ANALYSIS

Value of recreational fishing in the Brazilian Pantanal: a travel cost analysis using count data models

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Abstract

Recreational fishing value of the Brazilian Pantanal is measured using travel cost method (TCM). We compare non-linear, Poisson and negative binomial count data models to estimate recreational fishing trip demands. The count data and truncated models are used primarily to account for non-negative integer and truncation properties of recreational fishing trips as suggested by the recreation valuation literature. The results reveal that non-linear and truncated count data models perform relatively well in our study. The economic values of recreational fishing in terms of consumer surplus (CS) are derived using non-linear and truncated models. We estimate the CS values from $540.54 to $869.57 per trip resulting in the total social welfare estimate range from $35 to $56 million. The study demonstrates a relatively high value of recreational fishing in the Pantanal in comparison to similar studies conducted in other parts of the world. The findings of this study would be important for resource management decisions in the Pantanal and could serve as a reference in valuing similar resources in other ecosystems around the world. © 2002 Elsevier Science B.V. All rights reserved.

Keywords: Recreational fishing; Travel cost method; Count data models

1. Introduction

The Brazilian Pantanal is a 138,000 km² tropical seasonal wetland located in the center of South America. The Pantanal provides the flood plain for the 360,000 km² Upper Paraguay River Basin (UPRB) and is comprised of land in Bolivia and Paraguay as well as Brazil. It is considered a globally unique center of ecosystem services (Costanza et al., 1998; Seidl, 2000) and is a recently designated United Nations World Heritage site. The principal economic activities within the region are extensive cattle ranching, industrial and individual mining, recreational, subsistence, and commercial fishing, and, recently, ecological or rural tourism (Seidl, 2001).

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Recreational fishing in the region's many rivers is an important activity that competes with alternative uses of the resources and the ecosystems of the Pantanal. Approximately 175 hotels with 7750 beds and 40–50 boat-hotels served more than 46,000 recreational anglers who visited the southern part of the Pantanal between May of 1994 and April of 1995 (Catella et al., 1996). Approximately three of every four fish landed were captured by recreational anglers (Catella et al., 1996). Thus, it is in the interests of the scientific community as well as local decision-makers to better understand the local recreational fishing industry, its drivers and economic value in order to better manage the natural resources of the Pantanal region toward local economic development objectives and nurture one of the world's largest wetland ecosystems.

Although recreational fishing is only a part of the overall value of the resources and ecosystem services of the Brazilian Pantanal, this activity has drawn much attention from the public and natural resource managers recently because of the growing demand for recreational use of the resources in the region. The Pantanal's rivers provide fertile habitat for aquatic species, creating enormous potential for fishing activities to attract visitors to the region (Melack et al., 2000; Moraes and Seidl, 1999). Furthermore, relative to competing uses, recreational fishing may be a more economically efficient use of scarce regional natural, human and financial resources that could help sustain this wetland ecosystem of global significance.

This study provides an economic argument contributing to the overall valuation process in capturing non-market values of the ecosystem services of the Pantanal. Non-market valuation of natural resources, ecosystems and the environment is among the most debated topics in the recent economics literature (Mitchell and Carson, 1989; Arrow et al., 1993; Gowdy, 1997; Bromley, 1998; Brown and Gregory, 1999; Vatn, 2000; Mainwaring, 2001). Over time, the debates have focused on different aspects of valuation problems including methodological approaches (stated or revealed preferences), validity (content, criterion or construction) and features of the goods valued (use, option, existence or bequest).

Approaches and methods for value in use are now fairly agreed upon (Arrow et al., 1993; Mitchell and Carson, 1989; Freeman, 1993; Bateman and Willis, 1999), understanding that such an exercise constitutes an incomplete assessment of the total economic value, not to mention ecological value, of natural capital to society. We apply revealed preference valuation methods, focusing on use values of recreational fishing. This is among only a few studies employing similar methods in such remote and remarkable sites of tremendous ecological significance. The main objective of the paper is to estimate indirect market use value of recreational fishing in the Brazilian Pantanal using travel cost methods (TCM). The recreational use value of the resource is measured in terms of anglers' willingness to pay (WTP) or consumer surplus (CS). The CS estimate is considered as a good approximation of a welfare measure (Willig, 1976) for this value in use of the resource base.

The application of TCM to value recreational resources has been routine in the valuation literature (Freeman, 1993; Loomis and Walsh, 1997). Recreation research is typically conducted in the United States, Canada and European countries (Walsh et al., 1992; Navrud, 1999; Adamowicz, 1994). In the United States, Loomis et al. (1999) reported 109 CS estimates of recreational fishing from the meta-analysis of numerous studies. Further detailed review of recreational fishing studies of the U.S. is found in Sturtevant et al. (1998), Markowski et al. (1997). However, researchers very seldom undertake studies of recreation sites around the globe where, arguably, the world's most critical ecosystems are located.

Travel cost demand models for recreational fishing data model the anglers' demand for recreation trips as the dependent variable. Demand is determined by travel costs, the price variable, and other relevant site characteristics and socioeconomic factors. Anglers' WTP, or CS, representing the non-market value of recreational fishing, is estimated using the demand function. Because of the non-negative integer and truncated nature of the fishing trip data, the standard ordinary least-squares (OLS) model may be inappropriate to estimate the travel cost demand function. Thus, it