



Marine life preferences and perceptions among recreational divers in Brazilian coral reefs



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HIGHLIGHTS

- We examine divers' changes in marine life preferences and perceptions.
- Novice divers preferred megafauna and experienced divers, cryptic animals.
- Perceptions of decreasing in the quality of fish attributes were accompanied by the worst expectations.
- Experience and perceptions can be used as a predictor to maximizing diver's enjoyment.
- We provide managerial implication for sustainable dive tourism.

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ABSTRACT

Understanding diver preferences and perceptions of environmental attributes can help inform dive tourism management. We interviewed 190 recreational divers and examined their preferences for marine life in the Abrolhos National Marine Park, eastern Brazil. We also assessed divers' perceptions of changes in fish abundance when they revisit the dive site. Marine life preferences changed according with the divers' experience level. Novice divers preferred encounters with megafauna, whereas experienced divers preferred to see cryptic species. Individual perceptions of decline in fish abundance were influenced by longer time interval between visits. Visitors elicited the end of fish feeding, and illegal fishing, as the main causes of decline. Strategies to limit decline in the quality of marine life attributes, such as zoning and visitation limits based on carrying capacity estimates should be also based in divers' preferences and perceptions. Therefore, understanding divers' motivations and preferences will help maximize visitors' enjoyment and guide the dive industry into a more sustainable mode in the future.

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1. Introduction

1.1. Coral reefs and dive tourism

Coral reefs provide humans with a variety of benefits, including cultural, social, biological, and economic services and values such as fisheries, coastal protection, and tourism (Brander, Van

Beukering, & Cesar, 2007). Coral reefs are popular travel destinations, especially among scuba divers, underpinning one of the world's fastest growing recreational sports and rapidly developing to be a multi-billion dollar industry (Cope, 2003; Ong & Musa, 2012). Scuba diving is considered a low-impact activity and provides an economic alternative to fishing through non-extractive use of marine wildlife (Davis & Tisdell, 1996; Tapsuwan & Asafu-Adjaye, 2008). Preferred destinations worldwide are renowned for its high coral reef biodiversity, attaining high visitation rates, such as dive sites in the Caribbean (Tratalos & Austin, 2001), the Red Sea (Wilhelmsson, Ohman, Stahl, & Shlesinger, 1998) and Australia (Wilks & Davis, 2000).

The uniqueness and abundance of marine life are among the most important motivations for diving tourism (Mundet & Ribera,

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2001; Musa, Kadir, & Lee, 2006; Uyarra, Watkinson, & Côté, 2009). Because most of the marine protected areas (MPAs) possess relatively better quality of marine life, these areas have been experiencing an increase in the number of visitors (Green & Donnelly, 2003). MPAs generally protect marine life and conserve ecosystems healthy, thus making it attractive to dive tourism. However, diving can inflict direct and indirect negative impacts on reef ecosystems. For instance they could cause damage like trampling, feeding, and unintentional contact with corals through body parts, mainly fins (Barker & Roberts, 2004; Chung, Au, & Qiu, 2013; Hawkins & Roberts, 1993; Milazzo, Badalamenti, Vega-Fernández, & Chemello, 2005; Worachananant, Carter, Hockings, & Reopanichkul, 2008). These impacts may become intensified when destinations lack proper management and receives high rates of visitation, which may render diving tourism unsustainable.

1.2. Measuring specialization among recreational divers

Surveys have verified variability in environmental attitudes, behaviors, and preferences between experienced and novice recreationists within a variety of activities (Bricker & Kerstetter, 2000; McFarlane, 1994). This experience-related theory was named “recreation specialization”, which refers to a continuum of behavior from the general (broad interests and minimal resource dependence), to specific (skilled interests and high resource dependence). Recreation specialization is a multidirectional approach, influenced by experience, skill and activity setting preferences (Bryan, 1977). People approach their preferences differently, according with their level of experience in the activity. One indicator of experience level often used in studies of recreational scuba is number of dives performed in a lifetime (Camp & Fraser, 2012; Lucrezi, Saayman, & Merwe, 2013; Thapa, Graefe, & Meyer, 2006). This indicator is generally correlated with divers' certification (Miller, 2005), knowledge, skill and responsible behavior (Fitzsimmons, 2009; Musa, Seng, Thirumoorthi, & Abessi, 2011; Thapa et al., 2006). However, other indices of recreational specialization have been used to empirically examine scuba divers. For instance, Miller (2005) used a Multidimensional Recreational Specialization Index based on diver's level of participation (experience), training and associated skills, and coral reef setting history to examine divers' recreational specialization.

1.3. Understanding divers' marine life preferences, perceptions and implications for tourism management

Dive tourism managers must promote user satisfaction while preventing reef degradation. It is therefore important to understand divers' motivations, perceptions, and preferences. Observe and interact with marine life is the major reason for diving enjoyment (Ditton, Loomis, & Choi, 1992). Specific interests in marine life may predict typical behaviors and attitudes among recreational scuba divers (Lucrezi et al., 2013), such as the preference for swimming near the substrate by divers who want to observe sea-horses (Uyarra & Côté, 2007). However, scuba divers are not a homogeneous group. Knowledge, motivations, preferences and expectations can vary among individuals. Preferences also greatly depend upon aspects such as gender (Priskin, 2003) and experience (Dimmock, 2009; Fakeye & Crompton, 1991). Understanding diver preferences can help to manage the activity according to the diver's desires. Studies on divers' motivations, preferences and perceptions have been conducted in several diving destinations around the world, including Bonaire (Uyarra et al., 2009), Australia (Inglis, Johnson, & Ponte, 1999), Malaysia (Musa, 2002), South Africa (Dicken, 2014; Lucrezi et al., 2013), Thailand (Dearden, Bennett, & Rollins, 2007); Mauritius (Gössling, Lindén, Helmersson,

Liljenberg, & Quarm, 2008), Belize, Jamaica and Cuba (Williams & Polunin, 2000). Increasing in experience and specialization has been observed to influence marine life preferences among divers (Cater, 2008a, b; Ince & Bowen, 2011). However, there is no information regarding how preferences change according experience level in Southwest Atlantic coral reefs. This theme needs to be encouraged to improve the management of diving industry and its potential impacts upon the marine environment.

Recreational users revisiting the same locality over the years seemed to be able to perceive differences in the environment, especially regarding certain preferred biological attributes like fish abundance, coral cover, and species richness (Uyarra et al., 2009). These divers also have a greater perception of impacts at the sites (Miller, 2005). As these perceptions appear to directly affect divers' perceptions regarding biodiversity of the site, it becomes essential to maintain reef biodiversity at satisfactory levels. Large and charismatic marine animals, such as groupers (Giglio et al., 2014), rays (Luiz, Balboni, Kodja, Andrade, & Marum, 2009), sharks (Gallagher & Hammerschlag, 2011), mammals (Curtin & Garrod, 2008), and turtles (Bell et al., 2009) are important attractions for diving tourism. Other smaller species can also provide a special appeal because of their rarity, colorful and/or cryptic nature; such as sea-horses, frogfishes and nudibranchs (Goffredo, Piccinetti, & Zaccanti, 2004; Uyarra & Côté, 2007). Cater (2008a, b) observed that an initial desire to observe charismatic megafauna by novice divers is gradually supplanted by a fascination with smaller underwater inhabitants. Experienced divers were more often excited by colorful nudibranchs and cryptic fishes than sharks or turtles (Cater, 2008a, b).

Management strategies for recreational diving destinations (e.g. zoning and carrying capacity estimates; Davis & Tisdell, 1995; Ríos-Jara, Galván-Villa, Rodríguez, López-Uriarte, & Muñoz-Fernández, 2013) should be supplied not only with biological information of dive sites, but also with information about diver profile, behavior and motivations. Dives aiming to see species of megafauna may need specific management strategies to increase the chance of observing without disturbing animals. For instance, reductions in group size to reduce the noise levels and increase their chances of observing groupers (Rudd & Tupper, 2002), reduce behavioral changes in gray nurse sharks (Smith, Scarpaci, Scarr, & Otway, 2014) and establishment of a minimum approach distance between divers and whale sharks (Davis, Banks, Birtles, Valentine, & Cuthill, 1997; Quiros, 2007). The presence of cryptic species can also alter the behavior of recreational divers who may approach too close to the substratum, and thus increase the chances of collisions and damage to corals, both accidentally and intentionally (Uyarra & Côté, 2007).

1.4. Survey site and aims

Marine life preferences and perceptions regarding fish abundance between recreational divers were investigated in Abrolhos National Marine Park – ANMP, a no take MPA in eastern Brazil. The ANMP bears the highest marine biodiversity in the South Atlantic (Leão, Kikuchi, & Testa, 2003) and high levels of endemic fish and corals (Francini-Filho & Moura, 2008). It is a popular diving destination, considered as one of the best dive sites in Brazil. Marine fauna of the ANMP include components of megafauna, such as turtles, dolphins, rays, sharks, groupers, snappers, parrotfishes, triggerfishes, surgeonfishes, as well as cryptic species like the Brazilian basslet, *Grama brasiliensis*, the cleaner goby, *Elacatinus figaro*, nudibranchs and cleaner shrimps (Francini-Filho & Moura, 2008; MMA, 2011; Rossi-Santos, Wedekin, & Sousa-Lima, 2006). The presence of such a wide variety of marine life attributes makes

ANMP an appropriate place to investigate recreational diver preferences.

Surveys on the relationship between marine life viewing preferences, diver experience and perceptions of environmental change are still scant and are needed, mainly in regions where diving is an important economic activity. Therefore, in this study, we investigate the issue of marine life preferences and perceptions of recreational scuba divers in ANMP. We examined what marine life attributes were important to divers according gender and levels of experience (addressed here as number of dives performed). We also verify post-trip perceptions of change in fish abundance over consecutive visits, its causes and how affects divers' perceptions of quality. In addition, we propose management strategies to mitigate the possible impacts that cause decline in the quality of marine life attributes.

2. Material and methods

2.1. Abrolhos National Marine Park management and norms

The ANMP is located on an extension of continental shelf 65 km from Bahia State, extending over an area of 912 km² (Fig. 1). It was established in 1983, but effective conservation policy was implemented only in the mid-1990s. ANMP is divided into two areas, the Abrolhos archipelago and Timbebas reefs. Diving tourism is practiced only in Abrolhos archipelago. Annual visitation has decreased over the years, dropping 33% in 2002 (Alvarenga & Fleck, 2011). In the 1990s, unofficial estimates suggested that ANMP received approximately 10,000 visitors per year and actually receives 3500 visitors per year.

Fishing or collection of any kind, as well as the use of gloves and knives is forbidden inside the ANMP. The first dive in a multi-day liveaboard is restricted to the shallow reef sites, focusing on equipment adjustment and buoyancy control training. Diver guides conduct a maximum of eight divers per dive.

2.2. Questionnaire application and design

Diver preferences for marine life attributes were surveyed using structured questionnaires distributed on the last day to divers on the dive boat. We ensured that questionnaires were answered individually to ensure that interviewees were not influenced by the opinions of other divers. Random sampling was done to select divers from three diving boats. Questions addressed gender, nationality, experience, marine life preferences, and their perceptions of change in fish abundance, and causes. Marine life preferences were assessed by the following question: 'What are your favorite animals to watch on a dive?' Respondents could select three main attributes from the eight listed: 'shark and rays', 'big fishes', 'colorful fishes', 'whales and dolphins', 'turtles', 'corals', 'cryptic fishes', and 'small invertebrates' on a scale from 1 (less preferred) to 3 (most preferred). In the last two categories, we described characteristics of the fauna, citing examples of seahorses, gobies for cryptic fishes; and nudibranchs and cleaner shrimps for small invertebrates.

To assess post-trip perceptions of change in fish abundance, divers were asked whether they had previously done any diving in the two main sites in ANMP: Rosalinda shipwreck (0–20 m) and Portinho Sul fringe reef (4–6 m). To those divers revisiting the sites, six questions were posed, namely: 1) 'How many times have you visited these sites?', 2) 'Date of first-time visit' (to divers had returned more than once, we requested that they make their comparisons based on their first-time visit), 3) 'What changed regarding fish abundance?' (If any change was observed, divers were asked to report trends at intervals of 10%, for decreases or increases), 4) 'What are causes of the reduction?' (only to divers who observed reductions in at least one site), 5) 'Motivations to return to the ANMP' and 6) 'Was fish abundance as good as before?'. Respondents choose answers from among five categories: 'much worse than expected', 'worse than expected', 'as expected', 'better than expected' and 'much better than expected'. Before apply

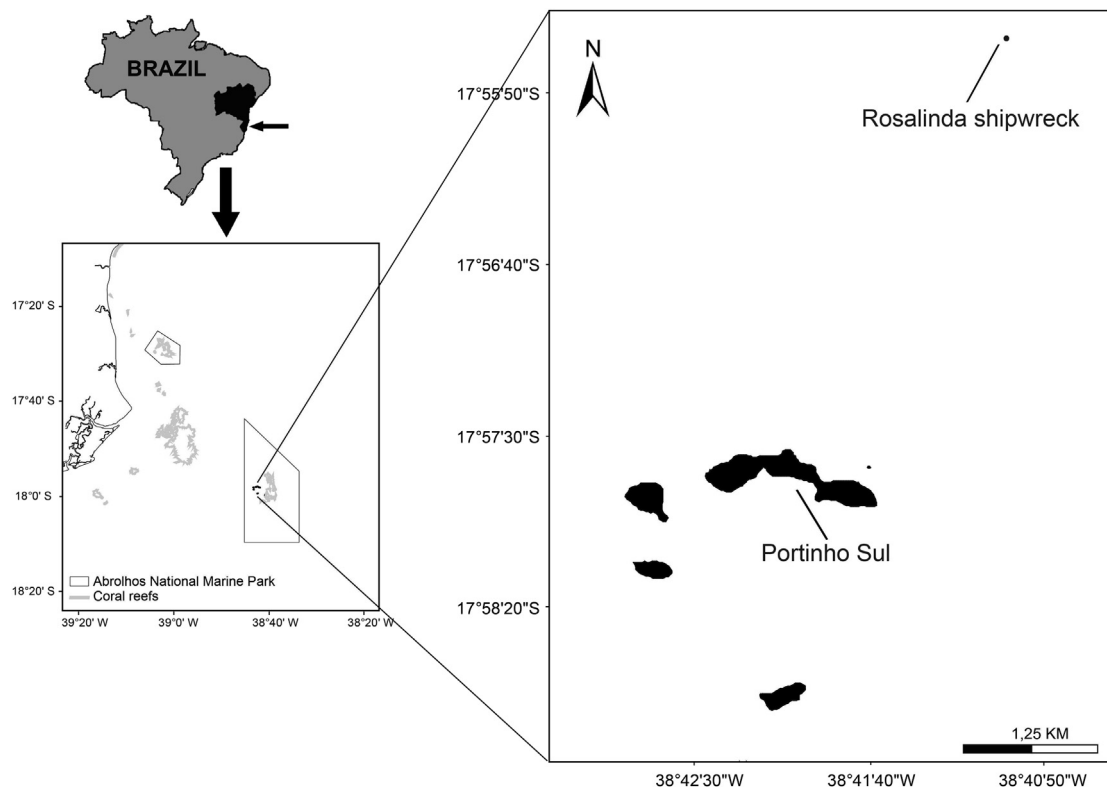


Fig. 1. Location of Abrolhos National Marine Park and sampled sites Portinho Sul fringe reef and Rosalinda shipwreck.

questionnaires, we explained the objectives of the study and requested permission to anonymously use the information provided. The response rate was 95%.

2.3. Data analysis

Marine life categories were divided into two groups based on previous studies on divers' preferences (Cater, 2008a; Dimmock, 2009). The first included the megafauna: medium and large creatures that are generally easily sighted, such as fishes (e.g. groupers, jacks and snappers), sharks and rays, marine mammals, turtles, and colorful fishes (e.g. parrotfishes and angelfishes). The second group included small and cryptic species that typically require divers' attention and searching skills: cryptic fishes and small invertebrates. Corals were included among cryptic species because divers with little knowledge about the marine environment (generally novices) do not recognize them as living creatures (Oigman-Pszczol, Oliveira, & Creed, 2007). Diver experience was measured by number of diver performed in a lifetime and categorized under four groups: (1) beginner: 1–25 dives; (2) somewhat experienced: 26–50 dives; (3) moderately experienced: 51–100 dives; and (4) experienced: >100 dives. For questions on the perception of fish abundance and motivation to return, we grouped diver revisits until 2003 and after 2003, because this was the year when fish feeding was banned. This change in norms was determinant to reduce abundance of fishes, according to the dive guides. Our objective was to verify changes in responses between divers who had visited ANMP before and after the fish-feeding ban.

Generalized linear model with Poisson distribution (Zuur, Ieno, & Smith, 2007) was used to identify relationships between marine life viewing preferences and diver profile (gender and experience level). Preferred marine life attributes were analyzed grouped either within the megafauna or cryptic fauna categories. Logistic regression was used to investigate the relationship between divers' perceptions of change in fish abundance. For the purpose of this analysis, references made to a decrease in fish abundance were grouped as negative; no change was rated as zero, while improvement was graded as positive. Statistical analysis was performed using R 3.0.1 (R Core Development Team 2013). Tests were done at a significance level of $p < 0.05$.

3. Results

3.1. Diver profiles

A total of 190 divers were interviewed between January to March 2012 (62%) and February 2013 (38%). Male gender represented 60% and female 40% of total divers interviewed. The age class between 31 and 40 years old represents 39% of respondents, followed by 21–30 (30%) and 41–50 year-olds (22%). Only two divers were foreigners from Germany. Beginner's representing 25%, somewhat experienced 20%, moderately experienced, 20%, and experienced 35%.

3.2. Marine life preferences

Respondents stated a total of 570 citations of preferred marine life attributes. Differences between megafauna and cryptic species were significant between experience levels. Cryptic fauna was preferred by experienced divers, whereas megafauna was preferred by novices (Table 1). Gender was not significant between experience levels. The preferences of male and female divers change from megafauna to cryptic fauna with increasing experience (Fig. 2a–b).

Sharks and rays obtained the highest mean score for beginners and somewhat experienced divers (mean score: 1.71 and 1.57,

Table 1
Parameters of the final generalized model.

Variable	Estimate	S.E.	Z-value	P-value
(Intercept)	-2.351	0.192	-12.20	<0.001
Experience	0.652	0.054	11.93	<0.001
Megafauna	2.807	0.208	13.478	<0.001
Experience × Megafauna	-0.942	0.063	-14.938	<0.001

Parameters are estimated in a GLM with Poisson distribution and log-link function with ranked preferences as the response variable for experience and marine life type. Showing coefficient estimates of explanatory variables, standard error (S.E.), test statistic (Z-value) and probability (P)-value. The reference level for marine life type in this regression was set as 'cryptic species'. Experience levels were converted to a continuous linear index as follows: beginner = 1, somewhat experienced = 2, moderately experienced = 3, experienced = 4.

respectively; Fig. 3). Moderately experienced divers preferred mainly shark and rays, corals and cryptic fishes. Experienced divers preferred cryptic and small creatures, like cryptic fishes and small invertebrates.

3.3. Divers' perceptions of change in fish abundances and its causes

Divers who revisited ANMP represent 36% ($n = 68$) of respondents. Among these, 56% had first visited the site until 2003, whereas 44% had visited after 2003. The average experience levels of those divers that had visited until 2003 was 95 ± 44 (\pm SD) dives, which is equivalent to the 'experienced' diver category. Divers that visited after 2003 obtained an average of 46 ± 28 dives, corresponded to the 'somewhat experienced' class, a category of novice divers. For analysis purposes, we considered divers who had visited ANMP for the first time until 2003 as experienced diver and those after 2003 as novice diver. For Portinho Sul and Rosalinda shipwreck, a significant relationship was recorded to perception of increase in fish abundance and a shorter time period since the first visit ($p = 0.002$; Fig. 4a; $p = 0.004$; Fig. 4b). Most perceptions of decrease in fish abundance were answered by experienced divers, 44% for Portinho Sul and 17% to Rosalinda shipwreck. These divers reported

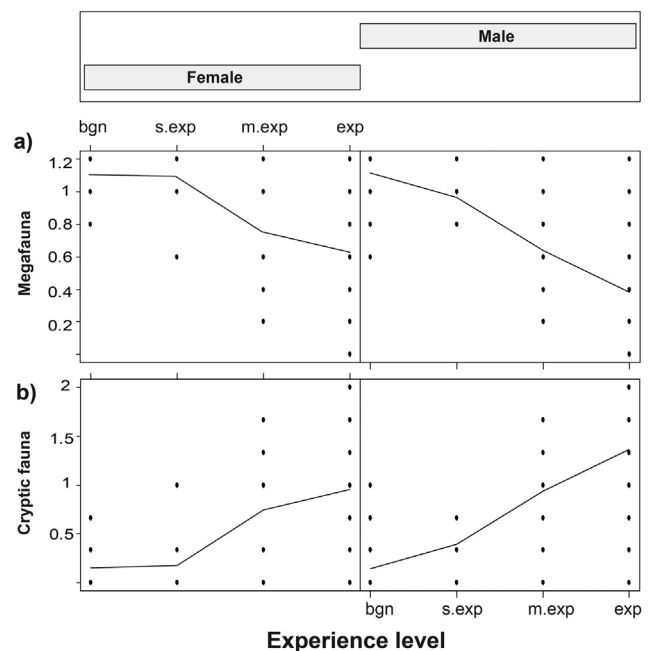


Fig. 2. Coplot of mean diver preferences score between (a) medium/large and (b) small/cryptic animals in Abrolhos National Marine Park. At each panel, a smooth line was fitted to aid interpretation. Experience level: bgn = beginner, s.exp = somewhat experienced, m.exp = moderately experienced, and exp = experienced.

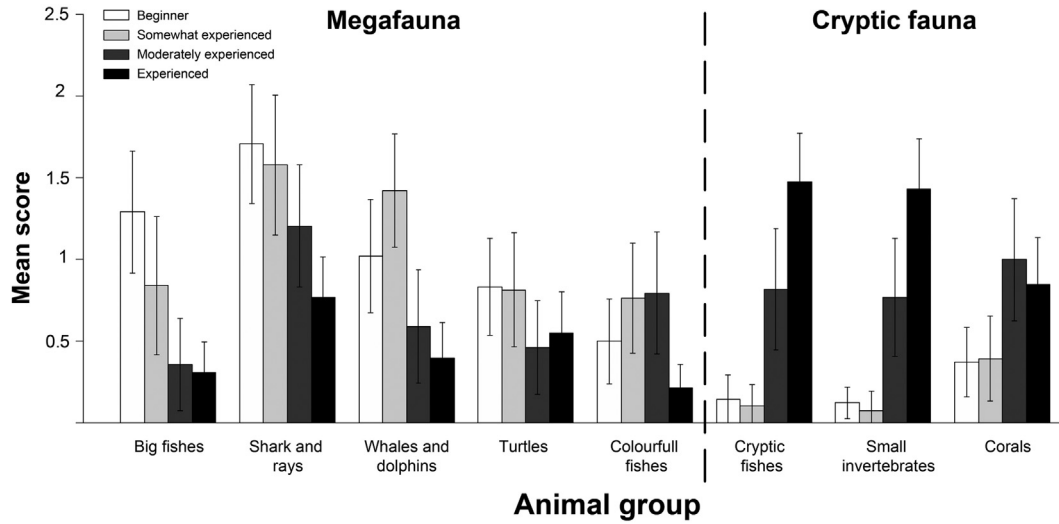


Fig. 3. Preferences (mean + CI) of animals that influencing scuba diving experiences in Arolhos National Marine Park between experience levels.

largest reductions (>30%). Only 6% (Portinho Sul) and 4% (Rosalinda shipwreck) of novice divers mentioned reductions, generally smaller (10–30%). All novice divers with short (<5 years) time intervals between visits reported improvement in fish abundance. Among the experienced divers, perceptions of quality regarding fish abundance in Portinho Sul were mainly ‘worse’ (51%) and ‘much worse’ (22%). Novice divers claimed mainly fish abundance ‘as expected’ (64%), and ‘better than expected’ (22%). Similar pattern was verified for the Rosalinda shipwreck, although the experienced divers more frequently recorded their answers as ‘as expected’ (47%) (Fig. 5).

Divers reported different causes for the change in fish abundance. For Portinho Sul, experienced divers attributed as the main cause the decline to the ban on fish feeding (37%), followed by excessive visitations (20%). These two causes were also mentioned as acting synergistically (36%). Novice divers cited poaching acting together with excessive visitation (30%), following by poaching alone (24%). For Rosalinda shipwreck, experienced divers mentioned mainly poaching (39%) and excessive visitation (26%). Novice divers reported mainly poaching (44%) and poaching acting together with excessive visitation (20%). Natural migration was quoted by novice divers in both sites (13% to Portinho Sul and 11% to Rosalinda shipwreck).

3.4. Motivations to return

Nine main reasons motivate recreational scuba divers to revisit the ANMP: Historical shipwrecks, diversity of fishes and corals, social enjoyment, helpful staff, improve skills, scenic beauty of islands, night dive and turtles abundance. We verify that 79% of experienced divers prefer specific aspects of diving, such as historical shipwrecks (40%), corals diversity (20%) and fish diversity (12%). For novice divers, the main reason was diversity of fishes (18%). However, 50% of mentioned motivations are related to social attributes and training, such as helpful staff (15%), social enjoyment and skill improvement (each with 14%).

4. Discussion

4.1. Influence of experience on marine life preferences

This study reveals that marine life viewing preferences change gradually between divers according to the experience level. The increase in experience influences divers to gradually change their preference from desiring to view megafauna (novice divers) to sighting the cryptic species (experienced divers). Novice divers

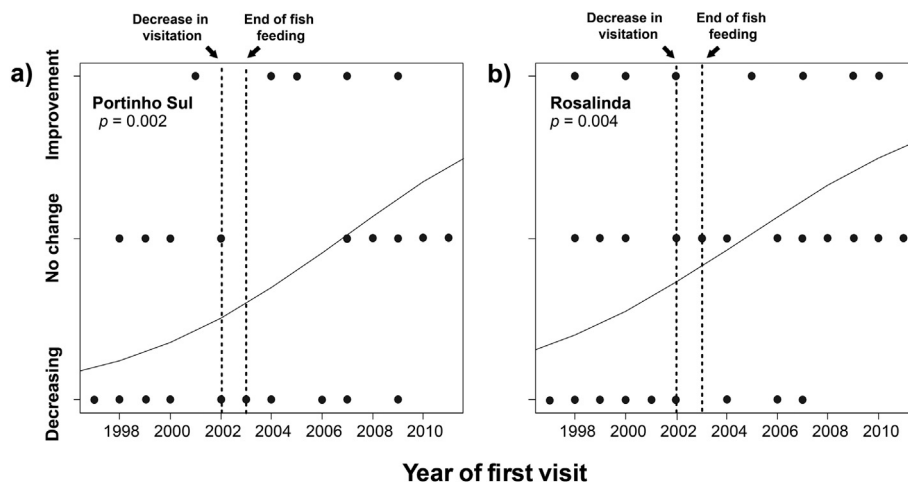


Fig. 4. Relationship between first-time visit year vs. perception of change in fish's abundance in dive sites (a) Portinho Sul fringe reef and (b) Rosalinda shipwreck in Arolhos National Marine Park.

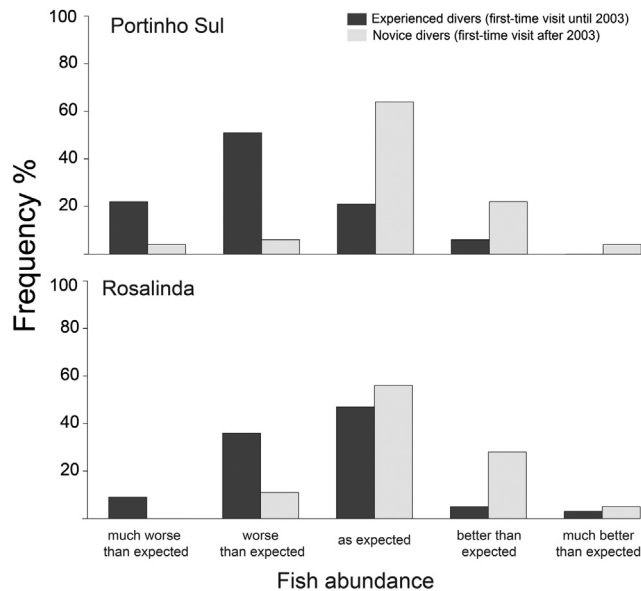


Fig. 5. Perceptions about fish abundance between divers that revisit sites Portinho Sul fringe reef and Rosalinda shipwreck.

ascribed greater importance to the opportunity of learning new skills (Fitzsimmons, 2009), exploring new destinations and overcoming fear and feeling successful (Lucrezi et al., 2013). They also show less knowledge regarding marine life (Leujak & Ormond, 2007). Sighting megafauna is appealing and prominent among most divers, due to its popularity or iconic status (Miller, 2005). These animals are more easily sighted and generally require no prior knowledge or ability to be detected or recognized. With increasing experience, divers tend to improve their skills of buoyancy control and displacement, thus increasing their self-confidence and ability to view cryptic fauna. Experienced divers possess more skills, are specialists, generally more focused on focal species (Catlin & Jones, 2010) and more able to look for small, even cryptic creatures that are not obvious to the inexperienced eye (Ince & Bowen, 2011). Our results reinforce the recreationist's specialization theory (Bryan, 1977; Ditton et al., 1992) among recreational divers, which gradually change from generalists to specialists rather than general interest to participate in diving tourism. However, our study not investigated the multidimensional aspects of recreationist's specialization theory. We use the most used variable to access experience of divers: the number of dives performed in a lifetime. Similar to our results, a recreational diver specialization study verify that large organisms provided the best experiences for beginner's divers. Specialist divers mentioned a higher frequency of best experiences for 'small organisms' (6–20 cm; (Miller, 2005)).

As observed from this study, the preferred attributes among the coral reef destinations are related to fishes, e.g. abundance and diversity (Coghlan, 2012; Leujak & Ormond, 2007; Williams & Polunin, 2000). The seasonal occurrence of humpback whales in ANMP (Martins, Andriolo, Engel, Kinas, & Saito, 2013) probably influenced the choice of preferences for marine mammals. On the other hand, the absence or low diversity/abundance of some attributes also can influence diver preferences. For instance, Lucrezi et al. (2013) verify that in Sodwana Bay, Africa, divers prefer to sight dolphins, sharks, rays and turtles, regardless of their experience. This may be due to the presence of very few cryptic species in the dive sites surveyed.

4.2. Perceptions of change in fish abundance and its causes

Experienced divers observed changes in management norms and visitation rates which influenced their perceptions of reduction in fish abundance. Fish feeding had been practiced in ANMP mainly along fringe reefs, attracting aggregations of groupers, snappers, jacks and smaller species. In fact, in many places, fish feeding is viewed as a powerful tourist attraction. This practice can attract aggregations of some fish species to the feeding site (Milazzo et al., 2005). However, there is a general consensus on their negative ecological consequences. Fish feeding can influence abundance of some species (Feitoza, Chaves, Ferreira, & Araújo, 2012; Illari, Sousa, Medeiros, Grotta, & Rosa, 2008) and cause health problems to fishes (Orams, 2002). Additionally, perceptions could be influenced by experiences and knowledge not directly related to their synoptic observations of that site. For instance, by knowledge of the oceans "being in trouble", of general declines in fish populations worldwide, and the tendency of recollections of the past to be influenced by memories being replayed and altered over time.

Regarding poaching, levels were not systematically estimated in ANMP, but several instances have been observed by researchers (Francini-Filho & Moura, 2008) and visitors (dive guides' personal communication). During data collection, we observed dozens of anchored boats (probably poaching) inside the ANMP, mainly at night. This fact may have influenced interviewees to cite poaching as a cause for the reduction in fish abundance. Another explanation is that sometimes divers found lost or tangled fishing equipment in dive sites.

Despite one third of decrease in visitation on ANMP after 2002 (Alvarenga & Fleck, 2011), we don't verified an expected reduction in responses for excessive visitation as a cause for the change in fish abundance between divers that first-visited after 2003. Divers that visit first-time after visitation decreases continue to mentioning excessive visitation, even after the reduction. This could be due to the fact that interviews were conducted during austral summer (the peak of visitation). Portinho Sul and Rosalinda shipwreck receive the largest number of visitors during austral summer, where sometimes two or more groups diving simultaneously. This can lead to the impression that visitation can also be a cause for the changes in fish abundance. This type of crowding effect has been a major indicator of detracting experiences between recreational divers (Davis et al., 1997; Rudd & Tupper, 2002). On the other hand, earlier studies have shown that scuba diving tourism has not negatively affected fish abundance over the years (Hawkins et al., 1999; Heyman, Carr, & Lobel, 2010). Long-term surveys are necessary to understand the ecological consequences of this activity.

Perceptions of decreasing in the quality of fish attributes and this correlation with the worst perceptions occur because the degree of enjoyment experienced by divers depends upon the quality of biological attributes preferred (Uyarra et al., 2009). As experienced divers have some first-visit reference dives with a greater abundance of fishes, they have worse perceptions in a scenario which includes decreases in fish abundance. Uyarra et al. (2009) also observed differences in perceptions between genders, especially to coral and fish-related attribute. We do not compare genders due the low representation of female gender between divers who revisit ANMP. Therefore, our results should be carefully interpreted.

4.3. Motivations to return

As verified for diver preferences, motivations also vary with the experience level. Novice divers are influenced by social and personal diving skills, while experienced divers are motivated mainly by dive characteristics (Fitzsimmons, 2009). This trend can help in drawing up a successful management strategy of zoning to mitigate

damage to corals. For instance, relocating novice divers from more fragile and pristine dive sites to less fragile sites, aiming develop their skills. Novice divers generally cause more damage to corals, due to their limited ability of buoyancy control (Barker & Roberts, 2004; Walters & Samways, 2001). Experienced divers possess better buoyancy control skills and knowledge regarding the fragility of marine environment (Ong & Musa, 2012). However, experienced divers generally seek to observe cryptic bottom-associated species, thus increasing the chances of collisions with corals (Uyarra & Côté, 2007). In ANMP, experienced divers often use additional equipment such as underwater camera and sidemount, which further increase the number of contacts with corals (Giglio et al., unpublished data). Therefore, the correlation between diver experience and damage to corals varies, influenced mainly by diver profile, diving goals and site characteristics.

Social enjoyment is clearly an important part of ecotourism experiences from among divers interviewed, providing an opportunity to connect with like-minded individuals during an activity (Cater, 2008b; Fitzsimmons, 2009). Wreck and night dives offer unusual, and therefore, memorable experiences in terms of underwater features, even more than dives considered to be technically difficult, which attract mainly experienced divers.

4.4. Management implications and recommendations

Understanding differences on diver's preferences may assist managers in designing a diversity of recreation opportunities aimed to meeting specific needs of diverse diver's profiles and to conserve the health of marine biota. For instance, divers can be grouped according to their experience level. As novice divers acknowledge skills improvement and social interactivity as important motivations for diving, dive guides can focus on activities aimed to develop this attributes, preferentially in sites with lower coral abundance and greater abundance of megafauna, such as large fishes. For experienced divers, shipwrecks, and sites with high complexity and abundance of cryptic species can be prioritized. The enjoyment and emotional motivation that divers get from these experiences are important factors influencing their future conservation actions, such as money donation for conservation programs. It also makes them more engaged in environmental-friendly behavior and attitude and to a higher degree of norms compliance (Musa et al., 2011). Furthermore, satisfied divers may be more willing to accept strict management scenarios (Fitzsimmons, 2009). Tourism managers can enhance satisfaction and enjoyment toward marine environment, as this is probably more effective in encouraging responsible behavior and conservation intentions than the mere sharing of knowledge and experiences.

This study reinforces diver's preference for fish-related attributes along coral reef destinations. These findings suggest that fish abundance and diversity are important factors for choosing a diving destination. The negative perceptions that experienced divers had in this study might start to influence travel decisions, if management interventions are not implemented. To improve divers' perceptions and enjoyment, we suggest the follow three management interventions. First, mitigate poaching through increase in surveillance and new enforcement approaches, such a permanent surveillance boat in ANMP and overnight surveillance effort for at least few days every month. Second, apply rules to limiting daily divers' visitation (including the number of simultaneous groups in the same dive site) and the establishment of a carrying capacity might be effective approaches to minimize diver's disturbances to reef fishes through crowding. There is evidence that high levels of diver visitation caused shifts in the structure of fish assemblages, short-term fish behavioral changes, and decrease in richness and abundance of several species (Albuquerque et al., 2014). Third, new

strategies to disseminate ANMP and others MPAs attractions (especially the cryptic fauna) such as promotional and educational videos showed to divers before diving.

In summary, the information provided in this study could help commercial dive operators and MPA managers to develop a better marine product that is consistent with the needs and wants of certified scuba divers visiting to the ANMP. Improving preferred attributes in the ANMP make dives fully enjoyable and satisfy the expectations of scuba divers, with clear benefits to dive tourism. A better understanding of motivations and preferences of divers can help guide dive industry into a more sustainable mode in the future.

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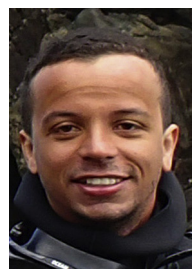
Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.tourman.2015.04.006>.

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