

# The economic role of sharks in a major ecotourism archipelago in the western South Atlantic



Natalia M. Pires<sup>a</sup>, Ricardo C. Garla<sup>a,\*</sup>, Adriana R. Carvalho<sup>a,b</sup>

<sup>a</sup> Programa de Pós-Graduação em Ecologia, Universidade Federal do Rio Grande do Norte, Campus Universitário, BR-101 s/no, 59078-70, Natal RN, Brasil

<sup>b</sup> Fisheries Ecology, Management and Economics Unit-FEME, Departamento de Ecologia, Universidade Federal do Rio Grande do Norte, cx postal 1524, Lagoa Nova, Natal, Brasil

## ARTICLE INFO

### Article history:

Received 28 October 2015

Received in revised form

14 June 2016

Accepted 15 June 2016

### Keywords:

Conservation  
Travel cost  
Valuation  
Elasmobranch  
Socio-economic value  
Economic benefits  
Marine protected area  
Brazil

## ABSTRACT

Using environmental resources to recreational purposes are likely to provide significant economic benefits to many levels of human societies. Here, recreational uses of one of the main dive destinations in the western south Atlantic (Fernando de Noronha Archipelago) were estimated at three different scales: the entire archipelago (through travel cost method), the marine resources (through diving) and sharks (through shark diving). The total recreational use of the archipelago was estimated at \$90.2 million USD annually. Divers are responsible for \$36.4 million USD out of the total value of all services produced for tourists. Sharks provide 4% of the total economic benefit within the tourism industry (\$2.64 million USD). The distance from the archipelago, income and length of stay are predictors for tourists' daily expenses. Even though sharks do not represent a tourism target for the archipelago at this point, shark diving earned higher amounts than the sum acquired by well-established industries at other sites. In addition, 23% of tourists interviewed become interested in shark diving after they arrive, demonstrating that this activity carries the potential to expand in the archipelago. However, if shark diving is to be encouraged, this development has to be approached cautiously, to maintain the standards required locally to other marine fauna ecotourism, and without use of bait to avoid potential negative effects of supplemental feeding.

© 2016 Elsevier Ltd. All rights reserved.

## 1. Introduction

Despite their ecological and economic importance, shark populations are declining worldwide due to a variety of human activities, including fishing, habitat destruction, pollution, climate change, and the Asian demand for their fins [1].

From a strictly economic perspective, sharks may generate revenue through fishing and through ecotourism. For the fishery, sharks represent a source of protein, leather, cartilage, oil, and fins, which is important for several communities in both developed and developing nations [2]. Sharks have become increasingly popular and important for tourism; during the last three decades, shark diving has generated considerable income for the communities exploiting this tourism asset [3]. As a result, the number of economic value assessments has increased in diving destinations with a high incidence of sharks, such as the Caribbean [4], Micronesia [5], South Africa [6,7], Maldives [8] and Australia [9,10].

While the overall revenue generated by shark fishing was estimated at \$630 million US Dollars (USD) annually, the first global economic assessment of shark diving was evaluated at \$314 million USD per year [11]. The different spatial patterns displayed by these two activities explains differences in their economic impact, since fisheries are distributed throughout the world, whereas shark tourism is restricted to sites where sharks are present and the diving industry is well developed.

However, at a local scale, the commercial value of sharks as tourism resources, in shark diving areas, far exceeds their value for fisheries [12]. Furthermore, no assessments have yet been made regarding many sites where the development of shark watching as an economic activity is possible [11]. Indeed, out of 260 sites mentioned in "The Shark Watcher's Handbook" [13] as suitable for shark watching, only 83 currently feature shark ecotourism operations, and economic estimates on sharks as tourism resources were available for only 31 [3].

Economic benefits from ecotourism are a powerful argument for protecting these resources. Local communities benefit from ecotourism attractions through both an increased numbers of visitors and longer stays. From economic estimates, the evidence

\* Corresponding author.

E-mail addresses: [nat.pocas@gmail.com](mailto:nat.pocas@gmail.com) (N.M. Pires), [rgarla@hotmail.com](mailto:rgarla@hotmail.com) (R.C. Garla), [acarvalho.ufrn@gmail.com](mailto:acarvalho.ufrn@gmail.com) (A.R. Carvalho).

on tourist spending has shown higher daily and per-trip expenditure by tourists interested in shark diving, compared to other tourists [6,10,14–17].

The main goal of this paper is to estimate the value added in a major archipelagic tourism site in the western South Atlantic, through ecotourism in general and through diving, mainly shark diving, in particular. Specifically, we aimed (i) to assess the total economic activity for the whole archipelago; (ii) to understand the proportion of value added represented by diving, and specifically by shark diving; (iii) to estimate the economic benefits generated by sharks for fishers, in contrast to their value as an ecotourism asset; and (iv) to estimate future economic scenarios, if shark diving were promoted in the archipelago as an ecotourism attraction.

## 2. Methods

### 2.1. Study Area

Fernando de Noronha Archipelago (hereafter referred to as Noronha) is an isolated group of volcanic islands, with a total area of 26 km<sup>2</sup>, located 345 km off the northeastern coast of Brazil (Fig. 1).

About 60% of the main island of the archipelago, and the insular shelf within the 50m-deep isobaths, constitute a Marine Protected Area (MPA) established in 1988. The remaining 40% of the archipelago's main island, and the rest of the insular shelf, are an Environmental Protection Area, a conservation unit designed to promote the sustainable use of natural resources [18]. The population of Noronha consists of approximately 2800 permanent and 900 temporary residents, totaling 3700 [19].

Ecotourism is the main economic activity of Noronha, and attracts about 60,000 people annually [20]. Diving is one of the main attractions in Noronha, with approximately 24,000 diving operations annually [21]. The annual Gross Domestic Product (GDP) for

Noronha is estimated at \$13.3 million USD [19].

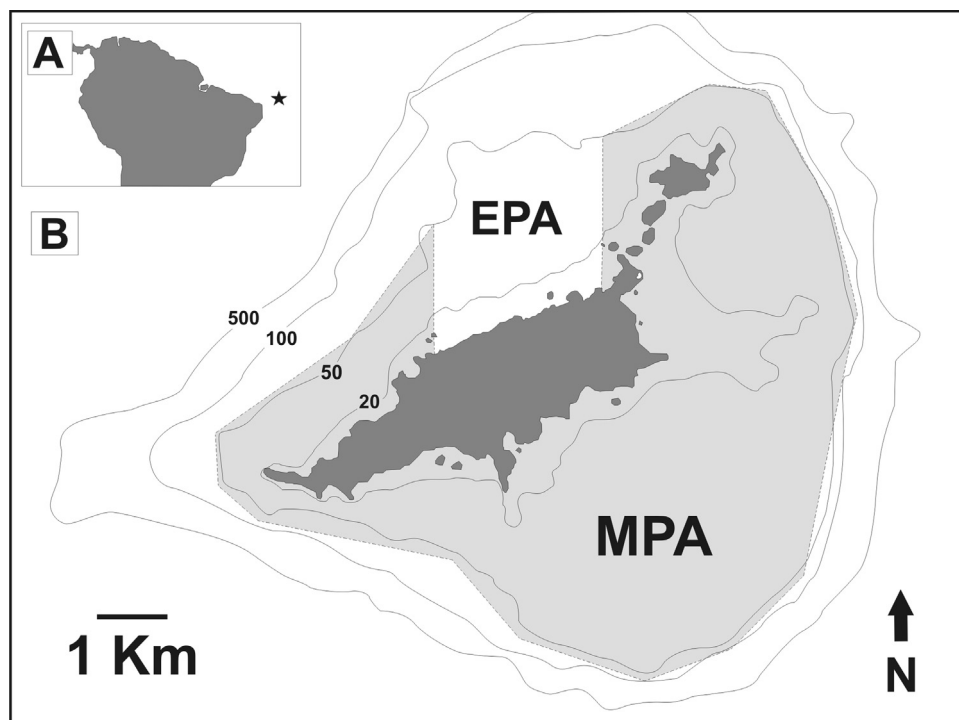
At least 20 shark species are known to exist in Noronha [22,23]. The three most common are the reef shark (*Carcharhinus perezi*), the nurse shark (*Ginglymostoma cirratum*) and the lemon shark (*Negaprion brevirostris*), which use the insular shelf as a nursery and mating area while their juveniles are resident [24–26].

The clear, tropical waters in the archipelago experience annual average temperatures of 26 °C, providing a high likelihood of encounters with the above-mentioned shark species. Juvenile lemon sharks (ranging from 70 to 150 cm in total length) and nurse sharks (100–200 cm in length) can be sighted in at least three snorkeling sites, swimming less than 10 m below the surface. Juvenile reef sharks (90–150 cm in length) and nurse sharks (100–200 cm in length) can be sighted while scuba diving, in depths ranging from 6 m to 40 m, in at least half of the 20 most important local diving locations. Adult individuals (more than 200 cm in length) of these species, as well as tiger sharks (*Galeocerdo cuvier*), can eventually be seen at the diving sites. In addition, at least three sightseeing areas on the top of cliffs about 50 m above sea level may be reached by a short hike; from these vantage points, adult lemon sharks can be observed at high tides [24–26].

### 2.2. Data sampling

For this study, people from five economic sectors of Noronha were interviewed. Different sets of questions were addressed to each target group, namely restaurant owners, dive operators, photographers, dive guides, environmental management authorities, fishers, and tourists (Table 1). Fishers and tourists were requested to provide more information than other groups, so they were interviewed with different questionnaires (see Supplementary Material).

Tourists were approached while waiting for their departing flight at Fernando de Noronha Airport. Half of the tourists (53%; N=229) answered a self-administered questionnaire, while 47% (N=196) were interviewed face-to-face to collect more specific



**Fig. 1.** A: Geographic localization of Noronha in the western South Atlantic indicated by the star. B: Boundaries of the Marine Protected Area (MPA, light gray) defined by the 50m-deep isobaths. EPA: Environmental Protection Area.

Download English Version:

<https://daneshyari.com/en/article/7488797>

Download Persian Version:

<https://daneshyari.com/article/7488797>

[Daneshyari.com](https://daneshyari.com)