

Does quality of scuba diving experience vary according to the context and management regime of marine protected areas?

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ABSTRACT

Sustainability of scuba diving tourism should be assessed not only in environmental terms, but also concerning the quality of the diving experiences. Through the application of semi-structured questionnaires, we assessed differences in the scuba diving experiences from three subtropical Brazilian marine protected areas (MPAs) with different contexts and management regimes. We found that MPAs of more restrictive categories attracted mostly divers motivated by their natural attributes. We also found that satisfaction levels were significantly lower in the no-take MPA, where public use planning is stricter. Although we could not replicate the MPAs' contexts, our findings highlight the importance of management strategy as well as the influence of MPA age and socio-ecological context on scuba diving experiences. In this regard, managers and dive operators are encouraged to assess user characteristics and the context in which the MPA finds itself to plan and develop sustainable tourism.

1. Introduction

Every year, millions of people seek entertainment in natural areas to enjoy scenic beauty and wildlife. Demand for nature-based tourism has shown significant growth in recent decades (Balmford et al., 2009; Huddart and Stott, 2019). Currently, tourism in protected areas is a major recreational and economic activity, generating about US\$ 600 billion a year (Balmford et al., 2015). However, the quality of experiences directly affects the long-term sustainability of tourism, as tourists tend to stop visiting and/or recommending the destination after negative experiences (Wongthong and Harvey, 2014; Zimmerhackel et al., 2018). The quality of experience and the environmental integrity level have positive relationships, demonstrating that the human dimension of tourism can give clues about the conservation levels of natural attributes (Tonge and Moore, 2007; Uyarra et al., 2009; Zimmerhackel et al., 2018).

Among the types of nature-based tourism, diving is a multi-billion-dollar industry having a considerable socioeconomic importance in many coastal communities (Davenport and Davenport, 2006; Spalding et al., 2017). Diving affords one of the greatest recreationist-environment connections due to the immersion of the practitioner in an environment with distinct characteristics from the terrestrial one. Scuba diving also encourages conservation of

destinations and has high sensitizing potential on aspects such as climate change and the current marine biodiversity loss crisis (Davis and Tisdell, 1996; Dearden et al., 2007). However, poorly managed diving tourism can negatively impact marine biota, reducing the diversity and complexity of benthic organisms (Giglio et al., 2020) and altering spatial trends of fish assemblages (Floros et al., 2013).

In addition to the responsible use of natural and social resources, the sustainability of diving tourism is assessed considering its economic viability, local community participation and the quality of diving experience (Wongthong and Harvey, 2014). Experiences are the psychological outcome from visiting the environment (Baker and Crompton, 2000; Prayag et al., 2013) and are affected by the visitor's profile, motivations, preferences, expectations and satisfaction with the destination (Gnoth, 1997; Baker and Crompton, 2000; Yoon and Uysal, 2005). Thus, to improve management responsiveness, it is necessary to understand the needs and expectations of divers (Manning and Lime, 2000; Ziegler et al., 2012).

Marine protected areas (MPAs) are created for the purpose of conserving biodiversity, restoring habitats and ensuring multiple ecosystem services, including nature-based tourism (Fabinyi, 2008; Halpern, 2014). Furthermore, for presenting a better conservation state, they are the preferred destinations for recreational divers (Davis and Tisdell, 1996; Davenport and Davenport, 2006). There are different

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Table 1

Summary of management context of studied MPAs. *International Union for Conservation Nature; **Levels of public use regulation: 0 = No regulations; 1 = Has few regulations; 2 = Has regulations, but with low supervision and 3 = Has regulations with high supervision. Information from MPAs were extracted from Brasil (2016), São Paulo (1993, 2008) and the management instruments (Fundação Florestal, 2014, 2018; ICMBio, 2017a, 2017b).

	Wildlife Refuge	State Park	EPA
Category (IUCN*)	III	II	V
Fishing/spearfishing restriction	No-take area	No-take area	Fishing and spearfishing allowed (multiple-use area)
Area (km ²)	674,09	50	4530,83
Distance from the coast (km)	33	33	34,8
Age (years)	3	26	11
N° of dive sites	10	12	9
Divers use time (years)	<1	>30	<40
Autarchy	Federal	State	State
Management Instruments	Management Council (2016), Management Plan (2017) and Public Use Plan (2017)	Management Council (2009) and Emergency Plan for Public Use (2014) and Management Plan (2018)	Management Council (2008)
Diving Regulatory Level **	3	2	0

categories of MPAs with distinct goals, but all involve management interventions in a defined geographic space (Christie and White, 2007; UNEP-WCMC and IUCN, 2016). In most of them, conservation is often achieved through the exclusion or managing of extractive activities, as well as encouraging the indirect use of resources through the contemplation of natural and landscape attributes, such as diving (Christie and White, 2007; Fabinyi, 2008).

The magnitude of the ecological and socioeconomic effects of MPAs are related to several factors, ranging from the characteristics of the species and habitats protected, to aspects related to the context of MPA, such as size, age, category, levels of enforcement and implementation of management instruments (Edgar et al., 2014; Gill et al., 2017; Ban et al., 2019). Thus, in general, no-take MPAs with strict regulations tend to have higher biodiversity and fish biomass and are therefore considered

to be in a better conservation state (Edgar et al., 2014; Ban et al., 2019).

In MPAs where tourism is allowed, besides biodiversity conservation, an important goal is the promotion of human well-being, generating positive experiences for their visitors. However, the assessment of this MPA effect remains a global knowledge gap (Ban et al., 2019; Rasheed, 2020). Therefore, it is essential to understand the influence of the MPAs' management context on the quality of visitor experience to guide adaptive management and investment priorities aiming to ensure MPA effectiveness (Manning and Lime, 2000; Ziegler et al., 2012; Bentz et al., 2015).

The quality of diving experience is a complex variable which we translated through the diver's overall satisfaction with the visit. This, in turn, has been defined as the emotion resulting from evaluations of the experiences lived during the activity (Babin and Griffin, 1998),

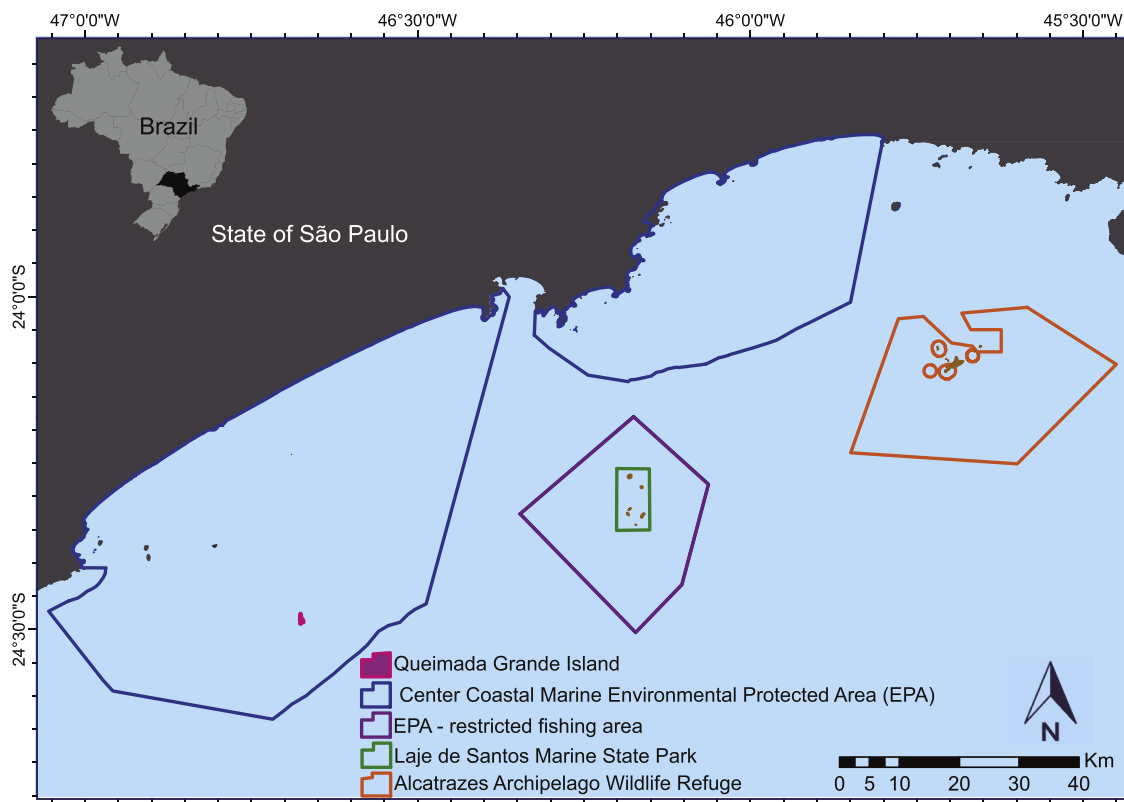


Fig. 1. Study Areas: Center Coastal Marine Environmental Protected Area (EPA), area of Queimada Grande Island; Laje de Santos Marine State Park; Alcatrazes Archipelago Wildlife Refuge.

reflecting the accumulated weight of various attributes (Albayraka and Caber, 2018). Here, we test the hypothesis that no-take MPAs with greater public use managing and fewer user conflicts, which theoretically are more well-conserved, produce better qualities of diving experiences. We characterized the divers' profile, considering demographic aspects, specialization, preferences and motivations. Subsequently, we compared overall satisfaction levels among MPAs in different management contexts and identified which attributes concerning management, service and environment were the most important for generating visitor satisfaction or dissatisfaction. With the results, managers will be able to understand the influence of the context of MPAs on visitation quality as well as better guide decision making as to which attributes should be prioritized to obtain excellence and sustainability of public use.

2. Study area

Recreational scuba divers were interviewed at three Brazilian subtropical MPAs (Table 1): the Alcatrazes Archipelago Wildlife Refuge (referred as Wildlife Refuge), the Laje de Santos Marine State Park (referred as State Park) and the Center Coastal Marine Environmental Protection Area (referred as EPA) that includes the Queimada Grande Island tourist area. Each one presents different management regimes and socio-political contexts. Although a greater number of divers visit the areas during the austral summer (from December to March), the diving operations occur throughout the year. The habitats of the three MPAs are characterized by rocky reefs covered by macroalgae, filamentous algae (i.e., turfs), encrusting coralline algae, sponges and corals (i.e., *Mussismilia hispida* and *Madracis decactis*) (Luiz et al., 2008; Rolim et al., 2019; Pereira-Filho et al., 2019).

2.1. Alcatrazes Archipelago Wildlife Refuge

According to the Brazilian National System of Nature Conservation Units (SNUC – Brasil, 2011), wildlife refuges have the primary objective of conserving biodiversity (corresponding to IUCN category III). The Wildlife Refuge (Fig. 1) was established in 2016 and is considered as the largest seabird-breeding site in southeastern Brazil (Campos et al., 2004), besides being reported to harbour one of the largest reef fish biomass on the Brazilian coast (Morais et al., 2017). Wildlife Refuge was established after three decades of clashes between researchers, environmentalists and the Brazilian navy. Overcoming this conflict, the area, once restricted and of military interest, was opened for visitation in December 2018. Since 2017, the administration has had three management instruments, the Management Council, the Management Plan and the Public Use Plan, all implemented since the beginning of visitation. Considering the regulations in its public use plan, Wildlife Refuge was the MPA with the most restrictive context to the visitors. It sets a maximum limit of 20 divers per site, with at least one guide for every four divers. Dive guides are trained and accredited by the MPA management and are responsible for ensuring low-impact diver behaviour. Divers are prohibited from using selfie sticks, stimulated to not approaching less than 1 m from the reef and not touch and/or disturbing marine biota. In addition, diving operators are responsible for submitting the divers to a briefing containing information on local natural attributes and the main rules of public use of the MPA.

2.2. Laje de Santos Marine State Park

According to SNUC, state and federal parks have the objective of protecting biological diversity, as well as providing environmental education and recreational use (corresponding to IUCN category II). The State Park is a no-take MPA established in 1993 (Fig. 1). In 2012, a fishing exclusion zone of 560 km² was established around the park and formalized in the Management Plan (in 2018) as a Buffer Zone. The State Park is considered one of the best diving spots of the Brazilian coast due to the good visibility of its waters and the seasonal occurrence of giant

manta rays (Luiz et al., 2009). It was established as the result of the joint efforts of environmentalists and researchers and its purpose was to protect the area from intense fishing. Until then, this has been done through the management council, in operation since 2009, emergency public use plan, first edited in 2010 and management plan since 2018. Thus, considering the emergency public use plan, State Park, was considered as an intermediate context MPA concerning restrictions on users. The carrying capacity is established at 126 divers at the same time distributed across all dive sites. Also, the presence of dive guides in any commercial activity of public visitation is required, whom are trained and accredited by the management body. The guides are responsible for briefing the visitors with information about the natural aspects and rules of the MPA, as well as monitoring divers and reporting occurrences. However, there is no rule as to the maximum number of divers per guide, with only one guide per vessel being usual. Divers are also prohibited from using selfie sticks and touching and/or chasing marine organisms.

2.3. Center Coastal Marine Environmental Protection Area - area of Queimada Grande Island

According to SNUC, EPAs main goals are to conserve values of interaction between humans and nature (corresponding to IUCN category V). Thus EPAs allow the sustainable use of their natural resources. The marine environment of Queimada Grande Island is part of EPA established in 2008 (Fig. 1). Queimada Grande has 0.78 km² of emerged land portion and is located on the southern coast of São Paulo, at 34.8 km from the mainland. The marine area around Queimada Grande Island is widely used for commercial and recreational fishing (hook and line and spearfishing) and recreational diving. These uses are poorly monitored and do not have specific ordering. In 2019, in the EPA area was described the southernmost Atlantic coral reef (Pereira-Filho et al., 2019). EPA's administration takes place through a management council, which includes the main stakeholders. However, during the execution of this work, the area had no other management instrument. Even so, during this period, the production of the EPA Management Plan started. In it, approximately 19 km² of the marine portion of Queimada Grande Island was defined as an Area of Interest for Tourism, aiming to making economic activities compatible with the conservation of natural resources. Considering that EPA has no instruments to regulate public use in the Queimada Grande area, it was categorized as an unrestricted MPA to divers.

3. Methods

3.1. Questionnaire outline

A semi-structured questionnaire was applied to divers, consisting in 20 questions organized in five sections (i.e., diver profile, specialization,

Table 2
Individual attributes assessed in the questionnaire.

Category	Attribute	
MPA management	1. Easy access to prior information on-site visitation	
	2. Rules by managing to avoid environmental impact	
	7. Low crowd of divers	
	8. No Litter	
	9. No fishing or lost fishing tackle	
	Service quality	3. Boarding/unloading location
		4. Quality of service Provided
		5. Briefing/additional conductor or instructor guidance
	Natural environment	6. Low impact diver behaviour techniques of other divers (buoyancy, touching organisms, etc.)
10. Water visibility		
11. Diversity and abundance of marine biota		
12. Encounters with animals		
13. Presence of orange cup coral <i>Tubastraea</i> sp. (invasive organism)		

preferred organisms, motivations and satisfaction) and addressed aspects related to the experience during the visit in each MPA (Appendix A). To understand the diver's main preferences and motivations, respondents rated their responses on a 5-point unidirectional Likert scale (between 1 = not at all important and 5 = extremely important).

To obtain the overall satisfaction with the visit, divers were asked to rate their overall experience using a 10-point scale, where 1 = very dissatisfied and 10 = extremely satisfied. Divers also assessed the performance of 13 individual attributes regarding MPA's management, service quality and natural environment (Table 2) using a 5-point Likert-Type scale ranging from 1 = not at all satisfied to 5 = extremely satisfied.

Questionnaires were distributed to divers between September 2018 and September 2019. Divers were contacted upon return of the visit in person or via email, which was obtained by the management through reports from dive operators. To disseminate the online questionnaires, QR Code stickers were also affixed to the operators' vessels. To understand the context of the MPA, we participated in the meetings with the Management Councils and referred to the management instruments (São Paulo, 1993, 2008; Fundação Florestal, 2014, 2018; Brasil, 2016; ICM-Bio, 2017a, 2017b). The data collection was approved by the Research Ethics Committee of the Federal University of São Paulo (CEP: 0450/2018), Brazil Platform (Nº 890074718.9.0000.5505) and by the managing bodies of the MPAs (COTEC: Nº 260108-004.823/2018 and SISBIO: Nº 62932-1).

3.2. Data analysis

To estimate the reliability of the questionnaire, Cronbach's alpha coefficient was calculated using the *psych* package (Revelle, 2018). This coefficient is an internal consistency indicator that measures the degree of correlation of responses (Hora et al., 2010). Data related to socioeconomic profile, specialization, preferences and motivation were assessed using frequency descriptive methods through *likert* package (Bryer and Speersneider, 2016). Differences between divers' overall satisfaction with the visit were tested using a nonparametric ANOVA (Kruskal-Wallis test) and Nemenyi's post-hoc test. To understand which attributes most impacted the diver's overall satisfaction and should be prioritized by management, the approach proposed by Mikulic and Prebezac (2008) was employed. This approach follows three main analytical steps, which are described below. All analyses were performed using R v. 3.6.1 (R Core Team, 2019).

Initially, a Penalty-Reward Contrast Analysis (PRCA) was performed, whose results were then used for the subsequent steps of this approach. The PRCA starts with the definition of two sets of dummy variables, generated from the attributes' performance values. The first set was created by recoding the lowest performance values as "1" (if the attribute's actual performance was 1), while all other values were recoded as "0" (if the attribute's performance was 2, 3, 4 or 5). The second set was created by recoding the highest performance values as "1" (if the attribute's actual performance was 5), while the other values were recoded as "0" (if the attribute's performance was 1, 2, 3 or 4) (Brandt, 1987; Matzler and Sauerwein, 2002; Mikulic and Prebezac, 2008).

A multiple regression analysis was performed using both sets of dummy variables as independent variables and global satisfaction values as dependent variables (Matzler and Sauerwein, 2002; Mikulic and Prebezac, 2008). Thus, each attribute obtained two standardized regression coefficients that were used to understand its ability to influence overall satisfaction. The first standardized coefficient refers to their ability to generate dissatisfaction when their performance was low (Penalty Index - p). The second refers to the ability of the attribute to generate satisfaction when its performance was high (Reward Index - r). The absolute values of each attribute's penalty and reward index were summed (Equation (1)) to provide their Range of Attribute-Impact on Overall Satisfaction (RIOS) (Mikulic and Prebezac, 2008).

The second step consists of an Impact Range-Performance Analysis

(IRPA) (Mikulic and Prebezac, 2008), which is performed with the calculations of the grand means of each attribute's performance and RIOS values. This analysis allows us to build a didactic two-dimensional matrix for the dissemination of results to managers. In this matrix, the mean performance values are represented along the Y-axis of a two-dimensional grid, while the RIOS values are distributed along the X-axis. To guide managers on the priorities of management adjustments, the matrix was divided into a four-quadrant grid. 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 of high priority for management when the RIOS value was high, but its performance was below the grand mean. When the RIOS value was high and the attribute performance was above the grand, the attribute was considered to be of medium priority (Mikulic and Prebezac, 2008).

The third step quantifies the asymmetry of the relationship between each attribute's performance and overall satisfaction through the "Impact-Asymmetry Analysis" (IAA). Thus, using the penalty and reward indices we measured the potential of a given attribute to generate dissatisfaction (DGP) and satisfaction (SGP) (Equations (2) and (3), respectively). Subsequently, these potentials were subtracted (Equation (4)) for the calculation of the Impact Asymmetry Index (IA). Attributes can be classified according to their IA values, being *delighters* ($IA \geq 0,4$), *satisfiers* ($0,4 > IA > 0,1$), *hybrids* ($0,1 \geq IA \geq -0,1$), *dissatisfiers* ($-0,1 > IA \geq -0,4$) or *frustrators* ($IA < -0,4$) (Mikulic and Prebezac, 2008). When the quality of experience is low, this analysis shows which attributes are responsible for generating satisfaction when their performance is above average (*delighters* and *satisfiers*) and which attributes generate dissatisfaction when their performance is below average (*frustrators* and *dissatisfiers*). Thus, the IRPA facilitates the prioritizing of attributes according to their performance, while the IAA allows for their categorizing according to their contribution to visitor satisfaction, facilitating decision making for managers and entrepreneurs regarding the investment of resources (Coghlan, 2012).

The following equations were used:

$$RIOS_i = |p_i| + |r_i| \tag{1}$$

Table 3

Recreational divers' socioeconomic profile and specialization sampled in the three MPAs. *Values expressed as mean and standard deviation. **Brazilian minimum wage was considered as R\$ 998.00 = US\$ 234.27.

	Wildlife Refuge	State Park	EPA
Gender - %			
Male	71	68	78
Female	29	32	22
Age (years) - %			
<25	6.4	9.3	7.8
25-35	26.2	38	38.3
36-45	40.4	33	40.4
46-55	17.7	19	21.3
56-65	7.7	1.5	0
>65	1.6	0.7	0
Schooling			
University Graduate	37	38	31
Postgraduate	51.8	51	55
Income (Brazilian minimum wages) - %			
Until 1	0.4	0	23.5
1-5	17.2	13	17.6
6-10	32	26	49
>10	38	48.6	9.8
Certification - %			
28 Basic		37 Basic	22 Basic
42 Advanced		28 Advanced	32 Advanced
Average number of dives	282 ± 773	447 ± 1632	634 ± 2500
Average number of dives (last 2 years)	39 ± 64	56 ± 128	84 ± 236
Average travel expense (US\$)	350 ± 143	201 ± 251	159 ± 94

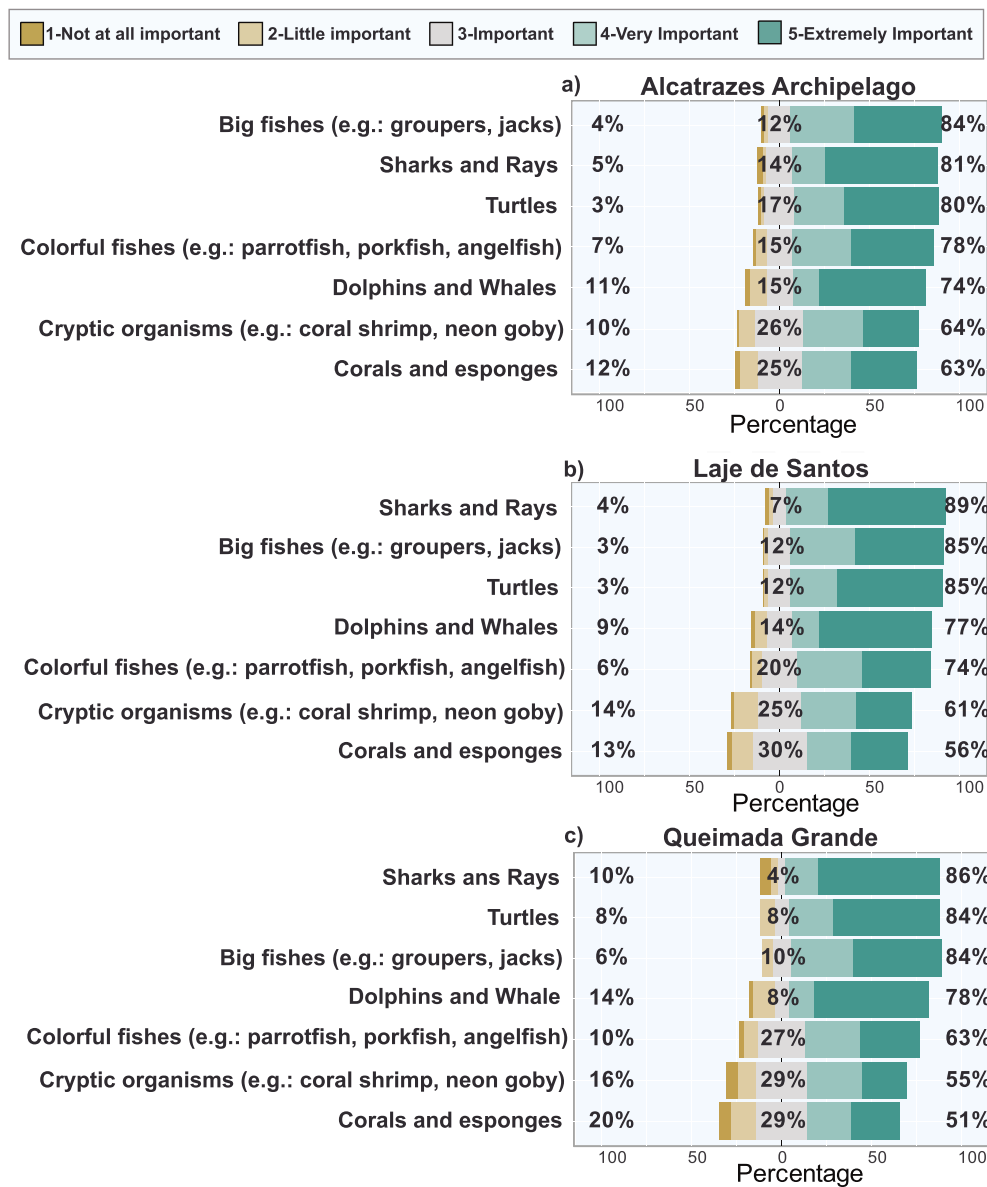


Fig. 2. Divers' preferred marine organisms. Organisms are organized (top down) in descending order from those with the highest percentage of positive responses (4 – Very Important and 5 - Extremely Important) to those with the highest percentage of more negative responses (1 – Not at all Important).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

$$DGP_i = |p_i|/R_{IOS}_i \tag{2}$$

$$SGP_i = |r_i|/R_{IOS}_i \tag{3}$$

$$IA_i = SGP_i - DGP_i \tag{4}$$

where, r_i = reward-index for attribute i ; p_i = penalty-index for attribute i ; R_{IOS}_i = range of impact on overall satisfaction for attribute i ; DGP_i = potential of generate dissatisfaction of attribute i ; SGP_i = potential of generate satisfaction of attribute i and IA_i = index impact-asymmetry of attribute i .

4. Results

4.1. Divers profile

A total of 456 questionnaires were obtained, 253 from Wildlife Refuge, 151 from State Park and 52 from EPA, representing 27%, 11%

and 23% of the total number of divers who visited the areas during the study period, respectively. Cronbach's alpha coefficient was greater than 0.7 for all questions, suggesting that the internal consistency of the questionnaire is high.

In all MPAs, the predominance was of male divers between 25 and 45 years old (Table 3). More than half of the divers had a postgraduate degree and a family income of at least US\$ 1405.62 per person per month. Regarding certification, entry-level divers predominated in State Park (37%), while in other MPAs most divers had advanced diving certificates (Wildlife Refuge: 42% and EPA: 32%; Table 3). Considering diving, transportation and lodging, the average spending varied widely among MPAs, ranging from US\$159 ± 94 (±SD) in EPA to US\$ 350 ± 143 in Wildlife Refuge.

Elasmobranchs (e.g., sharks and rays), sea turtles and large body-sized fishes (e.g., groupers, jacks etc.) were the preferred marine organisms by divers in all three MPAs (Fig. 2), while the least preferred were cryptic (e.g. coral shrimp, neon goby) and sessile organisms (e.g. corals and sponges). The most important motivation for the divers' visit

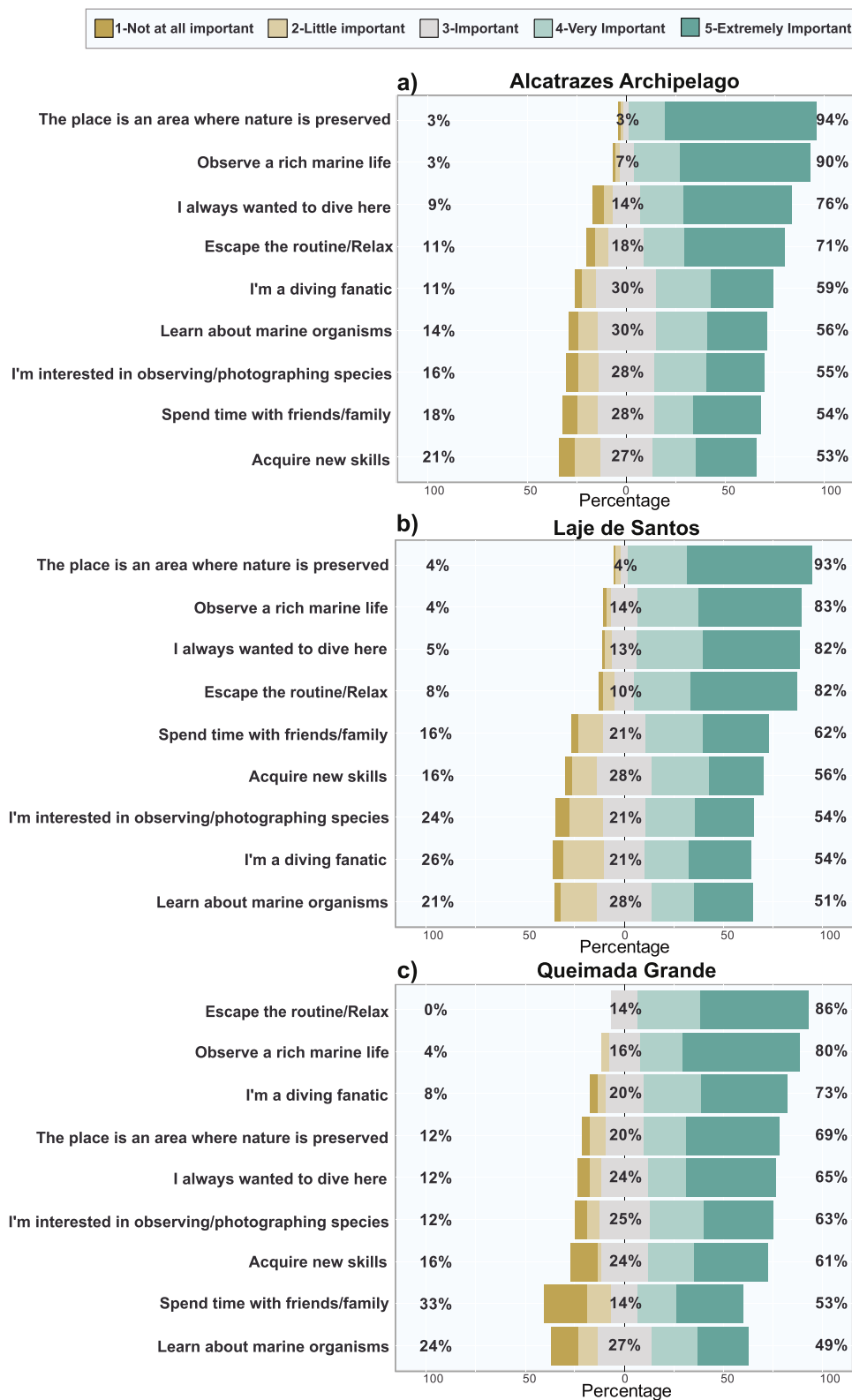


Fig. 3. Main motivations of recreational divers. Motivations are organized (top down) in descending order from those with the highest percentage of positive responses (4 – Very Important and 5 – Extremely Important) to those with the highest percentage of more negative responses (1 – Not at all Important). From left to right, numbers represent: the summed percentages of responses.

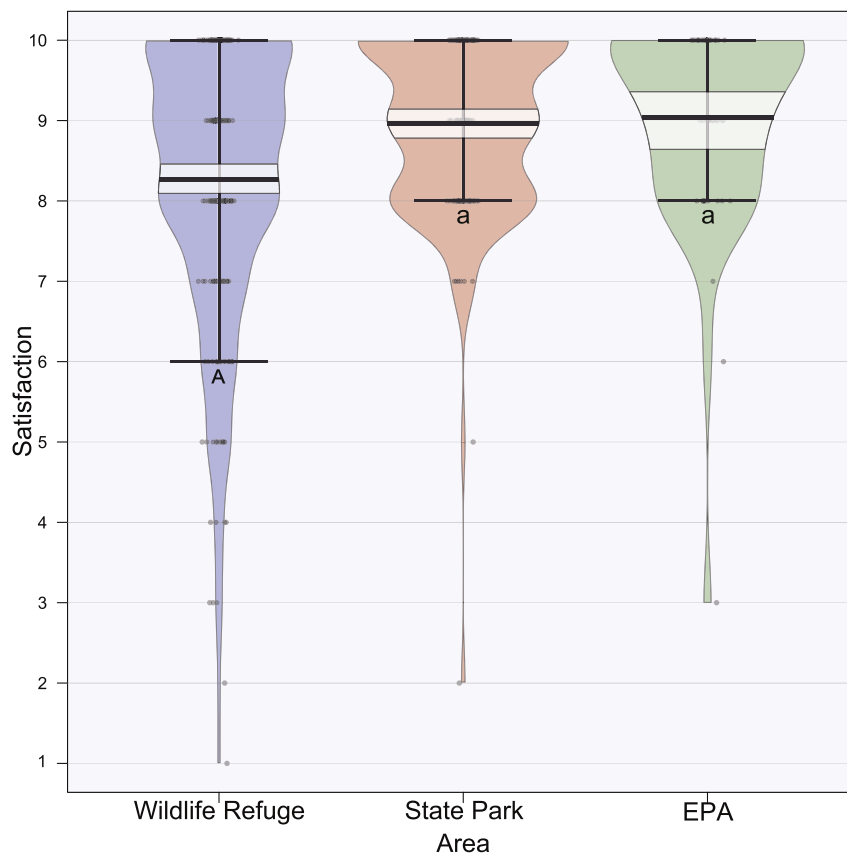


Fig. 4. Recreational Divers' Mean Overall Satisfaction. Points represent raw data, the dark line the mean, the bean the density, the band the 95% confidence interval and the deviations are the 10% and 90% percentiles. Capital letters represent significant difference in means ($p < 0.05$) according to Nemenyi's post-hoc test.

to EPA was “Escape the routine/Relax”, while in Wildlife Refuge and State Park it was “The place is an area where nature is preserved” (Fig. 3). However, the least important motivation for Wildlife Refuge divers was “Acquire new skills”, while for State Park and EPA divers was “Learning about marine organisms”.

4.2. Quality of experience

Although all studied MPAs achieved high satisfaction levels, visitors of the Wildlife Refuge had comparatively lower values (8.27 ± 1.73 , mean \pm SD) than those from the State Park and EPA (8.96 ± 1.13 and 9.03 ± 1.29 , respectively) (Wildlife Refuge vs. State Park $p < 0.05$, $H = 5.04$; Wildlife Refuge vs. EPA $p < 0.05$, $H = 4.27$; State Park vs. EPA $p > 0.05$, $H = 0.79$, Nemenyi's post-hoc test). (Fig. 4).

The IRPA analysis (Fig. 5.A1; Appendix B.1) indicated that the environmental attributes were classified as high-priority in influencing the global satisfaction of Wildlife Refuge's visitors, while “medium-priority” attributes were related to management. Moreover, Wildlife Refuge presented the highest number of attributes with the potential to generate dissatisfaction (*frustrators* and *dissatisfiers*). Only for Wildlife Refuge the attributes “1. Easy access to prior information on-site visitation”, “6. Low impact techniques of other divers” and “10. Water visibility” were classified as *frustrators* or *dissatisfiers* (Fig. 5.B1).

At State Park, the high-priority attributes were “1. Easy access to prior information on-site visitation” and “6. Low impact techniques of other divers” (Fig. 5.A2; Appendix B.2). Only for divers from State Park, attribute “5. Briefing/additional conductor or instructor guidance” appeared as a priority for management. The IAA analysis also showed that State Park was the MPA that obtained the highest number of attributes classified as *delighters* or *satisfiers* (Fig. 5.B2). Thus, for these divers most of the attributes have a strong potential to generate

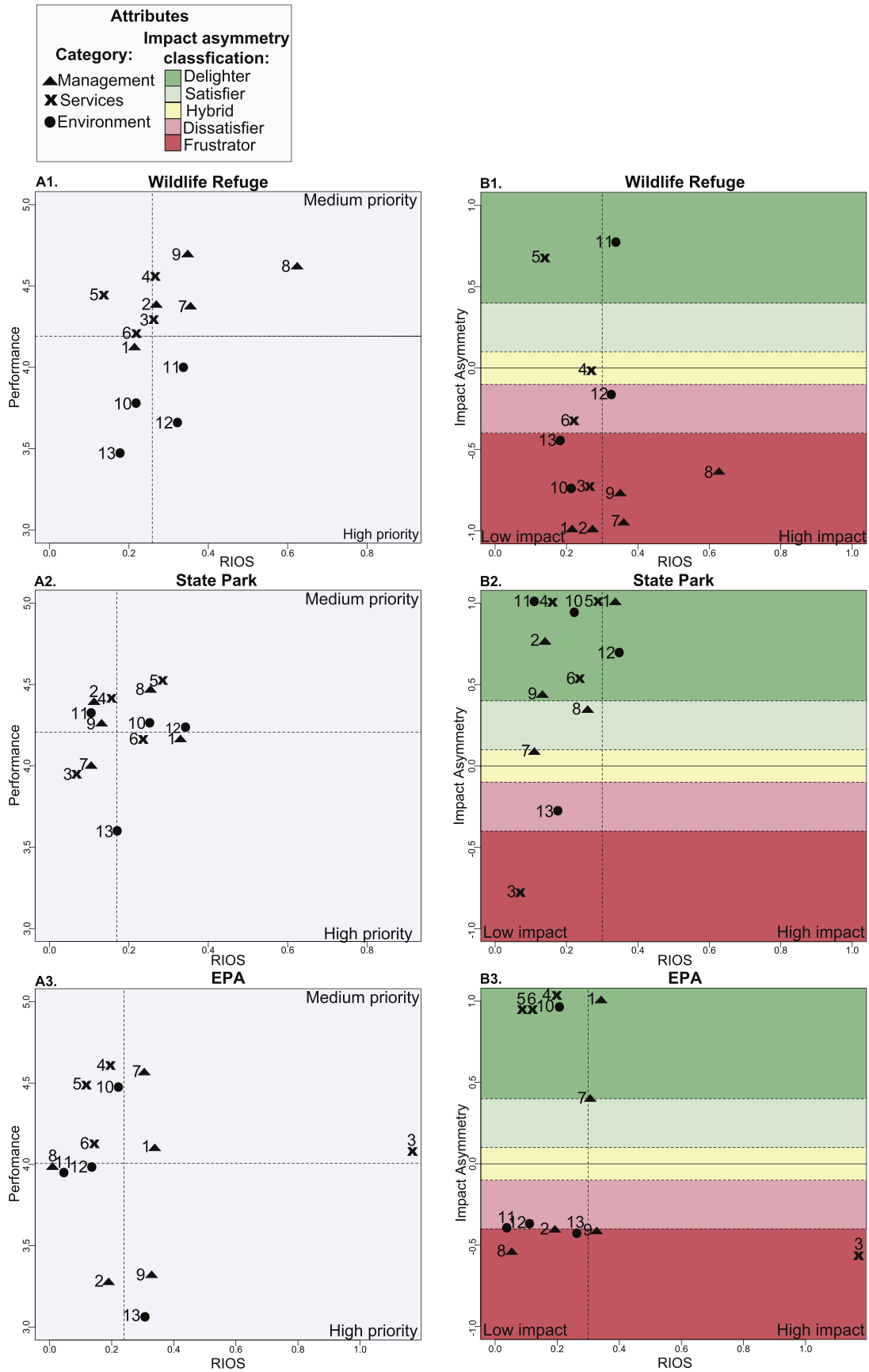
satisfaction when their performance is high but display little influence on satisfaction when their performance is low. Only the attributes “3. Boarding/unloading location” and “13. Presence of orange cup coral (invasive organism)” were able to negatively impact satisfaction when their performances is low.

For EPA divers, the IRPA analysis also revealed that the attributes “9. No fishing or lost fishing tackle” and “13. Presence of orange cup coral (invasive organism)” were a high priority for management (Fig. 5.A3; Appendix B.3). Medium-priority attributes were related to management and quality of service (“1. Easy access to prior on-site visit information”, “3. Boarding/unloading location” and “7. Low crowding of divers at the same point”). According to the IAA analysis (Fig. 5.B3), EPA was the second area that obtained the most attributes capable of generating diver dissatisfaction when their performances are low (*frustrators* or *dissatisfiers*). Interestingly, the attribute “11. Diversity and abundance of marine fauna and flora” appeared to be a frustrator only for this area.

Regarding all three MPAs, there were differences in the attributes that most impacted overall satisfaction (RIOS). In Wildlife Refuge the attributes that most impacted satisfaction were “7. Low crowding of divers at the same point”, “8. No litter” and “9. No fishing or lost fishing tackle”. In State Park, the attributes “1. Easy access to information on visitation” and “12. Encounters with animals” and in EPA attributes “3. Boarding/unloading location” and “9. No fishing or lost fishing tackle” most impacted satisfaction. Curiously, attribute “11. Diversity and abundance of marine fauna and flora” obtained higher RIOS values only in Wildlife Refuge, where it also appeared as a strong satisfaction generator (*delighter*).

5. Discussion

We found that higher levels of restrictions and ordering of uses in



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Fig. 5. A. 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. **B. 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. The attributes are: 1. Easy access to prior information on-site visitation; 2. Management rules to avoid environmental impact; 3. Boarding/unloading location; 4. Quality of service provided; 5. Briefing/additional conductor or instructor guidance; 6. Low impact techniques of other divers; 7. Low crowding of divers at the same point; 8. No litter; 9. No fishing or lost fishing tackle; 10. Water visibility; 11. Diversity and abundance of marine fauna and flora; 12. Encounters with animals; 13. Presence of orange cup coral (invasive organism).

MPAs are not synonymous with higher levels of visitor quality of experience. Contrary to our expectations, Wildlife Refuge (more restrictive MPA) achieved a lower mean overall satisfaction than the other studied areas. Wildlife Refuge also obtained the highest number of attributes classified as *dissatisfiers* or *frustrators* (i.e., capable of generating dissatisfaction when their performances are low). In addition, we showed that both Wildlife Refuge and State Park (no-take MPAs) attracted more divers motivated by the conservation status of the area when compared to EPA (sustainable-use MPA). In the latter, most divers were practicing diving to escape routine and relax. We suggest that more restrictive MPAs tend to attract visitors who are more demanding about having their expectations regarding biodiversity met. Therefore, managers and entrepreneurs who aim for long-term sustainable tourism should consider evaluating visitor profile alongside the socio-ecological context in which the MPA is inserted for public use planning.

5.1. Divers profile

In all three MPAs, diver profiles were typical of the scuba diving population (Verkoeyen and Nepal, 2019). Divers' preferred organisms were all from the megafauna, which are attractive due to their popularity and iconic status (Miller, 2005; Giglio et al., 2015). Encounter with megafauna may affect the experience primarily of less experienced divers (Miller, 2005), but previous studies observed this preference regardless of diver's specialization levels (Lucrezi et al., 2013). In the MPAs with more restrictive rules for divers, Wildlife Refuge and State Park, the attribute related with encounters with animals was classified as a priority, albeit being an attribute that is not under management control. We suggest that in no-take MPAs the expectations of encountering preferred organisms during diving are higher. Effect related to the global trend of no-take MPAs generally having higher fish biodiversity and biomass.

In tourism two types of motivations are described, those that push visitors to a destiny (*push*) and those that attract visitors to a destiny (*pull*) (Dann, 1977; Crompton, 1979). The former is related to internal and emotional aspects, such as relaxing and getting away from routine, while the latter involve external and cognitive factors, such as environmental characteristics (Gnoth, 1997; Yoon and Uysal, 2005). Our results revealed that the level of restrictions applied by MPAs is directly related to attraction motivations. This difference is probably due to expectations of finding better conservation status in no-take MPAs better regulated. So, the fact that Wildlife Refuge divers are less satisfied may be related to their motivations and expectations, because it is well known that motivations can influence the satisfaction of tourists (Devesa et al., 2010; Albayraka and Caber, 2018). Therefore, managers should understand the main visiting motivations for effective planning of public use and advertising of the MPA.

5.2. Quality of experience

Although the three areas are MPAs, their categories and management arrangements are different. Wildlife Refuge has been an area restricted to public use for over 30 years and, after more than a decade of demand, has been open for visitation for less than a year. This factor contributed to a high publicity and higher costs with the activity. By contrast, visitors are strictly supervised, the management-user relationship is grounded in environmental monitoring, and managers understand the presence of visitors as potential source of impacts to the environment.

This, according to the new MPA visitation paradigm proposed by Weaver and Lawton (2017), makes it a Second Generation MPA. In this sense, expectations that are not consistent with reality are known to affect the quality of the tourist experience (Pizam and Milman, 1993). Consequently, divers' poor knowledge of the conservation status of Wildlife Refuge, rigorous ordering and the high costs of the activity may explain unrealistic expectations with the local context and, subsequently, lower levels of satisfaction than other areas (Pizam and Milman, 1993; Ziegler et al., 2012). As the Wildlife Refuge is still in the beginning of diving operations, we need to consider the low experience of diving operators with this destination (e.g., choosing the best dive sites according to environmental conditions, since some can become difficult to divers when currents are too strong) can have on the quality of the dive and the satisfaction of the visitors.

Furthermore, all the highest priority attributes for Wildlife Refuge management were related to the environment. This contrasts with a previous study which have considered the Wildlife Refuge as one of the largest fish biomasses in Brazil (Morais et al., 2017). The fact that Wildlife Refuge was also the MPA where most attributes were classified as *frustrators* may again indicate that, despite being more restrictive, there are factors related to its context that are influencing visitors' experience and should be taken into account for the MPA to contribute to the well-being of visitors. In light of these observations, we recommend that managers and other stakeholders involved in diving in MPAs disclose accurate information about the conservation status of natural attributes and the management context of the area. This initiative could help to generate realistic expectations and, therefore, improve the experience for the divers. Parallel to this, managers also need to seek closer relationships with users to achieve greater support for conservation regulations and actions.

On the other hand, State Park represents the MPA with longer protection time and is close to one of the largest metropolises in the world (i.e., São Paulo), where divers regularly visit in a one-day trip. The high levels of satisfaction obtained may be linked to the sense of loyalty that divers and operators have with the area (Yoon and Uysal, 2005). These circumstances may justify the low number of attributes classified as *frustrators* and a large number of *delighters* and *satisfiers*. State Park is predominantly visited by divers with basic certification, which may explain the attribute "6. Low impact techniques of other divers" having underperformed and appearing as a high priority for management only for this MPA. To mitigate potential impacts on benthic organisms, we propose that the first few minutes of diving should be directed for divers to adjust their buoyancy. In addition, attribute "5. Briefing/additional conductor or instructor guidance" also appeared as a priority only for State Park. This suggests the need for better guide training and the inclusion of warnings regarding the potential impacts of diving in the briefing, as well as close supervision of divers to ensure minimum impact behaviour. The diving guide ability to intervene and correct the behaviour of divers reduces as the size of the group they are conducting increases (Roche et al., 2016). Therefore, we recommend the establishment of a maximum number of guided divers, so diving guides may be more effective to intervene whenever they perceive damage or contact with benthic organisms.

EPA, in turn, is inserted in a multiple-use MPA, that is, it allows for direct extraction of natural resources, such as fishing and spearfishing. However, this MPA obtained values of satisfaction as high as the State Park. This result contradicts common expectations, since it is an area that supposedly presents greater anthropic impacts due to its various

uses. High levels of satisfaction may be explained by more modest expectations, probably generated by the low cost of the visit and the little advertising the region receives (Pizam and Milman, 1993). Another factor that may have influenced such findings is that divers in this area were mostly interested in escaping routine and relaxing, motivations that do not depend directly on the conservation status of natural attributes. However, only for EPA the attribute related to lack of fishing or lost fishing tackle presented below-average performance and was considered a strong generator of dissatisfaction. This result indicates a conflicting context between uses in EPA marine area. Thus, the spatial planning of public use should be one of the priorities for the management of this area.

Wildlife Refuge and State Park are no-take MPAs, however there are contextual differences that may have contributed to differing mean satisfaction scores and the results of the IAA analysis to be different. Among them is the protection time, with State Park being the oldest MPA studied, whereas Wildlife Refuge is the younger. Hence, age can be an important factor because the level of enforcement increased after the establishment of the Refuge, although the area where it is located was restricted to public use for three decades. This factor may influence not only the conservation status of biodiversity, but also the social benefits generated by MPAs (Hargreaves-Allen et al., 2011). In addition, Wildlife Refuge divers had much higher RIOS values for the attribute related to marine biota than other MPAs, indicating that the quality of the experience of divers in this area exhibits a greater dependence on the conservation status of natural attributes. It is also worth considering that the RIOS values of this attribute in the multiple-use MPA were close to zero, suggesting that those divers were the least dependent on natural attributes for a good overall experience. Further research is needed to understand which variables influence the impact that diversity and abundance of marine organisms have on the quality of visitor experience.

Those interested in developing sustainable diving tourism in MPAs should make efforts to achieve or maintain high levels of diver experience, aiming at the conservation of natural resources and the competitiveness of the destination (Ziegler et al., 2012). We demonstrated that more restrictive MPAs attracted mainly divers motivated by the natural attributes. In addition, divers' experiences were influenced by the socio-environmental context of the MPA, being significantly lower in the more restrictive MPA. This indicates that fishing restriction is not the only decisive factor for visitor satisfaction and that the quality of visitors' experience should be considered when assessing MPA effectiveness. Therefore, diving stakeholders must be aware of the expectations and motivations that divers create in relation to their destination. Moreover, in the present work, a deeper understanding of the influence of contexts and management strategies on the quality of diver's experience was proposed. This is intended to help managers and other actors in the development of a more sustainable use of resources in MPAs, also considering the perceptions of visitors. Nevertheless, we could not replicate the MPAs' contexts, which limits the scope of our generalizations and reiterates the need for further studies to confirm our findings for other regions.

6. Final remarks and management recommendations

We investigated the influence of AMP context and management strategies on the quality of the scuba diving experience. Our main findings were: (1) scuba divers in no-take MPAs were more motivated by the area's natural attributes than those in sustainable-use MPA; (2) mean satisfaction values were significantly lower in the more restrictive MPA for public use; (3) management context can contribute to unrealistic expectations and therefore undermine the quality of visitor experience; and (4) the diversity and abundance of marine organisms was more important for the no-take MPA and stricter regulations for public use.

Sustainable use development is one of the purposes of diving tourism

management in MPAs. For this we suggest the adoption of the following management strategies: (1) consider the profile and motivation of visitors during planning; (2) improve the communication of information about the area, paying attention to the expectations and motivations that the divers create regarding the destination; (3) seek a closer relationship between managers and users, aiming to increase the support of divers to MPA rules and regulations; (4) establish maximum numbers of divers per guide in State Park; (5) promote actions that encourage visitor participation and interest in public use management decisions; and (6) prioritize the spatial planning of public use in contexts where there is conflict among the different types of use. The success of these strategies depends on a collaborative process that involves managers and diving stakeholders in developing adaptive public use planning. Monitoring and actions that promote positive visitor experiences are essential for MPAs open to tourism to produce human well-being and biodiversity conservation.

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Appendix A. Supplementary data

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