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Recreational fishing for sea trout—Resource for whom and to what value?

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ABSTRACT

Recreational fishing is an important activity that delivers substantial social and economic values. Proper management of recreational fisheries relies on information about resource use and associated values by different fishers, but such information is rare, particularly for open access fisheries. In this study a survey of 471 fishers on the Swedish island of Gotland in the Baltic Sea, assessed catches, proportion of catch-and-release (C&R), and economic value (expenditures and willingness to pay, WTP) of sea trout fishing in 2015–2016. Data was analysed in relation to gear used (fly and spin angling, nets and mixed fishery) and fisher connection to fishing site (permanent and temporary residents, Swedish and international tourists). There were marginal differences in daily catch rates, but significant differences in effort and annual catches between different fishers, with resident fishers having the highest catches. Anglers had 86% C&R rates, and fly fishers (> 95%) differed significantly from other anglers. Anglers, particularly fly fishers and fishing tourists, had much higher expenditures per year, fish caught and fish kept compared to net fishers. WTP before refraining from fishing, for doubling of fish supply and for potential fishing license was also highest among anglers. Our findings are discussed in terms of distinguishing characteristics for different types of recreational fishers. Fishing efforts, economic values and the need for further studies are also outlined in the context of fisheries and tourism management.

1. Introduction

Recreational fishing is an important activity that delivers substantial social and economic values. It provides recreation and the associated values, as well as possibilities for economic development based on renewable natural resources, supporting small and medium size entrepreneurs, mostly linked to tourism (Moksness et al., 2011; Stensland, 2010). However, recreational fisheries in Europe are presently facing many challenges and stocks of wild fish are decreasing due to a range of factors that include land use transformations and damming of rivers that affects water quality, habitat availability, fish migration and reproduction (Arlinghaus et al., 2008). Because of these challenges, there is a need for improved management, conservation and restoration of fish stocks in order to maintain and further develop recreational fisheries. Policy and management decisions concerning recreational fisheries require information about both the use of resource (fish) and how the users value it (Lew and Larson, 2014). This is particularly important in situations of potential conflict between different types of users (Fielder et al., 2016; Solstrand, 2013; Toivonen et al., 2004). This knowledge can also provide vital contributions to the social debate about the various uses of the fish resource, related to and regarding questions on how to balance the demand from different actors and still manage fish stocks in a sustainable way (Berrens et al., 1993). This is

essential in the case of fisheries where access rights and fishing options face very little regulation, as in some of Sweden's fisheries (Paulrud and Laitila, 2013). Moreover, knowledge about the benefits from fisheries is crucial when making decisions on specific management or conservation options (Kerkvleit et al., 2002), as these benefits can be weighed against the costs of management or restoration activities (Lupi et al., 2003; Massey et al., 2006; Melstrom et al., 2015), or in the context of even broader policy strategies, e.g. on tourism development (Moksness et al., 2011).

In Sweden, as many as 1.6 million Swedes (20% of the adult population) fish annually for recreational purposes, with a total of 11 million recreational fishing days, and an expenditure of around 9 billion Swedish crowns (≈ 0.9 billion Euro) (HAV, 2017). Moreover, recreational fishing is an important element of the nature-based tourism sector in Sweden (Fredman and Margaryan, 2014; Hultman and Sawe, 2016) and therefore represents a great potential in the development of tourism industry. One species of particular interest is sea trout (*Salmo trutta trutta*), which is a central commodity for recreational fisheries in Sweden and neighbouring countries. In Sweden, sea trout comprise 11% of national recreational fisheries landings by species from both freshwater and marine environment (HAV, 2017). Sea trout is an anadromous species, i.e. they are born in freshwater, migrate to the ocean and then return to freshwater to reproduce. Adult fish stay near the

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coast throughout their lives, but migrate each autumn to the streams to spawn (Bohlin et al., 2001). Sea trout populations in Sweden have declined recently in Sweden due to changes in habitats and decreased access to migration routes (SLU-Aqua, 2015; Östergren 2013). The Baltic Sea holds a large number of sea trout populations, but these populations are usually small and vulnerable to changes in the environment and fishing pressure, and thus in risk of genetic drift and decrease in genetic variation (Östergren et al., 2016). Many small populations are also more challenging to manage due to higher costs associated with data collection and monitoring, and large variations between the specific threats faced by each population. Because of these challenges information is missing on the catches for most of the populations, particularly in the coastal areas, where recreational fishing dominates (SLU-Aqua, 2015). This problem is most evident for open access fisheries, such as along the Swedish coast, with limited regulations and where different types of recreational fishers use the resource.

There have been relatively many studies attempting to value recreational fisheries, most of them in the US (Hughes, 2015). They usually focus on either valuation of specific species that is important for fishermen (Berrens et al., 1993; Duffield et al., 2012; Hutt et al., 2013), including situations of conflict between different users (Arismendi and Nahuelhual, 2007; Fielder et al., 2016) or placing an economic value on the contribution of particular habitat types to recreational fisheries (Bell, 1997; Fulford et al., 2016). Some authors also investigated the benefits from fisheries in relation to the costs of their management (Lupi et al., 2003; Palmer and Snowball, 2009). However, in Europe there are relatively few studies that investigate the socio-economic importance of recreational fisheries or aim at providing information to support decision making concerning recreational fisheries (Arlinghaus, 2006; Arlinghaus et al., 2002). A recent synthesis by Hyder et al. (In Press) estimated number of fishers, participation rates, days fished, catches and expenditures for European marine recreational fishing. Other existing studies often focus on the value of recreational fishing as contrasted with the restoration costs of associated fish habitat (Navrud, 2001; Paulrud and Laitila, 2013), while others provide estimates on recreational fishing expenditures and willingness to pay above the actual expenditures (i.e. consumer surplus). For example, Toivonen et al. (2004) provided such estimates for five countries of Northern Europe, and Peirson et al. (2001) investigated consumer surplus in recreational fisheries of England and Wales. There are relatively few valuation studies that focus specifically on sea trout. Stål et al. (2008) assessed how habitat disturbances affect the economic value of different habitats for five fish species, including the sea trout, but there is lack of basic information about the scale of fishery for sea trout (e.g. fishing effort, level of catches) and the value of sea trout fisheries for different users.

To the best of our knowledge there are few European studies that explore the use and value of fishery resources for different user groups such as anglers and net fishers. Liu et al. (2011) provides an overview of potential challenges of salmon management in Norway analysing interests and conflicts of different sectors relevant for salmon industry, and Olausson (2007) explores competition for salmon fishing between recreational anglers and commercial fishermen. Limited information makes future decisions concerning recreational fisheries difficult, particularly in situations of potential conflicts and trade-offs between resource users. For example, in the case of the Swedish recreational fisheries of sea trout with open access, conflicting interests potentially exist between anglers and net fishers, and between local residents and fishing tourists. Conflicts may arise around harvesting rights, fishing pressure, catch-and-release, economic return, etc. Information on the level of catches of different groups of fishers and the value they attach to fishing may help to take management or restoration decisions (Bergstrom et al., 2004) that would maximise the social and economic benefits of the fish resource (Oh et al., 2005).

This study is the first of its kind to explore the recreational sea trout fishery on Gotland, a large Swedish island in the central Baltic Sea.

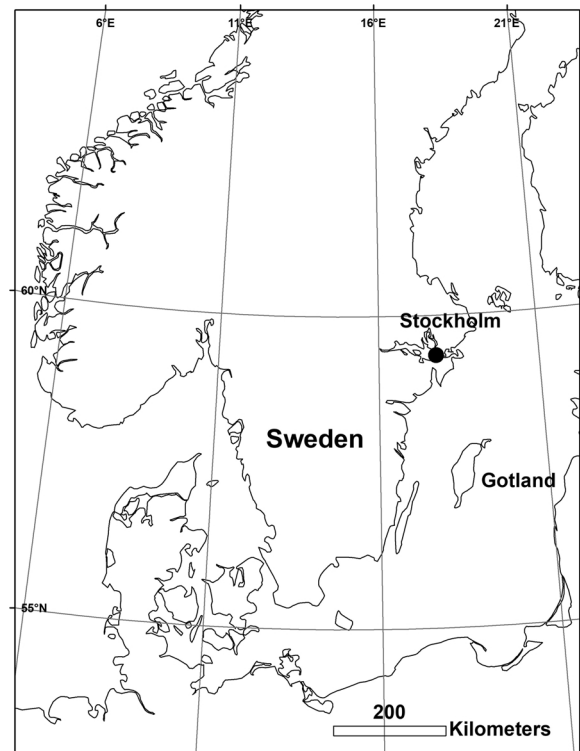


Fig. 1. Location of Gotland.

Using survey data, level of catches, proportion of catch-and-release (C&R) and economic value (expenditures and willingness to pay) of sea trout for different groups of recreational fishers were assessed. The fishers' community in our study sample was dissected in relation to type of gear used (fly and spin angling, nets and mixed fishery) and geographic connection to fishing site, i.e. Gotland (permanent and periodic residents, Swedish and international tourists) and the results are presented in relation to all these groups. An estimation of the total number of sea trout anglers, the key group fishing on Gotland, was also conducted through a creel survey. Our findings are discussed in terms of distinguishing characteristics for different types of recreational fishers. Fishing efforts, economic values and the need for further studies are also outlined in the context of fisheries and tourism management.

2. Material and methods

2.1. Study area

Gotland is a large island on the Baltic Sea, located approximately 80 km from the eastern coast of Sweden (Fig. 1). The island has an area of 3140 km² and a permanent population of approximately 57 000 people (Region Gotland, 2017). Due to its natural and cultural heritage Gotland is an important tourist destination for both Swedish and international visitors (Gotland, 2017). Recreational fishing is one of the major leisure activities on Gotland (FishYourDream, 2017), with both residents and tourists fishing. However, there is no official data on the number of recreational fishers and their resource exploitation on Gotland. Sea trout is the key recreational fishery species that is targeted on the island, and two main categories of fishers can be distinguished: (1) anglers, i.e. fishers using gears such as spin and fly and (2) net fishers (Länstyrelsen, 2015). The regulations for recreational fisheries for sea trout are limited. There are minimum size limits, restrictions on number/length of nets and closed areas outside stream outlets during spawning migrations, but no fishing licenses and no bag limits.

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