

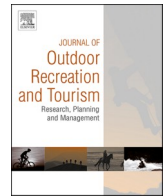


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Journal of Outdoor Recreation and Tourism

journal homepage: www.elsevier.com/locate/jort

Effects of the COVID-19 pandemic on SCUBA diving experience in marine protected areas

Marina Marconi^{*}, Vinicius J. Giglio, Guilherme H. Pereira-Filho, Fabio S. Motta

Marine Ecology and Conservation Lab. (LABECMar), Federal University of São Paulo, Rua Dr. Carvalho de Mendonça, 144, 11070-100, Santos, Brazil

ARTICLE INFO

Keywords:

Satisfaction
Human well-being
Ecosystem services
Outdoor recreational activities
Socioeconomic profile
Sustainability
Cryptic scenarios

ABSTRACT

Faced with the need for isolation of most people to reduce the transmission of COVID-19, a great concern for the well-being of the population has resurfaced. Considering the numerous benefits of outdoor activities to human health and well-being, we assessed whether the quality of the experience of recreational divers in a marine protected area (MPA) was impacted during the pandemic. We applied a semi-structured questionnaire to divers, collected their socioeconomic profile, preferences, motivations, experiences, and compared the results with those obtained in the previous season. We found that the quality of the recreational diver's experience remained high even during one of the world's biggest health crises. This suggests that the combination of contact with a preserved environment and the adaptation of regulations in favor of visitor safety was enough to stimulate positive experiences. Therefore, we highlight the importance of investing in adaptive management so that MPAs continue to promote ecosystem services such as human health and subjective well-being.

Management implications:

- Quality of experience for recreational divers remained high and was unaffected after the first major wave of COVID-19 cases.
- Through adaptive tourism management, MPAs can promote positive experiences even in challenging contexts.
- High impact of environmental attributes on the quality of divers' experience reinforces that threats to ecosystems are social impacts.
- Socially unequal access to benefits generated by MPAs may negatively influence population's support for these areas.
- Efforts are needed to strengthen the equity of distribution of positive social impacts in MPAs.
- Potential to provide positive experiences for users must be seen beyond economic value, but as an investment in the population's subjective well-being.

1. Introduction

Outdoor activities and interaction with the natural environment, such as in tourism in protected areas, contribute to reducing stress levels, in addition to improving cases of anxiety and depression (Aliyas, 2019; Gascon et al., 2018; Soga, Evans, Tsuchiya, & Fukano, 2021). Given these benefits, one of the objectives of marine protected areas (MPAs) that are open to tourism is to promote positive experiences in their visitors and, thus, also contribute to human well-being. However,

this type of MPA benefits remains poorly studied at the global and regional levels (Ban et al., 2019; Rasheed, 2020).

MPAs are the favorite destinations for recreational divers, an activity with a high connection between the tourist and the environment (Davenport & Davenport, 2006). The practice of recreational diving has positive effects on human mental health, especially for people who regularly use medication for chronic diseases (Carreño et al., 2020). However, the quality of the diving experience can be negatively influenced by the level of conservation and management context of the MPA

^{*} Corresponding author.

E-mail addresses: marina@atuair.com.br (M. Marconi), vj.giglio@gmail.com (V.J. Giglio), ghfilho@yahoo.com.br (G.H. Pereira-Filho), fmotta@unifesp.br (F.S. Motta).

<https://doi.org/10.1016/j.jort.2022.100501>

Received 9 September 2021; Received in revised form 22 November 2021; Accepted 23 February 2022

Available online 3 March 2022

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and, consequently, affect the well-being of divers and the sustainability of the activity in the area (Uyarra, Watkinson & Côté, 2009; Zimmerhackel et al., 2018; Marconi, Giglio, Pereira Filho, & Motta, 2020).

In February 2020, the first cases of the COVID-19 pandemic were reported in Brazil (Melo, Silva, Melo, & Freitas, 2020). Since then, hundreds of deaths led the Brazilian government to impose restrictions to avoid the SARS-CoV-2 spread involving mainly social isolation measures. The visitation of all federal MPAs was suspended in March 2020 to avoid SARS-CoV-2 spread (Brasil, 2020a) and reopened gradually since June 2020 following strict sanitary protocols (Brasil, 2020b). Recently, there has been a major change in the context of tourism in MPAs after the implementation of such sanitary measures and restrictions by authorities and managing bodies (Hockings et al., 2020; Brasil, 2020a). Concurrently, people worldwide were confined to their homes for many months, and trips were interrupted, leading to numerous limitations and restrictions on tourism and recreational diving.

This scenario caused changes in human behavior that ranged from the loss of livelihoods and food security to changes in travel and consumption patterns. These factors, together with a large number of pandemic-related deaths (Woolf, Chapman, & Lee, 2020), integrally impacted human well-being (Hanna et al., 2021; Lades, Laffan, Daly, & Delaney, 2020). Therefore, understanding the potential of MPAs to promote positive experiences in recreational divers, even in hostile scenarios like this one, brings new perspectives on the importance and ecosystem services that these areas provide. In addition, they contribute to the management of MPAs, bringing new data and perspectives to a complex and still poorly studied subject (Buckley et al., 2019; Naidoo et al., 2019; Romagosa, Eagles, & Lemieux, 2015; Jones et al., 2021).

Given this critical and unprecedented context, understanding the contribution of MPAs to the production of leisure satisfaction is an important step towards valuing these spaces as providers of positive experiences, and thus subjective well-being, for their visitors. Therefore, this study uses recreational diving performed at the MPA Alcatrazes Archipelago Wildlife Refuge as a model with the objective of:

- (1) providing a before-after comparison of the quality of recreational diving experience during the resumption of activities after the first wave of COVID-19 cases in Brazil, based on the results obtained in a pre-pandemic scenario (Marconi et al., 2020);
- (2) assessing which attributes related to the natural environment, MPA management, and quality of service most impacted the experience of recreational divers; and
- (3) monitoring whether the socio-economic profile, specialization, preferences, and motivations of divers have changed with the pandemic scenario.

Based on our results, we sought to offer insights on whether the restrictions and limitations established during the pandemic scenario affected the ability of the MPA to generate positive experiences and, consequently, promote the subjective well-being of visitors. Finally, the present study contributes to adaptive management, sustainability, and well-being promoted by diving tourism in MPAs.

1.1. Literature review

1.1.1. Motivations, visitor's satisfaction, and quality of experiences

The relationship between motivation and satisfaction is an issue that has attracted the attention of many tourism researchers, as satisfaction has a positive influence on tourists' recommendations and their intention to revisit (Hui, Wan, & Ho, 2007; Prebensen, Skallerud, & Chen, 2010; Bigné, Andreu, & Gnoth, 2005). In this sense, motivation is used to understand why people behave in a certain way and what needs they expect to be satisfied (Dann, 1981). Thus, the concepts of need, expectation, and satisfaction are related to motivation, although motivation and satisfaction are distinct constructs (Albayrak & Caber, 2018; Fluker & Turner, 2000). It is also important to highlight that motivation is

considered one of the essential forces for decision-making concerning a trip and is influenced by individual tourists' preferences, prior information, and previous experiences (Dagustani, Kartini, Oesman, & Kaltum, 2018).

Assuming the expectancy theory framework, which says that one's motivation for something arises as a function of the expectation that one has the ability to obtain desired results, it is possible to clarify which motivations affect tourist satisfaction (Albayrak & Caber, 2018; Hsu, Cai, & Li, 2010). To identify motivations concerning tourism, the pull-push framework is applied (Dann, 1977). This approach assumes that what makes people travel is a combination of factors related to both their internal desires (push factors) and attributes offered by the destination (pull factors) (Crompton, 1979; Dann, 1977; Mohammad & Som, 2010). Following this concept, the Optimal Arousal Theory (Iso-Ahola, 1982) suggests that tourists seek activities that provide new experiences and psychological rewards (internal/seeking factors), which make them escape the routine (external/escaping factors). In addition, there is empirical evidence that motivation measured after the activity can be used as a respondents' predictor of overall satisfaction (Albayrak & Caber, 2018).

Satisfaction can be conceptualized from both cognitive and emotional perspectives. From a cognitive perspective, satisfaction is considered as an evaluation carried out after the experience and includes the individual's expectations and performance, for example (Bowen & Clarke, 2002). In the emotional perspective, it is framed as a response derived from experience (del Bosque & San Martín, 2008). More recently, satisfaction came to be understood as a multidimensional construct that encompasses both psychological and emotional factors (Correia, Kozak, & Ferradeira, 2013). Thus, in this study, satisfaction was observed as the emotion resulting from the evaluation of the experience during recreational diving (Babin & Griffin, 1998), which reflects the accumulated weight of the performance of certain attributes (Pizam, Neuman, & Reichel, 1978; Mikulic & Prebezac, 2008). In our case attributes were related to the area's management, to the services' quality provided, and the natural environment.

In this context, the quality of experience is obtained during outdoor recreational activity and can be defined as the psychological state resulting from a visit to the natural environment (Baker & Crompton, 2000; Prayag, Hosany, & Odeh, 2013). It can be influenced by the visitor's socioeconomic profile, motivations, preferences, and satisfaction (Baker & Crompton, 2000; Gnoth, 1997; Yoon & Uysal, 2005). Therefore, the quality of an experience is a complex variable that is not only related to the recreational activity itself but is also affected by the individual's background and the visit's context. Based on this, the quality of visitors' experience was represented by the multidimensional satisfaction of recreational divers at the Alcatrazes Archipelago Wildlife Refuge. In this scenario, the divers' motivations were considered as subjective indicators of their main expectations and needs when practicing the activity.

1.1.2. Quality of experiences and subjective well-being

In recent decades, there has been a growing academic interest in empirical research on the concept of well-being (Chen, Fu, & Lehto, 2016). The conception of subjective well-being is a multidimensional and dynamic subject that depends on the relationship between factors internal to individuals and factors related to the external context (Staempfli, 2007). Subjective well-being can be defined as all types of evaluations individuals make of their own lives, whether positive or negative (Diener, 2006). Thus, a complex approach to subjective well-being suggests that it emerges from the interaction between interdependent domains, such as leisure, work, health, family, among others (Diener, Suh, Lucas, & Smith, 1999). Therefore, the general level of subjective well-being can be conceptualized as the degree to which positive emotions prevail over negative ones (Kammann & Flett, 1983).

Recreational physical activities combined with contact with nature have shown positive effects on well-being (Kuykendall, Tay, & Ng, 2015;

Niedermeier, Einwanger, Hartl, & Kopp, 2017; Thompson et al., 2011). Over the past decade, studies found that leisure activities in natural environments contribute to positive changes in subjective well-being (Chen et al., 2016; Kuykendall et al., 2015; Matsumoto, Sato, Asada, & Chiashi, 2018) and in human health (Carreño, Gascon, Vert, & Lloret, 2020; Romagosa et al., 2015). These experiences can contribute to the reduction of stress levels and the improvement of cases of anxiety and depression (Aliyas, 2019; Gascon et al., 2018; Soga et al., 2021). It was also found that the longer the time spent on leisure activities, the higher the impacts of these benefits on health and subjective well-being (Schlemmer, Blank, & Schnitzer, 2019). With these concepts in mind, studies have already shown that one of the main components of subjective well-being, general satisfaction with life, is positively related to satisfaction in leisure or a tourism experience (Neal, Sirgy, & Uysal, 1999; Chen et al., 2016; Tien, Anh, Ngoc, Trang, & Duc, 2021; Schlemmer, Scholten, Niedermeier, Kopp, & Schnitzer, 2021). Therefore, an individual's experiences have the potential to influence the components of their subjective well-being (Chen et al., 2016; Schlemmer et al., 2021).

In MPAs, it was observed that the marine and coastal environment can contribute to seven domains of subjective well-being, including environment, health and safety, social connections, education and knowledge, culture and heritage, governance, and local economy (Golan & Barclay, 2020). However, understanding the influence and potential that MPAs have to produce this kind of positive impact on their visitors is still scarce (Ban et al., 2019). As previously mentioned, leisure satisfaction is one of the most investigated topics in tourism, as it is linked to tourist loyalty and the recommendation of the destination. Thus, the focus has been on discovering the causes of subjective well-being, as it fluctuates depending on the dimension studied.

Herein, we directly assessed the degree of satisfaction of recreational divers with leisure in an MPA during the COVID-19 pandemic. We performed a multivariate analysis with global satisfaction as a dependent variable on attributes related to the environment, MPA management, and services provided by dive operators. Thus, we sought to offer insights into the MPA's ability to generate positive experiences and, consequently, promote the subjective well-being of visitors in a critical scenario.

2. Study Area

The Alcatrazes Archipelago Wildlife Refuge (Alcatrazes Refuge) (Fig. 1) is a no-take MPA established in 2016. It is located 33 km off the coast, with an area of 674.09 km² on the north coast of the state of São Paulo, southeastern Brazil. It is considered the shelter of one of the largest biomasses of Brazilian reef fish along the Brazilian coast (Morais, Ferreira, & Floeter, 2017) and is characterized by rocky reefs covered by macroalgae, filamentous algae (turfs), encrusting coralline algae, sponges, and corals (e.g., *Mussismilia hispida* and *Madracis decactis*) (Aued et al., 2018; Motta et al., 2021).

According to the National System of Nature Conservation Units (SNUC - Brasil, 2011), wildlife refuges have the conservation of biodiversity as their main objective and correspond to IUCN category III (Day et al., 2019). Before its creation, the area was restricted to public use by the Brazilian navy's interests, and only in December 2018, it was opened for visitation, with SCUBA diving operations and onboard visits.

During the pandemic, the Alcatrazes Refuge remained closed to public use between March and July 2020 to reduce the transmission rate of SARS-Cov-2 during the first major wave of cases in the country. In August 2020, visitation activities at the Alcatrazes Refuge were resumed, following sanitary protocols. One of the implemented restrictions was the 50% decrease in the maximum number of divers on the vessel and thus the number of divers per dive guide increased from four to six. Additionally, the mandatory use of a mask and physical distance during the navigation trip (Brasil, 2020b).

3. Material and methods

3.1. Study design

The present study used as a baseline the results obtained at the Alcatrazes Refuge in the period before the COVID-19 pandemic and was published in Marconi et al. (2020). This configures what we considered as the *pre-pandemic period* and refers to a sampling undertaken between September 2018 and September 2019 that comprised 253 questionnaires filled representing 27% of the total number of divers who visited the areas during the study period. The novel data collected in this study comprises the *pandemic period*, considered as the period after the resumption of activities during the COVID-19 pandemic (see item 3.2

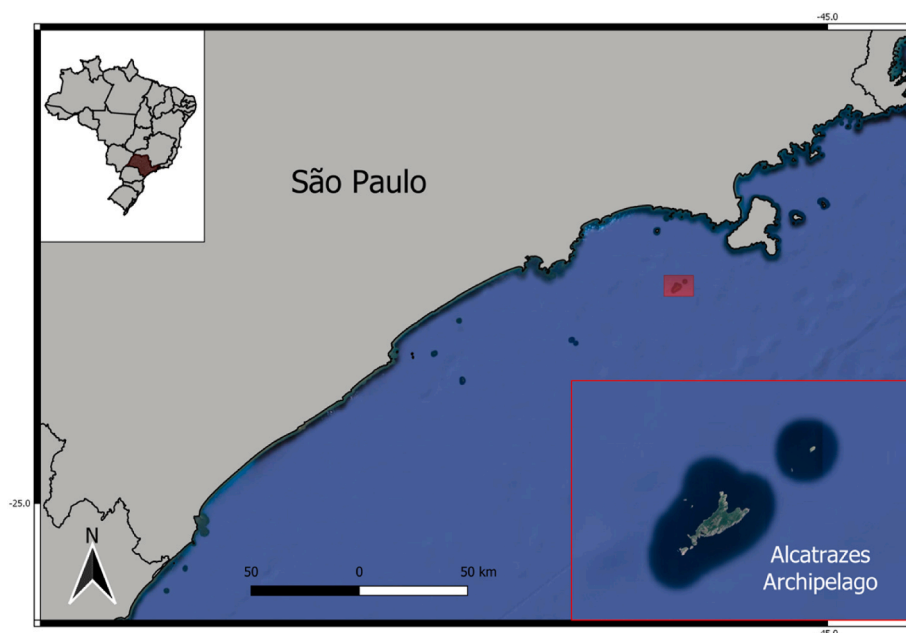


Fig. 1. Study Area. Alcatrazes Archipelago Wildlife Refuge.

below). This was possible because indicators related to the human dimension of recreational diving, such as the socio-economic profile, the quality of the experience, and the behavior of visitors, are monitored since the beginning of visitation activities at the Alcatrazes Refuge.

Therefore, it was possible to compare the results of both periods to assess how the COVID-19 pandemic context impacted the SCUBA diving experience in the MPA. The diving experience encompassed the overall satisfaction and the relative impact of the performance of individual attributes on this variable. The profile, preferences, experiences, and motivations of the divers were used to characterize the users of the MPA and provide further context for the interpretation of results. Subjective well-being was considered as an indirect result of the positive impact generated by the MPA on the divers' quality of experience.

3.2. Questionnaire design and sampling

A semi-structured questionnaire was applied to recreational divers (Supplementary Material, S1) between August 2020 and March 2021. This sampling period was defined by the month when diving operations at the Alcatrazes Refuge resumed and the month before Brazil's second wave peak of COVID-19. The questionnaire included aspects related to the diver's socioeconomic profile, quality of dive experience, specialization, preferred organisms, motivations, and satisfaction. This questionnaire was developed for a previous study (Marconi et al., 2020) based on the works of Mikulic and Prebezac (2008); Coghlan (2012); Lucrezi, Saayman, and Merwe (2013); and Bentz, Lopes, Calado, and Dearden (2016). The specific attributes included in the questionnaire (see Table 1) were selected in partnership with the local managers and dive operators, who provided insights into which aspects they saw as important to be evaluated.

Contact with visitors occurred either in person after the diving operation or via QR-Code on a sticker attached to the diving operators' vessels and disclosed by guides. Data collection is part of projects approved by the Brazilian Ethics Committee (N° 890074718.9.0000.5505) and by the managing body of the MPA (SIS-BIO: N° 62932-1).

To understand diver perceptions concerning their preferred organisms, a unidirectional 5-point Likert scale was used (between 1 = not at all important and 5 = extremely important). Regarding the motivation that made them choose Alcatrazes Refuge, divers selected only one of four possibilities: "The site is an area where nature is preserved"; "I'm interested in observing/Photographing species"; "Escape the routine/Relax" and "Spend time with family and friends".

The quality of the diving experience is a complex variable. It can be derived from a complex set of consumer perceptions about the experience itself, but also a range of peripheral experiences associated with diving (Maccarthy, O'neill, & Williams, 2006). In this way, we collected the performance of 12 individual attributes related to MPA management, the services provided by operators and conductors, and the

natural environment (see Table 1). Overall satisfaction was measured using a 10-point scale (1 = very dissatisfied; 10 = very satisfied) and a unidirectional 5-point Likert-type scale was used to assess the performance of the attributes, ranging from "1 = not at all satisfied" to "5 = extremely satisfied". The reliability of the questionnaire was estimated with Cronbach's alpha coefficient, using the *psych* package in R (Revelle, 2018).

3.3. Data analysis

All analyzes were performed using R version 3.6 (R Core Team, 2019). Data related to the divers' characteristics, preferences, and motivations were assessed using frequency descriptive methods through package *likert* (Bryer & Speerscheider, 2016). The differences between mean overall satisfaction of the pre-pandemic and pandemic periods were tested using a non-parametric ANOVA (Kruskal-Wallis test). To understand the impact of individual attributes on overall satisfaction we use the same approach used by Marconi et al. (2020), initially proposed by Mikulic and Prebezac (2008), which is described in the next paragraphs.

First, a multiple regression analysis was performed using two sets of dummy variables as independent variables and overall satisfaction values as dependent variables (Matzler & Sauerwein, 2002; Mikulic & Prebezac, 2008; Marconi et al., 2020). From this, each attribute obtained two standardized regression coefficients, one referring to the attribute's ability to generate dissatisfaction when its performance was low (Penalty Index - p) and the other indicating the attribute's ability to generate satisfaction when its performance was high (Reward Index - r). The absolute values of the penalty and reward indices of each attribute were added (Equation (1)), giving us their Range of Impact on Overall Satisfaction (RIOS) (Mikulic & Prebezac, 2008).

Subsequently, we performed an Impact Range-Performance Analysis (IRPA) to guide managers on management adjustment priorities. This analysis uses arithmetic means of the performance of each attribute and their impact values on overall satisfaction (RIOS). A horizontal dotted line was drawn on the grand mean of attribute performances and a vertical one was drawn on the grand mean of RIOS values. The attribute was considered as a high priority if its RIOS was high, but its performance was lower than average. However, if the RIOS value was high and the performance was also above average, the attribute was considered as a medium priority (Mikulic & Prebezac, 2008).

To compare the potential of an attribute to generate satisfaction (Equation (2)) with its potential to generate dissatisfaction (Equation (3)), we evaluated its asymmetry between the attribute's performance and overall satisfaction using an Impact-Asymmetry Analysis (IAA). Thus, we can classify attributes using the Impact Asymmetry Index (IA; Equation (4)) value as the following: "delighters" ($IA \geq 0.4$), "satisfiers" ($0.4 \geq IA > 0.1$), "hybrids" ($0.1 \geq IA \geq -0.1$), "dissatisfiers" ($0.1 > IA \geq -0.4$) and "frustrators" ($IA < -0.4$) (Mikulic & Prebezac, 2008). This step allows researchers, managers, and entrepreneurs to understand the attributes that most contribute to visitor satisfaction (Coghlan, 2012).

The following equations were used:

$$RIOS_i = |r_i| + |p_i| \quad (1)$$

$$SGP_i = |r_i|/RIOS_i \quad (2)$$

$$DGP_i = |p_i|/RIOS_i \quad (3)$$

$$IA_i = SGP_i - DGP_i \quad (4)$$

4. Results

4.1. Recreational divers' profile

Between August 2020 and March 2021, 564 SCUBA divers visited the

Table 1
Individual attributes assessed in the questionnaire (Marconi et al., 2020).

Category	Attribute
MPA Management	1. Easy access to prior information on-site visitation
	2. Management rules to avoid environmental impact
	7. Low crowding of divers at the same point
	8. No Litter
Service Quality	9. No fishing or lost fishing tackle
	3. Boarding/unloading location
	4. Quality of service provided
	5. Briefing/additional guide or instructor guidance
Natural Environment	6. Low impact techniques of other divers (buoyancy control, touching organisms, etc.)
	10. Water visibility
	11. Diversity and abundance of marine biota and flora
	12. Encounters with animals

Alcatrazes Refuge. Of these, 44 responded to the questionnaires, representing approximately 8% of the total number of divers who visited the area in this period. Cronbach's alpha coefficient was greater than 0.7, suggesting a high level of internal consistency of the questionnaire (Hora, Monteiro, & Arica, 2010).

Most divers were male, aged between 26 and 45 years (Table 2). Approximately two-thirds of respondents were postgraduates and had a family monthly income equal to or greater than six Brazilian minimum wages (considered as R\$ 1100,00 \approx US\$ 212,76) per person. Regarding certification, most divers had an advanced diving course (*Advanced Open Water* or equivalent). In addition, about 72% of the divers who visited the Alcatrazes Refuge during this period lived in the State of São Paulo, that is, they resided in the same State where the Alcatrazes Refuge is located. Considering the diving activity itself plus transport and accommodation, the average expense was US\$ 450.00 \pm 232 (mean \pm SD).

Divers' favorite organisms were elasmobranchs (sharks and rays), followed by large fish (e.g., groupers, jacks, etc.). While the least preferred ones were the cryptic and sessile organisms (Fig. 2). In the pre-pandemic period, the preferred and least preferred organisms were the same despite the different orders of preference. Regarding the motivations that led divers to choose to visit the Alcatrazes Refuge during the pandemic, "The place is an area where nature is preserved" was predominant with 44%, followed by "Escape the routine/Relax" with 30%. The least important motivation for divers was "I'm interested in observing/Photographing species" with 11%. The most important motivation remained the same between the two periods. On the other hand, contrary to what was observed in the period before the pandemic, the second most important motivation for recreational divers was "Escape from routine/Relax" (Marconi et al., 2020).

4.2. Divers satisfaction

The average overall satisfaction of divers during the pandemic was 8.60 (± 1.50), where values close to 10 indicate high satisfaction levels (Fig. 3). This result was statistically similar to that obtained in the period before the pandemic ($p = 0.342$; $q = 1.34$; Marconi et al., 2020).

Regarding the IRPA (S2), only three individual attributes were

Table 2

Socioeconomic profile and specialization of recreational divers who visited the Alcatrazes Refuge in two monitoring periods, the first period between December 2018 and October 2019 called Pre-pandemic (modified from Marconi et al., 2020) and the second between August 2020 and March 2021 during the COVID-19 pandemic. * The Brazilian minimum wage was considered as R\$ 1100,00 = US\$ 212,76. ** Values expressed as a mean and standard deviation.

	Pre-pandemic	Pandemic
Gender - %		
	71 M	76 M
	29 F	24 F
Age (years) - %		
<15	0	2.5
15–25	6.4	2.5
26–35	26.2	28
36–45	40.4	38
46–55	17.7	21.5
56–65	7.7	5
66–75	1.6	2.5
Schooling - %		
University Graduate	37	33
Postgraduate	51.8	61
Income (Brazilian minimum wages*) - %		
Until 1	0.4	0
1 a 5	17.2	13
6 a 10	32	33
>10	38	33
Certification - %		
	28 Basic	21 Basic
	42 Advanced	30 Advanced
Average travel expense (US\$)**	350 \pm 147	450 \pm 232.

classified as of high priority: "2. Management rules to avoid environmental impact", "10. Water visibility", and "12. Encounters with animals" (Fig. 4. B). In the pre-pandemic period (Fig. 4. A), only attributes "11. Diversity and abundance of marine fauna and flora" and "12. Encounters with animals" were classified as such (Marconi et al., 2020). Only the attribute related to the encounters with preferred animals remained as a priority in both periods. On the other hand, the performance of the attribute related to the biodiversity of the area was higher and decreased when compared with attributes "2. Management rules to avoid environmental impact" and "10. Water visibility".

The attributes that appeared as a medium priority for management during the pandemic were: "1. Easy access to prior information on-site visitation", "6. Low impact techniques of other divers"; "8. No litter" and "9. No fishing or lost fishing tackle". When compared with the pre-pandemic period, only attributes "8. No litter" and "9. No fishing or lost fishing tackle" remained as of medium priority (Marconi et al., 2020). The attribute related to diver agglomeration had better performance and did not appear among the priorities for management, while attributes "1. Easy access to prior information on-site visitation" and "6. Low impact techniques of other divers" had worst performances during the pandemic period.

According to the IAA analysis, two attributes that appeared as a high priority in the IRPA analysis ("2. Management rules to avoid environmental impact" and "12. Encounters with animals"), were also the ones that most positively impacted satisfaction (*delighters*) during the pandemic (Fig. 4. C, D). We also found major differences in the classification of attributes between both periods. In the pre-pandemic period, most attributes were classified as strong generators of dissatisfaction (*frustrators*; Marconi et al., 2020), while during the pandemic, all attributes evaluated were classified as strong satisfaction generators (*delighters*).

5. Discussion

Our results revealed that the quality of the SCUBA diver's experience was not affected by the COVID-19 pandemic, remaining with a high overall satisfaction level during one of the world's biggest health crises. The well-being of people during social isolation decreased markedly. One of the reasons was the decrease in contact with nature, which is positively associated with better mental health (Dempsey, Devine, Gillespie, Lyons, & Nolan, 2018; Pouso et al., 2021). Even with restrictions, the intense contact with nature through SCUBA diving provides significant enjoyment to the visitors who ranked it as a highly positive experience. Also, during the pandemic, the divers were more sensitive about the beneficial effects of SCUBA diving, as revealed by the fact that all attributes were classified as *delighters*. This indicates that even in a critical scenario such as the one presented by the COVID-19 pandemic, recreational diving at the Alcatrazes Archipelago was able to contribute to the subjective well-being of visitors.

5.1. Profile of recreational divers

The socioeconomic profile of the interviewees consisted mainly of middle-class men with a high level of education and remained the same as that observed during the pre-pandemic period. This profile is characteristic of the recreational SCUBA diving population and justifiable considering the high value of equipment and activity (Musa, Seng, Thirumoorathi, & Abessi, 2011). As such, contemplation, and benefits of the scenic attributes of Alcatrazes Refuge continue to be enjoyed only by a fraction of the society. These are people that are also more prone to access facilities and entertainment with safety practices during the COVID-19 pandemic (i.e., home office, internet access, private TV channels, food delivery services, private gardens and swimming pools, private cars, and others). These results further corroborate a recent study aimed at understanding the impacts of MPAs on the well-being of local communities. The authors found that governance was the domain with the highest number of negative impacts from the community

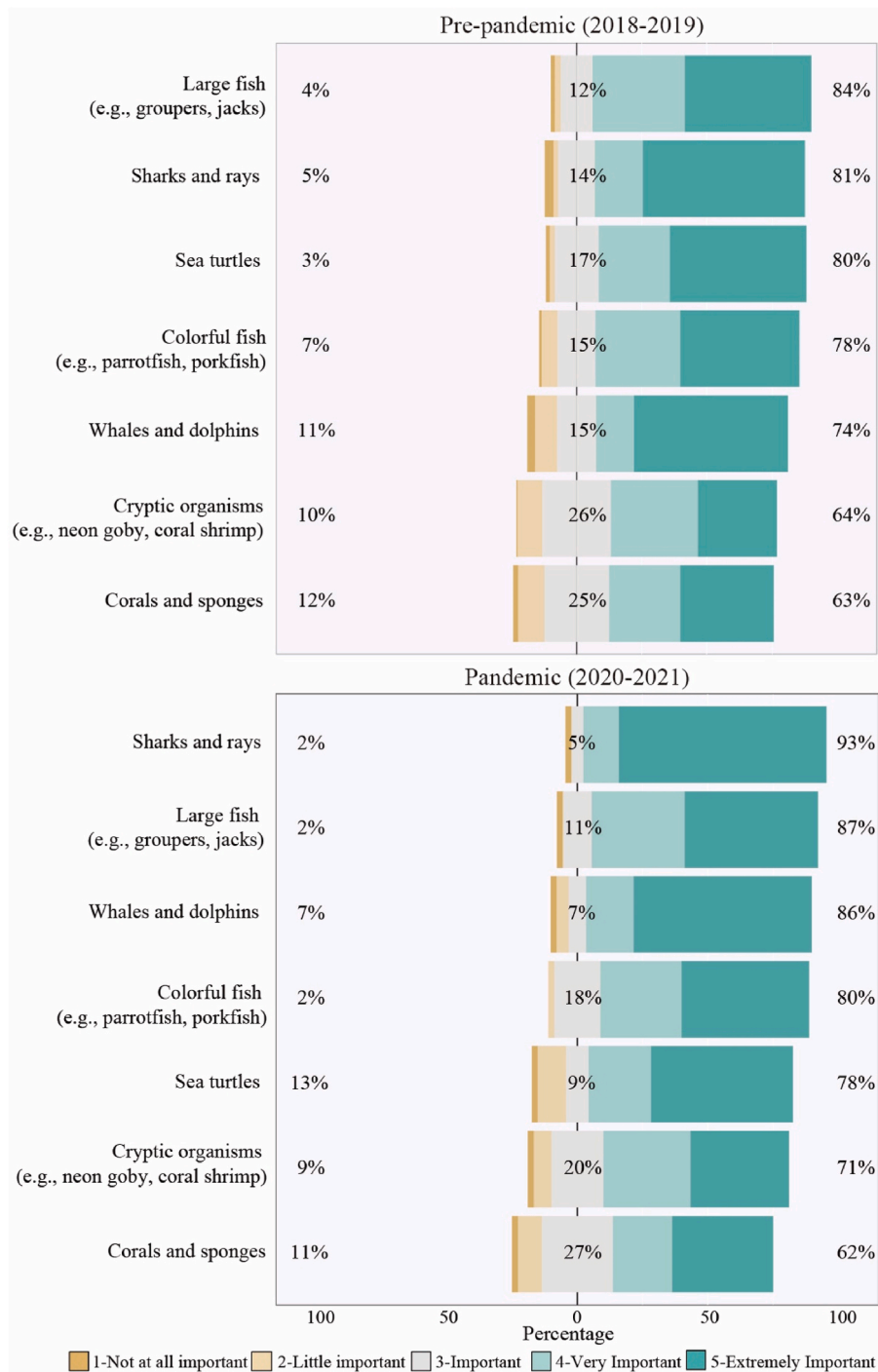


Fig. 2. Divers' preferred marine organisms. Organisms are organized (top-down) in descending order from those with the highest percentage of positive responses (4 - Very Important and 5 - Extremely Important) to those with the highest percentage of more negative responses (1 - Not at all Important). From left to right, numbers represent the summed percentages of responses.

perspective (Gollan & Barclay, 2020). Moreover, the attribute that most concerned participants were the uneven distribution of negative and positive impacts of MPAs (Gollan & Barclay, 2020).

Unfortunately, this limited access could decrease even more the engagement of the general public in favor of marine conservation. This is especially the case during the COVID-19 pandemic when the social inequality highlighted the absence of primary survival needs for most portions of the population in developing countries (Needham, 2010; Rossi, Byrne, Pickering, & Reser, 2015). Most of the interviewees are also residents of southeastern Brazil, where the Alcatrazes Refuge is

located. This is probably because domestic travel tends to offer less risk of contamination because of the short distances (Kusumaningrum & Wachyuni, 2020) and most divers had access to private vehicles to move from their home-cities toward coastal areas.

From the perspective of subjective well-being, governance is an essential domain and plays a relevant role in the acceptability of MPAs because it brings together aspects such as fairness, equity, participation, and trust (Jones, McGinlay, & Dimitrakopoulos, 2017; Gollan & Barclay, 2020). Therefore, we recommend that management devote efforts to strengthening social equity in MPAs through adaptive management and

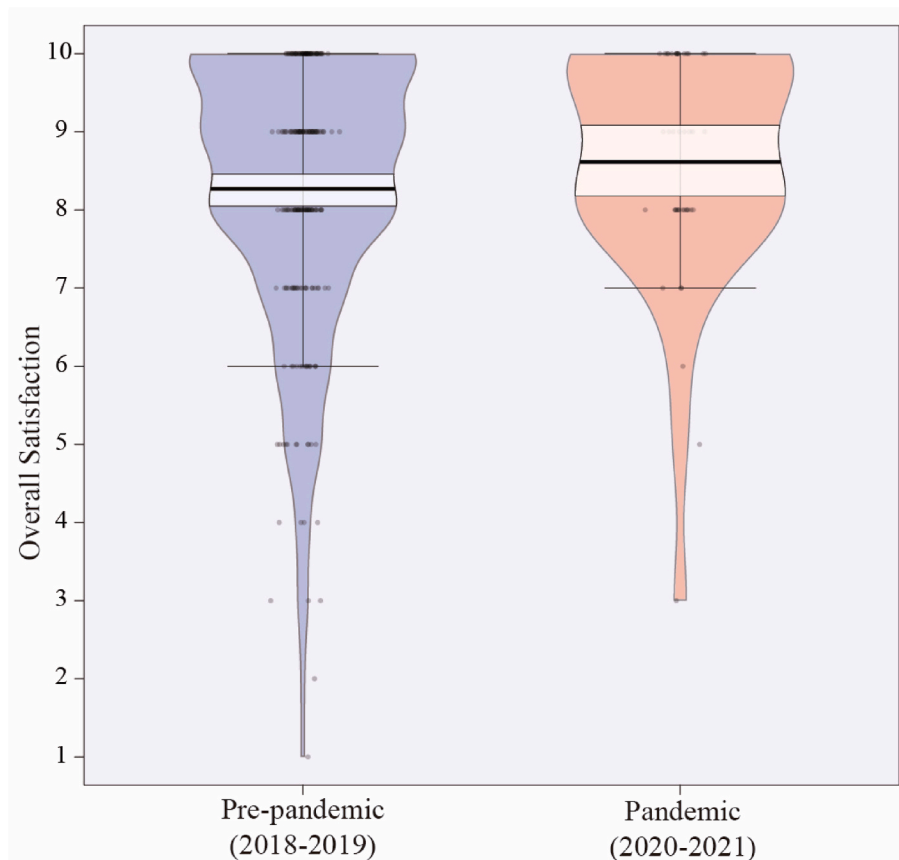


Fig. 3. Divers' Mean Overall Satisfaction. Points represent raw data, the dark line the mean, the bean the density, the band the 95% confidence interval, and the deviations are the 10% and 90% percentiles.

bidirectional communication between government and stakeholders (Fox et al., 2012). In addition, it would be appropriate to invest in more objective actions, such as allocating a percentage of seats on vessels so that low-income people can visit these places for free.

Megafauna organisms were the preferred organisms to be viewed by divers in both pre-pandemic and pandemic phases. These organisms usually are preferred to be viewed by divers (Giglio, Luiz, & Schiavetti, 2015). Megafauna organisms attract attention because many species are charismatic and threatened and are generally the focus of conservation projects and media campaigns (McClenachan, Cooper, Carpenter, & Dulvy, 2011). In Alcatrazes Refuge, diving operators constantly use images of encounters with elasmobranchs (sharks and rays), big fish (groupers and jacks), sea turtles, and cetaceans to publicize the destination since they are relatively abundant in the region (ICMBio, 2017; Motta et al., 2021; Karlovic, Gomes, Paiva, Babcock, & Dias, 2021). Meanwhile, cryptic and sessile organisms gain less publicity and thus are not valued by most divers. This prevents the perception of one of the major threats to which Alcatrazes Refuge is now subjected, the sun-coral invasion, besides local corals bleaching (Savio et al., 2021; Banha et al., 2019).

As in the pre-pandemic period, our results showed that the main reason for visiting the Alcatrazes Refuge was the search for a place where nature is preserved, related to attributes offered by the destination (pull factors) (Dann, 1977; Marconi et al., 2020). However, a major difference was that the second main motivation of recreational divers was related to intrinsic factors (push factors), such as the desire to escape the routine and relax (Dann, 1977; Dwisaputra & Achnes, 2017; Yousaf, Amin, & Santos, 2018). This second result was expected when we consider that a large part of the population was in a context of social isolation, living in limited environments and with little or no contact with nature. It also reinforces the idea that the trend after the pandemic

will be to invest in nature tourism, not only for a passive contemplation of nature but also to relax and escape routine (Kusumaningrum & Wachyuni, 2020).

In this way, tourism can also be carried out to strengthen health and develop physical and psychological well-being, especially by visitors from large urban centers whose contact with nature is restricted (Utama & Susanto, 2016). With this in mind, we highlight the value of MPAs as tourist destinations capable of contributing not only to the conservation of biodiversity but also as destinations sought after by visitors interested in improving their health and subjective well-being through contact with nature.

5.2. Quality of recreational diving experience during the pandemic

The quality of recreational divers' experience remained high even amid a challenging period such as the COVID-19 pandemic. This result may be linked to the fact that due to the extended period people were subjected to social isolation, divers were less demanding and, thus, the opportunity to enjoy contact with nature was enough for a high-quality experience. Joyful anticipation cannot be ruled out as an important driving force for the high quality of experience observed. This is due to the social context of a global health crisis and that diving provides an immersion in the marine environment, besides being a challenging physical activity and a way to escape from routine.

Joyful anticipation is conceptualized as anticipating an experience that triggers well-being (or happiness) even before undertaking the experience (Kumar, Killingsworth, & Gilovich, 2014). This can generate higher social benefits, and, in some cases, it was able to surpass the experience even before it was performed (Kumar et al., 2014). This effect can also be corroborated when the IAA results before and during the pandemic are considered. All attributes evaluated were considered

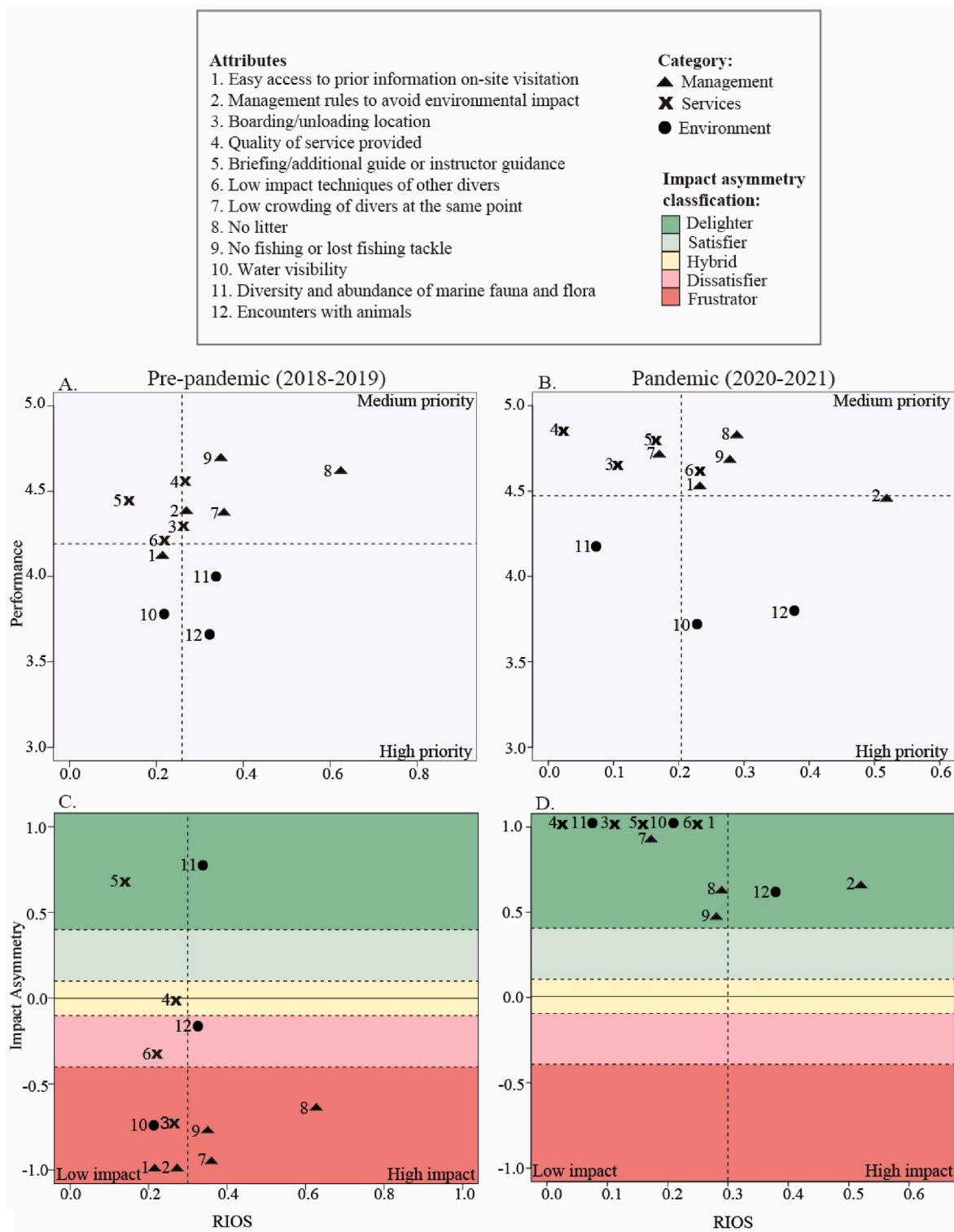


Fig. 4. A-B. Impact range-performance Analysis (IRPA). The range of attribute-impact on overall satisfaction (RIOS) is represented along the X-axis and the average performance of the attributes is represented along the Y-axis. The horizontal dotted line was drawn on the grand mean of attribute performances, while the vertical one was drawn on the grand mean of RIOS values of each attribute. C-D. Impact-Asymmetry Analysis (IAA). The range of attribute impact on overall satisfaction (RIOS) is represented along the X-axis, while the Impact Asymmetry Index (AI) is represented along the Y-axis.

strong satisfaction generators or with little negative influence on the divers' experience (classified as *delighters*) during the pandemic.

On the other hand, we cannot fail to consider the role that adaptive management may have had on divers' experience (Giglio et al., 2022). For the resumption of activities, the management team of Alcatrazes Refuge assessed the country's context and reformulated some

regulations to increase the safety of visitors to prevent the transmission of SARS-Cov-2 (Brasil, 2020b). Such regulations included the decrease in the number of divers per vessel, use of individual disposable materials that were previously prohibited, and mandatory use of masks and physical distancing. After the pandemic, there is also a tendency for tourists to prefer more isolated and safe destinations, so that the possible

feeling of security during the visit may have contributed to the high overall satisfaction (Kusumaningrum & Wachyuni, 2020). Therefore, further studies are needed to assess the influence of the pandemic on the management of MPAs and the quality of the experience after the COVID-19 pandemic, as new trends are expected concerning the demands of tourists.

When it comes to individual attributes, the one related to the local biodiversity had a higher performance when compared to the pre-pandemic period. Although the diversity and abundance of marine organisms during the diving are not directly controlled by management, this result may indicate positive effects related to protection time (Edgar et al., 2014). In addition, there may have been a decrease in expectations regarding biodiversity, as divers may also be better informed about the conservation context of the area and the oceanographic conditions encountered during the visit (Marconi et al., 2020).

Regarding the attribute related to animal encounters, which again emerged as a priority for management, it is necessary to consider that it is difficult to separate the experience of being in the natural environment and encountering animals during wildlife tourism (Curtin, 2009). In this sense, in areas affected by fishing, megafauna organisms are the last to recover their populations due to their life histories (Dulvy et al., 2014; Sadovy de Mitcheson et al., 2012), justifying the small number of encounters during the visit. Despite this, this attribute was not a generator of dissatisfaction, contrary to what was observed in the pre-pandemic period (Marconi et al., 2020).

Another priority that emerged during the pandemic was related to the rules established by the management to avoid environmental impact. This is likely related to divers being more concerned with safety issues than with protecting coral reefs and marine life (Musa et al., 2011). In this sense, it's important to understand which regulations can generate negative experiences in recreational divers and whether there is a relationship with their profiles and expectations. Even more so, considering that tourists with conservationist orientations tend to be more receptive to actions in favor of preservation than those with orientations more focused on the use of the environment (Needham, 2010; Rossi et al., 2015). Consequently, to predict negative reactions to management decisions and achieve high performance in these attributes, it's necessary to comprehend the profiles and motivations of divers and promote actions that encourage the participation and interest of visitors in the management of the area.

Regarding attributes related to litter, fishing, and lost fishing tackle that appeared as priorities, it is highlighted that during the period in which tourism activities were interrupted, the occurrence of prohibited practices may have been favored (Waithaka et al., 2021), as dive operators and guides assist inspection by denouncing illegal activities (Steenbergen, 2013). The emergence of the attribute related to low impact techniques from other divers as a priority may be associated with the recent increase in the proportion of divers per guide during the pandemic, from four to six divers per guide (Brasil, 2020b). This may have hindered the dive guides' ability to warn visitors about inappropriate behavior (Roche et al., 2016).

Overall, our results showed that most of the attributes that had a high impact on Global Satisfaction and that appeared as priorities for MPA management were related to environmental quality and management. This corroborates the suggestion that the domain of well-being related to the environment can be divided into two attributes: a healthy natural environment, and sustainably managing the environment (Gollan & Barclay, 2020). This study also observed that users, especially recreational users, saw the contemplation and encounter with marine life as a positive impact of the MPA. Therefore, our results also support the idea that the loss of habitats and threatened species must be considered not only ecological but also social impacts (Gollan & Barclay, 2020; Vanclay, Esteves, Aucamp, & Franks, 2015).

6. Conclusions

Given all the impacts caused by the COVID-19 pandemic to the tourism industry and protected areas (Hockings et al., 2020; Spenceley et al., 2021; Waithaka et al., 2021) maintaining the quality of the experience has been a challenge for diving stakeholders. In this respect, the importance of thinking about the sustainability of diving beyond the environmental aspect is highlighted. During the resumption of public use at the Alcatrazes Refuge, maintaining the high quality of the visitor experience demonstrated the importance of adaptive management for the continuous promotion of positive experiences in its visitors.

In addition, the COVID-19 pandemic has strengthened the worldwide society's view on the connection between healthy nature and human well-being as well as the critical need to change the relationship between people and the natural environment (Hockings et al., 2020; Waithaka et al., 2021). In this context, our findings suggest a higher sensitivity of visitors to the beneficial effects of SCUBA diving on their well-being during the pandemic. Thus, in a post-pandemic scenario, it is fundamental to promote information campaigns that reinforce the value of MPAs for human health and well-being.

The recognition that a preserved marine environment can contribute to the health and quality of life of its users can be a key factor for MPAs to be valued by society. It has already been observed that MPAs are valued by their recreational users when they enjoy positive experiences related to contemplation and encounters with marine life (Gollan & Barclay, 2020). It was also observed that participants perceived a lack of knowledge in the local community about the environmental benefits promoted by the MPAs, which inhibited the positive impacts and made the community not care about its conservation (Gollan & Barclay, 2020). Thus, it is understood that the positive impacts of MPAs are linked to environmental quality and access to the environment.

Our study corroborated the importance of environmental attributes on the quality of the experience of recreational divers. However, these benefits are still concentrated in a small portion of the population. Specifically, Alcatrazes Refuge contributed to the subjective well-being of its users during the COVID-19 pandemic through positive experiences in recreational diving. However, the enjoyment of these experiences is still limited, and, in the long term, this may harm the population's support for actions in favor of marine conservation in the region. Positive experiences must be used not only to generate loyalty in the tourist but also to add value to the establishment and maintenance of MPAs as potential hot spots for health and subjective well-being.

CRedit authorship contribution statement

Marina Marconi: Conceptualization, Methodology, Investigation, Formal analysis, Writing – original draft. **Vinicius J. Giglio:** Investigation, Writing – review & editing. **Guilherme H. Pereira-Filho:** Conceptualization, Writing – review & editing. **Fabio S. Motta:** Conceptualization, Methodology, Supervision, Writing – review & editing, Funding acquisition, Resources.

Acknowledgements

We thank the financial support from SOS Mata Atlântica Foundation (Grant 01/2018/05) for research in the Alcatrazes Archipelago Wildlife Refuge. We are grateful to the managers, diving operators, dive guides and voluntaries from the Alcatrazes Archipelago Wildlife Refuge for collaboration and support. FSM acknowledge individual grant #2019/19423-5 from FAPESP. VJG received a post-doctoral grant #2017/22273-0 from FAPESP. GHPF acknowledges individual grant from the Brazilian Research Council (CNPq).

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jort.2021.100000>.

[org/10.1016/j.jort.2022.100501](https://doi.org/10.1016/j.jort.2022.100501).

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