

Moving towards a sustainable cetacean-based tourism industry – A case study from Mozambique

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ARTICLE INFO

Keywords:

Marine mammals
Code of conduct
Marine protected areas
Sustainable management
Cetacean based tourism
Mozambique

ABSTRACT

Cetacean-Based Tourism (CBT) is often confused with sustainable tourism. However, not every CBT operator has an environmental education component attached to its programme. In reality, CBT has the potential to negatively impact the animals it is targeting; thus management is required to mitigate any harmful effects from tourism activities. This paper analyses the attitudes and perceptions of the marine operators and tourists that partake in dolphin-swim activities in the Ponta do Ouro Partial Marine Reserve (PPMR) in Mozambique. Hand-out questionnaire surveys with closed and Likert scale type questions revealed that the tours are an effective means to promote pro-environmental behaviour and consequently increase compliance with the code of conduct. Nonetheless, in the PPMR, both tourists and operators presented only basic knowledge of the regulations of the reserve and of the dolphin, whale and whale shark code of conduct, indicating that there is a need for improvement. We provide recommendations for improving local management, which are also applicable at the national and international level. Overall, this paper provides knowledge and guidance for moving towards a sustainable based CBT industry in the PPMR.

1. Introduction

Marine tourism has rapidly grown throughout the world [2], particularly Cetacean-Based Tourism (CBT), where tourists seek activities in which they can observe or swim with dolphins and whales [1]. CBT is one of the fastest-growing industries in the world, with activities in 119 countries, a return of 13 million tourists per year, and an estimated value of two million US dollars [1–5].

CBT includes any recreational or commercial dolphin watching, feeding, or swimming activity conducted in either captive or natural environments [6]. Often CBT is misidentified by tourists or falsely labelled by businesses as “ecotourism” and “sustainable”. These terms imply that an activity involves education and interpretation of the natural environment, whilst being managed to be ecologically sustainable, minimizing negative impacts [7,8,75]. Sustainable ecotourism activities can thus benefit socio-economic growth whilst also encouraging pro-environmental behaviour, as they utilise environmental education

programs that are specifically designed and implemented to increase awareness and understanding of the participants [1–3,9–13]. However, whilst some CBT activities can be classed as sustainable and/or ecotourism, others fail to follow these principles [10,14].

Furthermore, these human activities, specifically observing and swimming with wild cetaceans, have proven to have many impacts that are negative to the animals. Many studies report short-term impacts such as changes in the behavioural budget [2,15–18] or animals displaying avoidance by temporarily emigrating to tourism-free areas [3,5,16–20]. In some instances this has even led to long-term effects, for example declines in relative abundance or decreased female reproductive success [2,3,21–23,76].

To effectively manage CBT, it is necessary to control the levels of human disturbance and mitigate possible harmful effects to the populations [22]. This management requires guidance from scientific studies on how to mitigate any impacts, monitor regulation implications, and assess enforcement effectiveness [24]. Different approaches

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<https://doi.org/10.1016/j.marpol.2020.104048>

Received 1 August 2019; Received in revised form 21 May 2020; Accepted 22 May 2020

Available online 11 July 2020

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exist to regulate CBT activities, which can be broadly divided into two main groups: mandatory regulations and voluntary guidelines [1,3,21,22,25,76].

Voluntary codes of conduct (CoC) have been successfully implemented for CBT management (e.g. Moray Firth, Scotland)[26]. Typically the CoC is developed through collaboration between managers, operators, scientists and other stakeholders; operators then choose whether to participate or not. One of the most common forms of mandatory regulations involves the creation of Marine Protected Areas (MPA). MPAs are a tool to increase conservation actions and find vulnerable hotspots for

specific species [27,28] as well as protect the ecosystem from anthropogenic threats. However, MPAs can take several years to implement and require continuing management, which can be challenging in terms of logistics and economics. When used together, the two methods allow for more adaptability, where mandatory regulations can cover activities at national levels and the CoC are used to adapt management to local specifications [22,29]. CoC do not require government approval, therefore become active faster; this allows immediate, “on the ground” mitigation, while official regulations are being developed or amended, thus circumventing regulatory voids. This is a particularly important

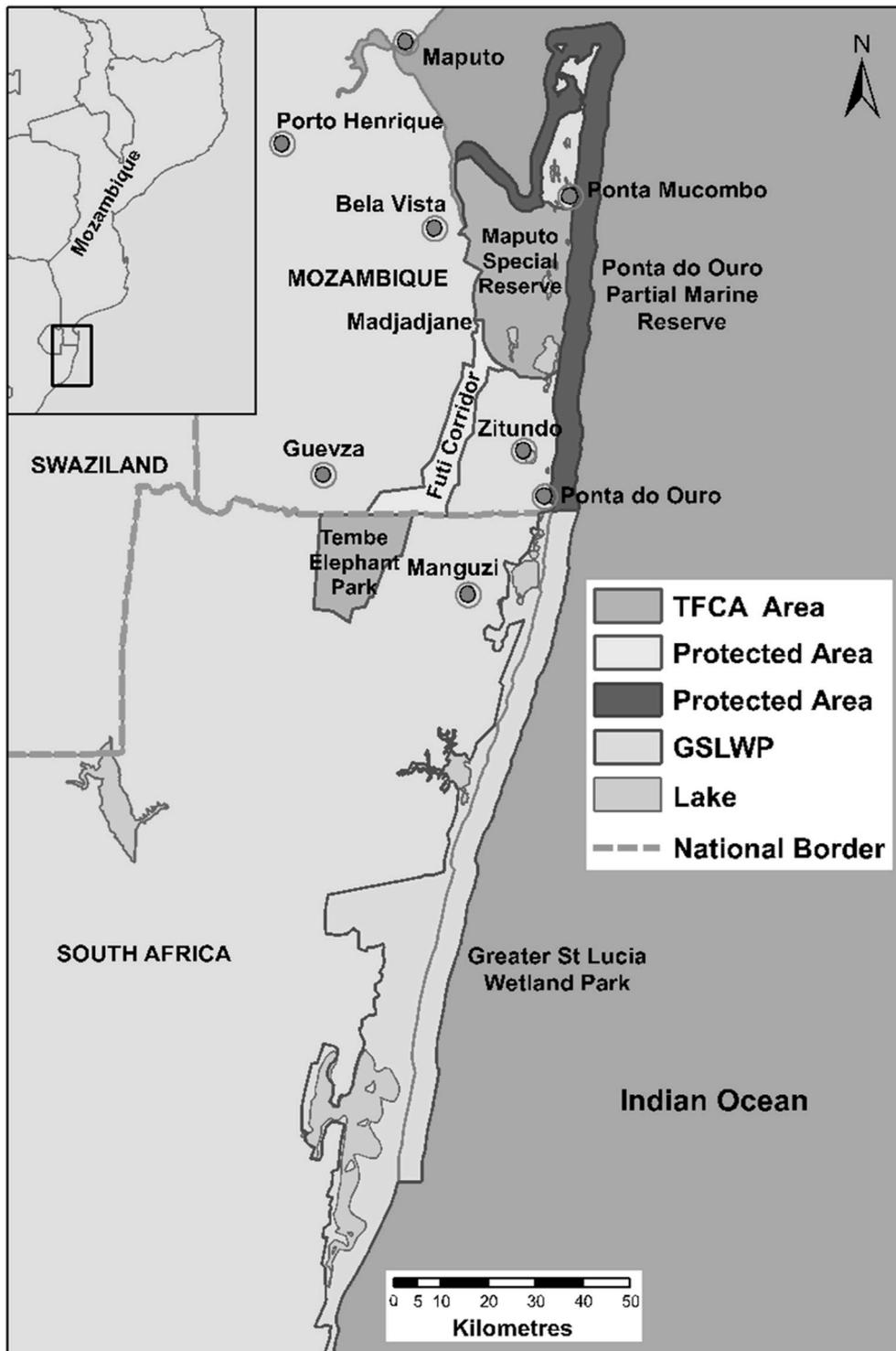


Fig. 1. Map identifying the TFCA and PPMR boundaries (Cartography by Carter,P.).

advantage in developing countries, where the CBT industry may have developed before appropriate management measures can be implemented. It also works as an advantage to developed countries where funding is lacking to enforce regulation.

● The PPMR as a case study

Mozambique is a southern African developing country known for biodiversity richness, both on land and in water. In 2000, a protocol was signed between South Africa and Mozambique, which established the Lubombo Ponta do Ouro – Kosi Bay Marine and Coastal Transfrontier Conservation and Resource Area. This is part of a wider protocol signed between South Africa, Mozambique and the Kingdom of Eswatini (former Swaziland). As a result, the Ponta do Ouro Partial Marine Reserve (PPMR) was created to link with iSimangaliso Wetland Park (IWP) a world heritage site in South Africa [30]. This area is considered to be of Global Importance [77]. Mozambique is part of the Eastern African Marine Ecoregion (EAME) [31].

The reserve has a total coverage of 678 km² and extends from Inhaca Island (25° 55'40.8" S, 33° 01'26.4" E), towards Ponta do Ouro village (26° 51'32.40" S, 32° 56'45.50" E) in southern Mozambique, with an extension of three nautical miles towards the Indian Ocean. It shares a border with South Africa's iSimangaliso World Heritage Site [32–34] (Fig. 1).

It is the number one destination in the country for wild dolphin-swim activities [33]. The area has experienced a series of anthropogenic pressures, such as unregulated coastal development, pollution, littering, and overfishing [35] as well as an increased amount of leisure and commercial vessel traffic (pers.comm Goncalves 2018). CBT began in the early 1990s with only one company operating and the remaining offering diving, fishing and snorkelling activities. In 2008, the number of CBT operators increased to three exclusive and nine non-exclusive companies (that also offered snorkelling in addition to dolphin trips), giving a total of twelve operators. In 2009, the PPMR was created for the protection of coastal marine species and their habitats [31,33]. Dolphin, whale and whale shark activities became regulated under the management plan that was implemented in 2010 (Table 1). Permits were issued and a CoC developed, which is to be adhered to by both commercial boat operators and recreational boaters within the PPMR [33]. With the management plan implemented, only four operators were issued dolphin permits; two in Ponta do Ouro bay (that ran exclusive dolphin-swim tours), one in Malongane bay, and one in Mamoli bay. All remaining operators were, however, still allowed to offer snorkelling trips that can easily lead to dolphin encounters if the operators are unwilling to comply and there is a lack of enforcement.

One of the CBT operators (Dolphin Encountours Research Centre, DERC) also collects scientific data relating to dolphin demographics and behaviour during its tours; collection has taken place since the

Table 1

Code of Conduct (CC) for dolphins, whale and whale sharks
No person will chase, herd, catch, kill, harass, feed or disturb marine mammals at any time. Keep a slow, steady speed without changing course. If your vessel is approached by marine mammals to bow ride, refrain from altering course to approach them. Always approach from the side, never from directly behind or from front. Minimize noise disturbance by maintaining a slow, steady speed. Do not approach dolphins/whales with small power craft i.e. jet skis.
Marine mammals have right of way.
Unless authorized, vessels are not to approach marine mammals within 300 m. Avoid mother and calf units. Do not enter into the water with newborns/calves. Only enter into the water with qualified and authorized personnel.
Keep noise levels to a minimum. No shouting or loud whistling.
A 20-min viewing time is to be followed. If marine mammals move off within this time, they must be left alone.
Refrain from interference if signs of disturbance are apparent (change of directional swimming, fast 'escape' swimming or extended dive times, erratic directional surfacing).
Fishing – dolphins may not be pursued for capture or attempt to be caught.

establishment of the company in 1994, prior to the proclamation of the PPMR. These data indicated a decrease in the quality of the dolphin/human interactions, where the percentage of swims in which interactions occurred decreased from over 60% (1998) to less than 30% (2008)[36] Based on this and other trends from DERC's annual report to the PPMR, the practice of CBT activities in the PPMR is currently unsustainable and posing risks to the conservation of the inshore bottlenose dolphins (*Tursiops aduncus*). Relatively little research has been conducted in the PPMR, with articles published on willingness to pay [32,37], analysing various angles of the recreational diving industry [35,38,39], and on the establishment of MPAs [31]. However, there is no published research on CBT in the PPMR or about the resident population of bottlenose dolphins that these activities typically target.

This study examines the attitudes towards and perceptions of CBT in the PPMR. Specifically, it surveys both the marine tourism operators that conduct business within the PPMR and tourists who partake in dolphin-swim activities. Both groups are assessed with regards to the PPMR management plan, the cetacean and whale shark CoC, and CBT regulation within the reserve. The results of this study provide recommendations for the revision of the management plan and code of conduct, as well as new scientific data to support the devising of the guidelines for CBT management at national and international level.

2. Materials and methods

2.1. Data collection

2.1.1. Questionnaire design

The research used the administration of two types of hand-out questionnaire surveys targeting tourists and operators. Although similar in structure, each questionnaire was specifically designed for each sample group. All questions were close-ended and no identification information was obtained from the respondents to ensure their confidentiality. All methods applied in this research were approved by the ethics committee from the Science Faculty of the University of Portsmouth (SFEC2019-025).

For the tourists, the questionnaire had four sections: 1) Reason for visiting, 2) Marine conservation, 3) Dolphin swim activity, and 4) Respondent details. The first section related to their reason for visiting the area. The second section aimed at understanding their attitudes towards and perceptions of marine conservation using a five point Likert scale of agreement. The third section, also on a five point Likert scale format, assessed previous experiences with CBT and other marine animals, compliance with the CoC by the operators as well as the respondents' opinion on the restrictions imposed by it, values of the experience and post-experience attitudes. The final section obtained demographic data such as, age, gender country of origin and duration of stay.

The marine tourism operator's questionnaire also had four sections: 1) Job description, 2) Marine conservation - MPA, 3) Marine Conservation - CoC, and 4) Marine conservation - participation. The first section focussed on job position, such as the number of times an operator communicates with a client/tourist. This was analysed to determine how much influence the operators can have over the tourists to educate them and develop environmental awareness. These data can also help to determine how influential the tourist could be, with relation to operators following guidelines and levels of compliance. The second section focussed on the knowledge of and attitudes towards marine conservation, the MPA and marine activities' restrictions. In order to gain an overall understanding of the awareness of and attitudes towards the PPMR, respondents were asked to indicate their level of understanding of the MPA designation. To obtain a better understanding of the operators' perception of the MPA, a series of statements were presented in a table and respondents were asked to indicate their degree of agreement. The third section sought attitudes towards and level of engagement with marine conservation, exploring whether operators were willing to

participate in the PPMR's management through education and awareness of tourists, as well as marine conservation programs. Finally, the fourth section focussed on knowledge of and attitudes towards the CoC. All statements were extracted from the original PPMR CoC to determine if operators knew what the CoC comprises and if they were satisfied with the regulations imposed.

2.2. Sample group & collection procedures

CBT tourists were surveyed from March 2018 to July 2018, to include the Easter and beginning of the winter school holidays, when more tourists are present in the PPMR. Nonetheless, all operators work year-round. Three CBT operators were used as platforms: the two permitted in Ponta do Ouro bay (DERC and Somente Aqua dolphin centre) and the one permitted in Malongane Bay (Halo Gaia). In the PPMR individuals can only approach cetaceans through authorized operators under guided tours; therefore, respondents were selected opportunistically as they returned from the activity and questionnaires were filled in on-site and individually (similar to Ref. [40–42]). This method had the benefit of providing immediate feedback, as well as reducing costs and surveyor time [43]. The survey was presented by a crew member of each company, requesting the respondent's attention and explaining the purpose of the survey; this guaranteed higher return rates of fully-completed questionnaires, and consequently promoted confidence in the results [43].

In the case of the marine operators, the PPMR office provided a list of all operators within the Ponta do Ouro and Malongane bays. These two bays represent the majority of commercial operations within the reserve, therefore providing good representativeness of the PPMR. The survey was administered in April 2018. The forms were either completed on-site with the surveyor or the respondent would complete them individually and return afterwards.

2.3. Data analysis

Data from the questionnaire survey were captured into Microsoft Excel and descriptive analysis was employed to describe basic features of the whole data set. The five-point Likert scale format questions were presented under a weighted average analysis, indicating possible trends on participants' attitudes and perceptions. A chi-square test for associations ($\alpha = 0.05$) was conducted to determine if different demographic groups were more aware than others of the PPMR and Code of Conduct. This test was done on both operators' and tourists' survey results. The tourist variables were: Gender (Female; Male; N/A i.e. participant didn't answer.), Country of Origin, some grouped into wider categories (South Africa, Mozambique, Europe, Others), Reason for visiting the PPMR (Dolphin swims, Diving, Enjoy the beach, Explore new place, Joining family or friends, Others), and Age (<20, 21–30, 31–40, 41–50, 51–60, >60). The operator's variables were: Job position (Skipper, Surfari/Snorkel guide, Manager/Owner, Topman, Dive instructor), Frequency of communication with clients (Often, Somewhat, Little, Nothing), and Frequency of activities with the clients (Daily, 2 to 4 times per week, Weekly, Never). The tourists' background variables were selected based on similar studies [10,39,44–46]. However, the operators' background variables were limited in order to keep them anonymous

3. Results & discussion

3.1. Tourists' attitudes towards and perceptions of the MPA and the dolphin code of conduct

A total of 117 tourists partaking in CBT activities completed the survey. This represents approximately 9.5% of cetacean tourists of the PPMR in the period of mid-March to mid-July (M. Goncalves, personal communication, March 29, 2020).

Of these, 4% were from Somente Aqua Dolphin Centre, 16% from

Halo Gaia and 80% from DERC. Distributing the questionnaires through the three main operators had the intent of producing results from tourists who participated in dolphin tours which followed differing formats (pre-briefing, in-water behaviour, vessel approach type, etc.) therefore, obtaining a wider representation of the group. However, results indicate a potential source of bias resulting from an uneven distribution of tourists amongst the operators. This can be justified by the different sizes of the companies as well as adherence to the study. For example, one of the two full-time operators misplaced a batch of completed surveys.

3.1.1. Respondent details and demographic analysis

From the total ($n = 117$) respondents, 62% were female and 31% were male, similar to many surveys undertaken with CBT participants [1,41,42]. The majority of participants (61%) were visiting from South Africa. As other local research has indicated, the main source of tourists for the PPMR is South Africa [32,35,47]. The respondents' age had good representation of every group, with exception of minors (4%) and people over 60 years (5%), justifiable by the roughness of the boating experience. Recent studies in the area have presented similar results [32]. The remaining groups were 21–30 y (20%), 31–40 y (20%), 41–50 y (28%) and 51–60 y (17%).

The majority of respondents (64%) were visiting the reserve for the first time and most indicated that they would revisit (91%). For the 36% who had already been in the PPMR previously, 32% indicated that they visited less than once a year, followed by 21% visiting once a year, and the remaining three options with 16% each [39]. Obtained similar results when surveying tourist divers in the PPMR, where the majority did more than one dive per year and all within the PPMR.

3.1.2. Attitudes & perceptions on MPAs and the PPMR

The majority of respondents (64%) affirmed that they were aware of the area being an MPA; however, the remaining were unsure or had no knowledge of the PPMR. When asked to rate how well they knew the reasoning behind the MPA's establishment, a combined total of 42% affirmed to have none to only some knowledge; 30% had good knowledge; and 28% affirmed they had excellent self-reported knowledge. A study in Malta has produced similar data with the majority of people being aware of the studied MPA, but a smaller proportion actually knowing why it was created [48–50].

When asked to give a level of agreement to statements related to the impacts of MPAs on marine activities there was no clear consensus. This further shows that the tourists have insufficient knowledge of what an MPA is. Studies analysing the public perceptions of MPAs in other countries have presented similar results [48–50].

3.1.3. Attitudes & perception on CBT and code of conduct

When asked about their participation in CBT activities, 50% responded that they had previously participated while 49% said they had not; the remaining 1% did not reply. From the previous participants, the majority had engaged in "swim with wild dolphin" activities, followed by 17% that engaged in "wild observation" and the remaining 29% participating in activities with captive animals ("Dolphinarium" and "Swim with captive dolphins").

The majority of the respondents (41%) indicated they had never participated in activities with other wild marine animals. Of those who had, most had participated in activities targeting whales and whale sharks (33%). There was a preference for cetacean-based activities in the natural environment with 64% having participated in wild dolphin swim activities and 17% in wild cetacean observation, which is similar to other studies with tourists [1,41,51]. This general trend of preferring activities with free animals may indicate that people support the idea of CBT being an effective vehicle for environmental education programmes. Including an educational and awareness component to the tour is an effective method to further develop a conservation awareness in people [1,42,52–55].

Table 2
The tourist's perception of the CoC represented in percentages per sentence.

	#	Statements	Strongly disagree (%)	Somewhat disagree (%)	Not sure (%)	Somewhat agree (%)	Strongly agree (%)	N/A (%)	TOTAL
Dolphins, whales and whale sharks code of conduct	1	Unless authorized, no vessel is to approach within 300 m of animals	4	3	3	15	72	3	100
	2	Animals have right of way	3	0	0	2	92	3	100
	3	If animals move off, they must be left alone	3	0	3	5	87	2	100
	4	Keep slow and steady speed, without changing course	4	3	4	16	70	3	100
	5	Do not approach animals with jet skis	5	0	7	3	83	2	100
	6	If dolphins approach bow, refrain from altering course to approach them	6	3	13	16	58	3	100
	7	Always approach from the side, never from behind or front	4	0	24	11	59	2	100

With regards to the CoC 50% of respondents replied that they were aware of the CoC (Table 2). However, 22% reported that they were unaware of the CoC and a further 25% were unsure of what it entailed. Considering that the survey took place after the dolphin trip, it is worrying that almost half of the participants concluded the activity with little or no knowledge of the CoC. This could indicate that the educational section of the experience is non-existent or inefficient. When asked to agree with a series of statements that described the CoC, the respondents showed excellent comprehension of the CoC, strongly agreeing with all statements. This shows that although many participants were unaware that a code was in existence, the majority did agree with the restrictions that it imposes.

Understanding what is and is not important to the enjoyment of the dolphin trip was assessed through a series of statements (Table 3). There was an overall consensus that the safety of both animals (Statements 1 & 12) and humans (Statements 6,8,& 9), the educational component (Statements 4,6,10 & 11), and seeing the animals both from the boat (Statement 2) and underwater (Statement 3) are important to the participants' satisfaction. Touching the dolphins was the only statement (5) considered not important (80%), contrasting with the captive animal business that humans seek to get "the kiss" or swim holding onto the dolphins' fin. Previous research indicates that participants are happy to comply with regulations once they are explained to them, because they do not want their actions to create disturbance or harm the wildlife [1, 52,56,57]. Statements four (Educational brief from crew) and 12

(Ensuring that I do not harm or have a negative impact on the dolphins) of this study corroborate such findings.

Good weather conditions (Statement 7), such as flat seas, blue skies and warm water and air temperatures, contribute to the enjoyment of the trip and can increase the number of sightings and underwater visibility of the animals. Many studies on outdoor activities have suggested that the weather plays an important factor [58,59].

Respondents gave high importance to interpretation and education as components of the experience, similar to findings in other studies about tourist's satisfaction and education in CBT [1,11,41,42,55,58].

The respondents were happy with the crew's compliance with the code, with 81% strongly agreeing and 73% agreeing that minimal impact procedures were undertaken (Table 4). When asked if the animals seemed disturbed, 21% were unsure and the statement had a weighted average of 2.4 sitting between "somewhat disagree" and "not sure". This could be explained by the respondents' little knowledge of dolphin behaviour, which makes the individual unfit to assess it personally. Time spent observing the animals was considered too short by 26% of respondents and sufficient by 51%. The levels of uncertainty on statements 4 (Dolphin swim programs have negative impacts on dolphins), 5 (Animals were unhappy with the human approach), and 7 (Number of drops were insufficient), combined with the desire to spend more time with the animals (Statement 10), could lead to operators breaching the regulations to ensure client satisfaction.

Table 3
Enjoyment of the tourist's dolphin experience, represented in percentages per sentence.

	#	Statement	Not at all important (%)	Not very important (%)	Fairly important (%)	Important (%)	Very important (%)	N/A (%)	TOTAL
Enjoyment of the tourist's dolphin experience	1	Ensuring that I do not harm dolphins	0	0	1	2	93	4	100
	2	Seeing dolphins from the boat	0	3	11	36	44	5	100
	3	Seeing dolphins underwater	0	3	9	27	56	4	100
	4	Educational brief from crew	0	1	9	25	61	4	100
	5	To be able to touch the dolphin	57	23	5	5	4	5	100
	6	Briefings about personal safety	1	5	13	25	50	6	100
	7	Good weather conditions	1	2	29	36	27	5	100
	8	Feeling comfortable with the snorkelling equipment	0	1	9	46	40	4	100
	9	Feeling safe whilst in the water	0	3	5	38	50	4	100
	10	Educational material during the presentation	3	9	15	38	29	4	100
	11	Opportunities to learn more information	1	1	17	38	38	5	100
	12	Ensuring that I do not harm or have a negative impact on the dolphins	0	0	0	6	90	4	100

Table 4
The tourist’s attitudes towards the dolphin experience, represented in percentages per sentence.

	#	State/nts	Strongly disagree (%)	Somewhat disagree (%)	Not sure (%)	Somewhat agree (%)	Strongly agree (%)	N/A (%)	TOTAL
Tourist’s attitudes towards the dolphin experience	1	Understanding of dolphins has increased	2	2	3	31	56	6	100
	2	Operator follows code of conduct	1	0	2	10	81	6	100
	3	Minimal impact procedures are undertaken to reduce human impact to dolphins	5	3	11	15	58	9	100
	4	Dolphin swim programs have negative impacts on dolphins	17	14	32	22	9	7	100
	5	Animals were unhappy with the human approach	30	21	21	11	9	8	100
	6	Animals seemed unphased/curious to human approach	2	5	15	35	32	11	100
	7	Number of drops are insufficient	26	26	20	11	8	10	100
	8	In water code of conduct is too strict	53	21	9	3	6	7	100
	9	Not allowed to touch animals in necessary	58	12	3	3	15	8	100
	10	Time spent observing animals is too short	25	26	14	21	5	9	100
	11	Would choose an observation only over swim with program to minimize impacts on animals	18	20	26	15	15	7	100
	12	Would pay the same for observation only, if it’s better for the animals	14	15	26	15	23	7	100

Previous studies have demonstrated that dolphin tours can be an effective vehicle for education [45,55], but that often tourists complain about the information provided being too lengthy or not interesting. It was also shown that if clients’ expectations are managed prior to the experience (pre-tour brief), their levels of satisfaction will increase [1]. A formal training of the boat crew on aspects such as boat and swimmer approach, dolphin behaviour, data collection, and guiding skills has been suggested in many research papers and put into practice successfully by some operators [1,16,60–62].

3.2. Marine operators’ attitudes and perceptions on the MPA and the dolphin code of conduct

A total of 35 questionnaires from nine marine operator companies were received and entered into the data. There were no questionnaires deemed ineligible. This represented 82% of the total number of the companies that work within the PPMR, resulting in a high response rate. The companies chosen were based on their location and activities, to ensure that all participants worked inside the PPMR boundaries and were involved directly or indirectly with CBT activities. The same methodology was used in other studies [26,61].

3.2.1. Job characteristics

The majority of the respondents were skippers (31%), followed by

owners and managers (23%), and dive masters and instructors (20%). The majority of the participants undertook marine activities with the tourists on a daily basis (60%), while some only participated two to four times per week (26%), with even less on a weekly basis (11%), and only 3% never engaging in marine activities. These results indicated a high level of involvement with the tourists, which means that the sample has a good representation of the staff that is involved with tourists who undertake marine activities. The results also indicate that the sample is representative of the population that is directly influenced by the management decisions on the PPMR. Many studies have presented data on the frequency and duration of activities to ascertain levels of involvement between the operation staff and the tourists [8,63–65] which aids in determining if and when an interpretation segment can be included. The majority declared that they speak often with the clients (86%), followed by 11% that speak somewhat, and 3% that engage little. There were zero responses to “never”. The results show, once again, a high level of communication between operators and tourists indicating the importance and potential that operators have to optimise the impacts of the experience for the tourists [40,42,44].

3.2.2. Attitudes & perceptions on MPAs

The majority of the respondents (51%) said that they had a good understanding of why the area had been designated an MPA, followed by 29% with excellent and 20% with some understanding (Table 5). The

Table 5
Marine operator’s perception of an MPA, represented in percentages per sentence.

	#	Statement	strongly disagree (%)	somewhat disagree (%)	Not sure (%)	somewhat agree (%)	strongly agree (%)	TOTAL %
MPAs have a number of implications to recreational activities	1	Protect marine wildlife and habitats	0	0	0	0	100	100
	2	Provide regulations for recreational activities	0	3	3	11	83	100
	3	Increase awareness of the marine environment	3	0	0	9	89	100
	4	Improve boating experience	0	9	9	40	43	100
	5	Have a bias towards certain activities	11	14	29	34	11	100
	6	Limit freedom of movement/access	9	9	14	34	34	100
	7	Represent over regulation	6	17	26	23	29	100
	8	How a low compliance rate	20	23	26	20	11	100
	9	Difficult to enforce	17	11	6	46	20	100
	10	Penalize infractioners	3	3	0	31	63	100

Table 6
Marine operator's attitudes towards the PPMR, represented in percentages per sentence.

	#	question	strongly disagree (%)	somewhat disagree (%)	not sure (%)	somewhat agree (%)	strongly agree (%)	TOTAL
Obligations & Responsibilities of marine operators	1	Operators are an example of behaviour to their clients	0	11	3	14	71	100
	2	Operators must reprimand their clients if they do not follow the MPA's regulation	0	0	3	11	86	100
	3	It is the operators' obligation to inform and educate their clients about the MPA's regulation	3	3	9	69	17	100
	4	Operators must participate directly on marine conservation events	0	0	23	26	51	100
	5	Operators should report any illegal activities witnessed	3	0	3	11	83	100
	6	Operators should record any illegal activities witnessed	3	0	6	20	71	100
	7	Operators can be citizen scientists	0	11	17	20	51	100

results indicate a high level of understanding regarding the concepts of MPAs and why this specific area has been designated. Similar results have been presented by a study on the diving industry of PPMR [47], as well as studies on operators and stakeholders perceptions and attitudes towards MPAs [63,65,66].

Over 80% of the respondents demonstrated a good grasp of the concept of an MPA and its obligations, as the results from statements 1 (Protect marine wildlife and habitats (100% SA)); 2 (Provide regulations for recreational activities (83% SA)); 3 (Increase awareness of the marine environment (89% SA)) and 4 (Improve boating experience (83% SWA + SA)) show. However, when they were asked to express their opinion about sentences 5 (Have a bias towards certain activities); 6 (Limit freedom of movement/access) and 7 (Represent over regulations), the results presented a division of opinions and some uncertainty. The same was seen for the sentence "have a low compliance rate", where around 40% disagreed but 26% were uncertain and 21% agreed. When it came to difficulties on the enforcement and penalties/fines the majority agreed, 66% and 94% respectively, indicating that operators understand the need to comply with regulations. These results are consistent with those produced in similar studies [63,65,66].

The majority (over 70%) agreed or somewhat agreed with all the statements related to their attitudes towards the PPMR (Table 6). Sentences 2 (Operators must reprimand their clients if they do not follow MPA regulations) and 6 (Operators should record any illegal activities witnessed) showed the highest level of agreement (over 80%). When asked if operators should directly participate in marine conservation

events, 23% were not sure and 51% strongly agreed. These results indicate that operators and their tours are an effective tool to be used for the education of environmental sustainability [4,41,44,45,52,53], reinforcing the need for an educational and awareness component to any guided marine activity [1,42,52–55,60].

3.2.3. Attitudes & perceptions on CBT and code of conduct

When asked if they were aware of the existence of a code of conduct that applied for dolphins, whales and whale-sharks, 86% responded yes whilst 14% admitted to only somewhat knowing that it existed and to which animals it applied. The results indicate that the methods used by the PPMR to inform operators with regards to the code were generally successful. Previous studies in other countries about CoC have produced similar results, indicating that operators are broadly aware of their existence (e.g. Ref. [26,61,67]).

A series of ten statements specific to the CoC were presented for respondents to give their level of agreement (Table 7). The majority (with a combined total of at least 80%) "somewhat agreed" or "strongly agreed" with all sentences indicating a high level of understating of the CoC. Based on these results, it could be assumed that operators, given that they agree with the statements, have high levels of compliance. Many studies in similar conditions have proven that awareness and understanding of the code does not necessarily result in full compliance by operators [1,26,61].

However, in this study, when asked how they would act in the event of encountering dolphins but not being authorized to approach (not a

Table 7
Marine operator's attitudes towards the CoC, represented in percentages per sentence.

	#	Question	strongly disagree (%)	somewhat disagree (%)	Not sure (%)	somewhat agree (%)	strongly agree (%)	TOTAL %
PPMR Code of conduct for dolphin, whales and whale-sharks	1	Code of conduct rules are to be adhered by both commercial and recreational operators	3	0	3	6	89	100
	2	Unless authorized, no vessel is to approach within 300 m	6	9	0	14	71	100
	3	Do not approach animals with jet skis	3	0	0	9	89	100
	4	Animals have right of way	0	0	0	3	97	100
	5	If animals move off, they must be left alone	3	0	0	11	86	100
	6	If dolphins approach bow refrain from altering course to approach them	3	3	14	40	40	100
	7	Always approach from side, never from behind or front	0	6	9	29	57	100
	8	Keep slow and steady speed without changing course	0	3	0	31	66	100
	9	Harassment and noise pollution from engines can lead to boat strikes	3	6	26	29	37	100
	10	Accidental entanglement and ingestion of fishing gear and marine debris can result in death	0	0	3	0	97	100

Table 8
Marine operator’s response to tourists during unauthorized approaches to cetaceans, represented in percentages per sentence.

	#	question	Yes %	Somewhat %	No %	N/A %	TOTAL
Operator’s response to tourists when unauthorized to approach cetaceans	1	Do you explain to the clients why you cannot approach?	100	0	0	0	100
	2	Do you make your clients aware of the code of conduct?	89	11	0	0	100
	3	Do you stop to observe?	26	57	14	3	100
	4	Do you allow clients to get in the water?	3	6	89	3	100
	5	Do you follow the animals for a period of time?	3	17	77	3	100

“dolphin tour”) (Table 8), the majority indicated that they would explain to the clients that they were not allowed to approach/follow/swim and would also mention the existence of the code. When asked if they would stop and observe, 26% said no, 14% said yes, and a total of 57% responded somewhat, displaying indecision towards following the code. When asked if the clients would be allowed to swim, 89% said no, with only a very small sample saying yes and somewhat (3% and 6%,

Table 9
Results of several chi-square tests for association examining the influence of demographic variables on awareness of the PPMR and Code of Conduct. Significant results (a = 0.05) are indicated in bold.

Variables	Aware of the MPA	Aware of the Code of Conduct
Gender (Tourist)	$\chi^2 = 1.299, df = 4, p = 0.862$	$\chi^2 = 1.958, df = 4, p = 0.743$
Country of origin (Tourist)	$\chi^2 = 2.954, df = 6, p = 0.815$	$\chi^2 = 6.706, df = 6, p = 0.359$
Reason to visit PDO (Tourist)	$\chi^2 = 11.344, df = 10, p = 0.331$	$\chi^2 = 9.551, df = 10, p = 0.481$
Age of participant (Tourist)	$\chi^2 = 18.074, df = 10, p = 0.054$	$\chi^2 = 19.426, df = 10, p = 0.035$
Job position (Operator)	$\chi^2 = 5.675, df = 4, p = 0.225$	$\chi^2 = 6.533, df = 4, p = 0.163$
Frequency of communication with clients (Operator)	$\chi^2 = 4.439, df = 2, p = 0.109$	$\chi^2 = 0.530, df = 2, p = 0.767$
Frequency of activities with clients (Operator)	$\chi^2 = 0.093, df = 2, p = 0.109$	$\chi^2 = 1.193, df = 2, p = 0.551$

respectively). The results for the last question, if they would follow the animals for a period of time, were similar. Results show an overall understanding and compliance with the code, unlike other studies that addressed compliance with codes [1,55,61,67,68].

Results from both tourists and operators surveys indicate that educational/interpretation programs lack in the PPMR however, are instrumental for the dissemination of information and help develop a pro-environmental behaviour [10,11,42,53,69] therefore, should be incorporated into every tourism activity as well as guide/facilitator courses to all staff members that have direct contact with the tourists.

3.3. Statistical analysis for associations

Results indicate that the awareness of the CoC by tourists differed according to age group ($\chi^2 = 19.426, df = 10, p = 0.035$) (Table 9). There were more individuals in the 21–30 age group unaware of the CoC than expected. Also, there were more tourists in the age groups of 51–60 and > 60 aware of the CoC than expected. The remaining groups did not demonstrate any significant association. A study with divers in the same MPA indicated that older tourists tended to have more experience with citizen science and overall conservation activities [39]; this could explain the high number of older tourists aware of the CoC.

4. Recommendations

This study produced a series of recommendations that are summarized in Fig. 2. We recommend that:

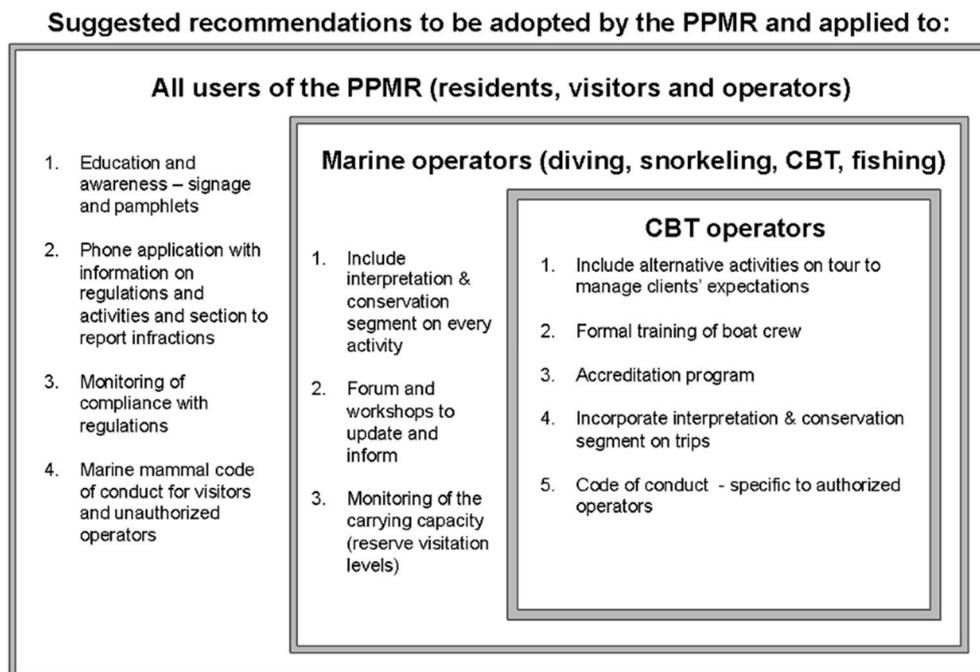


Fig. 2. Schematic of the recommendations and groups that they apply to.

The CoC be divided into two distinct documents; the first for CBT operators and the second for all remaining boaters, including both recreational and commercial. In particular, the codes should have simple, clear, realistic regulations and be feasible in the field [18,54,55,65,67,68,70]. Separating the codes and making them more accessible to the different user groups should increase understanding and compliance.

The formal training of operators could be used not only to educate operators and tourists but offer a platform for recording compliance and collecting additional ‘citizen science’ data on dolphin ecology. For instance, having a code designed specifically for authorized CBT-operators, combined with a mandatory formal training of the crew where social/guiding skills, data collection methods and dolphin behaviour assessment, should increase compliance, assist in the development of pro-environmental behaviours of the crew and tourists partaking in the CBT activities, and help with the monitoring of dolphin populations [1,16,60–62].

An accreditation programme where operators are evaluated based on the above standards can help customers choose from a pool of operators that all seem to follow similar practices. At the same time, it can incentive operators to comply and consequently obtain good publicity [16,61].

Effective monitoring of the operators and tourists’ compliance with regulations is required [9,55,70,71].

Analysis of the carrying capacity of the CBT industry and visitation levels [4,67,71].

Monitoring of the dolphin population is crucial to determine health and disturbance levels (Constantine et al., 2001, [2,3]; Garcia et al., 2017; [5,17,26,54,71–74].

Public outreach can be achieved using a variety of outreach platforms. For example, the use of infographics, pamphlets, sign boards and environmental officers in the villages and beaches specifically targeting tourists. Technology could also be used to assist with this [1,9,18,26,41,58,60,61,71] for example, creation of a phone application with open access to all to inform of the zoning, PPMR’s regulations and report infractions [65]. Given that older people are better informed of the CoC, a particular emphasis should be placed on educating younger people. Technology could also be useful in this regard.

The incorporation of other activities that would reduce focus on the dolphins, such as reef snorkelling, free-diving skills, bird watching and coastal and cultural information, to reduce the pressure off the dolphins.

Finally, fora and workshops to be held for regular communication with the stakeholders to discuss awareness, regulations, policy and monitoring, and the use of citizen scientists [9,16,18,26,60,71].

5. Conclusion

This study determined the attitudes and perceptions of marine operators and CBT tourists towards the PPMR and the code of conduct. Overall, these findings highlight potential areas of improvement, and informed several management recommendations.

The results indicate that both operators and tourists are aware of the existence of the MPA; however, there is a lack of awareness amongst tourists regarding the regulations of the reserve, particularly with regards to the CoC.

There was some uncertainty by the operators on whether to break the rules when pressured by the tourists to approach, swim or stay longer with the animals. Our results indicated that tourists were greatly in favour of well-regulated activities. Therefore, if properly educated, tourists’ knowledge could be used to increase the operators’ compliance with regulations.

The surveys conducted with operators and tourists, strengthen outputs from previous studies and demonstrate that if these mitigation measures are successfully implemented, the PPMR could have a thriving sustainable CBT industry, providing a significant boost to the local economy. It is necessary to enact legislation specifically for the protection of cetaceans and the management of the CBT industry. Further

studying of the dolphin population dynamics, health and levels of disturbance are necessary to support mitigation legal measures and changes to the reserve management plan.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Acknowledgements

The authors would like to thank Paul Carter, from the Department of Geography of the University of Portsmouth, for his cartographic assistance.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.marpol.2020.104048>.

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