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Distributional performance of a territorial use rights and co-managed small-scale fishery

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ABSTRACT

This work reports on how benefits are distributed among the owners of fishing grounds in the spiny lobster (*Panulirus argus*) fishery of Punta Allen, Mexico. This MSC certified (2012) small-scale fishery, has been co-managed as a Territorial Use Rights Fishery (TURF) since 1969. Members of the local fishing cooperative, have exclusive access to individual fishing grounds. The fishery is based on the use of artificial shelters. These bottom devices provide refuges for lobsters, reduce predation mortality, and facilitate harvesting by free diving and the use of hand nets. Data from the fishing cooperative logbooks were used to calculate fishing incomes indicators per fisher (revenues, quasi-profits of the variable costs, profits, and resource rent) achieved in seven lobster fishing seasons (2007–2014). Distributions statistics (shape parameters and log transformations), and inequality metrics (Lorenz curve and Gini index *G*) were applied to the income indicators. The analysis was complemented with a fishers' perceptions survey about the effectiveness of joint Government and cooperative regulations. The *G* index of the fishing revenues distributions showed low values (0.387 ± 0.017) and a stable trend in the seven lobster seasons analyzed. The calculated G values of the fishing income indicators increased from 0.387 to 0.490. There were no statistically significant differences in the resource rent earned by the age groups of campo owners. This finding could indicate intergenerational equity among current resource users. The results showed that in the lobster fishery of Punta Allen, the fishing incomes are spread more equally than most fisheries where distributional performance has been assessed.

1. Introduction

The distributional performance of incomes/benefits is posited to have an important impact on the sustainable management of a fishery, and hence the need for their evaluation. It involves the outcomes and implications of the distribution of the benefits and costs of a management action among individuals, groups or even communities (Clay et al., 2014). Fishery distributional performance has been mentioned as a key outcome to assess in the promotion of sustainable development (Berke, 1995; Munasinghe, 2000), consolidation of quota/licenses (Clay et al., 2014; Bellanger et al., 2016), and even on the grounds of fairness, human rights, social justice (Cowell, 1977; Capistrano and Charles, 2012; Klain et al., 2014). Indeed, it is acknowledged that distributional concerns and inherent equity or inequity can affect the acceptability and success of management systems (Guyader and Thébaud, 2001; Ostrom, 2009; Sumaila, 2010). Therefore several authors have suggested paying more attention to distributional performance of fisheries management (Dupont and Phipps, 1991; Armstrong and Clark, 1997; Thébaud et al., 2012; Clay et al., 2014).

Rights-based fisheries management systems have been identified as an effectively approach to avoid the "race for the fish" (Christy, 1973; Ostrom and Schlager, 1996; Asche et al., 2009). By granting each fisher a share (part, quota portion) of the total allowable harvest, the individual fishers improve the efficiency of their operations; when rights are transferable they will end up in the hands of those who value them most, achieving at the same time higher levels of efficiency in the process. Nevertheless, the potential concentration of harvest rights on only a few of the stakeholders has raised concerns about equity, social justice and wealth distribution. Due to these issues of concern it has been argued there is a need to pay more attention to the distributional performance of rights-based managed fisheries (Sumaila, 2010; Clay et al., 2014; Bellanger et al., 2016).

Territorial Use Rights Fisheries (TURFs) refer to "a place based right system" (Wilen et al., 2012), in which specific users have harvest/

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exploitation rights to certain aquatic resources located within a specified geographic zone (Christy, 1983). TURFs have long existed in small-scale traditional saltwater and estuarine community-based fisheries (e.g. Johannes, 1978; Ruddle et al., 1992). The scope of the rights granted is broad. TURFs may grant access to all marine resources within a specific area or may grant rights to use only a single resource or subset of resources and under constraints specified by regulations (Wilen et al., 2012). It is worthwhile to mention that most TURFs do not grant full ownership rights to resources; access rights are conveyed, but ownership of the resources resides in the nation/state.

TURFs like other rights-based fisheries, tend to inhibit (or at least mitigate) competition for resources, thus conserving target resources and preventing overfishing (Hilborn et al., 2005). Therefore, TURFs have gained attention as a management approach to foster sustainable fisheries, generate new economic value, and to restore overexploited stocks (Aburto et al., 2013; Lester et al., 2016). Nevertheless, TURFs may involve some limitations and drawbacks, among them: (i) adoption of a TURF is not a guarantee of the sustainability of fisheries (Quynh et al., 2017), (ii) TURF implementation could not by itself mitigate conflicts among users in Sri Lanka (Atapattu, 1987), (iii) a failure of TURF implementation in Taiwan (prior to 2000) has been described (Chen, 2012), (iv) there is evidence of TURFs failing in the sustainable management of highly mobile fish resources (Criddle et al., 2001), and naturally fluctuating stocks across years (Aburto et al., 2014). Examples of the latter are the Chilean fisheries of sea urchin *Loxechinus albus* where fishers faced falling catches under a TURF system, leading to a decrease in revenues (Defeo and Castilla, 2005), and the collapse of the macha *Mesodesma donacium* TURF fishery (Aburto et al., 2014).

The distributional performance of TURFs has been acknowledged since the early 1980′s as a topic that should be addressed (Pollnac, 1984; Smith and Panaïotov, 1984; Guyader and Thébaud, 2001). Although there are studies on the distributional aspects of ITQs (Guyader and Thébaud, 2001; Olson, 2011; Zhou and Segerson, 2014), the distributional impacts of TURFs have not been reported, and have been explicitly mentioned as a pending question for future research on TURFs (Quynh et al., 2017). Therefore, the aim of this study was to examine the distributional performance of a spiny lobster fishing activity among fishers of a small-scale fishery operating under a TURF scheme in Punta Allen, Mexico, including a perception analysis of regulations.

Located in the Punta Allen fishing village, the Vigía Chico cooperative decided to grant exclusive spiny lobster harvest rights to cooperative fishers within its fishing grounds (locally called campos[1]). This fact acknowledged each cooperative member as a spatial fishing right holder, a campo owner with exclusive spiny lobster harvest rights within their own fishing ground. The initial allocation of fishing grounds was undertaken in a “first come first served” mode. Although the campo system has been in place since 1969, when the fishing grounds were initially allocated (Miller, 1982; Seijo and Fuentes, 1989), it was in only 1994 that the federal Government recognized this internal agreement through a concession granted to Vigía Chico cooperative for the spiny lobster fishery (DOF, 1994).

2. Materials and methods

2.1. Study area

The Vigía Chico cooperative is based in the village of Punta Allen, a small coastal community located within the Sian Káan Biosphere Reserve (RAMSAR and World Heritage site) in the east coast of the Mexican Yucatan Peninsula. Punta Allen village is situated north of the Bahía de la Ascensión, a shallow karst bay (mean and maximum depth ≈ 3.5 m and 7.0 m, respectively). The bay is bordered by patches of fringing reefs, which creates a reef lagoon-like area between the bay entrance and the Caribbean Sea (Medina-Gómez et al., 2014). Fig. 1 presents the geographical location of the Bahía de la Ascensión and its main geographic points.

The baýs floor is composed of dense patches of sea-grass beds distributed among sandy, red and green algae and coral limestone (Eggleston et al., 1990; Arellano-Méndez et al., 2011). Bahía de la Ascensión is an important nursery habitat for several species of sharks (e.g., *Charcarinus leucas, Negaprion brevirostris*), manatees (*Trichechus manatus*), and spiny lobsters (*Panulirus argus*) (Vidal and Basurto, 2003). Bahía de la Ascensión and its surrounding zones are controlled by the Vigía Chico cooperative and divided into individual lobster fishing grounds assigned to the members. Although the spiny lobster fishery has been the most important economic activity in the Punta Allen village, the importance of tourism in the local economy has been rapidly increasing, and currently there are four local tourist cooperatives in Punta Allen (Araújo-Santana et al., 2013).

2.2. The co-management system of the fishing cooperative Pescadores de Vigía Chico

In addition to the federal government regulations on the spiny lobster fishery (Mexican Official Norm PESC 006-1993), Vigía Chico fishing cooperative established a set of self-imposed local rules for fishing that have proved to be highly effective in creating the sustainable management of its small-scale lobster fishery (Seijo, 1993, 2007). Its organization has been recognized as a successful example of a sustainable co-managed small-scale fishery (Schlager and Ostrom, 1992; Méndez-Medina et al., 2015), and was certified in 2012 by the Marine Stewardship Council (MRAG, 2015).

The self-agreed regulations include the campos sytem described above. These individual fishing grounds can be transferred through temporary lease or can even be sold, but only to another cooperative member. The cooperative regulations currently also limit the cooperative membership only to direct first degree male relatives (i.e., brothers and sons) of already current members; nevertheless there is some female participation in the fishery as non-member crew assistants. The campos system was called Individual Transferable Grounds, ITGs (Seijo 1993). Cooperative regulations also ban the use of Hooka/scuba diving and lobster harvest by gaff (Sosa-Cordero et al., 2008).

The fishing grounds owners have the obligation of using their grounds and invest in bottom fishing gears (artificial shelters) within the campos they own. It is worthwhile to mention that although only cooperative members can own fishing grounds, currently not all cooperative members are campo owners. Those without campos have the right to fish lobster, but only with a campo owner.

2.3. Use of artificial shelters in the lobster harvest

Campo owners deploy artificial shelters in which spiny lobsters congregate; this makes them easier to capture by free diving (Sosa-Cordero et al., 2008). During the 4-month lobster closed season (March to June), campo owners build and deploy new artificial shelters in their fishing grounds. Because of the different characteristics of the bottoms present in the area, there are some variations on the most common design of the artificial shelters. These adaptations respond to the environmental conditions of the site where the shelters will be deployed.

There are numerous designs, sizes, and construction materials and methods for artificial shelters. In addition to the area (bottom) where an artificial shelter would be placed, the choice depends on the fisher’s budget and even personal preferences. Lighter and thinner artificial shelters are utilized in the area known as “El Río” (or “La Ría”), to prevent their sinking due to the muddy bottom in that area. Campos located in the Caribbean Sea side (outside of the coral fringing patches) require heavier and thicker artificial shelters to withstand the currents

[1] These individual fishing grounds are also known as “parcelas”, a local term used to describe farming lots (Méndez-Medina et al., 2015).