V} (1.56)	5.20*^{V} (1.59)	5.23*^{V} (1.52)	5.12 (1.61)
Influence management of the river	4.20*^{G} (1.65)	4.56 (1.57)	4.75*^{V} (1.67)	4.64 (1.60)	4.62 (1.53)
Reliable and stable income	3.12*^{SGO} (2.05)	4.74*^{V} (2.11)	4.55*^{V} (2.12)	4.48*^{V} (2.12)	4.38 (2.16)
Provide salmon fishing to local anglers	4.00 (1.79)	4.01 (1.70)	4.18 (1.93)	4.10 (1.93)	4.11 (1.88)
Maximize income	3.21*^{SGO} (2.05)	3.99*^{V} (1.79)	4.04*^{V} (1.94)	4.12*^{V} (1.93)	3.96 (1.95)
Recreation and fishing for me, family and friends	3.98 (1.99)	4.20 (2.12)	3.89 (2.09)	3.83 (2.16)	3.93 (2.10)
Social contact with anglers	3.63 (1.85)	3.50 (1.95)	3.89*^{O} (1.94)	3.42*^{G} (1.85)	3.64 (1.90)
n[b]	80–86	93–97	248–252	226–229	647–661

Note: numbers shown as mean (SD).

[a]Landowners were asked on a scale from one to seven how they prioritized each of the listed objectives about their fishing right (1 = very low priority, 7 = very high priority).

[b]The sample size n varies from objective to objective for the same river because not all respondents answered about each of the objectives.

*^{SGO} $p < 0.05$. Bonferroni multiple comparison method. The mean of this objective for landowners in Verdal was significantly different to the mean of landowners in rivers S (Stjørdal), G (Gaula) and O (Orkla). V = Verdal.

the conceptual model in Figure 1. This was done in order to measure how these variables influence the landowners' different objectives. Thus, three regression models were run; one for the objective of preserving fish stocks, another for maximizing income and a third for achieving a reliable and stable income. The estimation results are presented in Table 6. Scatter diagrams and plots of the residuals confirmed independence and normality of the residuals. There was however some heteroscedasticity for all models with residuals increasing with increasing score on the dependent variable. This implies that the models will have a larger prediction error for a landowner who gives the objective high priority (score) than for the landowner who gives the objective a lower priority.

In the preserve stocks model the value of $R^2 = 0.24$ indicates that almost one fourth of the variability in the score on the objective of preserve fish stocks was predicted by the model. The independent variables with regression coefficients significantly different from zero were interest in salmon management, own fishing days, catch possibilities, and net income from salmon fishing. Interest in salmon management seemed to be the variable with the highest unique contribution in reducing variability of the model as indicated by its squared semipartial correlation (sr^2) of 0.09 (Table 6).

The value of $R^2 = 0.23$ in the maximize income model indicates that 23% of the variability in the score on this objective is predicted by the model. Own fishing days (negative) and catch possibilities were the two variables contributing the most to reduced variability of the model with sr^2 of 0.04 and 0.03 respectively. The regression coefficient for length of fishing right was the only one not significantly different from zero.

One-third of the variability in the score on the reliable and stable income model was predicted by the model, as indicated by $R^2 = 0.33$. Thus, the objective of achieving a reliable and stable income seems to be better predicted than the objectives of preserving stocks or maximizing income. Net income from salmon fishing and catch possibility, both with an sr^2 of 0.05 each, were the two variables with highest unique contribution in reducing the variability of the model. All regression coefficients except the ones for length of fishing right and net property income were significantly different from zero.

The variables "workload outside of the property" and "own fishing days" had a negative impact on both objectives related to income, while the latter had a positive impact on the objective to preserve fish stocks.

Discussion

This paper gives insight into landowners' objectives about use of the salmon fishing right and how this right is used in a tourism perspective. The large variation in landowners' priority of objectives is probably not unique to salmon fishing rights in mid-Norway, but can be generalized to other natural resources as well and in particular to those with tourism potential such as hunting and fishing rights. The heterogeneity of the landowner group with differences in fishing right and property characteristics, as well as landowner characteristic seemed to explain some of the large variation in objective scores about use of the fishing right as indicated by the regression models.

Overall it might seem surprising that landowners rated individual-oriented objectives related to income on average lower than the "greater good" objectives about

Table 6. Estimation results for the three standard multiple regression models.

	Model 1 Dependent variable (DV): Preserve stocks $R^2 = 0.24$, $F_{8, 512} = 20.3$, $p < 0.001$				Model 2 DV: Maximize income $R^2 = 0.23$, $F_{8, 511} = 18.6$, $p < 0.001$				Model 3 DV: Reliable and stable income $R^2 = 0.33$, $F_{8, 511} = 31.7$, $p < 0.001$			
Independent variables	Regr. Coeff.[a]	t[b]	Part[c]	sr^{2d}	Regr. coeff.	t	Part	sr^2	Regr. coeff.	t	Part	sr^2
Interceptor	4.23	18.40***			2.02	6.82***			1.94	6.34***		
1. Interest in salmon management (=1)	1.12	7.89***	0.304	0.09	0.53	2.89**	0.112	0.01	0.65	3.48**	0.126	0.02
2. Own fishing days	0.01	2.03*	0.078	0.01	−0.03	−4.72***	−0.184	0.03	−0.04	−4.73***	−0.171	0.03
3. Length fishing rights (km)	0.09	1.75	0.067		0.06	0.88	0.034		0.12	1.71	0.062	
4. Catch possibilities	0.11	2.46*	0.095	0.01	0.27	4.89***	0.191	0.04	0.35	6.15***	0.223	0.05
5. Net income salmon fishing (in 1000 NOK)	0.004	3.54***	0.136	0.02	0.01	3.34**	0.130	0.02	0.01	6.20***	0.224	0.05
6. Net property income (in 10,000 NOK)	−0.002	−0.42	−0.016		0.01	2.07*	0.081	0.01	0.01	1.31	0.047	
7. Workload outside property (% of a man-labor year)	−0.002	−1.20	−0.046		−0.004	−2.13*	−0.083	0.01	−0.005	−2.99**	−0.108	0.01
8. Residency on property (=1)	−0.15	−0.87	−0.033		0.51	2.32*	0.090	0.01	0.59	2.56*	0.093	0.01
Unique variance (Σsr^2)				0.13				0.13				0.17
Shared variance				0.11				0.10				0.16

Note: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

[a]Regr.coeff.= unstandardized regression coefficients, [b]t = t-value; [c]Part = semipartial correlation; [d]sr^2= squared semipartial correlation; shown for significant variables only.

protecting the salmon resource and management of the river. Length and quality of the fishing right and thereby the income potential from salmon fishing differed greatly among landowners in this study. A third of landowners reported having no income from their fishing right and it is not likely for these landowners to have income as a top objective. Their connection to the salmon resource, if any, is probably as anglers or managers of the stocks. There was also a strong and positive correlation between income-related objectives and management objectives, indicating that landowners earning money on the salmon have a strong individual-oriented motive for protecting the salmon resource. A study like this does not necessarily reveal landowners' true objectives or the distance between objectives, as protecting the resource is the socially acceptable objective for everyone to report. Respondents have often a tendency to present themselves in the best manner relative to social norms, and surveys can therefore produce social-desirability bias (King & Bruner, 2000). The score difference between the *reliable and stable income* objective and the similar, but less salient *maximize income* objective might be an indication of this.

The large variability of objectives among landowners is, however, in accordance with other studies. Follo, Forbord, Almås, Blekesaune, and Rye (2006) studied forest owners in mid-Norway and found large variation within this heterogeneous group regarding their relationship to and objectives about the forest resource. A study by Lien, Flaten, Jervell, Ebbesvik, Koesling, & Valle (2006) looked at what objectives Norwegian farmers had about their farm operation. To produce high quality food was ranked on top with reliable and stable income second. Profit maximization was ranked low. Farmers in Lien et al.'s study and the landowner group in this study ranked similar objectives about different resources in much the same way, even though all farmers have an income from the farm operation and can be seen as a more homogenous group. Studies from several countries show that farmers rank the profit maximization objective as low (Gasson, Crow, Errington, Huston, Marsden, Winter, 1988; Koesling, Ebbesvik, Lien, Flaten, Valle, & Arntzen, 2004; Willock, Deary, Edmards-Jones, Gibson, McGregor, Sutherland, et al. 1999).

Landowners in Verdal gave most objectives a significantly lower score than landowners in the other rivers, and also scored low on characteristics such as net income from salmon fishing and catch possibility, variables that contributed positively to the objective score in the regression models. In addition landowners in Verdal had a higher off-property workload, a factor with a negative score contribution in the two income models. A possible explanation of some of these differences could be that the Verdal River has a much shorter history as a top salmon river, a lower total catch and probably also lower quality of the fishing. Landowners in Verdal might therefore have lacked the interest or ability to develop angling tourism to the same extent as in the three other rivers.

The ANOVA test showed overall differences in mean yield per kg salmon for the different user groups, but post-hoc tests between pairs of groups showed significant differences only at a 10% level (p=.08) between two of the groups. The results are therefore interpreted with caution. There could be several reasons why so many landowners in this study chose to get capital income from long-term lease of the fishing rights, rather than offering higher yielding fishing packages which require labor input. One possible explanation could be that landowners perceive investing time and money

in salmon fishing tourism to be risky, due to the salmon being vulnerable to forces beyond the landowners' control. Another reason could be that there are better ways to use labor or other resources on or outside the property, activities that for many could be an optimal risk management strategy for the household. Lack of knowledge and/or interest in salmon fishing tourism might contribute to this pattern too. Conflicting objectives between co-owners or individual landowners as shown in this study could also hinder such use. Many landowners do not have a fishing right of the quality required for selling fishing packages, and present use whether it is lease or permit sale might in fact be reflecting the quality of the fishing right and therefore be optimal under current conditions.

The results from this study also showed that many landowners do not fish themselves, had low quality fishing rights and/or no income from salmon fishing and were less interested in salmon management issues. This minority of landowners would likely see just small gains or losses by actively getting involved in management or tourism, and because of transaction costs they would tend to not become involved, even though the landowner group as a whole would gain if they did. Olson (1965) pinpointed this lack of action by any one individual in such a setting, and called it the pervasiveness of latent groups.

Future research should investigate how and to what degree different uses of the fishing right is resource dependent, shaped by personal characteristics, or by institutions. New studies should also look at how landowners perceive and manage risk related to the salmon resource. The proposed studies could provide valuable information for public and private policy makers working with salmon fishing tourism, and salmon management and conservation issues.

A question of concern in all surveys is if results are valid for the whole population. A high response rate of 61% and results from the non-response study indicated little non-response bias of concern. Because many landowners were not involved directly in salmon fishing tourism or salmon management, they often did not know how many fish were being caught on their property or the fishing effort there. As in other surveys not all landowners filled out the question about income, a known sensitive question. Salmon fishing tourism has in the past been, and probably to a certain degree still is, a sector where landowners are reluctant to report their income. Numbers reported in this study such as net income per kg salmon could be suffering from measurement error because of this. There might be some social-desirability bias in this study due to the saliency of the different objectives about the fishing right, but it does nevertheless not affect the main finding that landowners have multiple objectives about their fishing rights. The fragmented and diverse ways in which fishing rights are sold and organized with common properties and beat arrangements, involving several landowners, also makes it difficult to map exactly how much of the river is sold in a particular way and compare between rivers, and therefore the study did not try to achieve this.

Conclusion

This study revealed that landowners in mid-Norway have complex and partly differing objectives about use of their salmon fishing rights. There is a large variation in

what objectives are important to this heterogeneous group. Landowner and property characteristics and the quality of the fishing right associated with each property seemed to explain some of the variation in how landowners scored objectives about their fishing right.

Less frequently investigated factors such as social institutions and norms most likely contribute to these objectives as well. Results imply that successful cooperation in salmon fishing tourism and in management and conservation of the salmon stocks must be based on an understanding of the multiple objectives of this heterogeneous landowner group. Openness about differing objectives is a prerequisite for avoiding conflict, and thereby building trust and cooperation with mutual gain as an objective.

Trust and openness is particularly important in nature-based tourism where landowners usually have to pool limited resources to succeed. The study offers results relevant for policy makers such as landowner organizations and local to national governmental authorities working with development of angling tourism in particular, and landowner-anchored nature-based tourism in general.

The findings in this study also indicated that selling angling as packages with a restricted number of rods and with additional services yielded higher income per salmon than some of the other use types. Future research should investigate how and to what degree different uses of the fishing right is resource dependent, shaped by personal characteristics, or by institutions.

Acknowledgments

I thank Sjur Baardsen and Øystein Aas for commenting on and discussing the manuscript and input on research design, F.S. Chapin, III for commenting on the manuscript, Brian Young for comments on the regression model, Rebecca Young for commenting on the language, and Anton Bjartnes at Origokart for providing the map. The two editors, plus three anonymous reviewers made remarks that greatly helped in improving the final paper. I thank them. This study is part of a research and development project funded by the Research Program Area and Nature-based Industrial Development (AREAL) under the Research Council of Norway. Verdal Vekst contributed financially too. The landowner organization the Trondheim Fjord Rivers owns the project and has also contributed financially. Research and development partners in the project are the Norwegian University of Life Sciences and Norwegian Institute of Nature Research (NINA). The project aims to foster sustainable management of wild salmon stocks in the Trondheim Fjord region in both ecological and socio-economic terms.

Notes

1. Landowner in this article refers to the term non-industrial private riparian landowner unless otherwise stated. This is similar to the term non-industrial private forest owner (NIPF) widely used in the forestry literature (Kuuluvainen, Karppinen, & Ovaskainen, 1996).
2. The fishing rights follow the property. An individual property can in some instances have several owners, what is referred to as “personlig sameie” (Korsvolla, Steinsholt, & Sevatdal, 2004). This is not to be confused with common property regime (“realsameie”) where several property units own one right together. Sevatdal (2006) calls this “farm commons”.

3. Fishing rights were measured as the length in meters on one side of the river. The reason why both sides were not included is that well-functioning beats in the main stem of the river often control fishing on one side only. In tributaries and upper parts of the main river, both sides ownership is more common, but fishing is not as good here. Total meters of river bank adding together both sides for each beat was assumed to be inexact as related to the purpose of the measure which was to indicate quality of fishing.
4. There were clear indications that some respondents had confused this question with the question of how many landowners there were in their beat arrangement. A beat arrangement is a voluntary agreement between landowners where they merge several fishing rights to be presented to the angler as a single fishing unit; the beat.

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Paper II

[I] found excellent quarters in a farmhouse near the village, and in half an hour I and my horse were eating our suppers. My fare was newly caught salmon, with a sauce of horseradish pounded into a cream, followed by excellent coffee; and all so nice, clean, and comfortable that I determined to halt here for some time.

Samuel Laing, 1837. Journal of a Residence in Norway

Effects of Property and Landowner Characteristics on Profit Efficiency in Salmon Angling Tourism in Norway

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Abstract

The objective of this paper was to analyze how different property and landowner characteristics and other factors affect landowners' profit efficiency from salmon angling tourism. A stochastic profit frontier function with an inefficiency module was estimated based on questionnaire survey responses from 203 landowners along four rivers of Mid-Norway. Profit efficiency decreased as the revenues from off-property and on-property activities increased relative to angling tourism. Factors increasing efficiency were long term rent of fishing instead of permit sale or selling fishing packages with additional services, and common property ownership instead of simple fee ownership. Cooperation, through merging several fishing rights into one unit instead offering fishing on a single property basis, decreased efficiency. This study did not distinguish between different forms of cooperation, and both mandatory cooperation in the form of common property and voluntary cooperation between private properties are issues for further research. As long as economic efficiency is a public goal, the implication for policy is to promote long-term renting, and to ensure a predictable economic environment for landowners specializing in salmon angling tourism. There is thus a need to extend rent periods beyond the current maximum of 10 years.

Keywords: nature-based tourism; rural tourism; landowner; fishing; property rights; natural resources management

Introduction

European landowners are encouraged by governmental authorities to diversify into tourism and other activities to compensate for falling margins in the agricultural and forestry sectors (Sharpley & Vass, 2006) and so sustain employment and income in rural areas. Landowners own natural resources that can provide tourism products, but more research is needed on the supply side of nature-based tourism (Fredman & Tyrväinen, 2010). In most Nordic countries there is a particular focus on turning landowners' fishing and hunting rights into tourism products. Atlantic salmon (*Salmo salar* L.*)* fishing tourism in Norway and Iceland is perhaps the best example of commercialization of such rights.

Annually 100,000-150,000 anglers, including around 35,000 foreigners, fish in one or several of Norway's 400 salmon rivers (Tangeland, Andersen, Aas, & Fiske, 2010). During three summer months these anglers spend an estimated 1.3 billion Norwegian kroner (NOK) (€1 = NOK 7.90) on fishing permits, accommodation, meal services and guiding, contributing substantially to the local economies. The Norwegian Forest Owners' Federation estimated that anglers' expenditure can be increased to NOK 2.0 billion by 2020 (Norges Skogeierforbund, 2010). Private small scale riparian landowners[1] are key actors in developing angling tourism. They supply fishing because they own the fishing rights. They can further be tourist hosts and offer accommodation, meals, guiding etc. Landowners also manage the salmon stocks through the riverowner organizations, and set fishing regulations, protect and restore stocks and river habitat. Angling as a recreational activity has received attention in the scientific literature (Pitcher & Hollingworth, 2002; Aas, 2008), but research focusing on angling from a tourism perspective, and especially the supply side, is limited (Borch, Policansky, & Aas, 2008).

Over recent years the landowner group has become more diverse with a majority of farmers now having at least some revenues from work outside the property, and an increasing number of owners not living on the property anymore (Storstad, Rye, & Almås, 2004). Sevatdal (2006) points out that this fragments interest, implying that there are multiple objectives in the landowner group about use of natural resources. Stensland's (2010) study from Norway showed a heterogeneous landowner group with differing and often conflicting objectives about use of the fishing right, and that off-property activities influenced these objectives. Landowners' profit from salmon angling was on average approximately NOK

30 000, but with large variation among landowners. One out of three had no profit from their fishing right. The private property landowners owned on average 644 m of riverbank and the corresponding fishing right, but variation was large and 55% owned 400 m or less. The common property group owned shares in a fishing right that on average was 1,476 m.

Studies of holders of fishing rights are limited, but several studies of landowners show that property and landowner characteristics influence technical and allocative efficiency in agriculture and forestry (Ahmed, Gebremedhin, Benin, & Ehui, 2002; Baardsen, Lien, & Størdal, 2009; Helfand & Levine, 2004; Lien, Størdal, & Baardsen, 2007; Rahman & Rahman, 2009). No prior studies have examined how these characteristics affect efficiency in the supply of salmon angling tourism.

Efficiency is important because it tells us how much is obtained from a certain effort or how much effort is required to obtain a certain result. It may be measured in technical or economical terms. Since producers are more or less efficient, results from efficiency analyses help us to identify best practices and sources of inefficiency. In this way we learn how to improve the efficiency and thus get more out of the efforts. It is important to distinguish between the absolute measure *profit* and the relative measure *profit efficiency*. A landowner may earn a lot of profit, but still be profit inefficient due to wasting resources. Put in other words, he or she may gain even more profit from the given inputs, or maintain the same profit by using less input. It is, however, impossible to maximize profit without at the same time being profit efficient.

There are several possible methods to analyze efficiency. In this paper we apply a "best practice" stochastic frontier function (Aigner, Lovell, & Schmidt, 1977) instead of the more common analysis using stochastic average functions or data envelopment analysis. Possible approaches include the production and cost frontier functions, but these may not be the most appropriate for this study because individual landowners face different prices (due to slightly different qualities of fishing) and they have different factor endowments. Estimation of efficiency should account for property specific prices (Ali & Flinn, 1989). This is exactly what the profit function does. It also treats both input and output variables as endogenous in contrast to cost and production functions (Kumbhakar, Ghosh, & McGuckin, 1991). Therefore, in this paper we apply a stochastic frontier profit function, and we specify it in a way that allows explanations of the profit inefficiency by a vector of variables not contained in the neoclassical profit function. This incorporates effects of property and

landowner characteristics, in addition to any other possible inefficiency effects. We are not aware of any other studies in tourism applying the stochastic profit frontier function.

In short, the main objective of this paper is to analyze how different property and landowner characteristics and other factors affect landowners' profit efficiency from salmon fishing tourism. Further, we recommend ways landowners may improve their profit efficiency and also how to interpret the results in an angling tourism policy setting.

Theory, Methods and Data

The Fishing Right and Property Regimes

In Norway fishing rights are indivisible from the property and cannot be sold without selling the land itself according to The Freshwater and Salmonids Act of 1992. The fishing right is a property right and thus defines who has access to the resource and under what conditions. Although landowners possess the exclusive access to fishing on their own property, most let other people fish there, either for free or by buying a permit.

Types of property regimes are: private property, common property, public property and open access (Vatn, 2005). Ownership of freshwater fishing rights in Norway is associated with the first three. Non-industrial private landowners own by far most of the salmon fishing rights in rivers, as either private or common property. In the case of a *private property* regime the fishing right belongs to a single property[2] or to an individual landowner. A *common property* regime is a variant of private property, with the difference that the fishing right is owned by a group of property units or co-owners (Bromley, 1991). Co-owners share the fishing rights and the majority decides the management. Objectives may vary among co-owners, such as whether the right should be used for maximizing profit, angling for the owners and their families, or a combination of these and other objectives.

While the access or business part of the fishing right is run by the individual landowner or a group of landowners, the fish stocks are managed collectively by all landowners along the river through a corporate body – the riverowner association. The rationale behind this is that salmon stocks use most of the river system as spawning and nursing grounds and cannot be managed on an individual property basis. The riverowner

association sets fishing regulations (e.g., personal quotas, length of season, equipment restrictions, etc.) for the whole river and also does fish enhancement projects, all within the frameworks set by governmental authorities. The length, quality and income from fishing rights vary considerably among landowners. Anglers prefer longer beats[3] with several pools to fish, and this is an incentive for landowners with short fishing rights to cooperate. Length alone, however, is not a good measure of quality angling as the fishing right might be localized where fishing is poor such as in a tributary, in the tidal zone, or way up in the river where salmon arrive only at the very end of the angling season.

Landowners' Relationship to the Property

Landowners' relationship to the property influences their behavior with regard to the fishing right and thereby the profit efficiency with which they supply salmon angling. In pure neoclassical economic terms landowners are producers of fish, fishing and related services with profit-maximization as objective. Landowners might have a diverse portfolio of activities on and off the property. However, they have limited resources and must choose how to allocate resources into those activities. Being profit efficient or maximizing profit from one activity can therefore, in some instances, decrease total profit. Landowners may have preferences other than gaining profit, e.g., with regard to management of household and fishing rights. At the same time they derive utility from these preferences which typically reduce profit and profit efficiency.

The conceptual model in Figure 1 shows which variables influence landowners' profit efficiency in supply of salmon angling. The neoclassical profit module includes all prices (output and inputs) for supplying salmon angling. These are what landowners receive, what they pay to the riverowner association for managing the salmon stocks (resource management price), and own costs related to supplying the angling product (business management price). The inefficiency module represents other variables affecting profit efficiency. Property characteristics include information about the fishing right and other property-based resources. The quality of the fishing right, how fishing is organized and sold, and also type of property regime tell about the income potential from angling tourism. Other natural resources and income generating businesses on the property such as agriculture, forestry, tourism facilities and hunting rights could influence the way landowners think about the fishing right and

allocate resources as well. Landowner characteristics consist not only of background information (such as age of landowner, household income and education level), but also what objectives landowners have about their fishing right.

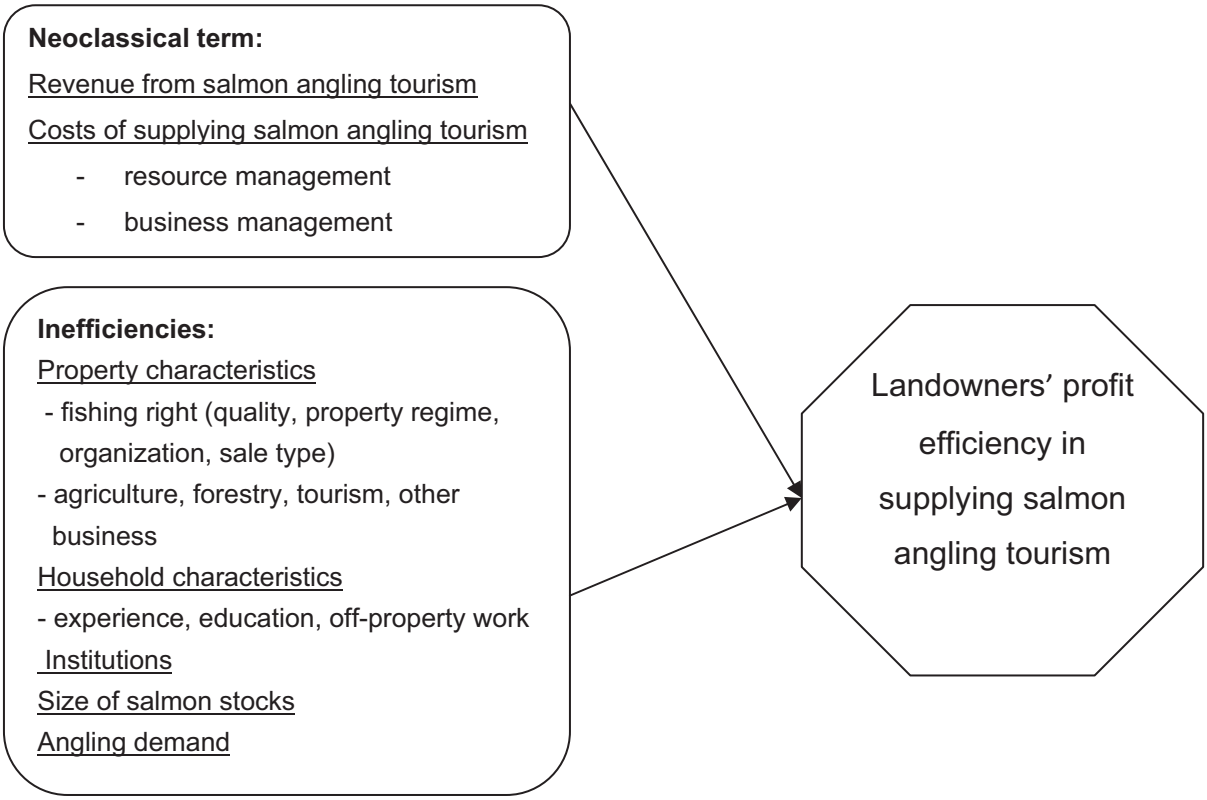

Figure 1. Conceptual model showing which factors that influence landowners' profit efficiency in the supply of angling tourism.

Profit Efficiency

We apply standard efficiencies and inefficiencies definitions in line with Baardsen et al. (2009) as follows. Technical efficiency/inefficiency is present when the output level of the production unit lies on/below the production frontier (i.e. the maximum feasible output) for a given set of inputs or, alternatively, the input level lies on/above the input frontier (i.e. the minimum required input) for a given set of outputs. Economic efficiency is also affected by

adjusting to prices and economies of scale. The production unit is said to be allocatively inefficient if its input proportions are suboptimal, given input prices and output level. This inefficiency arises from not equating the ratios of marginal products with the input price ratios when attempting to minimize cost. A cost-efficient unit is thus both technically and allocatively efficient. Finally, size or scale inefficiency exists when the chosen output level is suboptimal for given prices. This happens when the product price does not equal the marginal cost when attempting to maximize profit. Profit efficiency/inefficiency is present when the profit obtained is on/below the profit frontier (the maximum feasible profit). The profit-efficient unit is thus technically, allocatively, and scale efficient.

The Profit Frontier and Inefficiency Terms

We employ the same basic model as Baardsen et al. (2009) applied to analysis of timber supply efficiency, but for a single cross-section rather than for a panel. The normalized[3] and unrestricted (i.e. long run) stochastic profit function may be defined as:

$$\pi_i = f(P_i)e^{\xi i}, \qquad (1)$$

where π_i is the normalized profit from salmon angling of the *i*th landowner, P_i is the vector of normalized variable input prices, and ξ_i is the error term.

The error term is specified according to the frontier concept for cross sectional data with "mixed" effects, i.e., $\xi_i = v_i - u_i$, where $v_i \sim \text{i.i.d.}\, N(0,\sigma_v^2)$ are two-sided random error variables, independent of the nonnegative random inefficiency variables u_i. Following the specification introduced by Battese and Coelli (1995), but for a cross-section rather than a panel (T=1), u_i are assumed independently distributed as truncations at zero of the $N(m_{i,}\sigma_u^2)$ distribution, where $m_i = z_i\delta$, z_i is a $(1 \times p)$ vector of explanatory variables associated with inefficiency effects, and δ is a $(p \times 1)$ vector of unknown parameters to be estimated. Thus:

$$u_i = z_i\delta + w_i, \qquad (2)$$

where w_i are unobservable random variables, which are assumed to be independently distributed, obtained by truncation of the normal distribution with mean zero and unknown variance, σ_u^2, such that u_i is nonnegative (i.e. $w_i \geq -z_i\delta$) , cf. Battese and Broca (1997).

The values of the unknown parameters are estimated simultaneously using maximum-likelihood estimation, employing the program FRONTIER 4.1 (Coelli, 1996). The algorithm uses the reparameterizations $\sigma^2 = \sigma_v^2 + \sigma_u^2$ and $\gamma = \sigma_u^2 / \sigma^2$ (Aigner, Lovell, & Schimdt, 1977).

The measure of profit efficiency relative to the profit frontier is defined as (Coelli, 1996):

$$PE_i = \frac{E[\pi_i \mid u_i, P_i, Z_i]}{E[\pi_i \mid u_i = 0, P_i, Z_i]} = \frac{\hat{\pi}_{it} - u_i}{\hat{\pi}_{it}} \tag{3}$$

This expression becomes $PE_i = \exp(-u_i)$ when the dependent variable is in natural logarithms.

Empirical Model

The chosen translog specification of the normalized and unrestricted profit frontier function is

$$\ln \pi_i(P) = \beta_0 + \sum_{j=1}^{2} \beta_j \ln P_{ji} + \frac{1}{2} \sum_{j=1}^{2} \sum_{k=1}^{2} \beta_{jk} \ln P_{ji} \ln P_{ki} + v_i - u_i \tag{4}$$

and the model for technical inefficiency effects is defined by

$$u_i = \delta_0 + \sum_{n=1}^{12} \delta_n z_{ni} + w_i \tag{5}$$

The subscripts *j,i* on the normalized[4] (by output price) input prices (P) and respective parameters (β) refer to prices of resource management, and business management, for j = 1, 2. Prices and profit also have subscripts denoting i = 1, 2, ..., 203 landowners. The n = 1, 2, ..., 12 inefficiency variables (z) and respective parameters (δ) are two salmon angling

income marginalization ratios (against gross household off-property income, and net property income), property regime, fishing right quality, organization of fishing right, sale of fishing permits, long-term rent of fishing, three objectives about the fishing right (income, protect the resource, own angling), age and education. Choice of variables is discussed in the data and variables section.

Study Area

The Trondheim Fjord region of Mid-Norway has six major rivers and around thirty middle and small sized salmon streams making it an important region for the wild Atlantic salmon. The region has around 300,000 fishing days annually, which is about 1/3 of all salmon angling in Norway (Tangeland, et al., 2010). The Orkla, Gaula, Stjørdal and Verdal rivers are the four top salmon rivers in the Trondheim Fjord (Figure 2). The total annual catch in the four rivers for the period 2006-2010 was 10,000 to 22,000 fish (91% salmon; 9% sea trout *Salmo trutta* L.) averaging around 4-5 kilograms each (A.T. Baklien, Statistic Norway, personal comment, March 17 2011). For the period 1997-2007, Gaula and Orkla were among the top five Norwegian rivers in terms of numbers of salmon caught per year, whereas the Stjørdal and Verdal were among the top 20 and top 25 respectively (Norske Lakseelver, n.d.). The three best rivers have a more than a hundred-year history of fishing tourism, while the Verdal first attracted attention as an angling destination 25 to 30 years ago.

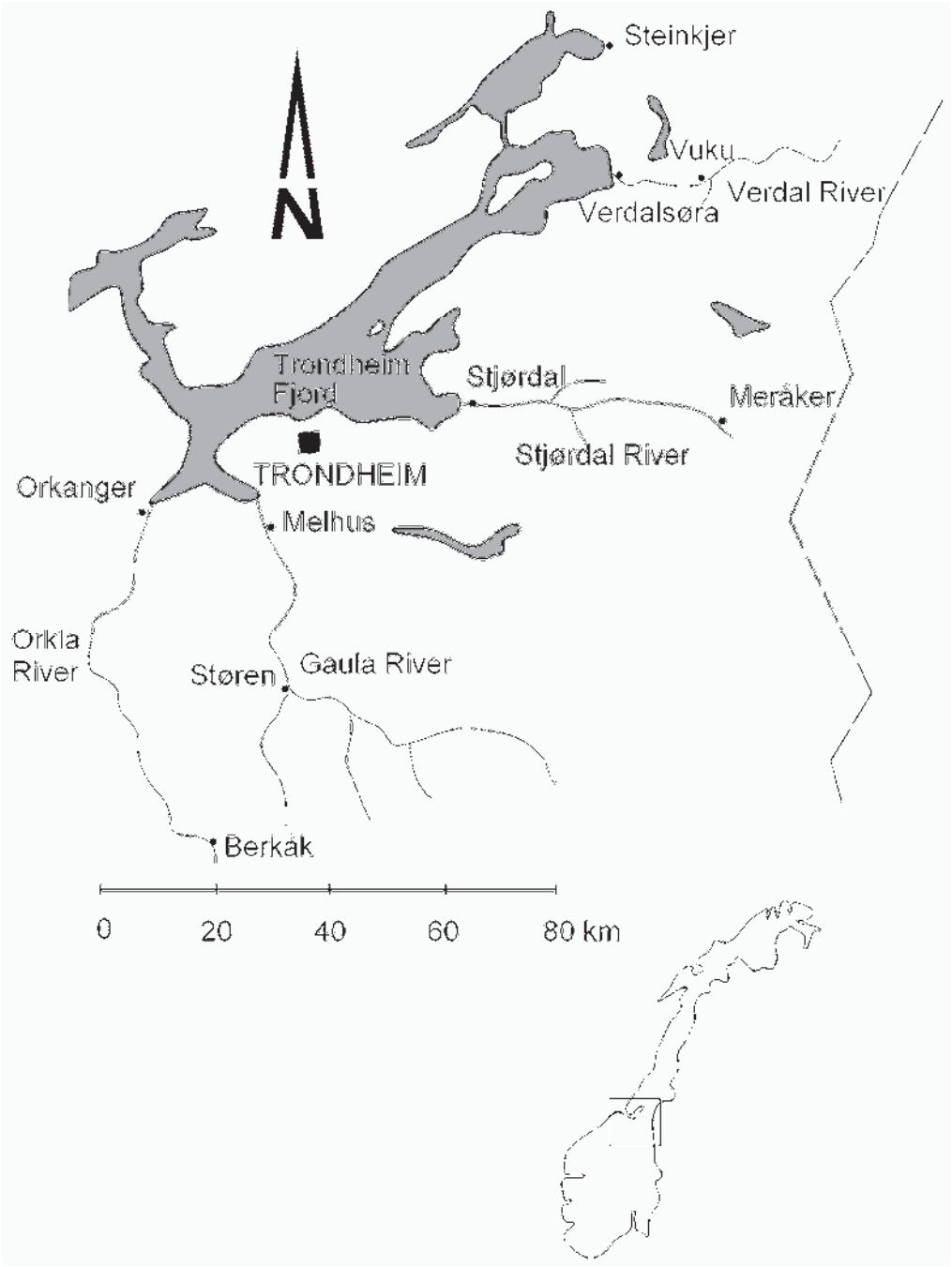

Figure 2. The Trondheim Fjord Region of Mid-Norway with the Verdal, Stjørdal, Gaula and Orkla Rivers (Map by Origokart).

Questionnaire Development and Data Collection

As recommended by Dillman (2007) a pre-test of the questionnaire (face-to-face meeting with eight landowners) and a small pilot study (n=18) were carried out before finishing the

questionnaire development. Questions were given as tick-the-box, four point ordered-category items or a seven-point semantic differential item with only one and seven given verbal labels, fill-in-the-number and a final open-ended question for any comments. Major topics in the questionnaire were fishing right and property characteristics, and objectives concerning use of the fishing right. Background information about the household such as income, education level and off-property work was also collected.

The rivers in the survey are the four largest rivers in the study area and were chosen due to the overall importance of salmon angling there, and because the riverowner associations had address lists of all landowners. The survey was sent to all individual private properties, but for the 45 common properties only the contact person for each commons was included. This exclusion of the other co-owners was done because detailed economic questions for the whole common property, information they often would not have, potentially could cause frustration and high non-response rates. The mail out included a total of 943 landowners. In addition a survey with a questionnaire lacking many of the detailed economic questions was sent to the reminding 262 co-owners in the common properties. Same procedure and number of contacts were used as for the main survey.

To achieve a high response rate we followed Dillman's (2007) Tailored Design Method for surveys incorporating up to five direct contacts with the respondents. The first contact, a pre-notice letter with information about the survey, was mailed in early June 2008. Four days later landowners received a questionnaire package where confidentiality issues were specifically addressed. A postcard with a reminder and a thank you was sent all landowners ten days after the questionnaire mail out. A replacement questionnaire and a new cover letter were sent in late August. Ten to twenty days after receiving the replacement questionnaires landowners received a telephone call reminder as a fifth contact. The telephone mode was also useful for checking whether the correct respondents had received the questionnaire. Data collection ended in October 2008. Overall response rate was 61% of a valid sample of 1161 respondents. Response rates varied between rivers with 76% (102 of 135 landowners responded) in Stjørdal, 63% (92 of 147) in Verdal, 63% (243 of 378) in Orkla, and 55% (275 of 501) in Gaula. In addition to these five contacts we used newsletters from the local riverowner associations and four article series in local newspapers to create awareness about the survey.

Non-response Study

Non-response bias is a cause of concern - even in surveys with high response rates (Needham & Vaske, 2008). A non-response study was conducted by telephone to check the validity of the sample. Thirty out of 37 (81%) landowners responded. The non-response study gave no indications of bias problems.

Specification of Data and Variables

About one third of the 561 respondents reported having no net income (profit) from salmon angling tourism, and they were excluded from the analysis because they do not belong to the target group. We used only the 203 observations where all variables were complete. Replacing missing values with the mean for the group is an alternative to using complete observations, but this may create other problems. There were several reasons why variables had missing values. Several landowners did not report income from angling tourism, net property income nor gross household income, and were excluded from the analysis.

A long run neoclassical profit function has only prices as arguments. After normalizing on the salmon angling gross revenues, the following prices are used as basis neoclassical arguments:

- Resource management price, P_1: variable cost of managing the salmon stocks relative to the turnover from salmon angling, defined as the amount paid to the river owner management association divided by gross revenues from salmon angling.
- Business management price, P_2: variable cost of managing the salmon business relative to the turnover from salmon angling, defined as the total costs of hired labor, goods and services involved in selling the salmon angling product divided by gross revenues from salmon angling.

The profit is defined as gross revenues from sales of angling services less variable costs of resource management and business management.

As seen in Figure 1 there are several inefficiency variables, involved in the supply of angling tourism. A fishing right may be:

- *Low quality* due to geographical location and physical conditions, such as what part of the river the right is in, length, difficult access, and how easy it is to fish.

- *Mismanaged* because of lack of proper organization, type of sale, experience (age), competence (education) or focus (marginalized compared with off-property work, or other on-property businesses).

The above factors represent inefficiency, but there is no comprehensive theory of inefficiencies, and the selection of inefficiency variables has a certain degree of arbitrariness (Irz & Thirtle, 2004). The efficient unit is one for which management is clever enough to make correct choices with regard to economic production. It is however uncertain what happens when events outside the immediate management control, sometimes called exogenous influences (Kumbhakar & Lovell, 2000), also affect production. Optimal decision-making is probably necessary, but not sufficient, for being efficient. Inefficiency may be due to random variables like drought, flood and poor salmon runs, and state variables describing the fishing right and the landowner. Inefficiency is therefore typically uncontrollable in the short run, while the state variables may be controlled in the longer run. The 12 inefficiency variables chosen in the study were:

- *External marginalization ratio,* z_1: household gross off-property income divided by the sum of salmon tourism profit and household gross off-property income. Baardsen et al. (2009) found that profit efficiency in timber supply decreases with increasing wage income. It seems natural that a landowner who makes all his or her money from the forest will also be more efficient than a marginalized forest owner, and it is natural to assume that marginalization somehow will affect profit efficiency in supply also of angling tourism.

- *Internal marginalization ratio,* z_2: net property income divided by the sum of salmon tourism profit and net property income. The marginalization argument above also applies here. The landowner has a portfolio of different activities, and we believe that he will tend to be less effective the smaller the part an activity plays in this portfolio.

- *Common property,* z_3: variable showing whether the landowner's fishing right was part of a common property fishing right (=1) or a simple fee ownership (=0). In a common property there are several co-owners with potentially multiple and differing

objectives about how fishing should be sold. This leads to compromises that might lower profit efficiency.

- *Fishing right quality, z_4*: landowners were asked to rate the catch possibility on their fishing right. We used a seven-point semantic differential item with only one (*very low*), four (*medium*) and seven (*very high*) given verbal labels. The item was meant to be understood as a continuum with equal intervals between the numbers. Better quality fishing rights are likely to yield more money than rights of less quality.

- *Organized as single fishing right, z_5*: fishing sold on a single fishing right only (=1), or by merging several fishing rights into one section by cooperation between landowners (=0). Cooperation between landowners makes longer sections, thereby increasing anglers' willingness to pay.

- *Sale fishing permits, z_6*: sale of an unrestricted number of fishing permits =1, other types of sale (=0) are long-term rent of fishing right (minimum 1 year), or fishing sold as packages with a restricted number of rods and with additional services. It is likely that how fishing is sold has an impact on profit.
- *Rent out fishing, z_7:* long-term rent of fishing (=1), other types of sale (=0) are unrestricted sale of fishing permits, or fishing sold as packages with a restricted number of rods and with additional services.
- *Income objective, z_8*: landowners were asked how they prioritized the objective "Reliable and stable income" regarding their fishing right. We used a seven-point semantic differential item with only one (*very low)* and seven (*very high*) given verbal labels. The item was meant to be understood as a continuum with equal intervals between the numbers. A landowner with income as a prioritized objective should be more profit oriented, too.
- *Resource objective, z_9*: landowners were asked how they prioritized the objective "Protection of salmon stocks". Same measure as for variable above. There is likely a correlation between profit orientation and protecting the very resource from which profit is derived.
- *Angling objective, z_{10}*: landowners were asked how they prioritized the objective "Angling for myself, family and friends". Same measure as for variable above. Their

own angling might interfere with selling angling to fishermen and thereby reduce profit efficiency.

- *Age,* z_{11}: age of owners in years. Age (experience) is likely to affect profit efficiency as landowners might be able to learn over time what combinations of resource inputs are most efficient.
- *Education,* z_{12}: classification where having studied at university/college = 1, otherwise=0.

Summary statistics for the variables before taking the logarithms and adding a constant to the profit are presented in Table 1. Note that profit varies considerably among landowners, as do the turnover and costs. Finally, the external marginalization ratio is higher than the internal one. This means that off-property income is higher than income derived from the property.

Table 1. Descriptive statistics.

Variable	Label	Mean	St.Dev.	CV	Min	Max
Profit, NOK_{2007}		*63 799*	93 756	1.47	150	625 000
Turnover						
Salmon gross revenues, NOK_{2007}		85 829	119 688	1.39	500	700 000
Costs						
Resource management , NOK_{2007}		8 159	12 306	1.51	0	97 000
Business management, NOK_{2007}		13 871	32 064	2.31	0	250 000
Efficiency variables						
External marginalization ratio	z_1	0.81	0.24	0.30	0.00	1.00
Internal marginalization ratio	z_2	0.72	0.24	0.33	0.04	1.00
Common property (dummy)	z_3	0.22	0.41	1.86	0	1
Fishing right quality	z_4	4.58	1.25	0.27	1	7
Organized as single fishing right (dummy)	z_5	0.71	0.46	0.65	0	1
Sale fishing permits (dummy)	z_6	0.16	0.37	2.31	0	1
Rent out fishing (dummy)	z_7	0.60	0.49	0.82	0	1
Income objective	z_8	5.35	1.68	0.31	1	7
Resource objective	z_9	5.91	1.14	0.19	1	7
Angling objective	z_{10}	3.59	2.01	0.56	1	7
Age	z_{11}	50.16	11.56	0.23	18	93
Education (dummy)	z_{12}	0.37	0.48	1.30	0	1

Note. CV, coefficient of variation; NOK, Norwegian kroner

Results

The maximum-likelihood estimates of the parameters of the unrestricted frontier profit function are presented in Table 2 (frontier) and Table 3 (inefficiency module). We note that the estimates in the frontier module are significant at the 0.1% level.

Table 2. Maximum likelihood estimates of the frontier.

Variable, label	Parameter	Coefficient	*t*-value
Constant	θ_0	-0.75	-95.63**
Resource management price, P_1	θ_1	-0.16	-40.36**
Business management price, P_2	θ_2	-0.12	-86.18**
P_1xP_1	B_3	-0.02	-43.36**
P_2xP_2	B_4	-0.02	-78.16**
P_1xP_2	B_5	0.01	3.58**

** p<0.01

Table 3. Maximum-likelihood estimates of the inefficiency module**.**

Variable, label	Parameter	Coefficient	*t*-value
Constant, z_0	δ_0	-8.31	-6.63**
External marginalization ratio	δ_1	2.44	8.22**
Internal marginalization ratio	δ_2	3.27	9.63**
Common property (dummy)	δ_3	-0.55	3.33**
Fishing right quality	δ_4	0.15	2.06*
Organized as single fishing right (dummy)	δ_5	-1.10	-7.57**
Sale fishing permits (dummy)	δ_6	0.29	1.24
Rent out fishing	δ_7	-0.70	-4.17**
Income objective	δ_8	0.08	2.17*
Resource objective	δ_9	-0.03	-0.56
Angling objective	δ_{10}	0.20	8.11**
Age	δ_{11}	0.02	3.09**
Education	δ_{12}	0.38	3.30*
Variance parameters			
	σ_u^2	0.43	10.66**
	γ	1.00	2.3 E7**
Log-likelihood function		180.0	

* p<0.05, ** p<0.01

Of greatest interest are the estimated coefficients in the inefficiency module. Positive estimates indicate that increasing values of those variables tend to associate with larger

inefficiency effects (that is, lower efficiency). All coefficients were significantly different from zero.

Profit efficiency decreased with increased marginalization rates. This implies that as property-based income or off-property income increase relative to the income from salmon angling, the profit efficiency from supply of salmon angling decreases. Profit efficiency decreased with increasing quality of the fishing right, and when landowners gave higher priority to income and angling objectives. Being part of a common property was more efficient than simple fee ownership. How fishing was sold also affected profit efficiency, with long term rent of fishing increasing efficiency compared to the two alternatives unrestricted sale of fishing permits, and fishing sold as packages with a restricted number of rods. Organizing the fishing right on an individual property basis was more profit efficient than by offering several fishing rights as one section. Increasing age and education also led to lower efficiency. The effect of the resource objective variable was not significantly different from zero. Average profit efficiency was 0.87.

The average landowner in this study had a profit of NOK 63,799, and the average profit efficiency of 87% implies an inefficiency loss of 9,533 NOK per landowner. Stensland (2010) estimated the average profit for all landowners in this study area to be 29,896 NOK. With a population of 1,175 landowners, and assuming profit efficiency of 87% being valid, this implies an efficiency loss of 4,467 NOK per landowner. The total loss to the landowner group is 5.25 million NOK per year. The calculation is made to illustrate a theoretical frontier/limit, as full profit efficiency is not attainable in the real world and, as already mentioned, neither is it the ultimate goal of utility maximizing landowners.

Discussion and Conclusion

The objective of this paper was to analyze how different property characteristics and owner characteristics affect landowners' profit efficiency from salmon fishing tourism. Further we aimed to recommend how landowners may improve their profit efficiency and also how to interpret the results in an angling tourism policy setting. In order to achieve these objectives we defined, estimated and tested an unrestricted profit frontier function with an integrated inefficiency module on a set of cross sectional data.

We found that profit efficiency in supply of salmon angling decreases as the income from salmon angling tourism becomes marginal compared to off-property income and property-based income. An interpretation of this is that landowners probably choose to devote most of their time and resources to income sources that matter, and hence deal with marginal sources in a less efficient manner. This result is in line with Baardsen et al. (2009), who reported decreasing forest owner profit efficiency from timber supply with increased wage marginalization. Other studies (e.g. Løyland, Ringstad, & Øy, 1995) also show that work outside the property affects forest activity negatively, probably because this leads to less interest in and competence about how, what, and when to log. The same is likely to apply to sales of fishing. There have been many studies on efficiency of agricultural production, see Byma and Tauer (2010) for a recent example, or Ozkan, Ceylan, and Kizilay (2009) for a review of some studies.

The negative impact from property income on profit efficiency might be explained by other property activities like agriculture and forestry taking focus, interest and resource input away from supply of salmon angling. This is again parallel to Baardsen et al. (2009) who found that agricultural income decreased profit efficiency in timber supply.

What about the other inefficiency variables? The merging of several fishing rights into one section by cooperation among landowners has been promoted as a mean to develop angling tourism and to get more out of the salmon resource; however our study indicates that such cooperation does not increase efficiency. Several forms of voluntarily cooperation exist, and this study did not try to distinguish among them. Stensland (2010) discovered that landowners have multiple and often conflicting objectives about use of their fishing rights. It is therefore likely that, for example, merging fishing rights through the riverowner association, which is typically combined with unrestricted permit sale and often has the objective of providing fishing to anglers, might have a different profit efficiency compared to circumstances where a few landowners themselves organize to merge their fishing rights commonly. Interestingly belonging to a common property which can be seen as “mandatory cooperation”, increased efficiency compared to simple fee ownership. The average fishing right quality was the same for the two property regimes, and the differences found are thus probably due to how the rights are managed or other characteristics of the properties or landowners. Dervo, Aas, Kaltenborn, and Andersen (2003) conclude that competence and cooperation are requirements for successful growth in the landowner anchored nature-based

tourism in Norway, but our results indicate that cooperation or maybe some sorts of cooperation might be a challenge. This is an obvious issue for further research.

Although sale of packages leads to higher average profits than unrestricted sale of fishing permits or long term rent of these permits, it is the long term rent which is most profit efficient. Initially it might be surprising that packages were less efficient than long term rent, as landowners are encouraged to develop fishing tourism and target wealthy customers who demand full packages. Providing accommodation, meals and guiding require input of labor and resources, and our results show that this is not profit efficient compared to seeking capital income and having minimal costs through long term rent. On sections with unrestricted sale of fishing permits, the permit price is typically low, and seasonal fluctuations in angler numbers might make it difficult to achieve full capacity of angler days, thereby lowering efficiency.

Increasing quality of the fishing right had a negative impact on profit efficiency. An explanation for this might be that those having higher quality fishing rights put in too much resource use for managing salmon angling, thereby being less efficient.

Even though giving high priority to stable and reliable income from the fishing right was positively correlated with profit, this prioritization decreased the efficiency. The reason could be that also the income focus from the fishing right makes landowners put in too much resource use. Giving high importance to angling for one's self, family and friends on your own property affected profit efficiency negatively. An explanation for this is that one's own angling is not compatible with profit efficiency as each day the landowner or his/her friends fish is consumed and cannot be sold to paying anglers.

Age and education both decreased profit efficiency. It might be that older landowners have deeper roots in traditional agriculture and forestry. Thereby they see angling tourism as a side activity not rooted in traditional farming and masculinity. This interpretation could be in accordance with Brandt and Haugen (2005), who found that rural men in Norway identified with masculine and traditional agriculture/forestry values, and that tourism interferes with these values. Another explanation could be that older landowners are not familiar with what modern day anglers demand and thereby become inefficient. We note that this finding is contrary to what Baardsen et al. (2009) found for profit efficiency in Norwegian forestry, but in line with what Nganga, Kungu, de Ridder, & Herrero (2010)

found for milk producers in Kenya. In theory, the average landowner makes 87% of achievable profit, and may increase this by catching up with the most efficient ones. This might, however, imply some adjustments that are difficult or impossible to make like increasing the quality of the fishing right. A better option may be to change the way fishing is sold and go for long term rent.

Finally, landowners might be better off losing some profit as long as this is compensated by increased utility from, e.g. one's own fishing, or making a living from the property resources only. Being below the angling profit frontier might be optimal taking all other factors into account, like in the typical farm household production economics model (see e.g. Chavas, Petrie, & Roth, 2005). A reasonable extension of the results is that profit efficient landowners know that getting labor income from the salmon resource requires more resource input, and that this might not be the most efficient way of allocating limited resources given a portfolio of on- and off-property activities to optimize. Our results show that getting capital income from the fishing right, as in long term rent, is more profit efficient than selling more labor intensive packages. These results are further supported by Stensland's (2010) findings where long term rent was the most common way of dealing with the fishing right, with 43% of landowners doing this way, indicating that many landowners regard this as the best practice.

Our results imply that profit efficiency in development of salmon angling tourism can be achieved by specialization in the landowner group. Both decreasing marginalization rates and long term rent lead to increased efficiency in supply of angling tourism. Landowners expanding the amount of fishing they control and earning more by renting fishing rights from neighboring landowners would become more profit efficient. Landowners renting out their rights would also increase their efficiency. Therefore, as long as economic efficiency is a public goal the policy implication is to stimulate long-term rent, and to ensure a predictable economic environment for landowners specializing in salmon angling tourism. There is thus a need to open up for longer rent periods than the current maximum of 10 years.

Acknowledgement

This study is part of a research and development project funded by the Research Program on Nature-based industry (NATUROGNÆRING) under the Research Council of Norway (grant no. 173869/I10).The landowner organization the Trondheim Fjord Rivers owns the project and contributed financially. Norwegian University of Life Sciences (UMB) and Norwegian Institute of Nature Research (NINA) are research partners in the project. The project aims to foster sustainable management of wild salmon stocks in the Trondheim Fjord region in both ecological and socio-economic terms. We thank Øystein Aas for input on research design, and Shana Loshbaugh for commenting on the language.

Footnotes

1. Landowners in this article refer to owners of fishing rights, being small scale private riparian landowners, unless otherwise stated. This is equivalent to small scale forest owners, sometimes referred to as non-industrial or family forest owners (Harrison et al., 2002).
2. The fishing right follows the property. An individual property can in some instances have several owners, what is referred to as personal co-ownership (Korsvolla, Steinsholt, & Sevatdal, 2004). This is not to be confused with common property regime (joint ownership of land) where several property units own one right together. Sevatdal (2006) calls this "farm commons".
3. A *beat* is defined as a length of river or bank, let or fished as a unit by angling (McLay & Gordon-Rogers, 1997). Landowners often pool several fishing rights to make one single beat.
4. Because the profit function is linearly homogenous in all prices (inputs and outputs), we may choose any price as a numeraire. We have chosen the output price. Thus, the gross income from salmon angling tourism is implicit in our formulation.

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Paper III

River fisheries are a natural resource of a very limited character, and would be rapidly exhausted, if allowed to be used by every one without restraint.

John Stuart Mill, 1848. Principles of Political Economy

Landowners' Perception of Risk Sources and Risk Management in Norwegian Salmon Angling Tourism

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Abstract

Understanding the factors that influence landowners' economic behavior regarding natural resources has implications for tourism development, resource management, and rural policy. This study examines objectives of Norwegian landowners relative to their salmon angling rights, the perception of risk sources in salmon angling tourism, risk management, and how marginalization of farm income affects these relationships. Data originate from a survey of landowners in four major angling destinations. Risk sources external to individual landowner control such as salmon stock variability and reduced angling season had the greatest perceived impact on angling tourism. The landowner group was heterogeneous with a majority receiving just a marginal income from the farm. This group of landowners prioritized their own recreation and angling over income received from the fishing right. Alternatively, landowners dependent on farm income ranked income opportunities higher than recreation and angling opportunities. Income marginalization of farm resources is expected to increase; this could lead to less fishing and other natural resources available for rural economic development. Securing healthy salmon stocks should be top priority for developing angling tourism Establishing angling tourism advisory services, and easing acquisition of fishing rights could reduce entrepreneurial risk and stimulate angling tourism development.

Keywords: Rural tourism; natural resources management; fishing; property rights; nature-based tourism; farm diversification

Introduction

Commodification of landowners'[1] hunting and fishing rights have been encouraged by governmental authorities, and seen as a means to maintain viable rural areas in a Nordic setting (Landbruksdepartementet, 1999, 2007; Naturvårdsverket & Fiskeriverket, 2005; Turistdelegationen, 2003). Currently, 24% of Norwegian farmers get income from lease of their hunting and fishing rights (Logstein, 2010). Atlantic salmon angling tourism is a good example of commercialization of such private property rights. Every year approximately 100,000 to 150,000 anglers visit Norway's salmon rivers and spend an estimated NOK 1.1-1.3 billion (€1= NOK 7.90, March 22 2011) on fishing permits, accommodation, and other goods and services (Norges Skogeierforbund, 2010; Aas, 2004).

The annual run of salmon to the rivers is stochastic by nature. Worldwide abundance and distribution of salmon have declined markedly during the last 30 years, and the current status is probably an all time low (Hindar, Hutchings, Diserud, & Fiske, 2011). Reduced growth and increased mortality in the ocean from 1980 up till now are major factors for the decimation of stocks (ICES, 2009). Human impacts play an important role in this decline, and include salmon farming, irrigation, acid rain, hydropower development, habitat deterioration, and overfishing. In general, Norwegian catches have declined the last 20 years. After some years of strong runs in the early 2000s, the last five years have experienced a downward trend (Anon, 2010; NOU, 1999). Around 120 of Norway's 400 salmon rivers were closed to angling in 2010.

The general decline in salmon stocks has changed the economic environment for actors in the Norwegian angling tourism market. As suppliers of angling tourism, landowners face uncertainties and risks when trying to account for the strength of the salmon run, length of the fishing season, bag limits, gear restrictions, and how the angling market will respond to these factors in terms of visitor numbers and expenditure. These perceived risks influence landowner decision-making about how to invest in, organize and sell angling tourism on their properties. Landowner household and farm characteristics also influence their perception and thus economic behavior (van Raaij, 1981).

Research on angling tourism and especially how landowner decisions influence fishing access and angling tourism markets is very limited (Borch, Policansky, & Aas, 2008), despite the clear political and economic interests involved. Studies of farmers and forest owners are a relevant comparison for this work because most Norwegian landowners own a farm.

Half of Norwegian farm households receive 25% or less of their total income from the farm (Logstein, 2010). An increasing number of owners do not live on their farm, and according to Sevatdal (2006), this causes a fragmentation of interest. This observation is supported by Stensland's research (2010) that shows a heterogeneous landowner group with differing and often conflicting objectives about their fishing right. Several studies show that farmers or forest owners working full-time on the farm have different objectives, perception of risk sources, and risk management strategies than their part-time colleagues (Lien et al., 2006; Størdal, Lien, & Hardaker, 2007). Even for landowners with full off-farm workload, labor or capital income from the property could be a major part of household income. A classification of landowners according to marginalization of farm income relative to household income is thus a better measure than the numbers of hours worked outside the farm in order to understand landowner economic behavior (cf. Baardsen et al., 2009).

This study investigates landowner and farm characteristics, objectives regarding the fishing right, landowner perception of risk sources in salmon angling tourism, landowner risk management and how marginalization of farm income affects these relationships. The study provides guidance and new insight for policy makers and advisors trying to assist landowner engagement into angling tourism. Empirical results are based on a postal questionnaire survey sent landowners in the Gaula, Orkla, Stjørdal and Verdal rivers of Mid-Norway.

Theory

The Fishing Right

In a Norwegian context, the fishing right follows the property, and cannot be sold without selling the land itself (cf. §19 in The Salmonids and Fresh-water Fish Act of 1992). Therefore, farms that historically acquired most of the good agriculture land next to the rivers hold the vast majority of salmon fishing rights. The fishing right is a property right and thus defines who has access to the salmon resource and under what conditions (Vatn, 2005:253). Landowners have exclusive access to fishing on their property. However, most landowners allow angler access, either for free, or by selling a permit or renting out the fishing right for a period.

Bromley (1991:22) refers to property regimes, or ownership types, as the structure of rights to resources and the set rules for how these are exercised. Vatn (2005:255) identifies four types: private property, common property, public property and open access. Norwegian salmon fishing is associated with the three first property regimes. Public property ownership is limited, except for in the far north. In a private property regime the individual landowner

owns and determines how to use the fishing right. In a common property regime the fishing right is owned jointly by a group of private properties, where the majority of co-owners decide if and how fishing may be organized and sold. Access to angling hence is managed on an individual fishing right level.

However, migrating salmon stocks use the entire river system as spawning and nursing grounds, and cannot be managed on an individual property basis. The stocks are a common-pool resource (Ostrom, 1990:30) and managed collectively by all landowners through a statutory river owner organization. The organization sets fishing regulations (e.g. gear restrictions, bag limits/quotas, length of season) for the entire river and conduct management actions within the regulatory framework set by governmental authorities. This "sharing of power and responsibility between the government and local resource users" is known as co-management (Berkes, George, & Preston, 1991). Advocating and lobbying for wild salmon interests, and protecting salmon habitat are also major tasks for the river owner organization.

The Salmon Angling Product

The salmon angling season in Norway typically runs three months, from June 1 to August 31. Fishing conditions can vary greatly in time and space for a single river depending on snow melt, water temperature, water level and size of the salmon runs.

Demand for beats[2] that yield productive fishing under various conditions are high. A good beat has several deep pools of slow moving water separated by shallower, faster moving riffles, and is usually about one km or longer in length (Ianssen & Johansen, 2007). Most Norwegian landowners own just a relatively short stretch of the river bank, as illustrated by Stensland (2010) where 55% of private property landowners owned 400 m or less. This means that a good beat often requires collaboration between landowners.

The overall beat structure and a high number of beats with no restriction on angler numbers are probably not optimal for providing good angling experiences, income for landowners or tourism development. Norway's 400 rivers offer the world's largest spawning ground for Atlantic salmon stocks, but international market shares is believed lost to other comparable angling destinations such as Scotland, Iceland and Russia (Aas, 2004). As a remedy to match these countries, angling tourism experts argue that Norwegian landowners to a larger extent should cooperate to offer longer fishing beats with fewer anglers per day, and integrate guiding and lodging in the angling product. Furthermore, landowners need to strengthen salmon stocks, and have a more pro-active attitude to catch and release, and

conservation of stocks (Millington-Drake, 2002; M. Hayes, personal communication, January 16, 2006).

Local communities often perceive the river and the salmon to be a local resource that they all have a share in. Landowners thus face pressure to provide easy access and cheap fishing to local anglers, a case being known as the public angling issue. This could be in conflict with developing angling tourism.

Catching fish is a key factor for angling tourism. In the study area, a visiting angler to the river Orkla needs an average of four days to catch a salmon (Fiske & Aas, 2001) whereas Icelandic rivers are managed to yield one fish per rod per day (Agnarsson, Radford, & Riddington, 2008). Catch probability could be improved by making beats longer, allowing fewer anglers per beat, and using guides to help inexperienced anglers. Other measures would also help such as limiting the allowable harvest per angler (bag limit), introducing gear restrictions (such as those that might facilitate live release of fish, reduce catch efficiency in certain areas and time, and by highly skilled anglers), and increasing stock size.

Angling tourism and management of fish stocks are tightly linked and require collaboration between individuals with limited property resources. Studies of rural tourism and nature-based tourism enterprises in Norway have found collaboration, networking, and competence to be important antecedence to economic growth and innovative capacity (Dervo, Aas, Kaltenborn, & Andersen, 2003; Kvam & Stræte, 2010; Nybakk, Vennesland, Hansen, & Lunnan, 2008; Rønningen, 2010).

Economic behavior

A landowner's economic behavior is defined by how he uses his scarce resources and land in particular. Economic decisions are defined as "the set of processes and acts of sacrificing scarce resources (money, time and effort) in order to acquire products and services that provide desired benefits and end states" (van Raaij, 1999). Van Raaij (1981) groups the factors that facilitate or constrain economic decisions into: personal factors, situational factors and general economic factors. Personal factors include: personality characteristics of the landowner (e.g. risk-adversity, entrepreneurial, cognitive style, mental strength), life-style characteristics of the household (e.g. wage earners vs. farm income, life-style vs. profit orientation), and the institutions (rules, norms and values) of a society or a subculture (e.g. local community). Cultural norms and values regarding involvement in angling tourism, one's own angling, and profit orientation differ between landowners due to traditions or social pressure from neighboring landowners, family and the local community. Household

income, farm resources, size of the salmon runs, and market situation are examples of situational factors in a landowner and angling tourism perspective. General economic factors, describe the larger scale (macro) economic environment in which decisions are being made, such as unemployment rate, income distribution, and the general government economic policy. The landowner's perception of the economic environment and his consequential economic behavior may shift depending on these three factors.

Elements of van Raaij's (1981) economic behavior model (Figure 1) are suitable for analyzing the relationship between farm and landowner characteristics, perception of the economic environment, and strategies for securing household income and livelihood (cf. Lien et al., 2006; Wilson et al., 1993).

The figure presents groups of variables being used in the research design. $P \rightarrow E/P$ describes how farm characteristcs, landowner's (household's) objectives, and other personal variables (P) influence landowner perceptions of the economic environment including risk sources (E/P). The relationship $P \rightarrow E/P \rightarrow B$ shows how farm/landowner variables and landowner's perceptions of the economic environment influence economic behavior (B), i.e. his risk management strategies. Off-farm work or farm diversification are personal characteristics (i.e. P), but are also strategies to deal with risk (i.e. B). A personal variable (e.g. income from on or off the farm) influences economic behavior and thereby how a fishing right is used (e.g. risk management). However, a risk management decision about how to derive income also alters the personal characteristics. Thus, the impact could also be $P \leftrightarrows E/P \leftrightarrows B$, and it can be impossible to prove which way the causation flows.

Figure 1. Elements of Van Raaij's (1981) model of the landowner's decision-making environment

A standard assumption of *Homo economicus* is that he tries to maximize his utility (Marshall, 1920:78). The landowner as a rational economic actor has a portfolio of activities to allocate his time to. Spending time on organizing landowner collaboration, selling angling and angling products might not be compatible with the combination of time and activities that yields the highest utility. The landowner will allocate his resources such that the marginal

utility derived from each of the activities will be equal, in line with Johansson and Löfgren's (1985:140) behavior model of the self-employed forest farmer.

A portfolio of income sources is a risk management strategy that reduces household exposure to risk, thereby securing household income and livelihood. Knight (1921) defines risk as the case in which there is an underlying (objective) probability distribution of outcomes, whereas for the related term uncertainty no such probability distribution exits. Keynes (1937) put it in simpler words and defined uncertainty as "we simply do not know". Kostov and Lindgard (2003) argue that risk from a decision-making perspective must be seen as a subjective measure. Actors can improve their performance by changing the environment or changing their perception of it, that is risk management. Huber (2007) claims that when decision-makers face risky situations, their first reaction is not to evaluate values and probabilities, but rather search for measures that can alter the perceived economic environment and reduce the risk, and in that way gain control of the situation. These risk management strategies can broadly be classified into new alternatives, control, precautions and worst-case plans (Kostov & Lingard, 2003).

Pluriactivity and diversification

The radical restructuring of the agriculture sector which has taken place during the two last decades, has changed rural Europe from a place of primarily food and fiber production towards a place also associated with recreation and consumption (Burton & Wilson, 2006). Both the European Union and Norwegian governmental authorities encourage farm diversification into business activities beyond agricultural and forestry primary production, such as tourism, other services and local food products (European Commission, 2004; Landbruksdepartementet, 1999). Diversification and entrepreneurial activity is highly encouraged, but wage earning is also a viable alternative to secure household income. Generating income from more than one economic activity is sometimes called *pluriactivity* (Eikeland & Lie, 1999) and can be divided into two categories (Eikeland, 1999): Wage earning and industrial. Wage earning pluriactivity includes persons/households who are wage earners in combination with running a business or self-employment. *Industrial pluriactivity* includes persons who are running a business or self-employed, in two or more enterprises or businesses.

The "post rural" (Murdoch & Pratt, 1993) or new forms of daily life in rural areas has blurred the boundaries between what is perceived as urban or rural. Rural areas have taken advantage of new technologies, new markets and the option of either working from home or

commuting. This has opened up new patterns of pluriactivity where one can make the distinction between "taking jobs" and "making jobs" (cf. Fuller, 1990). The dominant view of pluriactivity for a long time implied that restructuring in the agricultural sector would cause surplus farm labor to become wage earning ("taking jobs"). However, Eikeland and Lie (1999) found that rural households in Norway had different forms of income strategies in different regions depending on market availability for products and labor. Rural areas within reach of larger labor markets have better access to wage employment and markets for farm products (food, accommodation and other services). Alternately, sparsely populated rural areas lack many of these opportunities. Many people in the geographical periphery have thus surrendered to an adaptation of pluriactivity (especially industrial pluriactivity) by need instead of choice (Seierstad, 1991).

Eikeland (1999) found freedom, independence, and the possibility to develop occupational interests as ideological reasons why rural people living close to urban areas chose pluriactivity when full-time wage work was available. Rønning and Kolvereid (2006) showed that diversification into other economic sectors also increased the income of Norwegian farm households. In general a farm household might have a range of farm objectives and reasons for diversifying into tourism and other businesses, these again impact economic behavior. Findings from the literature include autonomy, life-style motives, use of the resource base, recreation, conservation, family connections and economic objectives (Barbieri & Mahoney, 2009; Getz & Carlsen, 2005; Ingemarson, Lindhagen, & Eriksson, 2006; Koesling et al., 2004; Lien, et al., 2006; Nilsson, 2002; Ollenburg & Buckley, 2007; Schmitt, 2010; Sharpley & Vass, 2006; van der Ploeg, 2010)

Data and Methods

Study area

Six major and approximately thirty medium and small salmon streams drain into the Trondheim Fjord of Mid-Norway. Every year approximately 30,000 salmon anglers spend an average of ten days fishing in this region summing up to one third of all salmon angling in the country (Tangeland, Andersen, Aas, & Fiske, 2010). Our study examines the four top salmon rivers in the region, the Gaula, Orkla, Stjørdal and Verdal rivers (Figure 2). During 2006-2010, anglers in these rivers caught 10,000 – 22,000 fish (91% salmon *Salmo salar* L.; 9% sea trout *Salmo trutta* L.) averaging 4-5 kg, annually (A.T. Baklien, Statistics Norway, personal comment, March 17 2011). Annual angler expenditures are estimated to contribute about 338 million NOK into the local economies (Kjelden et al., 2010). The Orkla and Gaula

Rivers are among the top five Norwegian salmon rivers, whereas the Stjørdal and the Verdal rivers are among the top 20 and 25 in terms of number of fish caught per year (1997-2007) (Norske Lakseelver, n.d.). The Orkla, the Gaula and the Stjørdal have a 150-year history of international angling tourism, whereas the Verdal first attracted attention as an angling destination just 25-30 years ago. The average landowner earned a profit of NOK 29,896 from salmon angling tourism in the 2007 season, but income was unevenly distributed with one out of three landowners receiving no profit (Stensland, 2010).

Salmon migrates 110 km up the main stem of the Gaula. In addition, salmon run up several tributaries leading to a total stretch of 200 km owned by 501 landowners. The Orkla has 88 km of fishable river controlled by 378 landowners. On the Stjørdal 135 landowners share rights to the main stem with a length of 50 km and another 19 km of tributaries. The 52 km in the Verdal are divided between 147 landowners. On all rivers most of the fishing occurs in the main stem. The lower reaches in the tidal zone and the very upper parts receive less angling effort.

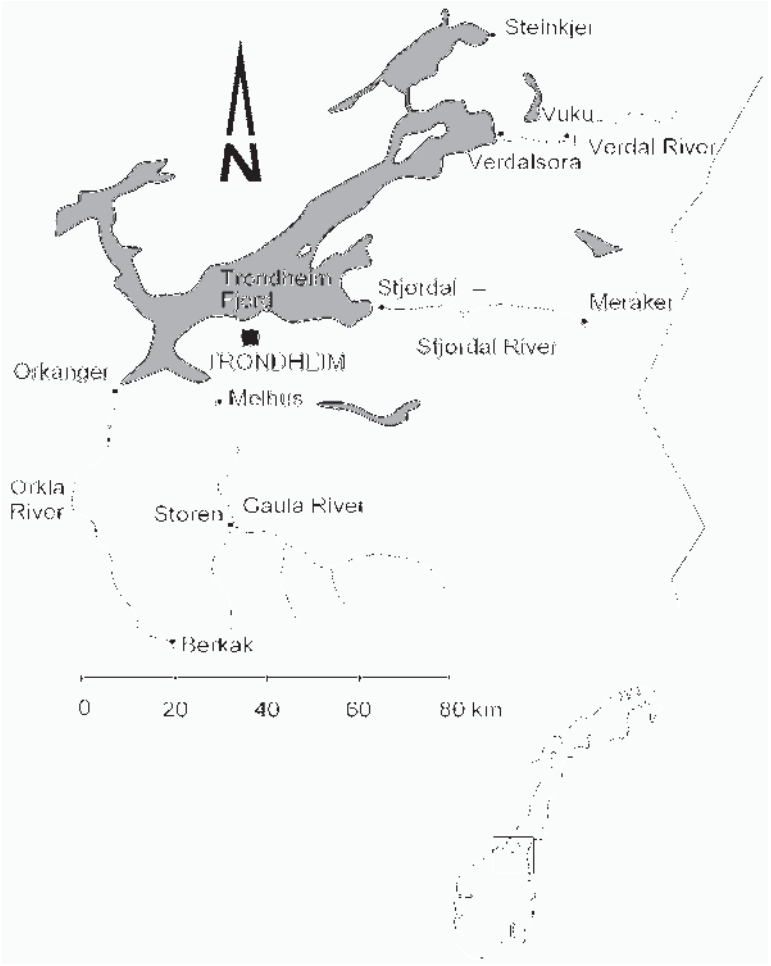

Figure 2. The Trondheim Fjord region of Mid-Norway with the rivers Verdal, Stjørdal,Gaula and Orkla. Map by Origokart.

Each of the four river valleys is inhabited by 14,000-22,000 people. The total region of Eastern Trondheim Fjord has a population of approximately 350,000 residents. The major work center in the region is Trondheim (population 150,000), however there are several local labor markets within one hour driving distance of most landowners, each with a few thousand jobs. The regional unemployment rate varied between two and five percent between year 2000 and 2010.

From 2003 to 2009 the percentage of farms in Mid-Norway, which the study area is a part of, with more than half of their net household income from the farm decreased from 43% to 34% (Logstein & Blekesaune, 2010; Storstad, Rye, & Almås, 2004), due to a combination of declines in the agriculture and forestry sectors, and the many opportunities for wage earning and off-farm business. Fifty-nine percent of farms have income from property activities other than traditional forestry and agriculture. Renting out fishing and hunting rights is undertaken by 35% of farms. Their interest in farming, independence, and living a rural life are the main reasons for being a farmer, whereas lack of other income sources and receiving good pay are given low priority. The main motivations for farm diversification are the need for more income, and use idle resources (Logstein & Blekesaune, 2010).

Data Collection and Questionnaire Design

Data were collected in the summer and fall of 2008 using a postal questionnaire survey sent to all 1,175 landowners along the Orkla, Gaula, Stjørdal and Verdal rivers. These rivers were chosen because of their importance as salmon angling destinations. Survey respondents were asked: (i) about farm, fishing right and landowner characteristics, (ii) to prioritize eight listed objectives about their fishing right, (iii) their perception of what degree of impact seventeen specific risk sources would have on their income from salmon fishing tourism, and (iv) what priority they would give sixteen specific risk management strategies to ensure household income.

Studies of farmers and forest owners (Follo, Forbord, Almås, Blekesaune, & Rye, 2006; Koesling, et al., 2004; Lien, et al., 2006; Størdal, Lien, & Baardsen, 2006; Størdal, et al., 2007), national reports on landowners (Birkeland, Lein, & Aas, 2000; Fiske & Aas, 2001), along with communication with river owner organizations, individual landowners and colleagues served as input and quality assurance of the questionnaire. A pre-test of the questionnaire using face-to-face meetings with eight landowners, and a small pilot study (n=18) were done as recommended by Dillman (2007).

To achieve a high response rate, the survey used Dillman's (2007) Tailored-Design Method with five direct contacts with respondents. These contacts were: (i) pre-notice letter sent in early June, (ii) questionnaire mail-out four days later, (iii) reminder and thank you postcard another ten days later, (iv) replacement questionnaire in late August, and (v) telephone call reminder in mid-September. The telephone mode was helpful to verify that the correct respondent received the questionnaire. Seven percent of the 580 persons in the telephone call reminder could not be reached. In addition to these five direct contacts, newsletters from the local river owner organizations and four article series in local newspapers helped to create local attention for the survey which may have improved response rate. The overall response was 712 answers out of a valid sample of 1161, a response rate of 61%.

Non-response error might be present even in surveys with high response rates (Needham & Vaske, 2008). To check for non-response bias I conducted a non-response-study with 12 selected questions from the questionnaire. Thirty responses were collected by phone through contacting 37 random non-respondents. The results from the non-response study did not indicate major bias.

Variables and Data Analysis

The sample was split into two groups by creating a farm income marginalization index. The index was made by taking the net self-employment income derived from the farm divided by gross household income. Landowners who demonstrated an index value of 0.25 or less was defined as dependent on "external income", whereas those with index value above 0.25 were defined as "farm-dependent." Eighty-five (11.9%) respondents did not report an answer on at least on one of the income variables creating the index, and these landowners could not be put into any of the two subsamples. Economic data are for the 2007 angling season, and reported as stated by respondents.

Landowner, farm and fishing right characteristics of the two subsamples were first compared using independent samples t-test with unequal variances. I used descriptive statistics for an initial examination of how the two landowner groups perceived risk sources related to income from salmon fishing tourism and managed risk related to household income.

Three exploratory factor analyses for the whole sample, each applying a principal axis factoring (common factor analysis) procedure with orthogonal rotation (varimax) were used to summarize information about (i) objectives about the fishing right, (ii) risk sources, and

(iii) risk management strategies into a reduced number of factors. A principal axis factoring procedure was determined to be most appropriate because it identifies underlying dimensions reflecting what variance the variables share in common (Hair, Anderson, Tatham, & Black, 1998). The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the three analyses (KMO = 0.76-0.91, termed "good" to "superb" according to Field (2009:647)). Bartlett's test for sphericity ($p < 0.001$) indicated that correlations between items/variables were sufficiently large for all factor analyses.

Items causing severe multicollinearity, or with a loading higher than 0.40 on more than one factor or loading less than 0.40 on all factors were deleted (Hair, et al., 1998). Three items were seen as a minimum per factor (Thurstone, 1927). A pairwise deletion approach was used for missing item values. Kaiser's criterion combined with the scree plot was used to test different factor solutions and the numbers of factors extracted. In the end, factors with eigenvalues above 1 were kept as these solutions gave the best factors when considering both theory and structure. All factors were checked for internal consistency via factor loadings, items correlation, alpha if item deleted, and Cronbach's alpha. Cronbach's alpha reliability scores were 0.61- 0.87, and above the minimum acceptable level of 0.60 for internal consistency (Cortina, 1993; Robinson, Shaver, & Wrightsman, 1991). Detailed reports of the factor analyses are given in tables 2-4.

Factor regression scores were saved for each respondent for subsequent use in the regression analysis. The combined effects of variables may be overlooked in a variable by variable comparison of the two groups, hence a regression approach was used to get a more complete view of the differences between the two landowners groups. Binary logistic regression was used to analyze associations between external income and farm-dependent landowners (dependent variables), and independent variables. The independent variables used for the regression model were:

- *Age*: Landowner age in years, open ended question.
- *Education*: Education at college/university level= 1, and 0 otherwise.
- *Residency on farm*: Residency on farm of the fishing right. Yes=1, no=0.
- *Quality of fishing right*: Landowners were asked to rate the catch possibility on their fishing right compared to other fishing rights. A seven point item with 1 (*very low*), 4 (*medium*) and 7 (*very high*) given verbal labels.
- *Objectives*: Landowners scored how they prioritized eight stated objectives about their fishing rights on a seven point item with only the endpoints 1 (*very low priority*) and 7

(*very high priority*) marked. Regression scores for the two extracted factors were used for model input.

- *Risk sources*: Landowners were asked on a seven point item, with only the endpoints 1 (*very little impact*) and 7 (*very large impact*) given verbal labels, how they thought 17 listed risk sources would affect their net income from salmon angling tourism in the next five years. Regression scores from the two extracted factors were used for model input.
- *Risk management strategies*: Landowners were asked on an item from 1 to 7, with only the endpoints marked (1= *very low priority*, 7= *very high priority*), how they prioritized sixteen stated strategies to secure household income. Regression scores from the three extracted factors were used for model input. In addition the single item off-farm work was used in the regression analysis.

Profile of the landowner groups

The average landowner was a 52 year old (range 18-93 years) male living on the farm of the fishing right with his spouse/cohabitant (Table 1). Compared to farm-dependent landowners, the external income landowners were on average older, resided on the farm less frequently, a larger ratio had attended college/university, and the household's off-farm workload was higher. Gross household income did not differ between groups, but net self-employment income from the farm was nearly six times higher among the farm-dependent landowners. Compared to the external income landowners, the farm-dependent landowners had better quality of fishing rights, the fishing right was less frequently part of a common property regime, and they also had higher profit from salmon angling tourism. In both groups about one of three landowners went salmon angling the last season.

Table 1. Descriptive statistics for landowner and farm characteristics

Variables	Whole sample[a]	Farm-dependent[b]	External income
Age of owner, in years **	52.7 (0.5)	50.2 (0.7)	52.9 (0.6)
Proportion males [c] (=1)	0.82 (0.01)	0.85 (0.02)	0.80 (0.02)
Residency on farm [d] (=1) **	0.85 (0.01)	0.96 (0.01)	0.79 (0.02)
Married/cohabitant [e] (=1)	0.81 (0.02)	0.80 (0.03)	0.81 (0.02)
Attended University/college [f] (=1)**	0.33 (0.02)	0.24 (0.03)	0.40 (0.03)
Household off-farm workload [g] **	100.3 (2.9)	77 (4)	121 (4)
Gross household income in 1000 NOK_{2007}	511 (10)	496 (15)	523 (13)
Net self-employment income from the property in 1000 NOK_{2007} [h] **	129 (5)	259 (6)	45 (2)
Length of fishing right in meters	903 (45)	980 (70)	846 (62)
Quality of fishing right [i] *	4.07 (0.06)	4.29 (0.10)	3.98 (0.08)
Common property regime [j] (=1)*	0.33 (0.4)	0.26 (0.03)	0.36 (0.03)
Profit salmon angling tourism in NOK_{2007}**	29,896 (2,530)	45,650 (5,295)	19,808 (2,508)
n[k]	558-698	204-245	307- 382

Note. Data are shown as mean (standard error). €1 =NOK 7.90, March 22 2011. Pairwise deletion of missing data.

[a] The whole sample is somewhat larger then the two subsamples as not every respondent was able to be classified into the two subsamples because of missing answers on income questions.

[b] The whole sample was divided in two by creating a farm income marginalization index (net self-employment income from the farm divided by gross household income). Landowners having an index score >0.25 was classified as *farm-dependent*, whereas a score of 0.25 and below were classified as *external income dependent.*

[c] Measured as dummy variable where 1 denotes male owner, 0 if female.

[d] Measured as dummy variable where 1 denotes that the landowner had residency on the farm, and 0 otherwise.

[e] Measured as dummy variable where 1 denotes being married or cohabitant, and 0 living alone. [f] Measured as dummy variable where 1 denotes education at University/college level, and 0 otherwise.

[g] The household couple's or single owner's total workload off-farm in percent of a full man labor year.

[h] Net self-employment income from the farm is the sum of self-employment in agriculture and forestry, and other industries on the farm, less any losses.

[i] Landowners were asked on an item from one to seven to evaluate the catch possibility on their property compared to other properties in the river. 1= very low catch possibility, 7= very high catch possibility.

[j] Measured as dummy variable where 1 denotes part of a common property, and 0 if individual ownership.

[k] Pairwise deletion of variables. The sample size n varies because not all respondents answered each question.

* $p<0.05$, ** $p< 0.01$. Independent samples t-test, unequal variances. Significant differences between the two subsamples.

Results

Objectives about the Fishing Right

Both landowner groups gave on average highest priority to the objective preserve fish stocks and have good fishing on the property (Table 2). Influencing management of the river was also important to both groups. Income objectives were important to the farm-dependent group. These landowners gave recreation and fishing for me, family and friends lowest priority, while the external income landowners scored this objective higher than income. Both groups had social contact with anglers and providing salmon angling to local fishermen as medium to low priority.

Table 2. Principal axis factor analysis and mean score of the two landowner groups' objectives regarding the fishing right.

Landowners' objectives[a]	**Farm-dependent**	**External income**		**Factors** [b,c]		**Item correlation**	**Alpha if item deleted**
	Mean	Rank	Mean	1	2		
Preserve fish stocks	5.57	1	5.41	0.77		0.71	0.76
Have good fishing on the property	5.20	2	5.05	0.80		0.73	0.75
Reliable and stable income	4.92	6	4.08**	0.68		0.55	0.85
Influence management of the river	4.68	3	4.59	0.74		0.68	0.77
Maximize income	4.48	7	3.66**	Deleted			
Provide salmon fishing to local anglers	4.02	5	4.14		0.42	0.38	0.56
Recreation and fishing for me, family and friends	3.41	4	4.19**		0.93	0.47	0.43
Social contact with anglers	3.58	8	3.58		0.45	0.41	0.53
% of variance				34.5	20.7		
Cronbach's α				0.84	0.61		
n[d]	238-242		356-363				

Note. [a] Landowners were asked on an item from one to seven how they prioritized each of the listed objectives about their fishing right. 1=very low priority, 7= very high priority.
[b] Factor loadings above 0.40 shown.
[c] Factor 1 named *Income and management*, factor 2 *Recreation.*
[d] Pairwise deletion of variables. The sample size n varies within the groups because not all respondents answered about each of the objectives.
** $p<0.01$. Independent sample t-test, unequal variances. Significant differences between the two landowner groups.
Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.761. Bartlett's Test of Sphericity $\chi^2(21) = 1624$, $p<0.001$. Determinant [R] = 0.078.

The factor analysis extracted the two factors *Income and management* and *Recreation* (Table 2).

Risk sources in supply of salmon angling

Salmon stock variability, reduced angling season, riverflow variability, angling demand variability, and landowner engagement in the salmon resource were the five risk sources landowners considered having the largest impact on future income from salmon angling tourism (Table 3). The farm-dependent landowners scored the top four risk sources significantly higher than the external income landowners. Fishery regulations such as bag limits and gear restrictions got a medium score, but were considered to have a larger impact than the remaining variables dealing with public angling issues, sale and organization of fishing. The top seven risk sources were demand, resource, and conservation issues, and are mostly beyond the control of the single landowner or the landowner group. The factor analysis extracted the two factors *Sale and organization of fishing* and *External resource issues* (Table 3).

Risk management strategies

The two landowner groups differed some in strategies to secure household income, and scored all strategies, but one, significantly different than the other group (table 4). Farm-dependent landowners gave on average highest priority to buy farm insurance, liquidity, forestry and agriculture on their property, buy personal insurance, keeping costs low and combination of farm activities. External income landowners had off-farm work on top. Liquidity, buy farm insurance and buy personal insurance also got a relatively high priority by this landowner group. Most important of the salmon related strategies was work to strengthen fish stocks. This strategy was given a higher priority than off-farm work by the farm-dependent landowners. As a parallel, external income landowners had work to strengthen fish stocks ranked as fifth, being more important than forestry and agriculture work on the farm, and combination of farm activities. In general, both groups downplayed strategies involving sale and organization of fishing rights. Long term lease of own fishing right (minimum 1 year), and collaboration about merging beats and sale/lease of fishing got a medium priority and were the most important of the other fishing related strategies. The factor analysis extracted the three factors S*almon and tourism*, *Agriculture*, and *Insurance* (Table 4).

Table 3. Principal axis factor analysis and mean score about perceived risk sources for the two landowner groups.

Risk sources[a]	**Farm-dependent**	**External income**		**Factors**[b,c]		**Item correlation**	**Alpha if item deleted**
	Mean	Rank	Mean	1	2		
Salmon stock variability	4.70	2	4.19**		0.71	0.65	0.82
Reduced angling season	4.67	1	4.22**		0.69	0.65	0.82
Riverflow variability	4.50	2	4.19*		0.65	0.61	0.83
Angling demand variability	4.47	5	3.91**		0.66	0.64	0.82
Landowner engagement in the salmon resource	4.19	4	4.01		0.62	0.60	0.83
Use of bag limits	3.75	6	3.69		0.57	0.60	0.83
Gear restrictions	3.71	7	3.68		0.50	0.51	0.84
Public angling issues	3.40	8	3.31	deleted			
Access to accommodation facilities	3.02	9	3.03	0.45		0.55	0.86
Beat collaboration	2.98	9	3.03	0.48		0.53	0.86
Personal situation	2.88	11	2.96	0.46		0.55	0.86
Access to meal service facilities	2.76	13	2.67	deleted			
Salmon fishing tourism costs	2.72	12	2.75	0.61		0.62	0.85
Common marketing/sale of angling products	2.67	14	2.63	0.75		0.73	0.84
Capital for investments	2.52	15	2.51	0.73		0.71	0.84
Rent fishing rights from others	2.27	16	2.33	0.76		0.65	0.85
Hired labor variability	2.06	17	2.14	0.73		0.68	0.85
% of variance				23.8	22.9		
Cronbach's α				0.87	0.85		
n[d]	227-237		357-364			606	592

Note. [a] Landowners were asked on an item from one to seven how they thought the listed risk sources would affect their net income from salmon angling tourism in the next five years. 1= very little impact, 7= very large impact.
[b] Factor loadings above 0.40 shown.
[c] Factor 1 named S*ale and organization of fishing*, factor 2 *External resource issues*.
[d] Pairwise deletion of variables. The sample size n varies within the groups because not all respondents answered about each of the objectives
* P<0.05, ** P< 0.01. based on independent samples t-test unequal variances. Significant differences between the two landowner groups.
Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.908. Bartlett's Test of Sphericity $\chi^2(105) = 3987$, $p<0.001$. Determinant [R] = 0.001.

Table 4. Principal axis factor analysis and mean score about risk management strategies for the two landowner groups.

Risk management strategies[a]	**Farm-dependent**	**External income**		**Factors** [b,c]			**Item correlation**	**Alpha if item deleted**
	Mean	Rank	Mean	1	2	3		
Buy farm insurance	5.97	3	5.14**			0.63	0.52	0.55
Liquidity – cash on hand	5.67	2	5.25**			0.58	0.44	0.66
Forestry and agriculture on farm	5.54	7	3.68**		0.83		0.66	0.60
Buy personal insurance	5.40	4	4.82**			0.63	0.54	0.53
Keeping costs low	5.02	6	3.69**		0.47		0.52	0.76
Combination of farm activities	4.79	9	3.22**		0.62		0.60	0.66
Work to enhance the fish stocks	4.47	5	4.24	0.42			0.39	0.73
Off-farm work	4.39	1	5.59**	Deleted				
Long-term lease of own right (≥1 year)	3.97	8	3.50**	Deleted				
Collaboration about merging beats and sale/lease of fishing	3.53	10	3.07**	0.46			0.42	0.72
Use economic advisors	3.12	13	2.12**	0.41			0.41	0.72
Use salmon fishing/ tourism advisors	2.73	12	2.36**	0.70			0.62	0.67
Off-farm investments	2.59	11	3.05**	Deleted				
Buy farm tourism insurance	2.38	14	1.87**	0.58			0.49	0.70
Organize business as corporation	2.03	15	1.78*	0.48			0.41	0.72
Rent fishing right from others	1.91	16	1.61**	0.64			0.51	0.70
% of variance				16.9	12.9	11.4		
Cronbach's α				0.74	0.76	0.68		
n[d]	228-236		352-366					

Note. [a] Landowners were asked on an item from one to seven how they prioritized the listed strategies to secure household income. 1= very low priority, 7= very high priority.

[b] Factor loadings above 0.40 shown.

[c] Factor 1 named *Salmon & tourism,* factor 2 *Agriculture*, factor 3 *Insurance.*

[d] Pairwise deletion of variables. The sample size n varies within the groups because not all respondents answered about each of the objectives

* P<0.05, ** P< 0.01. Independent samples t-test. Unequal variances assumed. Significant differences between the two landowner groups.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.825. Bartlett's Test of Sphericity $\chi^2(78) = 2079$, $p<0.001$. Determinant [R] = 0.03.

Characteristics and behavior of the landowner groups

A binary logistic regression model was run with farm-dependent landowners (=1) and external income landowners (=0) as dependent variables. An initial analysis run with more variables than in the final model, resulted in deletion of the non-significant variables property regime and sex. For statistical results of the model see Table 5. No multicollinearity problems were detected in the regression model. Residuals were normally distributed.

The binary logistic regression showed several significant differences between the two landowner groups. Compared to farm-dependent landowners, external income landowners were older, less frequently resided on the farm, had lower profit from salmon angling, and saw angling as a more important objective. There were no differences between how the two groups perceived risk sources regarding income from salmon angling. Compared to farm-dependent landowners, external income landowners prioritized the risk strategy off-farm work higher. In comparison the strategies agriculture, and salmon and tourism were of a higher importance for the farm-dependent landowners. There was no difference between the groups regarding the insurance strategy.

In general, the logistic regression analysis, and the variable by variable analyses in Tables 2-4 yielded similar results. However, the logistic regression analysis showed no significant differences in education level, and quality of the fishing right.

Table 5. Landowners groups; results of binary logistic regression. Dependent variable is farm-dependent (=1) or external income (=0).

			95% CI for Odds Ratio		
Independent variables	**B(SE)**		**Lower**	**Mean**	**Upper**
Constant	0.779	(1.333)			
Landowner and farm characteristics					
Age	-0.029(*)	(0.015)	0.944	0.972	1.001
Education	-0.361	(0.319)	0.373	0.697	1.302
Residency on farm	1.634*	(0.727)	1.233	5.124	21.297
Quality of fishing right	0.014	(0.120)	0.802	1.014	1.282
Profit salmon angling (1000 NOK)	0.005*	(0.002)	1.000	1.005	1.010
Objectives[a]					
Income and management	-0.246	(0.226)	0.502	0.782	1.219
Recreation	-0.646**	(0.173)	0.373	0.524	0.736
Risk sources[a]					
Sale and organizing of fishing	-0.152	(0.187)	0.596	0.859	1.239
External resource issues	0.217	(0.209)	0.825	1.242	1.870
Risk strategies					
Salmon & tourism[a]	0.452*	(0.196)	1.069	1.571	2.308
Insurance[a]	0.278	(0.220)	0.857	1.320	2.033
Agriculture[a]	1.377**	(0.219)	2.580	3.964	6.088
Off-farm work	-0.321**	(0.085)	0.614	0.726	0.857
n	358				

Note. [a] Regression factor score variables from the factor analyses for each landowner are used.
R^2= 0.52 (Nagelkerke), 0.38 (Cox &Snell). Model $\chi^2(13)=171.73$, $p<0.001$. Hosmer and Lemeshow test $\chi^2(8)=5.92$, $p=0.66$.
(*) P<0.10, * P<0.05, ** P< 0.01

Discussion

This study investigated landowner and farm characteristics, objectives about the fishing right, how landowners perceived risk sources in salmon angling tourism, how they managed risk; and how marginalization of farm income affected these relationships.

The large variation between landowner groups regarding landowner and farm characteristics, and objectives about the fishing right is probably not unique to salmon fishing rights in Norway. Similar conclusions could be generalized to include other natural resources as well, especially those with a tourism potential. Preserving the salmon stocks was the most important objective, one that all landowners agree on regardless of generating any income from the fishing right. The fact that profit maximization was ranked as a low priority is similar to findings in other international studies of farmers (Gasson et al., 1988; Koesling, et al., 2004; Willock et al., 1999). Other studies of Norwegian farmers and forest owners also show heterogeneous groups with multiple objectives about their farm (Follo, et al., 2006; Lien, et al., 2006).

External income landowners leaning priorities toward the recreational, rather than the production role of the fishing right, suggest potential challenges in development of angling tourism. Studies of forest owners also show that marginalization decreases efficiency in obtaining profit and output of resources, probably because of less focus on these resources (Baardsen, Lien, & Størdal, 2009; Lien, Størdal, & Baardsen, 2007). Currently, an increasing number of landowners receive most of their income from off-farm sources or do not reside on the farm. This could lead to less available fishing for tourist anglers, thereby reducing income and business opportunities for local communities and landowners renting fishing rights. External income landowners might also have a recreational or even passive view on other farm resources (e.g. hunting rights, timber). Marginalization of farm resources and the resulting consequences for rural development should be investigated further.

Both external income and farm-dependent landowners saw external resource issues (demand, resource and conservation issues) as having the largest impact on future income from the salmon resource, whereas sale and organization of fishing was downplayed in comparison. In findings from Sweden, including a variety of fishing tourism companies, fisheries management was an important public policy measure to develop angling tourism, but ranked second behind the need for marketing assistance (Paulrud & Waldo, 2010). Results from Finland are similar to Sweden (Toivonen, 2008). Contrasts to Norway might be a result of differences in pressure on fish stocks and the homogeneity of respondents in Finland and Sweden.

Stricter fishing regulations in the study region, closed rivers in other regions, and increased attention about the threats from fish farming, have raised awareness about the vulnerability of Norwegian salmon stocks. A consideration of those facts is probably why landowners consider salmon stock variability and the consequential reduced angling season as top risk sources. There can be no salmon angling tourism if rivers are closed or salmon stocks recede entirely. Studies of which management actions that landowners might see as the best way to strengthen and improve salmon stocks could give valuable information for fishery managers and policy makers.

River flow variability impacts fishing conditions and was seen as an important risk source. Drought or flooding make it harder or even impossible to catch fish, thereby reducing the quality of the angling product and how many anglers come to fish and how much they are willing to pay. Climate change has the potential to severely affect water flow levels by changing the current precipitation pattern. Dry periods in the summer or less snow deposition

in wintertime, could cause periods of low water levels and poor angling conditions during the fishing season.

Change in angling demand was considered to be an important risk source and is linked to situational factors such as length of season, fishing conditions and size of stocks as well as to the general economic environment. Without fish to catch, salmon anglers will eventually find something else to do or travel somewhere else to fish. Anglers mostly fishing in their local river might suffer most, whereas anglers already travelling far could find it easier to switch to another river or country. In Norway, recent changes in the salmon fisheries have not reduced the overall participation, but there are indications that site substitution has become more common (Tangeland, et al., 2010). The degree to which anglers are willing to travel elsewhere to fish requires further research, as the literature is non-conclusive about anglers willingness to substitute among sites (Gentner & Sutton, 2008).

Respondents saw landowner engagement in the salmon resource as a significant risk source. The absence or presence of well functioning landowner organizations thus makes a substantial difference as such organizations set fishing regulations, do fish management actions, and work to protect stocks and habitat. Bag limits and gear restrictions could be looked upon as being important risk sources in two different ways. One landowner group might have seen gear restrictions and bag limits as constraints scaring away their harvest oriented customers. The other group likely saw those risk sources as positive for the stocks and welcomed by their conservation minded fly-fishing customers. The public angling issue was more important than sources the landowner had more control of, i.e. sale and organization of fishing, and should be investigated further.

Of the sources dealing with sale and organization of fishing, access to accommodation facilities and beat collaboration were most important. In order to acquire a large share of anglers' spending, landowners often have to collaborate about providing accommodation or merging several shorter beats into one longer, attractive beat as promoted by governmental authorities. If landowners have different objectives about their fishing right collaboration might be hard. Accommodation is usually a large part of tourists' spending, and not offering accommodation could severely diminish future income.

In general, risk sources being mostly beyond the control of the single landowner and/or the landowner group were thought to have the largest impact on future income from salmon angling. Both man and nature have an impact on the abundance of salmon stocks, and some risk sources are both biological and institutional (e.g. salmon stock variability). One

might also wonder if other risk sources had been seen as more important if the trend for Norway was that most salmon stocks were healthy, and thereby taken for granted.

There are no other studies of how landowners perceive risk related to the salmon resource, but findings are similar to Lien et al. (2006) where Norwegian farmers ranked institutional risks (uncertainty about changes in taxes, support payments, and quota systems) and biological risk (crop diseases) high, and availability and cost of hired labor and leased farmland low. The findings are also comparable to other studies of farmers and forest owners where price risk and institutional risk were at the top of the list (Blennow & Sallnäs, 2002; Harwood, Heifner, Coble, Perry, & Somwaru, 1999; Lönnstedt & Svensson, 2000; Meuwissen, Huirne, & Hardaker, 2001; Størdal, et al., 2007).

Unlike Norwegian farming and forestry, angling tourism is highly dependent on a resource where no government payment support system exists. Private insurance options and governmental natural damage insurance for damage to forests and farm crops/stocks further reduce economic risk. No such insurance option exists for poor return of salmon to the rivers, leaving the landowners with the possibility of losing big on any investments in salmon angling tourism.

Landowners with a substantial part of their income from salmon angling tourism might be salmon tourism entrepreneurs and could facilitate collaboration in the heterogeneous landowner group. Future studies should thus address if these landowners have different perception of risk sources and different ways of dealing with risk than the overall landowner.

Risk management strategies included in the salmon & tourism factor got the lowest priority. The low scores reflect that other income sources were more important than income from angling tourism, but also that viability of the stocks and the salmon fishery might be seen as mostly beyond individual landowner control. Farm-dependent landowners gave higher priority to the factors salmon & tourism, agriculture, and further saw off-farm work as less important than the external income landowners which ranked the latter on top. The differences are not surprising considering where their income came from. Landowners used many kinds of risk management strategies, being similar to studies of farmers or forest owners where general risk management strategies such as maintain good liquidity, buy insurance, produce at lowest possible costs, and use of advisory services were important (Harwood, et al., 1999; Lien, et al., 2006; Meuwissen, et al., 2001; Størdal, et al., 2007).

Use of economic or tourism advisors was not a high priority. In comparison, free public advisory services exist to a large degree for forestry and agriculture. Forest owner

organizations have a tradition of providing services and support to members about how to manage their forests and often conduct management operations for them. Similar advisory businesses are very limited for salmon angling and tourism activities. Both landowner groups had work to strengthen fish stocks, long-term lease of own right, and collaboration about merging beats and sale/lease of fishing as the top three salmon strategies. Work to strengthen fish stocks mitigates the consequences associated with the number one risk source salmon stock variability, and is also in accordance with the top ranked objective preserve fish stocks. Long term lease of the fishing right requires very little investment of time and resources compared to providing full packages with accommodation and meals. By getting capital income from the fishing right, landowners avoid wasting their input if salmon runs fail. As shown in this study, landowners are pluriactive and thus evaluate from which economic activity they get the best return of their inputs. Forty-three percent of private property landowners in the four study rivers used long term lease, and Stensland (2010) suggests that such use also could reflect the quality of fishing rights.

Collaboration about organizing fishing rights and sale/lease builds better and longer beats, and pools costs between landowners. Achieving such landowner collaboration might be challenging since the external income landowners saw their own recreation and angling as a more important objective than receiving income from their fishing right.

Conclusions

Risk sources being mostly beyond the control of the single landowner or the landowner group were perceived to have the largest impact on future income from salmon angling tourism. Landowners were most concerned about the health and protection of salmon stocks. The message to policymakers is that securing healthy salmon stocks is perceived as the top priority for development of angling tourism. Protection of salmon stocks reduces the risk involved with investments in angling tourism. This study illustrates the important connection between sustainable natural resource management and tourism development.

Policymakers should be aware that the landowner group is diverse with a majority of landowners dependent on income sources outside the farm. These landowners give higher priority to recreation and own angling than income from sale of fishing. Farm-dependent landowners on the other hand, value income from angling tourism before own recreation and angling. The number of landowners generating most of their income off-farm is expected to increase and this will influence how fishing and other natural resources are managed. This trend may result in less angling and other resources offered in a market, and therefore

constrain potential development of rural tourism. Moreover, external income landowners holding back fishing rights and other resources could limit opportunities for the landowner depending on cooperation or renting resources to create income opportunities from his farm.

Policies and actions to mitigate this could be to offer advisory services such as those in the agriculture and forestry sectors, and so build competence about angling tourism in the landowner group. Landowners and entrepreneurs specializing in organization and sale of angling tourism might have an important role in facilitating collaboration between landowners or developing high end angling products. Such fishing tourism entrepreneurs however have problems convincing landowners to lease out their fishing rights for more than one to two years at a time (V. Heggem, Aunan Lodge, personal communication, Feb 22 2011). This instability reduces entrepreneurs' willingness to invest.

There is a legal disparity between rent of land for agriculture production and rent of fishing rights. The Salmonids and Freshwater Fish Act sets a period of 10 years as a maximum for rent of fishing rights. The Land Act of 1995 requires rent of agriculture land to last a minimum of 10 years. A similar legal rule concerning fishing rights would provide more stability for fishing tourism entrepreneurs, reduce risk and encourage investments and professionalization.

The inconsistency in use of policy instruments between "new" farm activities (e.g. fishing tourism) and traditional agriculture and forestry is unfortunate and might signal a classification of respectively "inferior" and "superior" farm activities.

Acknowledgments

This study was funded by the Research Council of Norway (grant no.173869/I10) and part of a research project owned by the landowner organization The Trondheim Fjord Rivers. I thank Sjur Baardsen and Øystein Aas for input on research design. I also thank Baardsen, Reidun Heggem, Winslow Hanson, Erlend Nybakk, and Emilie Springer for commenting on earlier versions of the manuscript.

Footnotes

1. In a Norwegian setting the fishing right belongs to whoever owns the land adjacent to the water, cf. The Salmonids and Freshwater Fish Act of 1992. Landowners in this article refer to owners of fishing rights, being small scale private riparian landowners, unless otherwise stated. This is equivalent to small scale forest owners, sometimes referred to as non-industrial or family forest owners (Harrison, Herbohn, & Niskanen, 2002).

2. A *beat* is defined as a length of river or bank, let or fished as a unit by angling (McLay & Gordon-Rogers, 1997). Landowners often pool several short beats to make a single, long beat.

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Paper IV

Hvis laksen skal få utfolde seg som art, så kan man følgelig ikke skille den fra elven, ikke hindre den i sprangene, ikke forvirre dens genetiske kode, ikke gripe fundamentalt inn i elveløpet, og ikke umuliggjøre dens vandringer. Gjør vi dette, så hindrer vi arten i å realisere seg selv, krenker dens rettigheter til eksistens på sine premisser.

Kaj Skagen, 1998. Ørkentaler

A Typology of Landowners in Norwegian Salmon Angling: Attitudes towards River Owner Organizations and Management Actions

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Abstract: Atlantic salmon (*Salmo salar* L.) recreational fisheries in Norway are facing shorter seasons and harvest restrictions because of low runs. Private fishing right holders (landowners) are important stakeholders being co-managers of the stocks, owners of salmon habitat, and suppliers of angling. Landowners saw measures addressing salmon farming and *Gyrodactylus salaris* (Malmberg) as the most important management actions to strengthen stocks. Actions restricting own activity or gain were downplayed. The results show a need to build knowledge and improve communication between landowners and river owner organizations about the effects of stocking, catch and release, and other management actions. Four distinct landowner types were identified based on their objectives for the fishing right. The diversity in the landowner group suggests cooperation challenges for angling tourism and management salmon stocks. Policy instruments to facilitate cooperation are discussed for each landowner type. The empirical research is based on a survey of landowners in Mid-Norway.

Keywords: angling tourism; co-management; landowners; natural resources management; property rights; recreational fishery

Introduction

Private ownership of freshwater fishing rights dominates the Nordic countries, the British Isles, and France, but is also common in a wide range of other European countries (Arlinghaus, Mehner & Cowx, 2002; Sipponen, Mitchell, & Vanberg, 2010). Private holders of fishing rights have important, and often multiple, roles in recreational fisheries (Gudjonsson & Scarnecchia, 2009; Sipponen, 2001; Stensland, 2010). Yet studies investigating stakeholders' roles, objectives and attitudes in recreational fisheries have tended to focus primarily on angler groups. The general lack of basic socio-economic data about stakeholder groups is seen as one of the inherent problems throughout the inland fisheries sector (Cowx & Van Anrooy, 2010). A study of the private ownership of fishing rights in recreational fisheries would help to address some of these gaps in the research literature.

The management responsibility of natural resources is a topic which has been extensively addressed (see Ostrom (1990) for a review). Hardin (1968) advocated privatization, or government control, of common-pool resources to avoid what he called the "tragedy of the commons". Ostrom (1990) argued that local stakeholders groups have the ability to manage natural resources sustainably. During recent decades, there has been a gradual change in the governance of natural resources, with a steady transfer of power and responsibility from government to local level institutions (Goodwin, 1998; Moseley, 2003).

The concept of co-management – defined as "the sharing of power and responsibility between the government and local resource users" (Berkes, George, & Preston, 1991), has received much attention in the commercial fisheries literature (Jentoft, McCay, & Wilson, 1998; Pinkerton, 1989), but is scarcely researched in *recreational* fisheries. Co-management is not only about managing the natural resource, but also about managing *relations* (Natcher, Davis, & Hickey, 2005). Arlinghaus et al. (2002) argue that there is an urgent need to improve communication and information links between scientist, managers, and stakeholders in order to achieve sustainable recreational fisheries.

Atlantic salmon (*Salmo salar* L.) fisheries in Norway, Scotland and Iceland are good examples of co-management arrangements in recreational fisheries due to private fishing right holders' roles, and the economic, ecological and cultural roles of wild salmon in these countries (Agnarsson, Radford, & Riddington, 2008; Gudjonsson & Scarnecchia, 2009; McLay & Gordon-Rogers, 1997; NOU, 1999). Norwegian right holders are landowners[1], suppliers (of angling), managers (of the stocks), and, in many cases, tourist hosts - providing accommodation, meals or guiding to anglers. The gradual delegation of power in the salmon fishery to statutory river owner organizations, from 1995 onwards, implies new roles and

responsibilities for their members – the landowners (Dervo, Andersen, & Aas, 2006). This empowerment also brings with it a need for communication and knowledge building. Norwegian landowners' do not form a homogeneous group, and there are vast differences between landowners in, for example, the quality of their fishing rights, the amount of profit derived from angling, and objectives for fishing rights (Stensland, 2010). Such heterogeneity means that collaboration in fisheries management and the development of angling tourism is a potential challenge (Bardhan & Dayton-Johnson, 2000; Schlager & Blomquist, 1998).

This study aims to identify different types of Norwegian landowners, and to quantify their objectives for the fishing right. The paper further investigates landowners' prioritization of management actions to strengthen stocks and attitudes towards river owner organizations' work (for example: their management of stocks, maintenance of landowner interests and information provision). Recommendations for policy measures that could improve cooperation in salmon management and conservation, and angling tourism are given for each type of landowner. The empirical research is based on a questionnaire survey of landowners in four salmon rivers of Mid-Norway.

Co-management of Norwegian salmon stocks

The fishing right[2] is a property right, and defines who has access to the salmon resource and under what conditions (Vatn, 2005:253). Farm properties own most salmon fishing rights in Norwegian rivers, although the state is a major landowner in the three northernmost counties. There are two types of private ownership (Vatn, 2007): *Private property* owned by one individual landowner, and *common property* where several private properties each have a share in a single fishing right and thus jointly decide if, and how, fishing is to be rented out.

Landowners collectively manage river stocks through a statutory river owner organization which sets fishing regulations (e.g. personal quotas, length of season, gear restrictions, etc.) for the whole river, and is also responsible for other management actions and monitoring in the river- all within the framework set by the Government. River owner organizations have power and responsibility under conditions of an approved management plan for the fishery, and that most landowners are members of the river owner organization. While river fishery in Norway is strictly sport fishing, fishing for salmon at sea is a semi-commercial activity with bag nets operated by landowners holding such property rights.

Abundance and distribution of Atlantic salmon have declined markedly during the last 30 years, and the current status is probably an all time low (Hindar, Hutchings, Diserud, & Fiske, 2011). Human impacts (such as hydro-power development, overharvesting, salmon

farming, irrigation, acid rain, habitat destruction, parasites) and less favorable ocean conditions are important reasons for such a decline (Anon, 2010; ICES, 2009; Miljøverndepartementet, 2006; WWF, 2001). Norway has the world's largest spawning grounds for salmon, but the harvest has also declined here - and most noticeably at sea (Fangel, Andersen, & Aas, 2008; Liu, Olaf Olaussen, & Skonhoft, 2011; NOU, 1999). In 1993 around 3,500 net fishermen caught 2,800 tons of salmon (Fangel, et al., 2008). In 2010, Norway's total harvest of wild salmon was 700 tons, with only 260 tons caught at sea by 869 fishermen (A.T. Baklien, Statistic Norway, personal comment, Feb 9 2011; SSB, 2011a). Fishing seasons at sea and in rivers have gradually been reduced or closed in the last ten year. Around 120 of 400 salmon rivers were closed for angling in 2010.

The Trondheim Fjord salmon fishery

The Trondheim fjord region of Mid-Norway has around 30 salmon-bearing streams, including six major rivers. Every season (June – August) 25,000-30,000 salmon anglers spend an average of ten days fishing in this region summing up to about one third of all salmon angling effort in the country (Tangeland, Andersen, Aas, & Fiske, 2010).

The four study rivers (Gaula, Orkla, Stjørdal and Verdal) are the top salmon rivers in the region. The Gaula runs 110 km down to the sea. Its tributaries add up to 200 km, which are owned by 501 landowners. The 88 km of the Orkla has 378 landowners. The Stjørdal has 135 landowners, with a main stem of 50 km and tributaries of another 19 km. The 52 km in the Verdal are divided between 147 landowners. Anglers in these rivers annually caught 10,000 – 22,000 fish (91% salmon; 9% sea trout *Salmo trutta* L.) averaging 4-5 kg each, in the period 2006-2010 (A.T. Baklien, Statistic Norway, personal comment, March 17 2011. Angler expenditures are estimated to contribute to a turnover of about NOK 338 million (€1= NOK 7.90, March 22 2011) annually into the local economies (Kjelden et al., 2010). The average landowner had a profit from salmon angling tourism of NOK 29,896 in the 2007 season, one out of three landowners however had no profit (Stensland, 2010).

Angling tourism experts argue that in order to match competing international salmon angling destinations such as Iceland, Russia and Scotland, Norwegian landowners should cooperate to offer longer beats[3] with fewer anglers, integrate guiding and lodging to a stronger degree, strengthen salmon stocks, and have a more pro-active attitude to catch and release (Millington-Drake, 2002, M. Hayes, personal communication, January 16, 2006).

The average visiting angler to the Orkla takes about four days to catch a salmon (Fiske & Aas, 2001), whereas Icelandic rivers are managed to yield one fish per day per rod

(Agnarsson, et al., 2008). Prior to 2005, around 60% of the harvest in the Trondheim fjord region was taken at sea. According to the Coase Theorem (Coase, 1960) two private parties can allocate resources efficiently without government intervention if the property right is clearly defined and the right holder is compensated for giving up his right. The major river owner organizations offered fishermen compensation if they kept their nets on land for the five years 2005-2009. Annual payments were NOK 70 per kg salmon - well above market price of around NOK 50 per kg. Around 80% of recorded catches were leased and involved 65 fishermen. The cost was around NOK 4 million per year and paid by landowners and sponsors. Some free-riding by non-paying landowners did occur (cf. Olaussen, 2007). The lease was meant to strengthen salmon stocks and fishing tourism. Similar net fishery leases from Iceland and Scotland served as inspiration (Einarsson & Gudbergsson, 2003; McLay & Gordon-Rogers, 1997). From 2008 onwards, the net fishing season was halved, which in turn reduced the net fishery to the extent that the agreement was not extended after 2009.

Methods

Data collection

Empirical data were collected in a postal survey, sent all 1,175 landowners along four rivers of mid-Norway – Gaula, Orkla, Stjørdal and Verdal. The design, pre-testing and a small pilot study of the questionnaire were conducted as recommended by Dillman (2007). Data collection started in June 2008 and ended in January 2009. Dillman's (2007) tailored design method for surveys - with up to five contacts per respondent - was used. In addition, newsletters from the river owner associations, and four article series in local newspapers created awareness about the survey. The survey yielded 712 answers out of a valid sample of 1,161, giving an overall response rate of 61%.

Non-response bias is a cause of concern - even in surveys with high response rates (Needham & Vaske, 2008). A non-response study was conducted by telephone in February 2009 to check the validity of the sample. Thirty out of 37 (81%) landowners responded. The non-response study gave no indications of bias problems.

Data analysis

A pairwise deletion approach to missing variables was used. Data analysis was conducted in five steps. First, a cluster analysis using a combination of Ward's method, and the non-hierarchical K-means clustering method (Hair, Anderson, Tatham, & Black, 1998) decided the best number of clusters. Segmentation of landowners into mutually exclusive groups was

based on their prioritization of eight objectives about their fishing right - using a seven point scale with only the endpoints one (*very low priority*) and seven (*very high priority*) given verbal labels. Second, a bootstrap test on a random half of the sample checked the robustness of the cluster analysis. Third, one-way variance analyses (ANOVA) with Tamhane's posthoc tests or chisquare tests were used to detect differences between groups in landowner and farm characteristics. Fourth, landowner groups were asked to score ten management actions to secure fish stocks on a seven point scale. Scores were compared using a series of ANOVA, repeated-measures ANOVA and posthoc tests. Fifth, a new series of ANOVA, posthoc tests and t-tests were used to compare landowner groups' attitudes to the lease of bag nets and the work of the river owner organizations. All statements were measured on seven point scales.

Results

The best cluster analysis solution for differentiating between, and interpreting, segments was achieved with four groups (Table 1). A new cluster analysis with a bootstrap sample drawn from the full sample confirmed the robustness of the four group solution. There were differences between all four groups for many of the eight objectives. The groups differed in many farm and landowner characteristics (Table 2). The main findings from Tables 1 and 2 are presented in clusters 1-4 below.

Table 1. Results of the cluster analysis based on landowners' objectives about their fishing right

Cluster Landowners' objectives[a]	1 Passive	2 Recrea- tionist	3 Multi- objective	4 Economist	F-value	Tamhane posthoc[c]
Maximize income	1.88	1.87	5.38	4.82	362.0[b]	3>4>2,1
Reliable and stable income	1.68	1.94	6.06	5.43	620.9[b]	3>4>2,1
Influence management of the river fishery	2.68	4.45	5.80	4.55	119.1[b]	3>4,2>1
Preserve fish stocks	3.38	5.61	6.42	5.48	139.6[b]	3>4,2>1
Have good fishing on the property	2.60	5.09	6.33	5.18	227.7[b]	3>4,2>1
Provide salmon fishing to local anglers	2.90	4.77	5.18	3.37	66.1[b]	3,2>4,1
Recreation and fishing for me, family and friends	2.64	6.11	4.96	2.40	251.8[b]	2>3>1,4
Social contact with anglers	1.81	3.98	5.15	2.97	126.7[b]	3>2>4>1
n	98	137	196	244		
Ratio of total sample	14.5%	20.3%	29.0%	36.2%		

Note. Numbers shown as mean.
[a] Landowners were asked on an item from one to seven how they prioritized each of the listed objectives about their fishing right. 1=very low priority, 7= very high priority.
[b] $p<0.001$. Comparing means between all clusters were tested using one-way analysis of variance (ANOVA).
[c] Cluster by cluster compared using Tamhane's posthoc multiple comparison method. The > - symbol denotes significance difference between clusters at a 5% level.

Table 2. Property and landowner characteristics of each landowner group; ANOVA, Chi-square and posthoc tests.

Cluster Characteristics	Passive	Recrea-tionist	Multi-objective	Economist	F-value	Tamhane posthoc[b]
Age in years	52.8	51.4	54.5	50.1	5.09[a]	3>4
Male[c] (=1)	0.79	0.85	0.83	0.84	0.56	ns
Residency on property[d] (=1)	0.80	0.71	0.92	0.89	11.3 [a]	3,4>2
Attended college/university[e] (=1)	0.28	0.38	0.24	0.41	5.55[a]	4,2>3
Off-property workload[f]	0.61	0.64	0.42	0.55	7.22[a]	2,1,4>3
Net property income in 1000 NOK_{2007} [g]	110	82	140	157	11.30[a]	4,3>2; 4>1
Gross household income in 1000 NOK_{2007}	496	508	481	546	2.63[a]	4>3
Stated interest in salmon issues[h]	0.16	0.52	0.68	0.48	52.8[a]	3>2,4>1
Engagement in salmon issues[i]	0.24	0.80	0.81	0.53	47.0[a]	3,2>4>1
Common property[j] (=1)	0.23	0.26	0.38	0.36	3.50[a]	3>1
Length of fishing right in m[k]	515	804	1204	933	8.10[a]	3>1,2; 4>1
Fishing right quality[l]	3.05	3.61	4.81	4.31	40.88[a]	3>4>2>1
Profit salmon tourism, NOK_{2007}	2,222	5,261	45,733	43,864	19.68[a]	3,4>2,1
Change in resource mgt fee in $NOK_{2007,}$ (%)[m]	16 (+ 6%)	877 (+170%)	3,850 (+ 75%)	3,409 (+ 83%)	2.94[a]	3,4>1
Within river distribution	χ^2 = 29.16, df = 9, p = 0.001					
River Verdal, ratio	29.9%	27.6%	19.5%	23.0%		
River Stjørdal, ratio	12.0%	20.0%	31.0%	37.0%		
River Gaula, ratio	12.1%	18.8%	33.2%	35.9%		
River Orkla, ratio	12.5%	19.4%	27.2%	40.9%		
Use of fishing right, within cluster	χ^2 = 171.1, df =12, p < 0.001					
Non-sale of fishing	41.9%	37.9%	3.7%	5.4%		
Unrestricted permit sale	18.3%	30.3%	27.2%	19.6%		
Long term lease (≥1 year)	35.5%	21.2%	46.6%	53.3%		
Packages[n]	3.2%	2.3%	18.3%	17.1%		
Other arrangement	1.1%	8.3%	4.2%	4.6%		

Note. Numbers shown as mean. €1= NOK 7.90, March 22 2011. Pairwise deletion of missing data.
[a] p<0.001. Comparing means between all clusters were tested using one-way analysis of variance (ANOVA).
[b] Cluster by cluster compared using Tamhane's posthoc multiple comparison method. The > denotes significance difference between clusters at a 5% level.
[c] Sex of landowner. Male = 1, female=0. [d] Residency. Landowner lived on the property of the fishing right= 1, otherwise 0. [e] Education at college/university level= 1, otherwise 0. [f] Landowner's workload off-property as ratio of a full man-labor year.
[g] Net property (self-employment) income is the sum of self-employment income in agriculture, forestry and fishing and self-employment income from other industries on the property received during the calendar year, less any losses.
[h] Mean value of an index containing three variables. Interest in: (i) salmon management issues in own river, (ii) be board member of the river owner organization, (iii) participate in management actions in the river. 0= not/little interested. 1= very/quite interested.
[i] Mean value of index containing three variables. (i) Has been/is a board member in the river owner organization (no=0, yes =2), (ii) checking own fishing section during season (never=0, 1-4 times a month=1, 2-7 times a week=2), (iii) own fishing days (none=0, 1-5 times=1, > 5 times=2).
[j] Owns the fishing right as part of a common property =1, and 0 if individual ownership.
[k] Measured as length on one side of the river. The longest river bank.
[i] Landowners were asked on an item from one to seven to evaluate the catch possibility on their property compared to other properties in the river. 1= very low catch possibility, 4= medium catch possibility, 7= very high catch possibility. [m] Change in annual resource management fee from the period before the lease (average of years 2002-2004) to 2007. [n] Restricted number of rods with additional services

Cluster 1: The passive owner. The passive owners scored all objectives about their fishing rights low. This cluster contained 14.5% of landowners. The average passive owner was (as in the other groups), a male in his fifties with residence on the farm. Among the groups they had the lowest quality fishing rights (defined as catch possibility on their river bank), the lowest profit from angling, and the highest ratio of non-sale of fishing. Unlike for the other groups, the net lease brought just a small increase in resource management fees for the passive owner. Interest and engagement in salmon management issues was on average low.

Cluster 2: The recreationist. The *recreationist* group included 20% of landowners, and the most important objective for them was *recreation and fishing for me, family and friends. Preserve fish stocks* and *have good fishing on the farm also* scored high. Income objectives were of low priority. Relatively many *recreationists* lived off-farm, and their average workload outside the farm was high. Profit from salmon angling was low. Non-sale of fishing and unrestricted permit sale were common. Engagement in salmon issues was high.

Cluster 3: The multiobjective owner. This group scored high, or very high, on all objectives, and made up 29% of the landowners surveyed. Preserve fish stocks and have good fishing on the farm were the most important objectives. Recreation and fishing for me, family and friends received the lowest score. Off-farm workload and education level were low. Landowners in this group had the best quality fishing, and a high profit from angling. Around 50% rented out their fishing right on a long-term basis. The highest proportion of landowners offering fishing packages was found in this group (18.3%), although this figure was similar for group 4. Stated interest and engagement in salmon management issues were high, and reflected in the score given *influence management of the river fishery*.

Cluster 4: The Economists. This group included 36% of all landowners. Income and conservation objectives were given the highest priority (as with multiobjective owners). Economists differed from multiobjective owners, however, by giving low scores to recreation and fishing for me, family and friends; *providing salmon fishing to local anglers;* and *social contacts with anglers*. Compared to multiobjective owners, economists were younger, had a higher level of education and household income, worked more off-farm, and had lower quality fishing. Profit from salmon angling was high. Half of economists offered long term lease. Engagement and interest in salmon issues were medium.

Attitudes to management actions

To strengthen fish stocks in their river, landowners in all four clusters gave highest priority to: *reduce the threat from fish farming* (minimizing salmon louse *Lepeophtheirus salmonis*

(Krøyer) and escapes problems) and *disinfect fishing tackle* to stop the spread of the parasite *Gyrodactylus salaris* (Malmberg) (Table 3). *Stocking of salmon*, *habitat improvement* and *reduced net season* for fishermen at sea were also given a high overall priority.. *Reduce river harvest, extedn the net lease beyond 2009* and *build salmon ladders* received a medium score, while *catch and release* was perceived to be the least important action by all groups. Multiobjective owners scored all actions higher than or just as high as any other group. Passive owners scored most actions lower than multiobjective owners. Catch and release was lower prioritized by recreationists than by multiobjective owners and economists.

Table 3. Landowner groups' priority of management actions to secure stocks. ANOVA and posthoc test.

Cluster Management action[a]	Passive	Recrea-tionist	Multi-objective	Economist	Sample mean[b]	F-value	Tamhane posthoc[d]
a) Reduce threats from fish farming	6.15	6.51	6.72	6.53	6.53	6.84[c]	3>1
b) Disinfect fishing tackle	6.13	6.47	6.78	6.42	6.49	8.95[c]	3>2,4,1
c) Stocking of salmon	5.51	5.42	5.86	5.23	5.49	5.94[c]	3>4
d) Habitat improvement in tributaries, for sea trout	5.11	5.40	5.95	5.26	5.48	8.58[c]	3>2,4,1
e) Habitat improvement, main river	4.81	5.41	5.93	5.22	5.42	12.18[c]	3>2,4,1
f) Reduce net season	3.86	5.19	5.86	5.51	5.35	20.25[c]	3>2>1;4>1
g) Extend lease of bag nets	3.61	4.31	4.89	4.60	4.50	6.59[c]	3,4>1
h) Reduce river harvest	4.47	4.33	4.17	4.13	4.23	0.89	ns
i) Build salmon ladders	3.97	4.08	4.53	3.83	4.10	3.55[c]	3>4
j) Catch & release	3.16	2.78	3.63	3.71	3.42	6.43[c]	4,3>2

Note. Numbers shown as mean. ns = no significance. Pairwise deletion of missing data.

[a] Landowners were asked on an item from one to seven to prioritize the stated management actions to strengthen fish
stocks in their river. 1= very low priority, 7= very high priority

[b] Significant differences between management actions: a, b > c, d, e, f > g, h, i > j. Repeated-measures ANOVA comparing sample means, $F(7, 2686)=177.8$, $p<0.05$. Mauchly's test indicated that assumptions of sphericity had been violated, $\chi^2(44)=652.1$, $p<0.05$, therefore degrees of freedom were corrected using Greenhouse-Geiser estimates of sphericity ($\varepsilon= 0.77$). Bonferoni multiple comparison method, 5% level.

[c] $p<0.001$. Comparing means between all clusters were tested using one-way analysis of variance (ANOVA).

[d] Cluster by cluster compared using Tamhane's posthoc multiple comparison method. The > -symbol denotes significance difference between clusters at a 5% level.

Attitudes towards river owner organizations' work and the net fishery lease

A series of t-tests for the sample means showed deviation from four (*neutral*) for all statements (Table 4). The landowner groups all agreed that river owner organizations protected landowner interests regarding salmon management issues and that they set fishing regulations which protected stocks. Multiobjective owners and economists agreed more

strongly with these statements than passive owners and recreationists. Overall, landowners were neutral or slightly disagreed with the view that they received too little information about salmon management issues from the river owner organizations.

Multiobjective owners and economists slightly agreed that the river owner organization had given them enough information about the lease agreement. Passive owners and recreationists shared a neutral view of this statement. Overall, landowners felt they had had sufficient ability to express their opinion about the net lease. Responses on *the net lease yields no economic benefits to landowners were* neutral or in slight agreement, with *passive owners* and *recreationists* agreeing more on this statement than *economists*. There was a slight agreement that net fishermen get paid too well. All groups agreed or slightly agreed that payment to the lease should be mandatory for landowners with angling income.

Table 4. Landowner groups' agreement/disagreement on statements about river owner organizations' (ROA) work and the lease of bag nets ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Cluster Statement	Passive	Recrea-tionists	Multi-objective	Economist	Sample mean	F-value	Tamhane posthoc[b]
ROA protect landowner interest regarding salmon management	4.48	4.53	5.33	5.34	5.05	12.96[a]	3,4>2,1
ROA make fishing regulations that protect stocks	4.71	4.50	5.49	5.31	5.11	14.09[a]	3,4>1,2
ROA give too little information about salmon management in the river	3.95	3.80	3.64	3.48	3.66	2.01	ns
ROA gave me enough information about the lease	3.88	3.98	4.64	4.46	4.33	7.93[a]	3,4>2,1
Lacked the ability to express my opinion about the lease in public meetings	3.27	3.36	2.99	2.69	2.99	4.73[a]	2,1>4
The lease yields no economic benefit for landowners	4.62	4.65	4.28	3.95	4.28	5.99[a]	2,1>4
Fishermen get paid too well	4.46	4.74	4.68	4.65	4.65	0.56	ns
Payment to the lease should be mandatory for landowners with angling income	4.31	4.91	5.44	5.22	5.09	6.76[a]	3,4>1

Note. Numbers shown as mean. ns = no significance. Pairwise deletion of missing data.
[a] $p<0.001$. Comparing means between all clusters were tested using one-way analysis of variance (ANOVA).
[b] Cluster by cluster compared using Tamhane's posthoc multiple comparison method. The > -symbol denotes significance difference between clusters at a 5% level.

Discussion

This paper has identified four types of Norwegian landowners, with vastly differing views about their fishing right, management actions to secure stocks, landowner organizations' work, and the net fishery lease. Despite variations between groups in this study, protecting the fish stocks was of prime importance for all landowners, regardless of objectives about income or own angling. Income maximization was ranked as a low priority by many landowners in this study similar to several studies of farmers (Gasson et al., 1988; Koesling et al., 2004; Willock et al., 1999).

The passive owners and recreationists, constituting one third of all landowners, gave very low priority to deriving income from angling. This makes development of fishing tourism a challenge because renting their river bank, could be important for other landowners and local communities trying to develop longer and better beats. Similarly, Salmi and Muje (2001) found small ownership units to be a hindrance to voluntary cooperation in Finnish fishery associations. Olson (1965) termed this lack of collective action "the pervasiveness of latent groups". Studies of Norwegian forest owners report that the marginalization of forest income decreases the ability to generate profits and output of forest resources - probably because of a reduced focus on the marginalized resource (Baardsen, Lien, & Størdal, 2009; Lien, Størdal, & Baardsen, 2007). The current trend of an increasing number of Norwegian farmers not residing on the farm, or generating most of their income off-farm (Logstein & Blekesaune, 2010; Sevatdal, 2006; Storstad, Rye, & Almås, 2004), could mean less fishing will be available for anglers in the future, and thereby income for landowners and local communities will be reduced.

Reducing threats from fish farming and the parasite *Gyrodactylus* are the highest priority management actions by both landowners and The Norwegian Scientific Advisory Committee for Atlantic Salmon Management (NOSACASM) (Anon, 2010).

Stocking of fish and *habitat improvements* were highly ranked by landowners. However, according to NOSACASM, stocking has a negative, or no effect, in most cases (Anon, 2010). Instead, managers should focus on strengthening natural reproduction through habitat improvement and reduced harvest (Bottom, Jones, Simenstad, & Smith, 2009; Todd, Friedland, MacLean, Hazon, & Jensen, 2011). Until recently, fishery sciences and management had an agrarian utilitarian view on fish and waters; whereby hatchery fish was seen as a way to improve nature (Bottom, 1997; Lichatowich, 1999). The governmental fishery division in Norway dedicated much of its time and resources to stocking and building fish ladders as ways of increasing production (Berg, 1986; NOU, 1999; Skurdal, 1995).

Voluntary stocking activity by landowner and angler groups was widespread and peaked in many rivers in the 1970s and 1980s. Marine survival in this period was much higher than today. The good salmon runs might therefore have been seen as "proof "for the effects of stocking (Anon, 2010). Arlinghaus and Mehner (2005) believe that a lack of fishery science knowledge is why fishery voluntary managers prefer actions that give immediate catch results (e.g. stocking) instead of more long-term, sustainable strategies (e.g. habitat improvement). An implication of this finding is that there is a need for governmental authorities, scientists and river owner organizations to improve communication and to inform landowners about the effects of stocking and other management actions.

Activities that could be perceived to restrict own activity or gain, such as extend the net lease, reduce river harvest, and catch and release were given lower priority than other actions. Similar results are found for German anglers (Arlinghaus & Mehner, 2005) and salmon anglers in Norwegian rivers (Tangeland et al., 2010).

Thorstad, Næsje, Mawle, and Policansky (2008) conclude that catch and release might be a successful tool to protect declining salmon stocks. In 2006 governmental authorities indicated that catch and release could be an important and legal management tool in Norway (Miljøverndepartementet, 2006). A strong subsistence orientation to angling in Norway (Aas, Thailing, & Ditton, 2002), combined with unfamiliarity and lack of knowledge about catch and release is probably explaining why so many landowners scored this management action low. Catch and release for Norwegian salmon is however growing (SSB, 2011b; Tangeland, et al., 2010), and attitudes may change over time. Arlinghaus et al. (2007) call for research to understand the role of catch and release as a source of conflict between stakeholders, but also as a facilitator for a conservation ethics in recreational fisheries. Such research has implications for designing policy instruments to facilitate cooperation among stakeholders regarding salmon management and conservation.

According to landowners, river owner organizations were in general doing a good job protecting landowner interest and setting fishing regulations that protected stocks. Based on the findings about priority of management actions and relatively many landowners being disinterested in salmon issues, one could question if landowners have the competence to know this. The communication and information flow could be improved, as landowners wanted more general information from the river owner organization and especially about the net fishery lease. This could build trust and enhance cooperation among landowners.

There are several plausible reasons why the net lease ended after 2009. The reduced net fishery season from 2008 on probably contributed to landowners seeing other

management actions as more important. In addition, landowners wanted to transfer the costs of reducing the net fishery to the government, as reducing the net fishery season was given higher priority than extending the net lease despite its similar effects on stocks. Although the later evaluation report showed a considerable net economic gain from the net fishery lease (Kjelden et al., 2010), the average landowner considered the economic benefits to be missing or limited. This disparity might origin from a lack of information to landowners before and during the lease period, as indicated in the results, but also lower return of salmon to the coast camouflaging the biological effects of the lease. For many landowners paying towards management and conservation of stocks is a new concept. Previous experience, based on favorable ocean conditions, may have given the impression that salmon will come back regardless of whether management actions were taken. The overall steep increase in resource management fees caused by the lease could be perceived as a waste and not an investment. Landowners had incentives for not paying to the lease and free-ride because more salmon would appear on their beat as long as enough landowners contributed. The passive owners were less engaged in salmon issues and overall more reluctant to the net lease than the other groups, despite facing only small increased expenses. The other groups, and especially the multiobjective owner, gave higher priority to influencing management of the river than the passive owners. Berkes (2009) remarks that newly emerged co-management arrangements tend to be captured by the local elite, and could be a source of conflict and disempowerment. Future research should address the disempowerment issue in co-management of recreational salmon fisheries.

Landowners may respond differently to specific policy instruments addressing cooperation in the management of recreational fisheries and angling tourism. A common classification of public policy instruments is (1) economic means, (2) regulations, and (3) information (Vedung, 1998). The *multiobjective owners* would be the easiest to influence using all three policy instruments, whereas the *passive owners* could be difficult to influence. The most targeted measure for all groups would be regulations. Mandatory membership in river owner organizations (as is the case in Iceland) would ensure financial contributions from all landowners towards the management and conservation of salmon stocks. Requiring a certain minimum size for a beat to be opened for fishing, could ensure beats better suited for angling tourism and more angling available on an open market. Landowners holding back fishing for themselves would in many cases have to cooperate with neighboring properties. A legal minimum size for hunting areas is in effect for allocating harvest quotas of moose, and is such a concept familiar to landowners. In Iceland the whole river is managed as one unit

(Gudjonsson & Scarnecchia, 2009). Introducing such a measure in Norway could open up new areas for anglers, and could facilitate tourism development. Economic means such as taxes and subsidies would mainly motivate the economists and multiobjective owners. Information would reach all groups, but this is probably the weakest policy instrument. This policy instrument is, however, the only which is likely to generate any level of interest in salmon management issues amongst the passive owners.

The distinct kind of landowner types is probably not unique to salmon fishing rights in Mid-Norway. Similar cluster types exist for forest owners in Sweden (Ingemarson, Lindhagen, & Eriksson, 2006) and Denmark (Boon, Meilby, & Thorsen, 2004), and indicate a relevance of such typologies for other resources than forest and salmon fishing rights. The revealed heterogeneity of the Norwegian landowner group has the potential to make cooperation in fishery management and angling tourism rather difficult. The net fishery lease has, however, shown that collective action is possible, despite the transaction costs involved, and the incentives for landowners to free-ride.

Acknowledgments

This study was funded by the Research Council of Norway (grant no.173869/I10) and part of a research project owned by the landowner organization The Trondheim Fjord Rivers. I thank Sjur Baardsen and Øystein Aas for input on research design. I also thank Baardsen, Aas, Fredrik Ingemarson, and Kerry Wray for comments on earlier versions of the manuscript.

Footnotes

1. In Norway, the fishing right belongs to whoever owns the land adjacent to the water, cf. The Salmonids and Freshwater Fish Act of 1992. Landowners in this article refer to owners of fishing rights, being small scale private riparian landowners. . This is equivalent to small scale forest owners, also referred to as non-industrial or family forest owners (Harrison, Herbohn, & Niskanen, 2002).

2. A fishing right is a legal property right. The physical part of the right is referred to as a *river bank.*

3. A *beat* is defined as a length of river or bank, let or fished as a unit by angling (McLay & Gordon-Rogers, 1997). Landowners often pool several fishing rights to make one single beat.

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Appendix 1

Questionnaire in English

SALMON ANGLING AND ECONOMIC DEVELOPMENT IN THE TRONDHEIM FJORD REGION OF NORWAY

A SURVEY OF LANDOWNERS IN THE ORKLA, GAULA, STJØRDAL AND VERDAL RIVERS

(MAIN QUESTIONNAIRE)

Return to: LAKS OG VERDISKAPNING
UNIVERSITETET FOR MILJØ- OG BIOVITENSKAP
INSTITUTT FOR NATURFORVALTNING
POSTBOKS 5003
1432 ÅS

IDNO

About completing the questionnaire
The questionnaire is to be completed by the person who owns the fishing right/property. Some of the questions can be difficult to answer, of minor importance to you or you may feel that you have answered related questions already. However, we want you to answer all questions as accurate as possible if you are not asked to skip questions. The completion may feel time consuming, but your answers are important for the research, so we hope you take the time needed and do your best.

If you own the fishing right as a co-owner in a common property regime, i.e. several properties own ONE fishing right together, then for some questions you are asked to answer for the common property as a whole.

If you want to tell us or the organization the Trondheim Fjord Rivers, something that you cannot express in the questions asked use the last page of the questionnaire. If you have questions about completion of the questionnaire get in touch with us.

Many thanks in advance!

Best regards, Stian Stensland
Norwegian University of Life Sciences
Phone 6496 5735 (w)/ 4110 3617 (p), E-mail: Stian.stensland@umb.no

START HERE:

I Landowner-based salmon management and the net fishery lease in the Trondheim fjord

1 How interested are you in salmon management in your river?
Make a cross in one of the boxes below

A ☐ Very interested
B ☐ Quite interested
C ☐ Little interested
D ☐ Not interested

2 How interested are you of being a board member in the river owner organization?

A ☐ Very interested
B ☐ Quite interested
C ☐ Little interested
D ☐ Not interested

3 Have you been a board member in the river owner organization?

A ☐ Yes
B ☐ No

IDNO

4 How interested are you in actively participating in fish enhancement and management actions? E.g. physical actions in tributaries /main river, hatchery, fish stocking etc.

A ☐ Very interested
B ☐ Quite interested
C ☐ Little interested
D ☐ Not interested

5 During the 2007 salmon fishing season, how often were you down to the river on your property to check the conditions or talk to anglers?

A ☐ Never
B ☐ Once per month
C ☐ 2-4 days a month
D ☐ 2-4 days a week
E ☐ 5-7 days a week

6 How many times did you fish for salmon and sea trout in the 2007 season? (1 day = once)

Write the number here, approximately _____times per year.

7 From 2005 on to 2009 a large amount of the bag net fishing in the Trondheim fjord was not in use. This is because the landowners around the Trondheim fjord paid the net fishermen NOK 70 per kg salmon for not fishing, so that more salmon could reach the spawning rivers. Total cost of the net fishery lease is about NOK 4 million per year. To what degree do you agree or disagree in the following statements about the net fishery lease, and how the river owner organization (ROO) in your river works? *Circle one answer for each row A-J. 1 and 7 are extremes on the scale.*

	Statement:	Strongly disagree						Strongly agree
A	Net fishermen get paid too well……..	1	2	3	4	5	6	7
B	The lease yields no economic benefit for landowners ……..	1	2	3	4	5	6	7
C	ROO gave me enough information about the lease	1	2	3	4	5	6	7
D	Payment to the lease should be mandatory for landowners with angling income …..…….	1	2	3	4	5	6	7
E	The amount paid to net fishermen should in the future vary according to the catch in the river…….	1	2	3	4	5	6	7
F	Landowners paying to the lease should have a longer fishing season than those not paying……...	1	2	3	4	5	6	7
G	I have lacked the ability to express my opinion about the lease in public meetings……..	1	2	3	4	5	6	7
H	ROO protect landowner interest regarding salmon management ……	1	2	3	4	5	6	7
I	ROO make fishing regulations that protect stocks	1	2	3	4	5	6	7
J	ROO give too little information about salmon management in the river …….....	1	2	3	4	5	6	7

IDNO

8 How high or low priority do you think the following management actions should be given to strengthen the fish stocks in your river? M*ark one answer for each row A-J.*

	Management action:	Very low priority						Very high priority	Do not know
A	Extend lease of bag nets after2009.....	1	2	3	4	5	6	7	☐
B	Stocking of salmon …….....	1	2	3	4	5	6	7	☐
C	Build salmon ladders to increase spawning areas……...	1	2	3	4	5	6	7	☐
D	Reduce river harvest …….....	1	2	3	4	5	6	7	☐
E	Catch & release ……	1	2	3	4	5	6	7	☐
F	Reduce net fishing season	1	2	3	4	5	6	7	☐
G	Habitat improvement in tributaries, for sea trout …….	1	2	3	4	5	6	7	☐
H	Habitat improvement, main river..…….	1	2	3	4	5	6	7	☐
I	Disinfect fishing tackle (against spread of Gyrodactylus salaris)…….	1	2	3	4	5	6	7	☐
J	Reduce threats from fish farming (escapees and salmon louse).....	1	2	3	4	5	6	7	☐
K	Other, write here:_____	1	2	3	4	5	6	7	

II The fishing right

9 In which river(s) and section do you own a fishing right?
If you own fishing rights in several rivers or river sections set several marks.

Verdal River

AA ☐ Verdal River/ Helgaåa River below Grunnfossen. (incl. Inna)
AB ☐ Helgaåa River above Grunnfossen

Stjørdal River

BA ☐ Stjørdal River in Stjørdal kommune
BB ☐ Meråker
BC ☐ Forra
BD ☐ Sona

Gaula River

CA ☐ Gaula River from the sea to Gaulfossen
CB ☐ Gaula River above Gaulfossen all the way to Singsås
CC ☐ Gaula River above Singsås to Eggafossen
CD ☐ Sokna (at Støren)
CE ☐ Bua
CF ☐ Other tributary → Write which: _____

Orkla River

DA ☐ Orkla River below Bjørsethdammen (Orkdal and Meldal kommuner)
DB ☐ Orkla River in Meldal kommune above Bjørsethdammen
DC ☐ Orkla River in Rennebu kommune

10 How is the fishing right that follows your property owned? In a common property regime the fishing right is owned jointly by a group of private properties. *Make a cross and fill in*

A ☐ I / my property own the fishing right individually
B ☐ The fishing right is owned by (→ *fill in the number*): _____co-owners in a common property
C ☐ Other (e.g. firm, public ownership) → Write what: _____

11 Does the fishing right include both sides of the river?

A ☐ No, one side only
B ☐ Yes, both sides

12 How long is the river bank associated with your fishing right?
If you/ the common property own fishing on both sides of the river, state both sides. Fill in.

A Length of river bank on one side _____m
B Length of river bank on the other side_____ m

13 How would you consider the catch possibilities on your property compared to other properties in the river?
Circle the option that suits best on the 1-7 scale.

Very low			Medium			Very high
1	2	3	4	5	6	7

14 Organization of the fishery. Is your property/common property part of a beat collaboration with other properties, or is the fishing organized in other ways?

A ☐ Fishing is rented out/ sold separately for my property
B ☐ Included in the river owner organizations common arrangement
C ☐ A total of (→ *fill in number*) _____ properties is included in a voluntarily beat collaboration
D ☐ Other arrangement → Describe briefly:_____

15 What kind of sale/rent mainly exists for your property?
Mark the alternative(s) that <u>best</u> describes how the fishing is used on your property.

A ☐ No lease /non-sale of fishing → **GO TO QUESTION 18**
B ☐ Sale of fishing permits
C ☐ Rents out on long therm basis (minimum 1 year)
D ☐ Exclusive fishing with a restricted number of rods and additional services such as accommodation, meal service or guiding etc.
E ☐ Other arrangements . → Describe briefly: _____

16 Who sells/ rents out fishing on your property?

A ☐ Arrange it myself
B ☐ Other people
C ☐ Both of the above alternatives

17 Who decides the price of angling permits/ rent out fishing on your property?

A ☐ I / the common property decides
B ☐ Landowners in the beat collaboration jointly decide
C ☐ The river owner organization
D ☐ The local hunter and angler association
E ☐ Other arrangement . → Describe briefly:_____

18 How many fishing days was the total fishing effort on your beat in 2007, including your own fishing? If you are a part of a beat collaboration, give the fishing effort for the beat collaboration. If not write for your property/ the common propery. We would like to know approximately how many times ("fishing days") anglers fished on your property/beat collaboration. One fishing day = 1 person fishing once in one day or one day. E.g. if the beat hosts 3 anglers on average every day of the 92 day season this equals 276 fishing days. *If you do not know the fishing effort indicated the reasons for this below.*

A Number of fishing days in the 2007-season (fill in): _____

I do not know the number of fishing days because:

BA ☐ Anglers do not report to me /landonwers when they arrive the beat
BB ☐ I /we have not kept a record of the fishing effort
BC ☐ The renter does not report the fishing effort on the beat
BD ☐ Other → Describe briefly:_____

19 How much fish was caught on your property or beat collaboration in the 2007 season? If you are part of a beat collaboration giove the catch for the collaboration. If not write for your property /common property. *Give a best estimate if you do not know the exact number of fish and weight.*

AA Number of kilos of salmon_____ → AB Number of salmon: _____
BA Number of kilos of sea trout:_____ → BB Number of sea trout:_____

I do not know the catch because:

CA ☐ Anglers do not report catch
CB ☐ I /we have not kept record of the catch
CC ☐ The renter does not report the catch on the beat
CD ☐ Other. → Describe briefly:_____

III Objectives about the fishing right, future income

20 Owning a fishing right may imply different objectives and challenges, and may include several considerations. How high or low do you prioritize the following objectives about use of your fishing right? *Circle a number for each row A-J.*

	Objectives:	Very low priority						Very high priority
A	Maximize income ……...	1	2	3	4	5	6	7
B	Reliable and stable income……..	1	2	3	4	5	6	7
C	Influence management of the river fishery	1	2	3	4	5	6	7
D	Preserve fish stocks …….....	1	2	3	4	5	6	7
E	Have good fishing on the property…..	1	2	3	4	5	6	7
F	Provide salmon fishing to local anglers	1	2	3	4	5	6	7
G	Recreation and fishing for me, family and friends …..	1	2	3	4	5	6	7
H	Social contact with anglers ……..	1	2	3	4	5	6	7
I	Other, write here:_____	1	2	3	4	5	6	7

21 In five years, how do you think net income from salmon fishing tourism on your property would be affected by the following conditions? *Circle one answer for each row A-Q*

	Risk sources:	Very little impact						Very large impact
A	Salmon stock variability ……	1	2	3	4	5	6	7
B	River flow variability (flood, drought)……	1	2	3	4	5	6	7
C	Angling demand variability ……	1	2	3	4	5	6	7
D	Hired labor variability (stability, dependence)…….....	1	2	3	4	5	6	7
E	Salmon fishing tourism costs…… ……	1	2	3	4	5	6	7
F	Rent fishing rights from others (price, availability of beats etc)…..	1	2	3	4	5	6	7
G	Common marketing/sale of angling products……	1	2	3	4	5	6	7
H	Capital for investments…….....	1	2	3	4	5	6	7
I	Public angling issues……...	1	2	3	4	5	6	7
J	Reduced angling season ……...	1	2	3	4	5	6	7
K	Gear restrictions (e.g. prohibition of using worms in August)…...	1	2	3	4	5	6	7
L	Use of bag limits (day- og season quotas)……	1	2	3	4	5	6	7
M	Beat collaboration with other landowners (organizing, rent of fishing etc.)……...	1	2	3	4	5	6	7
N	Landowner engagement in the salmon resource……	1	2	3	4	5	6	7
O	Personal situation (health, family relations etc)……..	1	2	3	4	5	6	7
P	Access to accommodation facilities……..	1	2	3	4	5	6	7
Q	Access to meal service facilities……...	1	2	3	4	5	6	7
R	Other (*fill in*):_____	1	2	3	4	5	6	7

IV Economic development, cost and income associated with the fishing right

Then we would like to ask you some questions about income, cost, and labor input about owning a fishing right. We remind you that your answers are of great help to us, although it is voluntary to answer the questions in the survey.

22 Approximately how much did you/your common property pay in <u>resource management fee</u> to the river owner organization in 2007, and on average for the period 2002-2004? *Fill in*

A Payment to the net fishery lease in 2007……. NOK:_____
B Other resource management fees in 2007 (membership fee etc.) NOK:_____
C Average annual resource management fees 2002-2004. Approximately NOK ____per year

23 Do you/the common property have income, costs or labor input associated with renting out/selling angling /angling tourism? Here you should also include work associated with renting out angling or facilitating angling access etc.

No ☐ → **GO TO QUESTION 32**
Yes ☐ → **GO TO QUESTION 24**

24 A property can have gross income/turnover from salmon angling in many ways. Below we have listed some possible income alternatives. Write gross income for the different alternatives for your /your common property's rent/sale of angling tourism for the 2007-season. *If exact numbers are missing make a best possible estimate. AlternativeLY mark "do not know". State in NOK 1000 or NOK 100.*

A Gross income, leasing out/sale of angling ……NOK: _____☐ Do not know
B Gross income, rent of cabin/house to anglers…NOK: _____☐ Do not know
C Gross income, camp/trailer ground related to angling NOK:_____ ☐ Do not know
D Gross income, meal service to anglers……... NOK: _____ ☐ Do not know
E Gross income, rent of fishing tackle,/boats……... NOK: _____☐ Do not know
F Gross income, ghillie/ rower/ guide…….. NOK: _____☐ Do not know
G Gross income, sale of fishing tackle, kiosk sale etc. NOK: _____☐ Do not know
H Other gross income, directly associated to angling.
Write what:_____ NOK: _____☐ Do not know

25 Approximately how large was your /the common property's total turnover /gross income related to salmon angling in the 2007 season, and on average per year the period 2002-2004? We ask about this because we try to find out if the 2007 season differ from the years prior to the net fishery lease

A Turnover in 2007……...approximately NOK: _____
B Average annual turnover for the years 2002-2004 approximately NOK _____per year

26 Approximately how large share of this turnover originates from anglers having permanent residence near your river?

A ☐ 0%
B ☐ 1-25%
C ☐ 26-50%
D ☐ 51-75%
E ☐ 76-100%
F ☐ Do not know

27 How large is the labor input associated to salmon angling tourism and other tourism activities? *Fill in number of man labor weeks for the 2007-season. Write 0 if very little or no activity*

Own /households/common property work related to:

A All kind of tourism activities (incl. salmon angling tourism)._____weeks ☐ Do not know
B Salmon angling tourism only……_____weeks ☐ Do not know
C Number of persons (incl. myself) taking part in tourism related work...._____
D Hired help related to salmon angling tourism……_____weeks ☐ Do not know

28 Could you give an estimate on your /common property's total costs associated with selling/renting out salmon angling tourism for the 2007 season, and on average for the years 200-2004? The main parts of the cost are probably associated with accommodation, meal service and sale of goods. Include e.g. wage expenses for hiring people (not for yourself or your household), purchase of goods, electricity, maintenance, services, writing off investments etc. If you had no costs write 0. Expenses associated with managing the salmon stock, cf. question 22, such as fees paid for the net fishery lease and other resource management fees are not included.

A Costs for the 2007 season related to salmon a. tourism. Appr. NOK_____ ☐ Do not know
B Costs per year 2002-2004 related to salmon a. tourism. Appr. NOK_____ ☐ Do not know

29 How large part of your /the common property's costs related to renting/sale of angling tourism originates from purchase og goods and services in the municipalities next to the river? Examples on services are hired labor, goods etc. The household's labor is not included.

A ☐ Have no costs
B ☐ 0 %
C ☐ 1-25%
D ☐ 26-50%
E ☐ 51-75%
F ☐ 76-100%
G ☐ Do not know

30 How much do you consider the investments done by you/the common property hve made related to angling tourism to e worth today? Example on investments could be shelters, accommodation, other facilitation for anglers etc. Give an estimate

A The investments done are currently worth around NOK: _____

31 How much do anglers pay to fish on your beat /beat collaboration, and what kind of "permits" are being sold? This includes the stretch you/the common property own or rent out together with others. If you do not know permit prices or how much is paid for renting fishing please mark "do not know price" for the correct alternative.

	Type of permit/rent on the beat:	Price	Do not know price
A	Do not know…….. ☐		
B	Free fishing …..……. ☐		
C	Do not rent out /sell fishing…….…….. ☐		
D	Rent out the property as one unit for the whole season……..	NOK_____	☐
E	Day permits…….	NOK_____	☐
F	Week permits*……. (*with week permits we mean a reltive short stretch or no limits the number of permits sold)	NOK per angler/week_____	☐
G	Season permit for resident anglers …….	NOK_____	☐
H	Season permits for non-resident anglers……...	NOK_____	☐
I	Sale of week packages/ renting out the beat on a weekly basis** (** restricted number of rods)	NOK per angler/week_____	☐
J	Angling course where permit is included…….	NOK per angler/day_____	☐
K	Other, write what:_____	NOK _____	☐

V. Finally we would like to ask some questions about the landowner and household characteristics

32 How old are you?

Your age: _____

33 Sex?

A ☐ Woman
B ☐ Man

34 Maritial status.

A ☐ Single /widow/widower/divorced
B ☐ Married/co-habitant

35 Do you have residence on the property of the fishing right?

A ☐ Yes
B ☐ No

36 Approximately how large was the household's (your and your partner) self-employment income from the property in 2007? *Please mark below*

A ☐ Less than NOK 50.000
B ☐ NOK 50.000 - 100.000
C ☐ NOK 100.001 - 200.000
D ☐ NOK 200.001 - 300.000
E ☐ NOK 300.001 - 400.000
F ☐ More than NOK 400.000

37 Approximately how large was the household's gross income (including wage and capital earnings) in 2007? *Please mark below*

A	☐ Less than NOK 200.000	D	☐ NOK 600.001 - 800.000
B	☐ NOK 200.001 - 400.000	E	☐ NOK 800.001 - 1.000.000
C	☐ NOK 400.001 - 600.000	F	☐ More than NOK 1.000.000

38 Mark how high or low each of the alternatives below are prioritized to secure the household's future income. *Circle one answer for each row A-P.*

	Alternatives:	Very low priority						Very high priority
A	Off-farm work ……	1	2	3	4	5	6	7
B	Off-farm investments …….....	1	2	3	4	5	6	7
C	Forestry and agriculture on farm ……..	1	2	3	4	5	6	7
D	Combination of farm activities ……	1	2	3	4	5	6	7
E	Use economic advisors ……	1	2	3	4	5	6	7
F	Buy personal insurance …….....	1	2	3	4	5	6	7
G	Organize business as corporation……..	1	2	3	4	5	6	7
H	Keeping costs low ……...	1	2	3	4	5	6	7
I	Liquidity – cash on hand ……	1	2	3	4	5	6	7
J	Use salmon fishing/ tourism advisors …….....	1	2	3	4	5	6	7
K	Long-term lease of own right (≥1 year)…….	1	2	3	4	5	6	7
L	Collaboration about merging beats and sale/lease of fishing…	1	2	3	4	5	6	7
M	Rent fishing right from others ……..	1	2	3	4	5	6	7
N	Work to enhance the fish stocks ……...	1	2	3	4	5	6	7
O	Buy farm insurance.....	1	2	3	4	5	6	7
P	Buy farm tourism insurance …….....	1	2	3	4	5	6	7
Q	Other, write what:_____	1	2	3	4	5	6	7

39 Please state the highest education level for you and your partner/spouse.
Mark for each person

	Grade 1-9	High school (incl. Agriculture school)	1-3 years on college /university	> 3 years on college /university
A Myself	☐	☐	☐	☐
B Partner	☐	☐	☐	☐

40 Have you got off-property work?
Make a mark. Fill in how large percentage of a man labor year if yes.

				Position off-property
A	Myself	☐ No	☐ Ja	_____%
B	Partner	☐ No	☐ Ja	_____%

41 If you want to receive a summary of the results from the survey please write your e-mail address here

E-mail address:_____

42 If there is anything else you want to tell us about salmon angling or management of salmon stocks in the Trondheim fjord region, please write below or attach additional pages.

IN ADVANCE, THANK YOU FOR YOUR CONTRIBUTUTION!

PLEASE RETURN THE QUESTIONNAIRE IN THE PRE-STAMPED ENVELOPE

RETURN TO:
LAKS OG VERDISKAPNING
UNIVERSITETET FOR MILJØ- OG BIOVITENSKAP
INSTITUTT FOR NATURFORVALTNING
POSTBOKS 5003, 1432 ÅS

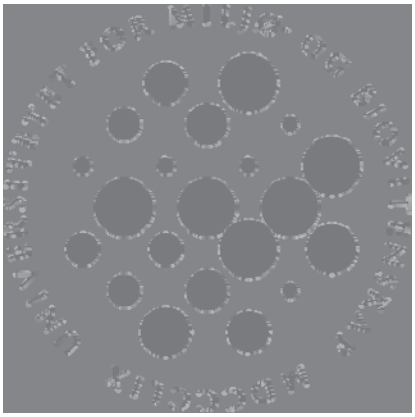
IDNO

Appendix 2

Questionnaire in Norwegian (original)

LAKSEFISKE OG VERDISKAPNING I TRONDHEIMSFJORDREGIONEN

EN SPØRREUNDERSØKELSE BLANT GRUNNEIERE I LAKSEELVENE ORKLA, GAULA, STJØRDALS- OG VERDALSVASSDRAGET



Returadresse: LAKS OG VERDISKAPNING
UNIVERSITETET FOR MILJØ- OG BIOVITENSKAP
INSTITUTT FOR NATURFORVALTNING
POSTBOKS 5003
1432 ÅS

IDNR

OM UTFYLLING AV SKJEMAET

Skjemaet fylles ut av en/den person som står som eier av fiskeretten/eiendommen. Noen av spørsmålene kan være litt vanskelige, angår deg i mindre grad eller du synes kanskje at du har svart på liknende spørsmål andre steder i skjemaet. Vi ønsker likevel at du svarer så nøye som mulig på alle spørsmålene om ikke annet framgår. Utfyllingen kan føles tidkrevende, men dine svar er viktige for forskningen så vi håper du tar deg den tiden du trenger og fyller ut så grundig som mulig etter beste evne. Bokstavkodene i skjemaet er til hjelp for meg som skal legge inn data i ettertid.

Er du med i et sameie/felleseie, det vil si der flere eiendommer eier en fiskerett i lag, så bes du svare for sameiet der dette framgår av spørsmålene.

Om det er noe annet du ønsker å meddele oss eller organisasjonen Elvene rundt Trondheimsfjorden, og dette ikke kommer frem gjennom dine svar kan du benytte sistesiden for kommentarer. Har du spørsmål til utfyllingen av skjemaet, eller står fast på noe så ta kontakt.

På forhånd takk for hjelpen!

Med hilsen Stian Stensland

Universitetet for miljø- og biovitenskap
Tlf 6496 5735 (a)/ 4110 3617 (mobil), E-post: Stian.stensland@umb.no

START HER:

I Grunneierbasert lakseforvaltning og oppleieordningen i Trondheimsfjorden

1 Hvor interessert er du i lakseforvaltningen i ditt vassdrag? *Sett kryss i en av boksene under*

A ☐ Svært interessert
B ☐ Ganske interessert
C ☐ Lite interessert
D ☐ Ikke interessert

2 Hvor interessert er du i å delta i elveeierlaget med styre- eller tillitsverv?

A ☐ Svært interessert
B ☐ Ganske interessert
C ☐ Lite interessert
D ☐ Ikke interessert

3 Har du hatt styre- eller tillitsverv i elveeierlaget?

A ☐ Ja
B ☐ Nei

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4 Hvor interessert er du i å delta aktivt i fiskekultiveringsarbeid i vassdraget?
Eksempel: fysiske tiltak i sidebekker/ hovedvassdrag, klekkeridrift, yngelutsetting osv.

A ☐ Svært interessert
B ☐ Ganske interessert
C ☐ Lite interessert
D ☐ Ikke interessert

5 I løpet av laksesesongen 2007, hvor ofte var du nede ved elva på eiendommen din for å sjekke forholdene og/eller snakke med fiskerne?

A ☐ Aldri
B ☐ En gang per måned
C ☐ 2-4 dager i måneden
D ☐ 2-4 dager i uka
E ☐ 5-7 dager i uka

6 Hvor mange ganger fisket du i elv etter laks og sjøørret i 2007-sesongen?
(1 dag =1 gang)

Skriv antallet her; ca _____ganger per år.

7 Fra og med 2005 til og med 2009 er en stor andel av kilenotfisket i Trondheimsfjorden ikke i drift. Dette skyldes at elveeiere rundt Trondheimsfjorden betaler sjølaksefiskerne 70 kr per kg laks for ikke å fiske, for at mer av laksen skal nå gyteelvene. Tilsammen koster denne avtalen ca 4 millioner kroner per år.

Hvor enig eller uenig er du i følgende påstander omkring oppleieordningen, og hvordan elveeierlaget i ditt vassdrag arbeider?
Ring rundt et svaralternativ for hver linje A-J. 1 og 7 er ytterpunkter på skalaen.

	Påstand:	Helt uenig						Helt enig
A	Sjølaksefiskerne får betalt for mye for ikke å fiske	1	2	3	4	5	6	7
B	Oppleieavtalen gir mindre igjen til elveeierne økonomisk enn det den koster…….	1	2	3	4	5	6	7
C	Elveeierlaget har gitt meg nok informasjon om oppleieavtalen…….....	1	2	3	4	5	6	7
D	Alle elveeiere som har inntekt fra laksefiske bør pålegges å betale inn til oppleieavtalen…...……	1	2	3	4	5	6	7
E	Beløpet som betales til sjølaksefiskerne bør i framtida variere med totalfangsten i elva over tid...	1	2	3	4	5	6	7
F	Elveeiere som betaler inn til oppleieavtalen bør få ha lengre sesong enn de som ikke betaler inn….	1	2	3	4	5	6	7
G	Som grunneier har jeg manglet muligheten til å si min mening om oppleieavtalen i møter arrangert av elveeierlaget/andre. ……...	1	2	3	4	5	6	7
H	Elveeierlaget ivaretar grunneiernes interesser i den lokale lakseforvaltningen…….	1	2	3	4	5	6	7
I	Elveeierlaget setter fiskeregler som ivaretar laksestammen i vassdraget…….	1	2	3	4	5	6	7
J	Elveeierlaget gir for lite informasjon om lakseforvaltningen i vassdraget……...	1	2	3	4	5	6	7

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8 Hvor høyt eller lavt synes du følgende tiltak bør prioriteres for å styrke fiskebestandene i ditt vassdrag? *Ring rundt et svaralternativ for hver linje i A-J. (Evt. kryss vet ikke).*

	Tiltak:	Svært lav prioritet						Svært høy prioritet	Vet ikke
A	Fortsette oppleieordningen etter 2009...	1	2	3	4	5	6	7	☐
B	Økt utsetting av laksunger i elva……..	1	2	3	4	5	6	7	☐
C	Bygging av flere fisketrapper slik at gyteområdene i vassdraget øker……	1	2	3	4	5	6	7	☐
D	Redusere uttaket av fisk i elva……...	1	2	3	4	5	6	7	☐
E	Gjenutsetting av fisk (fang-og-slipp)….	1	2	3	4	5	6	7	☐
F	Korte ned fisketida for sjølaksefisket....	1	2	3	4	5	6	7	☐
G	Fysiske tiltak i sidebekkene for å forbedre leveområdene for sjøørreten…	1	2	3	4	5	6	7	☐
H	Fysiske tiltak i hovedvassdraget(/-ene) for å forbedre leveområdene for fisk….	1	2	3	4	5	6	7	☐
I	Desinfisere alt fiskeutstyr før det brukes i elva (mot gyro)…….	1	2	3	4	5	6	7	☐
J	Minske problemene med lakselus og rømminger fra oppdrettsnæringa.....	1	2	3	4	5	6	7	☐
K	Annet, skriv her:_____	1	2	3	4	5	6	7	

II Om fiskeretten og utnyttelsen av fisket

9 I hvilken elv eier du fiskerett?
Eier du fiskerett i flere vassdrag og/eller flere deler av vassdraget så setter du flere kryss

Verdalsvassdraget

AA ☐ Verdalselva/Helgaåa nedenfor Grunnfossen. (inkl. Inna)
AB ☐ Helgåa ovenfor Grunnfossen

Stjørdalsvassdraget

BA ☐ Stjørdalselva i Stjørdal kommune
BB ☐ Meråker
BC ☐ Forra
BD ☐ Sona

Gaulavassdraget

CA ☐ Gaula fra sjøen og opp til og med Gaulfossen
CB ☐ Gaula ovenfor Gaulfossen og til og med Singsås sentum
CC ☐ Gaula ovenfor Singsås sentrum til Eggafossen
CD ☐ Sokna (v/Støren)
CE ☐ Bua
CF ☐ Annet sidevassdrag → Skriv hvilket: _____

Orklavassdraget

DA ☐ Orkla nedenfor Bjørsethdammen (Orkdal og Meldal kommuner)
DB ☐ Orkla i Meldal kommune ovenfor Bjørsethdammen
DC ☐ Orkla i Rennebu kommune

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10 Hvordan eies fiskeretten som følger din/ husholdningens eiendom?
Et sameie eller felleseie er der flere eiendommer eier en fiskerett i lag. *Sett kryss og fyll inn*

A ☐ Jeg/min eiendom eier fiskeretten alene
B ☐ Fiskeretten eies av tilsammen (→ *fyll inn antall*): _____grunneiere/gårder i et sameie/felleseie, der jeg har en andel
C ☐ Annet (f.eks. eies av kommune, firma) → Skriv hva: _____

11 Eier din eiendom /sameiet fiskeretten på begge sider av elva?

A ☐ Nei, kun på en side
B ☐ Ja, på begge sider

12 Hvor lang er den fiskeretten din eiendom /sameiet eier?
Eies det fiskerett på begge sider av elva, oppgi lengde for begge sider. *Fyll inn*

A Lengde på fiskerett på den ene siden av elva_____m
B Lengde på fiskerett på den andre siden av elva_____ m

13 Hvordan vil du generelt vurdere fangstmulighetene på din egen /sameiets eiendom i forhold til andre eiendommer i vassdraget?
Ring rundt det svaralternativet på 1-7-skalaen som passer best

Svært dårlige			Middels			Svært gode
1	2	3	4	5	6	7

14 Organisering av fisket. Inngår din/sameiets eiendom i et frivillig valdsamarbeid i lag med flere andre eiendommer, eller organiseres fisket på andre måter?

A ☐ Fisket leies ut/selges separat for min eiendom/sameie
B ☐ Inngår i elveeierlagets fellesopplegg
C ☐ Tilsammen (→ *fyll inn antall*) _____ eiendommer inngår i et frivillig valdsamarbeid
D ☐ Annen ordning → Beskriv kort:_____

15 Hva slags type utleie/salg av laksefisket foregår hovedsaklig på din eiendom/sameie?
Kryss av nedenfor for alternativet(-ene) som best beskriver hvordan fisket på din eiendom/sameie, eller i valdsamarbeidet benyttes

A ☐ Ikke utleie /ikke salg av fiske → **GÅ TIL SPØRSMÅL 18**
B ☐ Selger fiskekort
C ☐ Leier ut for lengre tid (minst én sesong)
D ☐ Selger eksklusivt/ tilrettelagt fiske der det inngår tilleggsprodukter som overnatting (og/eller eventuelt servering, guiding etc)
E ☐ Annen ordning. → Beskriv kort:_____

16 Hvordan omsettes rettighetene til fiske for din eiendom/sameie?

A ☐ Selger kort/leier ut selv
B ☐ Ordnes av andre
C ☐ Begge deler

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17 Hvem bestemmer prisen på fiskekort/leie på din eiendom/sameie?

A ☐ Jeg selv /sameiet bestemmer
B ☐ Elveeiere i valdsamarbeidet i felleskap
C ☐ Elveeierlaget
D ☐ Jeger- og fiskerforeningen
E ☐ Annen ordning. → Beskriv kort:_____

18 Hvor mye ble det fisket på valdet ditt/deres i 2007, inkludert eget fiske? Om du er en del av et valdsamarbeid, oppgi fiskeinnsats for valdsamarbeidet. Hvis ikke skriv for din/sameiets eiendom. Her ønsker vi å vite anslagsvis hvor mange ganger (”fiskedager”) det ble fisket på eiendommen /valdsamarbeidet. En fiskedag = 1 person som fisker en dag eller gang. Eksempelvis om det er i gjennomsnitt 3 fiskere innom valdet hver dag hele sesongen, så blir det 3 fiskere x 92 dager i sesongen = 276 fiskedager. *Har du ikke en slik oversikt så kryss av grunnen(e) til dette*

A Antall fiskedager i 2007-sesongen ca (fyll inn): _____

Har ikke oversikt over antall fiskedøgn på grunn av:

BA ☐ Fiskerne rapporterer ikke til meg/oss valdeiere når de ankommer valdet
BB ☐ Jeg/vi har ikke ført oversikt over fiskeinnsatsen
BC ☐ Leietaker rapporterer ikke hvor mye som fiskes på valdet
BD ☐ Annet. → Skriv hva:_____

19 Hvor mye fisk ble det tatt på eiendommen din/ eventuelt valdsamarbeidet, i 2007-sesongen? Om du er en del av et valdsamarbeid, oppgi fangsten for valdsamarbeidet. Hvis ikke skriv for din/sameiets eiendom. Gi et best mulig anslag om du ikke vet antall fisk og antall kg helt nøyaktig

AA Antall kg laks: _____ → AB Antall laks: _____
BA Antall kg sjøørret:_____ → BB Antall sjøørret:_____

Har ikke oversikt over fangsten på grunn av:

CA ☐ Fiskerne rapporterer ikke fangst
CB ☐ Jeg/vi har ikke ført oversikt over fangsten
CC ☐ Leietaker rapporterer ikke hvor mye som fanges på valdet
CD ☐ Annet. → Skriv hva:_____

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III Mål med fiskeretten, framtidig økonomisk resultat

20 Det å eie en laksefiskerett/vald i elva kan medføre ulike mål og utfordringer, og ofte kan det være flere hensyn å ta. Hvor høyt eller lavt prioriterer du følgende målsettinger angående forvaltning og utnytting av din egen fiskerett? *Sett ring rundt ett svaralternativ for hver linje A-I*

	Målsettinger:	Svært lavt prioritert						Svært høyt prioritert
A	Størst mulig inntekt……..	1	2	3	4	5	6	7
B	Sikker og stabil inntekt……..	1	2	3	4	5	6	7
C	Påvirke forvaltningen av elva……	1	2	3	4	5	6	7
D	Ta vare på fiskeressursen ……..	1	2	3	4	5	6	7
E	Ha godt fiske på eiendommen……..	1	2	3	4	5	6	7
F	Tilby lokale fiskere laksefiske……..	1	2	3	4	5	6	7
G	Rekreasjon og fiskemuligheter for meg selv, egen familie og venner……..	1	2	3	4	5	6	7
H	Sosial kontakt med fiskere…….	1	2	3	4	5	6	7
I	Annet; skriv her:_____	1	2	3	4	5	6	7

21 På fem års sikt, hvordan tror du at det økonomiske resultatet fra laksefisket på eiendommen din vil påvirkes av følgende forhold? *Ring rundt svar for hver linje A-Q*

	Påvirkningsfaktorer:	Svært liten påvirkning						Svært stor påvirkning
A	Variasjon i størrelsen på villlaksbestanden …….	1	2	3	4	5	6	7
B	Variasjon i vassføringa i vassdraget (flommer, tørke)…….	1	2	3	4	5	6	7
C	Variasjon i etterspørsel etter laksefiske……	1	2	3	4	5	6	7
D	Leid arbeidskraft (usikkerhet om anskaffelse, stabilitet, pålitelighet)……...	1	2	3	4	5	6	7
E	Usikkerhet om kostnader knyttet til å drive laksefiskeutleie……	1	2	3	4	5	6	7
F	Leie av vald fra andre (usikkerhet om pris, tilgang på vald etc)..	1	2	3	4	5	6	7
G	Usikkerhet om felles markedsføring/salg av laksefiskeprodukter	1	2	3	4	5	6	7
H	Tilgang til kapital for investeringer…….....	1	2	3	4	5	6	7
I	Økt fokus på allmennhetens adgang til laksefiske……	1	2	3	4	5	6	7
J	Innkorting av fisketiden i elva……..	1	2	3	4	5	6	7
K	Innføring av redskapsbegrensninger (eks. forbud mot markfiske i august)……	1	2	3	4	5	6	7
L	Innføring av fangstkvoter (døgn- og sesongkvoter)…….	1	2	3	4	5	6	7
M	Valdsamarbeid med andre grunneiere (usikkerhet om organisering, utleie av fiske etc.)……..	1	2	3	4	5	6	7
N	Grunneiernes engasjement i forhold til villaksressursene……	1	2	3	4	5	6	7
O	Personlig situasjon (helse, familieforhold mv.)……	1	2	3	4	5	6	7
P	Tilgang på overnattingskapasitet …….	1	2	3	4	5	6	7
Q	Tilgang på serveringsfasiliteter……	1	2	3	4	5	6	7
R	Andre (*fyll inn*):_____	1	2	3	4	5	6	7

IV Næringsutvikling, kotnader og inntekter forbundet med fiskeretten

Så vil vi gjerne spørre deg noen spørsmål om inntekter, kostnader og arbeidsinnsats forbundet med det å eie fiskerett. Vi minner om at dine svar er til stor hjelp for oss, men at det er frivillig å svare på de enkelte spørsmålene i undersøkelsen.

22 Omtrent hvor store utgifter hadde din eiendom/sameiet til forvaltningen av laksestammen i 2007, samt i gjennomsnitt per år for perioden 2002-2004? *Fyll inn nedenfor*

A Utgifter til oppleieavtalen i 2007……. _____kr
B Andre forvaltningsutgifter i 2007 (medlemskap i elveeierlag etc): _____ kr
C Gjennomsnittlige årlige forvaltningsutgifter for årene 2002-20004. Ca_____kr pr. år

23 Har du/sameiet inntekter, kostnader eller arbeidsinnsats forbundet med laksefiskeutleie? Her inkluderes også arbeid du gjør i forbindelse med utleie eller tilrettelegging ved elva

Nei ☐ → **GÅ TIL SPØRSMÅL 32**

Ja ☐ → **GÅ TIL SPØRSMÅL 24**

24 En eiendom kan ha bruttoinntekter/omsetning knyttet til laksefiske på flere måter. Nedenfor har vi listet opp noen aktuelle inntektsmuligheter. Skriv opp bruttoinntekt for de ulike alternativene i tilknytning til din/sameiets laksefiskeutleie i 2007-sesongen. *Mangler du eksakte tall, gjør et best mulig anslag, eventuelt kryss for "vet ikke". Rund av til nærmeste tusen- eller hundrekroner*

A	Bruttoinntekt fra utleie av fiske/salg av fiskekort….._____kr	☐ Vet ikke
B	Bruttoinntekt fra utleie av hus/hytter til fiskere….. ._____kr	☐ Vet ikke
C	Bruttoinntekt fra drift av campingplass/ caravanoppstillingsplass relatert til fiske …....._____kr	☐ Vet ikke
D	Bruttoinntekt fra matservering/bevertning til fiskere.._____kr	☐ Vet ikke
E	Bruttoinntekt fra utleie av fiskeutstyr/ båter……... _____kr	☐ Vet ikke
F	Bruttoinntekt fra utleie av klepper/roer/guiding…….._____kr	☐ Vet ikke
G	Bruttoinntekt fra salg av kioskvarer/fiskeutstyr o.l. _____kr	☐ Vet ikke
H	Annen bruttoinntekt knyttet direkte til laksefiske. Skriv hva:_____..... _____kr	☐ Vet ikke

25 Omtrent hvor stor var din/sameiets totale omsetning/bruttoinntekt knyttet til laksefiske for sesongen 2007, samt i gjennomsnitt per år for perioden 2002-2004? Vi spør om dette for å forsøke og finne ut om 2007-sesongen skiller seg fra årene før oppleieavtalen trådte i kraft

A Omsetning for 2007-sesongen……..ca _____kr
B Gjennomsnittlig årlig omsetning for årene 2002-2004…….ca _____kr per år

26 Omtrent hvor stor del av denne omsetningen kommer fra fiskere med fast bosted ved ditt vassdrag? Med "fast bosted" mener vi at vedkommende bor i en av elvekommunene året rundt

A ☐ 0 %
B ☐ 1-25 %
C ☐ 26-50 %
D ☐ 51-75 %
E ☐ 76-100 %
F ☐ Vet ikke

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27 Hvordan er arbeidsinnsatsen knyttet til laksefiske og evt. andre turistaktiviteter?
Fyll inn antall ukesverk for 2007-sesongen. *Sett 0 dersom svært liten eller ingen aktivitet.*

Eget/husholdningen(e)s/sameiets arbeid på eiendommen knyttet til:

A All slags turistrelatert aktivitet (inkl. laksefiske)....._____ ukesverk ☐ Vet ikke
B Kun laksefiske……_____ ukesverk ☐ Vet ikke
C Antall personer i husholdningen (inkl. meg selv)
som tar del i turismerelatert arbeid……....._____ stk
D Innleid hjelp relatert til laksefiske……_____ ukesverk ☐ Vet ikke

28 Kan du gi et anslag på din eiendom/sameiets totale kostnader forbundet med laksefiskeutleie for sesongen 2007, og i gjennomsnitt per år for perioden 2002-2004? Hovedtyngden av kostnadene er trolig knyttet til losji/camping, servering og salg av varer. Ta med for eksempel lønnsutgifter til leid hjelp (ikke til deg selv eller noen i din husholdning), vareinnkjøp, strøm, vedlikehold, innkjøp av tjenester, avskrivning på investeringer etc. Hadde du ingen kostnader skriv null. Utgifter til lakseforvaltning, jf spørsmål 22, så som oppleieavtale og forvaltningsavgift tas ikke med her).

A Kostnader for 2007 forbundet med utleie av laksefiske….cirka_____kr ☐ Vet ikke
B Kostnader per år for 2002-2004 forbundet med laksefiskeutleie; cirka_____kr ☐ Vet ikke

29 Hvor stor andel av dine/sameiets kostnader forbundet med fiskeutleien stammer fra innkjøp av varer og tjenester i kommunene som vassdraget renner gjennom? Eksempel på tjenester er innleid arbeidskraft. Eksempel på varer er matvarer, byggevarer etc. Husholdningens arbeidskraft regnes ikke med.

A ☐ Har ingen kostnader
B ☐ 0 %
C ☐ 1-25 %
D ☐ 26-50 %
E ☐ 51-75 %
F ☐ 76-100 %
G ☐ Vet ikke

30 Hva tror du de investeringene du/sameiet eventuelt har foretatt i forbindelse med fiskeutleie er verdt i dag? Eksempel på investeringer kan være gapahuker, annen tilrettelegging, husvære etc. Angi et omtrentlig anslag

A Investeringene som er gjort, er i dag verdt ca kr _____

IDNR

31 Hva betaler fiskerne for å fiske på valdet ditt/valdsamarbeidet, og hva slags fisketillatelser selges? Dette gjelder den strekningen du/sameiet eier selv eller leier ut i lag med andre. Dersom du eksempelvis ikke vet fiskekort- og utleiepriser på grunn av at andre organiserer fisket så kryss av for "vet ikke" under. Fyll også inn riktig pris

	Type fiskekort/utleie på valdet	Pris	Vet ikke pris
A	Vet ikke…….. ☐		
B	Gratis fiske……. ☐		
C	Selger ikke fiskekort/leier ikke ut…….. ☐		
D	Leier ut eiendommen samlet for hele sesongen……..	_____kr	☐
E	Døgnkort…….	_____kr	☐
F	Ukekort*……. (*Med ukekort mener vi kort på strekning med liten/ uten begrensning i tilgangen)	_____kr per fisker per uke	☐
G	Sesongkort for lokale fiskere……..	_____kr	☐
H	Sesongkort for utenbygds fiskere……...	_____kr	☐
I	Selger ukepakke/ leier ut vald på ukebasis**……. (** fiske på ukebasis på vald med begrenset antall fiskere)	_____kr per fisker per uke	☐
J	Fiskekurs der fisketillatelse inngår…….	_____kr per fisker per dag	☐
K	Annet skriv hva:_____	_____kr	☐

V. Avslutningsvis vil vi spørre noen spørsmål om eieren (den som har mottatt spørreskjemaet) og husholdningen

32 Hvor gammel er du?

Skriv antall år: _____

33 Er du mann eller kvinne?

A ☐ Kvinne
B ☐ Mann

34 Sivil status. Er du?

A ☐ Enslig /Enke/Enkemann/Skilt
B ☐ Gift/ samboer

35 Bor du på bruket/eiendommen der du har fiskerett?

A ☐ Ja
B ☐ Nei

36 Omtrent hvor stor var <u>husholdningens (din og partners)</u> netto næringsinntekt fra eiendommen i 2007? *Vennligst sett ett kryss*

A ☐ Mindre enn 50.000 kr
B ☐ 50.000 - 100.000 kr
D ☐ 200.001 - 300.000 kr
E ☐ 300.001 - 400.000 kr

IDNR

C ☐ 100.001 - 200.000 kr F ☐ Mer enn 400.000 kr

37 Omtrent hvor stor var husholdningens samlede bruttoinntekt (inkl. lønns – og kapitalinntekter) i 2007? *Vennligst sett ett kryss*

A ☐ Mindre enn 200.000 kr
B ☐ 200.001 - 400.000 kr
C ☐ 400.001 - 600.000 kr
D ☐ 600.001 - 800.000 kr
E ☐ 800.001 - 1.000.000 kr
F ☐ Mer enn 1.000.000 kr

38 Angi hvor lavt eller høyt prioritert hvert av valgene nedenfor er for deg/dere i å sikre husholdningens framtidige inntekt. *Ring rundt ett svaralternativ for hver linje i A-P*

	Valg:	Svært lavt prioritert						Svært høyt prioritert
A	Arbeid utenfor eiendommen…….	1	2	3	4	5	6	7
B	Investeringer utenfor eiendommen……...	1	2	3	4	5	6	7
C	Arbeid på eiendommen innen jord- og skogbruk……..	1	2	3	4	5	6	7
D	Kombinasjon av flere næringsgrener på eiendommen…..	1	2	3	4	5	6	7
E	Bruk av økonomiske rådgivningstjenester……	1	2	3	4	5	6	7
F	Ha person- og ulykkesforsikring……...	1	2	3	4	5	6	7
G	Organisere driftsenheten som aksjeselskap (for å spre risiko og begrense ansvaret)…….	1	2	3	4	5	6	7
H	Produsere til lavest mulig kostnad……	1	2	3	4	5	6	7
I	God likviditet – ha penger i bakhånd……	1	2	3	4	5	6	7
J	Bruk av rådgivere med kunnskap om laksefiske og/eller turisme……...	1	2	3	4	5	6	7
K	Langtidskontrakter for utleie av vald (hele eller deler av valdet leies ut for mer enn en sesong)…….	1	2	3	4	5	6	7
L	Samarbeid med andre valdeiere om felles organisering og salg/utleie av fiske……..…….	1	2	3	4	5	6	7
M	Leie vald fra andre grunneiere……..	1	2	3	4	5	6	7
N	Arbeide aktivt for å øke fiskebestanden i vassdraget……	1	2	3	4	5	6	7
O	Ha gårdsforsikring.....	1	2	3	4	5	6	7
P	Ha gårdsturismeforsikring…….....	1	2	3	4	5	6	7
Q	Annet, skriv hva:_____	1	2	3	4	5	6	7

39 Hva er lengste utdanning for deg og evt. samboer/ektefelle?
Kryss av for hver per person

	Grunnskole	Videregående skole (inkl landbruksskole)	1-3 år på høgskole/ universitet	Mer enn 3 år på høgskole/ universitet
A Meg selv	☐	☐	☐	☐
B Partner	☐	☐	☐	☐

40 Har du/dere arbeid *utenfor* eiendommen/bruket i dag?
Sett kryss. Fyll inn stillingsandel hvis ja.

			Stillingsandel utenom
A Meg selv	☐ Nei	☐ Ja ⇉	_____%
B Partner	☐ Nei	☐ Ja ⇉	_____%

IDNR

41 Dersom du ønsker å motta et sammendrag av resultatene fra spørreundersøkelsen skriv e-postadressen din her

E-postadresse:_____

42 Er det noe annet du vil fortelle oss om laksefiske og lakseforvaltning i Trondheimsfjorden kan du bruke plassen under eller skrive på eget ark

TAKK FOR HJELPEN!

SEND DET FERDIG UTFYLTE SKJEMAET I VEDLAGTE FERDIGFRANKERTE SVARKONVOLUTT

RETURADRESSE:
LAKS OG VERDISKAPNING
UNIVERSITETET FOR MILJØ- OG BIOVITENSKAP
INSTITUTT FOR NATURFORVALTNING
POSTBOKS 5003, 1432 ÅS

IDNR

Appendix 3

First contact. Pre-notice letter

UNIVERSITETET FOR MILJØ- OG BIOVITENSKAP
INSTITUTT FOR NATUIRFORVALTNING
WWW.UMB.NO/INA

DATO 02.JUNI 2008

0110
1909

Fornavn Etternavn
Adresse
Postnr Poststed

Kjære grunneier

Forskningsprosjekt om grunneiere, næringsutvikling og villaks i Trondheimsfjorden

Om noen få dager vil du motta et spørreskjema i posten, der vi ber deg om hjelp i et viktig forskningsprosjekt som gjennomføres av Universitetet for miljø- og biovitenskap på Ås (tidligere Norges Landbrukshøgskole) i samarbeid med elveeierlagene i Orkla, Gaula, Stjørdal- og Verdalsvassdraget.

Tema for forskningen er hvordan grunneiere bruker fiskeretten sin, og forhold omkring grunneierbasert næringsutvikling og lokal lakseforvaltning. For at forskningen skal gi et riktig bilde av hva et mangfold av grunneierne faktisk mener og gjør, er vi avhengige av deltakelse også fra de grunneiere med liten interesse for lakseforvaltning eller med vald der det fiskes lite eller ingenting

Vi kontakter deg nå fordi mange grunneiere liker å få vite om en slik undersøkelse på forhånd.
Resultatet av denne undersøkelsen vil gi grunneiere, forskere, politikere og offentlig forvaltning økt informasjon om laksefiskets betydning for lokalsamfunnene i Trøndelag, og hvordan laksestammene kan tas vare på.

Takk for din tid. Det er bare med hjelp fra velvillige og hjelpsomme grunneiere som deg at vi kan få gjennomført den planlagte forskningen.

Med vennlig hilsen

Stian Stensland
Universitetet for miljø- og biovitenskap, Ås

Jon Kjelden
Elvene rundt Trondheimsfjorden
www.elvene.no

P.S. For å si takk for hjelpen kommer vi til å legge med et nytt hefte om ”Laksefiske som opplevelsesnæring” sammen med spørreundersøkelsen du mottar. Heftet er basert på forskning og intervju av sportsfiskere i Trondheimsfjordelvene.

Appendix 4

Second contact. Cover letter for questionnaire package

UNIVERSITETET FOR MILJØ- OG BIOVITENSKAP
INSTITUTT FOR NATUIRFORVALTNING
WWW.UMB.NO/INA

DATO 06.JUNI 2008

0110
1909

Fornavn Etternavn
Adresse
Postnr Poststed

Kjære grunneier

Vi tar kontakt med deg for å få din hjelp i et forskningsprosjekt[1] om grunneiere, villaks og verdiskapning i Trondheimsfjorden. For at forskningen skal gi et riktig bilde av hva grunneierne faktisk mener og gjør, er vi avhengige av at også grunneiere med liten interesse for lakseforvaltning eller med vald der det fiskes lite eller ingenting svarer på vedlagte spørreundersøkelse. Ditt svar er viktig og verdifullt for vår forskning.

Gjennom vedlagte spørreundersøkelse ønsker vi din hjelp til å få svar på blant annet:

- Hvordan fiskeretten utnyttes hos ulike typer grunneiere
- Hva slags syn de ulike grunneiere har på lokal lakseforvaltning
- Hva laksefiske og oppleieordningen betyr økonomisk for elvedalene og grunneiere

Resultatet av denne undersøkelsen vil gi grunneiere, forskere, politikere og offentlig forvaltning økt informasjon om lokal lakseforvaltning og laksefiskets betydning for lokalsamfunnene i Trøndelag. Undersøkelsen vil også inngå i et doktorgradsarbeid ved Universitetet for miljø- og biovitenskap (UMB).

Spørreskjemaet sendes til alle grunneiere i Orkla-, Gaula-, Stjørdal- og Verdalsvassdraget. Svar fra enkeltpersoner er konfidensielle og vil ikke kunne gjenkjennes i rapporter og publikasjoner. Elveeierlagene vil ikke få tilgang til hva den enkelte har svart. UMB står for innsamling, behandling og lagring av data.

Denne undersøkelsen er frivillig, og du kan trekke deg uten å oppgi grunn. Imidlertid er det til stor nytte for oss om du kan sette av de omlag 20-45 minutter det tar å gjennomføre undersøkelsen. Benytt vedlagte svarkonvolutt. **Svar helst innen 18. juni**. Alle som oppgir e-post får tilsendt et sammendrag av resultatene. Som takk for hjelpen legger vi med et nytt hefte om "Laksefiske som opplevelsesnæring". Heftet er basert på forskning og intervju av sportsfiskere i Trondheimsfjordelvene.

Har du spørsmål eller kommentarer til undersøkelsen, kan disse noteres på side 12 eller rettes til Stian Stensland, tlf 6496 5735(a) / 4110 3617. **På forhånd takk for hjelpen!**

Med vennlig hilsen

Stian Stensland

Jon Kjelden

Stian Stensland
Universitetet for miljø- og biovitenskap, Ås

Jon Kjelden
Elvene rundt Trondheimsfjorden

[1]Spørreundersøkelsen er en del av det større forskningsprosjektet "Laks og verdiskaping i Trondheimsfjorden". Prosjektet eies av grunneierne i Orkla-, Gaula-, Stjørdal- og Verdalsvassdraget gjennom organisasjonen Elvene rundt Trondheimsfjorden (ErT). Universitetet for miljø- og biovitenskap på Ås (tidligere Norges landbrukshøgskole) og Norsk institutt for naturforskning (NINA) står for forskningen i prosjektet. Norges Forskningsråd har stått for finansieringa. Datamaterialet fra spørreundersøkelsen vil anonymiseres ved prosjektets slutt 31.12.2010.

Appendix 5

Third contact. Postcard reminder

LAKSEFISKE OG VERDISKAPNING I TRONDHEIMSFJORDREGIONEN

EN SPØRREUNDERSØKELSE BLANT GRUNNEIERE I LAKSEELVENE ORKLA, GAULA, STJØRDALS- OG VERDALSVASSDRAGET

Fornavn etternavn
adresse
poststed postnr dato

Kjære grunneier

I forrige uke fikk du tilsendt en spørreundersøkelse om grunneiere, villaks og verdiskapning i Trondheimsfjorden. Undersøkelsen ble sendt alle grunneiere i Orkla, Gaula, Stjørdals- og Verdalsvassdraget, og er en del av et forskningsprosjekt finansiert av Norges Forskningsråd.

Om du allerede har fylt ut og sendt tilbake spørreundersøkelsen, så takker vi så mye for ditt bidrag til forskningen. Dersom du ennå ikke har gjort det, så vær så snill og gjør det i dag. Vi er spesielt takknemmelig for din hjelp fordi det er bare ved å spørre grunneiere som deg at vi kan forstå hva slags syn grunneiere har på oppleieavtalen og lokal lakseforvaltning.

Har du ikke mottatt spørreundersøkelsen eller du har mistet den, vær så snill ta kontakt med Stian Stensland så sender vi deg en kopi i posten i dag.

Med vennlig hilsen

Stian Stensland
Universitetet for miljø- og biovitenskap, Ås
Tlf 6496 5735(a) / 4110 3617.
E-post: stian.stensland@umb.no

Jon Kjelden
Elvene rundt Trondheimsfjorden

Appendix 6

Fourth contact. Cover letter for replacement questionnaire package

UNIVERSITETET FOR MILJØ- OG BIOVITENSKAP
INSTITUTT FOR NATUIRFORVALTNING
WWW.UMB.NO/INA

DATO 29.AUGUST 2008

0110
1909

Fornavn Etternavn
Adresse
Postnr Poststed

Kjære rettighetshaver

Tidlig i juni sendte vi deg en spørreundersøkelse[1] som omhandler hva slags syn du som rettighetshaver har på forvaltningen av villaksen i vassdraget, samt meninger om oppleieavtalen i Trondheimsfjorden. Videre ville vi vite hvordan fiskeretten din utnyttes. Etter det vi kan se har vi ikke fått svar fra deg så langt.

Svarene vi har fått inn så langt viser at det er ulike oppfatninger om hvordan fiskebestanden i vassdraget skal styrkes, fang-og-slipp, innføringen av sesongkvoter, oppleieavtalen og mål med fiskeretten blant rettighetshavere. Vi tror resultatene vil være til stor nytte for villaksen, forskningen, myndigheter, rettighetshavere og lokalsamfunn.

Vi tar kontakt med deg igjen fordi ditt svar er viktig for vårt forskningsarbeid. Hvert svar, enten det kommer fra en liten eller stor rettighet, er verdifullt for oss. Det er bare ved å få svar fra nesten samtlige rettighetshavere i Orkla, Gaula, Stjørdal- og Verdalsvassdraget at vi kan være sikre på at resultatene gir en riktig beskrivelse av hva ulike typer rettighetshavere faktisk mener og gjør i forhold til å eie en fiskerett.

Enkelte personer har tatt kontakt med oss og fortalt at de ikke skulle ha mottatt spørreundersøkelsen fordi de har solgt eiendommen, ikke har fiskerett eller har overlatt drifta til neste generasjon. Om noen av disse punktene gjelder for deg, vennligst skriv det på forsiden av undersøkelsen og send den tilbake i vedlagte konvolutt så vi kan slette deg fra adresselista vår. Oppgi gjerne navnet på ny eier.

En kommentar til undersøkelsesopplegget. En kode er trykt nederst i høyre hjørne på spørreskjemaet slik at vi kan se at du har svart på undersøkelsen og vi slipper å purre deg for manglende svar. Universitetet står for innsamling, behandling og lagring av data. Dine svar er konfidensielle og vil ikke kunne gjenkjennes i rapporter og publikasjoner. Elveeierlagene vil ikke få tilgang til hva den enkelte har svart.

Vi håper du vil svare og sende oss skjemaet snart. Ønsker du imidlertid ikke å delta i undersøkelsen, la oss få vite det ved at du skriver det på forsiden av skjemaet og returnerer det i vedlagte ferdigfrankerte konvolutt.

Med vennlig hilsen

Stian Stensland

Stian Stensland
Universitetet for miljø- og biovitenskap, Ås

[1]Spørreundersøkelsen inngår i forskningsprosjektet "Laks og verdiskaping i Trondheimsfjorden". Prosjektet eies av grunneierne i de fire nevnte vassdragene gjennom organisasjonen Elvene rundt Trondheimsfjorden (ErT). Universitetet for miljø- og biovitenskap på Ås (tidligere Norges landbrukshøgskole) og Norsk institutt for naturforskning (NINA) står for forskningen i prosjektet.

P.S.Har du spørsmål så bare ta kontakt med meg på telefon 6496 5735 /4110 3617

Appendix 7

Fifth contact. Telephone call reminder

Telefonpurring

Hei, det er Stian Stensland fra Universitetet på Ås som ringer.

(-Snakker jeg /kan jeg få snakke med [navn]?)

Jeg ringer fordi jeg arbeider med forskning på villaks og grunneiere i Trondheimsfjordelvene og at vi har sendt ut ei spørreundersøkelse til alle grunneiere i elvene. Fordi forskninga er viktig for oss ringer vi til alle grunneiere i vassdraget for å være sikre på at spørreundersøkelsen er mottatt og for å høre om det er evt. spørsmål om den.

Har du mottatt den? (evt. korrekt adresse?)

Håper du kan hjelpe oss i forskninga med å svare, da det er viktig å få inn svar fra flest mulig og ulike typer grunneiere.

Takk for hjelpen / at du vurderer å fylle ut skjema!

Jeg kontakter deg ikke igjen med forespørsel om å fylle det her skjemaet.

Ha det bra!

Koder for Stian mht grunn til at de ikke har svart:
MS, lagt igjen beskjed på mobilsvar. IS= ikke svar å få på telefon.
0. Ikke mottatt: rett adresse:
1. Ja, mottatt. A. Kastet.
2. Usikker om mottatt.
3. Har sendt.
4. Eier ikke fiskerett.

5. Vil ikke delta.
A. Gammel/klarer ikke
B. Ikke interessert /angår meg ikke
C. Er imot dette/protest
D. Fiskes ikke/kort eiendom.
6. Skal fylle ut.
7. Vurderer å fylle ut
8. Feil person. Ny eier er:
9. Ønsker nytt skjema: Epost:

Appendix 8

Non-response study by telephone

Bortfallstudie. Februar 2009

Det med store bokstaver under leses ikke.

START:

Hallo, det er Stian Stensland fra Universitetet på Ås som ringer.

Snakker jeg med [navn]?

Jeg ringer fordi at vi nå har gjort ferdig en spørreundersøkelse blant rettighetshavere omhandlende det å eie en fiskerett og villaksforvaltningen i Trondheimsfjordelvene. Naturlig nok, så er det ikke alle som deltar i en slik frivillig undersøkelse.

Vi forskere ønsker å vite om de resultatene vi har fått også gjelder for den gruppa av rettighetshavere som har valgt å ikke delta. Derfor foretar vi nå en kontroll med å ringe til et tilfeldig utvalg av rettighetshavere som ikke har deltatt i undersøkelsen og ber de svare på 11 spørsmål over telefon. Det hele tar ca 5-10 minutter, og det er enkle spørsmål. Du avgjør selv hvilke spørsmål du vil svare på. Det er til stor hjelp for oss om du blir med på dette korte telefonintervjuet. Skal vi starte nå, eller passer det bedre at jeg ringer en annen dag denne uka?

JF. SPM. 1 I ORGINALSKJEMA

1. Hvor interessert er du i lakseforvaltningen i ditt vassdrag? Jeg leser opp fire svarlaternativer. (IKKE LES SELVE BOKSTAVENE A-D)

Er du:

A ☐ Svært interessert
B ☐ Ganske interessert
C ☐ Lite interessert
D ☐ Ikke interessert

JF. SPM. 6 I ORGINALSKJEMA

2. Omlag hvor mange ganger fisket du i elv etter laks og sjøørret i 2007-sesongen?
(1 dag =1 gang)

Ca _____ganger per år.

JF. SPM. 7 I ORGINALSKJEMA

3. Fra og med 2005 til og med 2009 er en stor andel av kilenotfisket i Trondheimsfjorden ikke i drift. Dette skyldes at elveeiere rundt Trondheimsfjorden betaler sjølaksefiskerne 70 kr per kg laks for ikke å fiske, for at mer av laksen skal nå gyteelvene. Tilsammen koster denne avtalen ca 4 millioner kroner per år.

Hvor enig eller uenig er du i påstanden jeg snart skal lese opp? Du kan svare alle hele tall mellom 1 og 7; der 1 er helt uenig, 4 er hverken enig eller uenig. 7 er helt enig. Jeg vil gjenta dise svaralteranbtivene etter at jeg har lest påstanden.

Påstand:	Helt uenig						Helt enig
B Oppleieavtalen gir mindre igjen til elveeierne økonomisk enn det den koster…….	1	2	3	4	5	6	7

(vet ikke -9)

JF. SPM. 9 I ORGINALSKJEMA - SPØRSMÅLET FYLLES UT AV STIAN

I hvilken elv eier du fiskerett? *Eier du fiskerett i flere vassdrag og/eller flere deler av vassdraget så setter du flere kryss*

A Verdalsvassdraget
B Stjørdalsvassdraget
C Gaulavassdraget
D Orklavassdraget

JF. SPM. 10 I ORGINALSKJEMA

4. Hvordan eies fiskeretten som følger din/ husholdningens eiendom?
Et sameie eller felleseie er der flere eiendommer eier en fiskerett i lag. *Sett kryss og fyll inn*

A ☐ Jeg/min eiendom eier fiskeretten alene
B ☐ Fiskeretten i et sameie/felleseie, der jeg har en andel
10. b. eies av tilsammen (*fyll inn antall*): _____grunneiere/gårder

C ☐ Annet (f.eks. eies av kommune, firma) → Skriv hva:
_____

JF. SPM. 11 I ORGINALSKJEMA

5. Eier du /sameiet fiskeretten på begge sider av elva?

A ☐ Nei, kun på en side
B ☐ Ja, på begge sider

JF. SPM. 12 I ORGINALSKJEMA

6. Hvor lang er den fiskeretten du /sameiet eier?
Eies det fiskerett på begge sider av elva, oppgi lengde for begge sider. *Fyll inn*

A Lengde på fiskerett på den ene siden av elva_____m
B Lengde på fiskerett på den andre siden av elva_____ m

JF. SPM. 13 I ORGINALSKJEMA

7. Hvordan vil du generelt vurdere fangstmulighetene på din egen (/sameiets) eiendom i forhold til andre eiendommer i vassdraget?
Du kan svare alle hele tall på mellom 1 og 7; der 1 svært dårlige fangsmuligheter , 4 er middels og 7 er svært gode.

Svært dårlige			Middels			Svært gode
1	2	3	4	5	6	7

JF. SPM. 24K SOM ER DET ØKONOMISPØRSMÅLET SOM BLE BRUKT I "SAMEIESKJEMAET"

8. Omlag hvor store var dine (ikke sameiets) nettoinntekter knyttet til laksefiske i 2007-sesongen? (LES resten OM NØDVENDIG: En eiendom kan ha inntekter og kostnader knyttet til laksefiske på flere måter. Eksempel på inntekter er utleie/salg av fiske, overnatting, servering, fiskeutstyr, kiosk og guiding knyttet til fiskere. Likeledes er det utgifter knyttet til de nevnte aktivitetene. **Nettoinntekter =Bruttoinntekt (omsetning) – utgifter.)**

I et sameie/felleseie eller fellesvald kan det ofte være slik at det beløpet hver enkelt får utbetalt fra utleie avfiske tilsvarer nettoinntekten. *Mangler du eksakte tall, gjør et best mulig anslag, eventuelt kryss for "vet ikke". Rund av til nærmeste tusen- eller hundrekroner*

K Min eiendoms nettoinntekt fra laksefiske i 2007:….._____kr ☐ Vet ikke

For å kunne sammenlikne de personene som har deltatt i spørreundersøkelsen, med de som ikke har deltatt trenger vi også å vite noen personlige opplysninger om deg. Dette er vanlige spørsmål i slike undersøkelser.

JF. SPM. 32 I ORGINALSKJEMA

9. Hvilket årstall er du født?

A Skriv årstall_____
B Alder. JEG REKNER UT SELV

JF. SPM. 33 I ORGINALSKJEMA

Er du mann eller kvinne? [FYLLES UT AV STIAN]

A ☐ Kvinne
B ☐ Mann

JF. SPM. 39 I ORGINALSKJEMA

10. Hva er den lengste utdanningen du har fulført? Jeg leser alternativene

	A=1 Grunnskole	B=2 Videregående skole (inkl landbruksskole)	C=3 1-3 år på høgskole/ universitet	D=4 Mer enn 3 år på høgskole/ universitet
A Meg selv	☐	☐	☐	☐

11. Til hjelp for senere forskning ønsker å vite nærmere om hvorfor en del ikke har deltatt på undersøkelsen. Kan du si oss hvorfor du ikke har valgt å delta?
ÅPENT SPØRSMÅL. ALTERNATIVENE UNDER LESES IKKE OPP

KODING FOR BRUK AV STIAN:
1. Vil ikke delta:
A) Ikke interessert /angår meg ikke
B) Fiskes lite/kort/dårlig eiendom
C) Deltar ikke på undersøkelser
D) Protest/ er imot forv./forskning/oppleien
E) Liker ikke å oppgi personlige opplysninger/ ikke anonymt
F) Skjema er for omfattende
G) For gammel/klarer ikke fylle ut
2. Har glemt det
3. Travel/ Ikke prioritert det.
4. Ingen god grunn
5. Ønsker ikke å oppgi grunnen for at jeg ikke har svart
6 Annet .....
7. Slikt går gjennom felleseiet/sameiet/valdsamarbeidet

Da takker jeg så mye for hjelpen og ønsker en god dag/kveld!

ISBN 978-82-575-0990-3
ISSN 1503-1667

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