



Punishment and compliance: Exploring scenarios to improve the legitimacy of small-scale fisheries management rules on the Brazilian coast



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ABSTRACT

This study investigated the effects of legal and societal punishment on fishermen's compliance behaviour, according to fishermen's age and level of dependency on fisheries, through the use of interviews and scenarios. Ninety-five fishermen living in a coastal park (Ponta do Tubarão Sustainable Development Reserve) in the Brazilian northeast, where controlled exploitation of natural resources is allowed, took part in this study. The results showed that age alone would not affect compliance, regardless of the level of enforcement. However, it was noticed that the fishermen who claimed to depend on the money provided by fisheries, regardless of their age, were more likely to say that they would not comply, even if enforcement were stricter. The scenario analysis showed that increased monitoring and punishment (including societal pressure) could enhance compliance, especially among younger fishermen, who claimed not to depend solely on fisheries. Therefore, fisheries management should also consider differences in social groups, and not focus solely on the enforcement and punishment mechanisms, assuring that livelihood options that consider different social needs are provided.

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1. Introduction

It is widely accepted that fisheries are undergoing some difficulties worldwide, with some stocks already collapsed and others on the way to becoming economically non-exploitable [1,2]. Such changes affect stocks exploited by both industrial and small-scale fisheries. One of the main causes for such decline is overexploitation by fishermen [3]. To cope with these difficulties different types of management have been proposed and/or tentatively implemented over the years in order to enhance sustainable resource exploitation, steadier markets and fair access to the resources [3–5]. However, combining all these aspects into a single management strategy is a hard task, especially given that the success of these initiatives seems to be largely dependent on the compliance of the ones involved and affected by these measures, such as fishermen [3,6].

Reaching compliance in fisheries is not straightforward, as seen in multiple examples around the world, such as in Denmark [7],

Tanzania [8], the Southern Ocean (Antarctica) [9] and Ghana [10]. Non-compliance is a widespread issue that still challenges both researchers and management authorities [3]. Fish overexploitation, despite the existence of regulations, is one of the outcomes of non-compliance that also negatively influences food security, sustainable management possibilities, and socio-economic opportunities [3,7].

Becker [11] was one of the first scholars to come up with a theoretical model for explaining non-compliance behaviour that could be applied to fisheries. His model is based on the assumption that people are rational thinkers, more likely to commit crimes if the possible benefits that accrue to a criminal activity exceed the benefits of compliance. When people feel that the likelihood of getting caught for their wrongdoing is low, the chance that they will violate the rules increases [8,11,12]. The implementation of regulations, monitoring, enforcement, and punishment are defined as the most influential aspects to increase compliance behaviour [4,13–15]. A more effective enforcement implies higher compliance, just like more severe punishments do [8,16–19].

Even though Becker's model is commonly used, it has been criticised for lacking social aspects [6,18,20]. The likelihood of complying with management regulations in the case of fisheries

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depends not only on the level of enforcement and the severity of punishment, but also on a person's attitude, motivations [6,10,21], age [6,10] and peer pressure [4,6]. For example, when there is little or no enforcement some fishermen, but not all, can feel indifferent towards the regulations. Also, fishermen are more likely to disregard the rules if they feel that the regulations in place are too strict and therefore could jeopardise their livelihoods [9,10,22]. Age also seems to matter in defining compliance level. Several examples in the literature suggest that young fishermen tend to have a higher rule-violation rate in comparison to the older fishermen [6,10]. One possible explanation is that older fishermen are likely to have more experience with the system in place and could be more aware of the consequences of overexploiting fish stocks, while younger fishermen would be more reluctant towards compliance because of lacking such experience [6,10,23]. Finally, the perception of the fairness of regulations in place and the decision on whether to comply or not can be enhanced by the behaviour and attitude of other fishermen. When the majority of fishermen tend to show non-compliance behaviour without suffering its consequences, some fishermen will tend to copy this behaviour, feeding the feeling of indifference towards the rules [6,19]. Likewise, direct peer and societal pressure can increase or decrease compliance, as it has been demonstrated by the seminal work of Sutinen [24] and later by Hønneland [20].

Hence, combining social and economic aspects can foster a more comprehensive understanding of compliance behaviour and attitudes towards regulations, which is especially relevant to achieving success in fisheries management. This study was done to add to the current body of knowledge on compliance, by focussing upon the role of enforcement associated with the different degrees of punishment, age, financial need, and societal pressure. The existing knowledge suggests that by increasing punishment mechanisms a higher rate of compliance can be achieved. However, it is not yet clear how far fishermen are willing to go to keep violating the rules and how high the punishments have to be to increase compliance. Moreover, the role of age in compliance, when interacting with other factors, is still not clear, as it is still not known, for example, if younger fishermen would be less or more affected by societal pressure and peer judgement than older ones. The current study draws on these issues, testing, specifically, if being younger and dependent on fisheries as the main source of income affects the compliance rate, according to the different levels of regular (e.g.: application of fees) and societal (e.g.: being ostracised) punishment. By combining these aspects into a single study, it was hoped that this understanding could help to create better fisheries management regulations, capable of benefiting both the conservation of natural resources and the livelihoods of fishermen's communities.

2. Material and methods

2.1. Study region

This study was done with fishermen of three coastal communities (Diogo Lopes, Barreira and Sertãozinho), which represent the only coastal villages located within the boundaries of the Sustainable Development Reserve Ponta do Tubarão, on the Brazilian northeastern coast (between $-36^{\circ}50'20''$ W and $-5^{\circ}06'75''$ S, $-36^{\circ}48'22''$ W and $-5^{\circ}14'49''$ S) (Fig. 1). The total area of the reserve is 12,960 ha and encompasses several ecosystems, such as mangroves, shrub land, and dunes [25]. This reserve was established in July 2003, as a result of an intensive common effort and of manifestations by fishermen and other local people against land encroachment for developments, such as shrimp farms and the construction of a resort, in order to assure the exclusive right to the land [26].

A Sustainable Development Reserve (SDR) implies a park category where resource exploitation is allowed as long as it is done sustainably. A management plan is supposed to regulate all the resource use, but, in this specific case, even after almost a decade since its establishment, only a provisory and very loose pre-management plan defines the local rules [26]. This means that the place is subjected to the same fisheries management regulations that apply to the NE coast, including lobster and crab regulations (closed seasons and minimum sizes), minimum distance from the coast for trawling, shrimp closed season, minimum depth for setting a gillnet, among many others. Also, in a SDR, communities are supposed to participate in the management, by helping to establish the rules, doing part of the monitoring and the enforcement, in a co-management arrangement.

2.2. Data collection

As a first step, open qualitative interviews were held with researchers and graduate students, who were acquainted with the reserve and the communities, in order to obtain a more complete understanding of the real level of regulations and enforcement regarding fisheries management and community involvement in the co-management. They were also asked questions concerning the status of the conservation of the reserve and the socio-economic situation of the communities (education, age, and number of fishermen). These preliminary interviews helped to shape the interviews and make them applicable to the fishermen.

The interviewed fishermen were found through the snowball sampling method, in which the fishermen interviewed first suggested other names that fit the criteria established. In this study, the criteria used were: a fisherman had to be fishing in the area for more than 5 years and had to be older than 18. The minimum fishing experience in the area was a way to assure that the fisherman was aware of the local regulations and their level of enforcement, besides being already established in the community, with friends and acquaintances. Even though the minimum age to work as a fisherman in Brazil is 16, here 18 was adopted because this is usually when fishermen are already independent or actively providing for their families.

A total of 95 interviews were held in the three communities, each one lasting on average 30 min. A structured questionnaire was used, which was pre-tested and then adapted. The interview gathered information on socio-economic aspects (age, education, household structure, income), fishing activities (level of dependence, gear, main target species), knowledge of existent regulations, monitoring, and enforcement and punishment. Fishermen were also asked if under the current level of enforcement and punishment they would comply with the regulations and why, even though it was clear that at the time of the study the level of enforcement varied from low to non-existent. At the end of the interview, fishermen were faced with hypothetical scenarios of different levels of punishment, assuming that enforcement was done regularly. Studies using scenarios, including some done with fishermen, have showed that people can relate to hypothetical situations, which could help foresee the consequences of management changes [27,28]. Fishermen were asked to imagine situations in which punishment was relatively low and then others where it was higher, and how this would influence their behaviour regarding compliance (Table 1). The difference between low and high punishment was defined as time without gear or equipment (e.g.: having the boat seized for one week versus one month), time in prison (e.g.: one day versus one month) and value of a fine (R\$100 versus R\$500 – Brazilian money). Fishermen were also asked to say if they would comply or not if there were some sort of social sanction, such as being ostracised by family and friends. To all these questions, fishermen could answer “yes” (they would comply), “maybe” or

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