



Valuing recreational salmon fishing at a remote site in Finland: A travel cost analysis

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ABSTRACT

The River Teno is the most visited river for recreational wild salmon fishing in Finland and is one of the most productive wild salmon rivers in Northern Europe. Despite the popularity of recreational fishing in the area, no estimates are available for its economic value. This study uses a travel cost recreation demand model to estimate the recreational value of salmon fishing in the Teno river area. Following a two-step estimation procedure outlined by McConnell, we show that on-site time per trip is endogenous. The estimated consumer surplus per trip ranges from 235 to 338 euros. The estimated total recreational value of salmon fishing in the area is 2.6–3.7 million euros. Also, according to the empirical results, the number of fishing trips per angler is strongly affected by the angler's previous salmon catch in the Teno river area, which underlines the importance of the proper and sustainable management of recreational salmon fisheries.

1. Introduction

The economic value of recreational fisheries of salmon in the northern rivers of Finland has been widely recognized, but there is a lack of information on the value of the recreational experience. Knowledge of the economic value of recreational salmon fisheries is urgently needed in order to assess the social and economic importance of recreational fisheries and to support the associated management decisions. The main objective of this study was to estimate the economic value of recreational angling in the River Teno using a single-site travel cost model while considering the role of on-site time in welfare measurement. The study sought to answer the following questions: Which factors are indicators of fishing behavior (i.e., the time spent on site per trip and the number of trips taken per season)? What is the consumer surplus of a fishing trip in euros? And what was the related total recreational use value of the River Teno in 2011 in Finland?

The River Teno, on the border between northern Norway and Finland (see Fig. 1), is the most popular recreational salmon fishing river in Finland (Romakkaniemi et al., 2010) and one of the most productive wild salmon rivers in Northern Europe (ICES, 2016). It attracts significant fishing tourism on account of its good reputation, relatively high catch rates of wild salmon, and the possibility to catch very large fish (Anon., 2015). The Teno has the largest wild Atlantic

salmon stock complex in the world, and is one of the few remaining large river systems that still support multiple and abundant Atlantic salmon populations (Vähä et al., 2007; Anon., 2012b). In recent years, the annual salmon catch of the Teno has made up to 15–20% of the total riverine salmon catch in Europe (ICES, 2013). However, a number of the salmon populations of the Teno tributaries have declined, along with the number of large multi-sea-winter (MSW) salmon, causing pressure to further regulate the salmon fishery (Anon., 2012b). In the Utsjoki municipality in Finland, fishing tourism is an important source of income for locals, while fishing tourism on the Norwegian side is minor. Several studies have shown that management policies aimed at increasing catch rates produce substantial benefits for anglers using the site (Freeman, 1995). Thus, knowledge of the value of recreational fishing tourism in the area is essential to be able to compare the socio-economic influences of different management actions, such as fishing regulations, in addition to their biological effects.

Another urgent need for valuing salmon fishing comes from the Finnish national fishway strategy (Anon., 2012a), which aims to restore the natural cycle of migratory fish species. There are currently only four free-flowing rivers out of the 34 potential salmon rivers in Finland, of which the River Teno is the most important. Restoration of the migratory fish stocks in modified rivers often means that hydropower producers receive smaller profits due to decreased water flow through

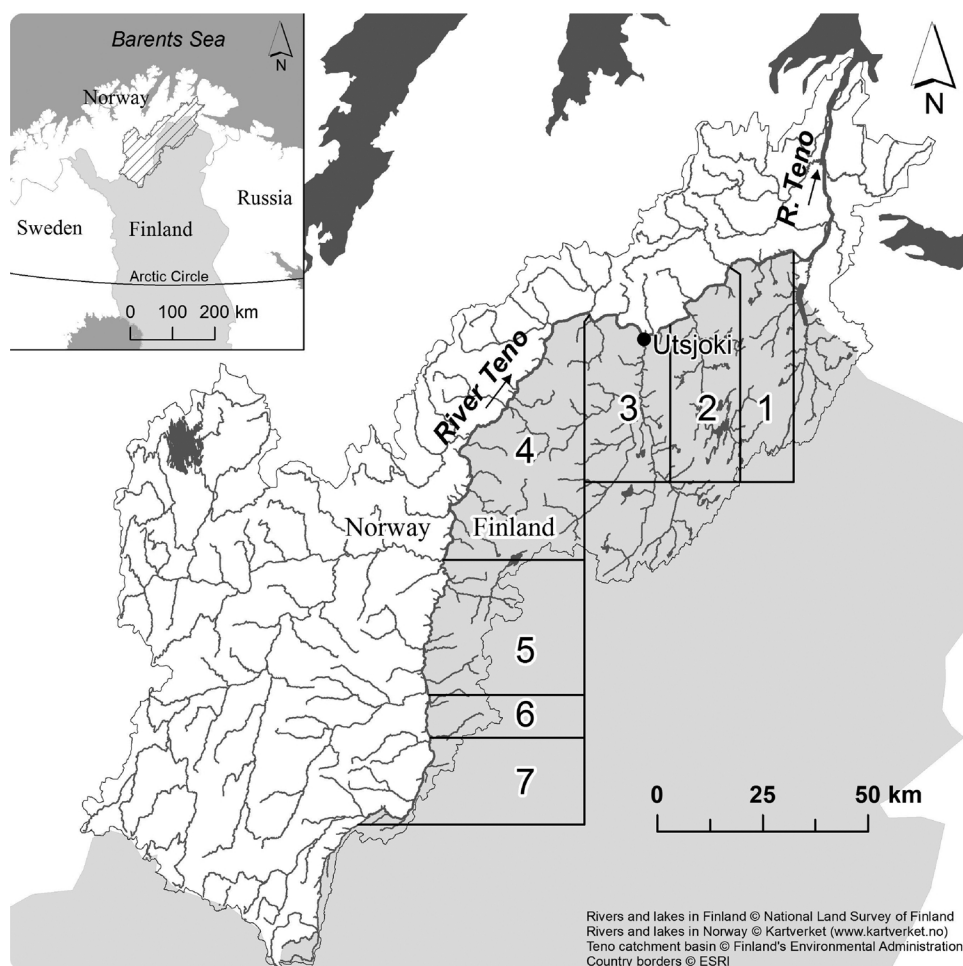
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Fishing areas: 1. Nuorgam, 2. Vetsikko, 3. Utsjoki village, 4. Outakoski (River Teno), 5. Outakoski (River Inari), 6. Middle River Inari, 7. Upper River Inari and Skietsham River

Fig. 1. The Teno fishing permit area covering the Teno-Inarijoki river system.

turbines and costs related to the upkeep of fishways and other restoration measures. Thus, river management authorities are in need of economic estimates of the benefits from restoration processes. For salmon rivers, it is to be expected that recreational fishing would play a large role in these benefits, making it important to understand the potential of recreational benefits attainable in a freely flowing river.

The majority of fishing tourists visit the Teno river area only once per fishing season and stay for several days, a week on average, since the Teno is in the far north and the travel costs from southern Finland are high in terms of monetary expenses, as well as travel time. Few recreational anglers visit the Teno more frequently, while there is considerable variation in the duration of a fishing trip, making the data heterogeneous and challenging to analyze. On-site time can be problematic in the estimation of recreation demand, as it has a dual role in the travel cost model as a source of utility and as a cost.

Modeling recreational demand with travel cost analysis can be improved by carefully modeling the on-site time, especially in the case of endogenous on-site time (Berman and Kim, 1999). When on-site time is predetermined and the length of stay hardly varies among visitors, on-site time can be regarded as an exogenous variable in the trip demand model. However, when varying the on-site time affects the price of a trip, it can be regarded as endogenously determined. In this case, the on-site time is considered as a decision variable that is dependent on different cost- and site-specific factors and the length of stay varies considerably among visitors. McConnell (1992) and Acharya et al. (2003) applied a two-step estimation procedure outlined by McConnell,

whereby an auxiliary regression is first used to determine whether on-site time is endogenous or exogenous, and the specification of the main trip demand model depends on the outcome of the first step. We applied this two-step approach to allow for the specific characteristics of the recreational fishing data for the Teno river area.

We first briefly present the literature on the valuation of recreational fishing using the travel cost method, followed by an introduction to count data models, the treatment of on-site time, and the estimation procedures. In the sections “Study area and data collection” and “Model estimation”, we present the survey data and the modeling approach employed in this study. The results are presented and discussed in the “Results” section. The final section discusses the policy implications of the study.

2. Literature

Applications of the travel cost method (TCM) to recreational fishing are numerous (e.g. Agnello and Han, 1993; Curtis, 2002; Ezzy et al., 2012; Fleming and Cook, 2008; Morey et al., 1991; Morey and Waldman, 1998; Shrestha et al., 2002; Vaughan and Russell, 1982). However, only a few peer-reviewed articles have been published on the valuation of recreational fisheries in Northern Europe (Nordic countries: Toivonen et al., 2004; Norway: Navrud, 2001). There are more examples in the grey literature (Finland: Parkkila et al., 2011; Anon., 2009; Parkkila, 2005; Sweden: Paulrud, 2000, 2001; Paulrud and Dalin, 2001). Navrud (2001) studied the use value of recreational salmon

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