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Recreational specialization and the marine-based conservation behaviour intention of recreational divers in Hong Kong

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ABSTRACT

This study examined divers' recreational specialization, pro-environmental attitudes, and marine-based conservation behaviour intentions. A questionnaire-based data collection approach was used to survey 398 divers who visited popular diving sites in Hong Kong by employing structural equation modelling to determine the potential relationships among the proposed variables. The results showed a statistically positive relationship between divers' recreational specialization and their pro-environmental attitudes, along with a statistically valid relationship between divers' recreational specialization and their marine-based conservation behaviour intentions. However, divers' pro-environmental attitudes were not statistically significant with their marine-based conservation behaviour intentions; thus, the discrepancy regarding different research findings between the current and previous studies was further discussed. In particular, our findings confirmed that recreational specialization could be a reliable predictor of divers' pro-environmental attitudes and marine-based conservation behaviour intentions to fill the research gaps regarding scuba diving-based nature tourism in Hong Kong. Consequently, management implications and recommendations were presented in accordance with the development of marine environmental conservation and sustainable scuba diving tourism in Hong Kong.

1. Introduction

Previous studies have shown that coral communities play a vital role in motivating tourists to engage in water-based recreational activities, among which scuba diving is recognized as one of the most popular nature-based tourism (Barker and Roberts, 2004; Dearden et al., 2006; Lamb et al., 2014; Salim et al., 2013; Zhang et al., 2023). According to the Professional Association of Diving Instructors (PADI, 2021), the organization has granted over 28 million diver certificates since 1967 and operates 6600 dive centres and resorts in over 186 countries or territories worldwide. The popularity of scuba diving has generated a multibillion-dollar tourism market with substantial economic repercussions (Mathieu et al., 2003; Oh et al., 2012; Ong and Musa, 2011; Salim et al., 2013; Schumann et al., 2013; Thur, 2010).

Not surprisingly, countries have established marine protected areas (MPAs), considering their effectiveness in safeguarding marine ecology and promoting the tourism economy in the region (Davis and Tisdell, 1995; Dixon, 1993; Jobstvogt et al., 2014; Kelleher, 1999; Rousseau and Fuertes, 2020). Many previous studies explored the value of protected areas and the willingness to pay of potential users including divers and anglers and these results indicated that most divers were willing to pay for a considerable amount to visit marine protected areas and support the establishment of marine protected areas (Jobstvogt et al., 2014; Mathieu et al., 2003; Rodrigues et al., 2016; Rousseau and Fuertes, 2020; Thur, 2010). Rousseau and Fuertes (2020) reported that the divers of the Netherlands and Belgium are willing to contribute to the cost of managing natural marine environment and an estimated total access value for a trip to a diving site named Oosterschelde can be as much as 21.7 million euro per year. Similar results suggested by Thur (2010) study in the Bonaire National Marine Park. The mean willingness to pay among divers is ranged from US$61 to US$134 to access the marine park annually. The recreational value of marine protected areas can significantly offer financial supports for the conservation of the invaluable marine environment as well as enhancing the economic development for countries. However, because of unrestricted tourist visitation and the rapid development of reef-based tourism to most dive sites around the

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world, the presence of divers has been identified as a potential threat to the sustainability of marine ecosystems, even though MPAs may prevent coral communities from degrading significantly (Davis and Tisdell, 1995; Hasler and Ott, 2008; Lamb et al., 2014).

As expected, previous research has shown a significant relationship between coral damage and diver density (Barker and Roberts, 2004; Guzner et al., 2010; Hasler and Ott, 2008; Hawkins and Roberts, 1992; Lamb et al., 2014). Such adverse effects were mainly a result of divers' improper diving behaviour, including stepping on, kicking, and making physical contact with corals. In addition to the perceptible physical damage, the abuse of chemical products such as sunscreens and copper emissions has further contributed to the degradation of coral communities (Danovaro et al., 2008). To better manage marine ecosystems from destructive human impacts, studies have emphasized the importance of understanding divers' diving attitudes and their responsible behaviour in contributing to marine conservation and ecosystem protection (Lucrezi et al., 2021; Oh et al., 2012; Ong and Musa, 2011, 2012a, 2012b; Rodrigues et al., 2016). Under these conditions, different theoretical variables have been applied in previous studies, such as past experiences (Chung et al., 2013; Lucrezi et al., 2021; Musa et al., 2011; Oh et al., 2012; Ong and Musa, 2011), sociodemographic characteristics (Chung et al., 2013; Ong and Musa, 2011), and recreational specialization (Anderson and Loomis, 2011; Ha et al., 2020; Salim et al., 2013; Thapa et al., 2005, 2006), to understand divers' related conservation diving attitudes and behaviours. Among these concepts, the use of recreational specialization as a theoretical variable is recognized as an efficient approach that can help manage scuba diving while increasing the effectiveness of scuba diving as an incentive-driven conservation activity (Dearden et al., 2006). Specifically, previous studies have demonstrated that varying degrees of recreational specialization can significantly reflect changes in divers' pro-environmental attitudes and marine-based conservation behaviour (Anderson and Loomis, 2011; Ha et al., 2020; Oh et al., 2012; Ong and Musa, 2011, 2012b; Salim et al., 2013; Thapa et al., 2005, 2006). Specialized divers recognize undesirable conservation behaviour, such as losing buoyancy control and touching marine mammals, better than less specialized divers (Salim et al., 2013). They feel a greater sense of embarrassment from losing buoyancy control, touching corals, taking dead coral fragments, or touching marine mammals than less specialized divers do (Anderson and Loomis, 2011). Previous studies have identified a positive association between the specialization of nature-based tourists and their environmentally responsible behaviour. For instance, Cheung et al. (2017) suggested that highly specialized birdwatchers likely exhibit environmentally responsible behaviour when performing birdwatching activities in bird conservation reserves.

However, the role of the theoretical framework of recreational specialization in understanding recreational divers' pro-environmental attitudes and conservation behaviour has not been well documented in Hong Kong. In addition, an assessment of the relationship between pro-environmental attitudes and marine-based conservation behaviour within divers' recreational participation has mainly been conducted in Southeast Asia and Western countries (Lucrezi et al., 2021; McCawley and Teaff, 1994; McCawley and Teaff, 1995; Oh et al., 2012; Ong and Musa, 2011, 2012a, 2012b; Thapa et al., 2005, 2006). In contrast to these studies, very limited studies have been identified in studying the relationship between pro-environmental attitudes and marine-based conservation behaviour in the Far East, particularly among Chinese recreational divers in Hong Kong.

Therefore, this study aims to investigate the relationship between recreational specialization and pro-environmental attitudes while exploring how recreational specialization influences marine-based conservation behaviour intentions among recreational divers in Hong Kong. Specifically, three research questions have been developed to address these research objectives. (1) What is the relationship between divers' recreational specialization and pro-environmental attitudes when diving in MPAs in Hong Kong? (2) What is the relationship between divers' pro-environmental attitudes and marine-based conservation behaviour? (3) What is the relationship between divers' recreational specialization and marine-based conservation behaviour? More importantly, the findings of this study can provide scientific evidence to assist authorities in improving their visitor management strategies to avoid negative impacts by understanding divers' pro-environmental attitudes and conservation behaviours regarding their recreational specialization framework. In addition, the findings of this research can enhance our knowledge of scuba diving as a nature-based tourism activity and contribute to several significant policy implications regarding nature-based tourism planning, environmental conservation, and visitor management in MPAs in Hong Kong.

1.1. Development of scuba diving in China

Scuba diving is a technique where recreational divers use a self-contained underwater breathing apparatus that works by applying a system of compressed air cylinders and regulators to ensure that oxygen mobility is achieved for the breathing support of divers (Bitterman et al., 2009). Since the emergence of scuba diving as a unique form of recreation, hundreds of millions of visitors have been driven to try diving because of its alleged advantages in boosting divers' physical and mental well-being (Blumhorst et al., 2020; Henrykowska et al., 2021). Likewise, scuba diving in China has undergone four stages between its inception (before 1995) and its expansion (2002 to 2010) in response to enormous recreational tourism market demand (Fang and Li, 2016). Currently, popular diving destinations are generally concentrated in the southern part of China in the provinces of Hainan and Guangdong, including Sanya, Double Moon Bay in Huizhou, and Miao Wan Island in Zhuhai (Fang and Li, 2016). Comparatively, Hong Kong was the first region in China to develop scuba diving after the establishment of the Hong Kong Underwater Association (HKUA) in 1967. The HKUA has made an outstanding contribution by providing many recreational opportunities through the introduction of scuba diving while vigorously promoting the use of flippers and other types of underwater recreational activities in Hong Kong.

Notably, divers are not a homogenous group, and individual diving preferences could substantially differ (Dearden et al., 2006; Giglio et al., 2015). Previous studies have shown that divers generally prefer diving sites with abundant marine biodiversity and are concerned about good physical diving conditions (Dearden et al., 2006; Giglio et al., 2015; Zhang et al., 2023; Schumann et al., 2013). However, studies have shown that marine organisms and the marine environment are vulnerable to threats, and divers may directly or indirectly influence the marine environment due to increased human visitation arising from human activities (Davis and Tisdell, 1995; Hasler and Ott, 2008; Hawkins and Roberts, 1992; Lamb et al., 2014). For example, Barker and Roberts (2004) observed that divers equipped with cameras had significantly more contact with coral reefs when diving in Saint Lucia than those without cameras and that such underwater behaviour posed a significant risk to coral communities. In addition, Chung et al. (2013) found that coral damage caused by divers in Hong Kong was more prominent among divers with relatively less diving experience and those who carried cameras while diving. Notably, the study measurement approach of Chung et al. (2013) was based on direct observation of the underwater diving behaviour of recreational divers, while the statistical analysis associated with divers' environmental attitudes and marine-based conservation concepts have yet to be further explored in Hong Kong. As a response to the shortcomings and gaps among previous studies, it is crucial to understand divers' pro-environmental attitudes and conservation behaviour for the development of guidelines and regulations that minimize the negative impact on the biodiversity conservation of those aquatic organisms within MPAs in Hong Kong.

1.2. Recreational specialization framework

The terminology of recreation specialization was first introduced by Bryan (1977) as "a continuum of behaviour from the general to the particular for depicting anglers, reflected by equipment and skills used in the sport and activity setting preferences." Generally, angler enthusiasts were classified into four groups based on their use of equipment, participation history, commitment, and recreational involvement by categorizing the specialization levels from the least specialized "occasional fishermen," through "generalists" and "technique pros" to the highly specialized "technique-setting specialists." In the same study, the author has further claimed that the most specialized anglers generally preserved consistent beliefs and attitudes from engaging in similar recreational behaviour despite the categorical differences across various individual recreationists.

Given Bryan's successful method of measuring anglers, recreational specialization has been incorporated into the research attributes regarding conservation attitude (Cheung et al., 2017; Dyck et al., 2003; Oh and Ditton, 2008; Salz and Loomis, 2005), and environmental behaviours (Bryan, 1977; Cheung et al., 2017; Ha et al., 2020; Oh and Ditton, 2008; Salim et al., 2013; Thapa et al., 2005, 2006) to study the various groups of nature-based recreationists, such as birdwatchers (Cheung et al., 2017; Hvenegaard, 2002; Rutter et al., 2021; Scott et al., 2005), hikers (Dyck et al., 2003; Kim and Song, 2017; Lee and Lee, 2021; Wöran and Arnberger, 2012), and scuba divers (Anderson and Loomis, 2011; Ha et al., 2020; Salim et al., 2013; Thapa et al., 2005, 2006).

Extant studies have included various constructed indicators concerning the original theoretical model of Bryan (1977) in their methods of measuring recreational specialization. For instance, Scott et al. (2005) used a self-categorization approach to examine the recreational motivation and engagement of birdwatchers who travel to the Platte River (Nebraska) to experience the annual crane migration that occurs there. The study found that birdwatchers' general behaviour, skill, and commitment items constituted a single-factor solution in the recreational specialization framework and were good predictors of birdwatcher motivation. In addition, some studies have proposed describing specialization in terms of evaluating the components of the behavioural, affective, and cognitive contexts by integrating them with recreationists' prior experience, frequency of participation, time commitment, centrality-to-lifestyle, and financial investment to provide a more comprehensive evaluation of recreational specialization (Cheung et al., 2017; Dunlap and Liere, 1984; Dyck et al., 2003; Ha et al., 2020; Lee and Lee, 2021; McFarlane, 2004; Oh and Ditton, 2006, 2008; Thapa et al., 2006).

However, Oh and Ditton (2006) emphasized that although Bryan's conceptual framework of recreational specialization has successfully guided numerous research efforts in various academic fields over the past 30 years, there have been conceptualization and measurement differences in understanding the framework of recreational specialization. In particular, Ditton et al. (1992) found that although previous studies have successfully studied different types of recreationists by applying recreational specialization, these studies have not developed the original concept of recreational specialization to a better form. At the same time, "previous work has failed to recognize that Bryan's definition of specialization and supporting propositions are circular in their reasoning" (Ditton et al., 1992). Under these circumstances, Ditton et al. (1992) reconceptualized recreation specialization as "a process by which recreation social worlds and subworlds segment and intersect into new recreation subworlds and the subsequently ordered arrangement of these subworlds and their members along a continuum" to understand individual differences in the recreational specialization framework. Moreover, McFarlane (2001) indicated that recreational specialization as a complex academic phenomenon has been primarily focused on quantitative research methods and that inconsistencies in its conceptualization and measurement have resulted in a lack of desired complexity and specificity to determine its progression and underpinning variables. In addition, despite the reality that subtypes of recreationists with varying degrees of specialization have been established across several quantitative studies, it is unclear whether these subtypes reflect phases in a process or indicate participation styles. To address this challenge, Scott and Shafer (2001) developed a more comprehensive understanding of the developmental process of recreation participation by focusing on recreationists' behaviours, skills, and commitments while integrating them into their stages of participation, career changes, and turning points to determine the degree of recreation specialization. Considering the analyses mentioned above, we decided to dig further into the various dimensions of the recreational specialization framework to study the diving-related attitudes and behaviours of Chinese divers in Hong Kong with the objective of enriching theoretical and practical contributions to the development of scuba diving tourism in Hong Kong.

1.3. The influence of recreational specialization on tourists' pro-environmental attitudes

The relationship between recreational involvement and environmentalism is complicated, resulting in a need for further investigation (Thapa, 2010). Previous studies have demonstrated that recreational specialization could significantly predict tourists' pro-environmental attitudes (Cheung et al., 2017; Oh and Ditton, 2008). For instance, Hvenegaard (2002) indicated that birdwatchers with greater degrees of specialization were more inclined to pay for yearly conservation, while Salz and Loomis (2005) found that "most" specialized anglers were more conscious of the negative repercussions of recreational harvest than "moderately" and "very" specialized anglers were. In the context of scuba diving, Ong and Musa (2012a) discovered that Malaysian divers' attitudes toward their responsible underwater diving behaviour might be significantly affected by their diving experience, demonstrating that divers' specialization could positively affect their diving attitudes. The measurement evidence concerning Malaysian divers' specialization (diving experience) was based on the definition of measuring recreationists' specialization according to their participation history within the framework proposed by Bryan (1977). Apart from Malaysian divers, Ha et al. (2020) found that the relationship between divers' specialization and their diving attitudes can be measured using a multidimensional construct and can be well utilized in the theory of planned behaviour model for studying Chinese divers' attitudes and behaviours in mainland China. The authors categorize divers' attitudes into "verbal commitment", "affect", and "knowledge" according to the previous literature and explore the relationship between mainland Chinese divers' specialization and their diving attitudes and marine-based environmental behaviours. As expected from their research hypothesis, results demonstrated that specialization could be positively related to divers' "affect" and "knowledge", indicating a significant relationship between divers' specialization and their diving attitude was supported among mainland Chinese divers. However, Dyck et al. (2003) revealed that mountaineers' general environmental attitudes were completely irrelevant to their level of recreational specialization, and their attitudes toward low-impact practices differed significantly from their levels of specialization. As a result, it is possible to rationalize that the association between recreational specialization and environmental attitudes may have different experimental values due to the various classes of outdoor activities. Coincidentally, the recreational specialization of scuba divers has not been adequately employed as a means to explore their pro-environmental attitudes in Hong Kong; therefore, the first research hypothesis is proposed on the basis of a comprehensive evaluation of previous literature.

H1. Divers' recreational specialization is positively correlated with their pro-environmental attitudes.

1.4. The influence of pro-environmental attitudes on tourists' conservation behaviours

Studies have indicated that an individual's pro-environmental attitude is a crucial component of their pro-environmental behaviours, which might be used to encourage recreationists to take concrete action for ecological conservation (Cheung and Fok, 2014; Dunlap and Liere, 1984; Halkos and Matsiori, 2017; Van Liere and Dunlap, 1981). In other words, more ecologically conscious recreationists could act more responsibly throughout their recreational activities (Cheung et al., 2017; Lee and Jan, 2015; Luo et al., 2020). To illustrate, McCawley and Teaff (1995) observed that coral reef divers who are concerned about the harmful effects of human activities on the natural marine environment are likely to be more concerned with environmental preservation while demonstrating a more supportive attitude and knowledge about rules and regulations regarding nature conservation. In addition to scuba diving, Kil et al. (2014) found a strong association between hikers' pro-environmental attitudes and their self-reported ecologically responsible behaviour, indicating that hikers with greater environmental awareness may engage in environmentally responsible conservation behaviour while hiking. Since previous studies have demonstrated that pro-environmental attitudes are positively associated with recreationists' conservation behaviour in the context of major recreational activities, the second hypothesis is proposed as follows:

H2. Divers' pro-environmental attitudes are positively correlated with their marine-based conservation behaviour.

1.5. The influence of recreational specialization on tourists' conservation behaviour

Recreational specialization has been applied to different types of nature-based tourism to understand tourists' conservation behaviour (Bryan, 1977; Cheung et al., 2017; Kuentzel and Heberlein, 1992; Oh and Ditton, 2008); however, scuba diving, while having been studied in different countries, has been largely overlooked (Anderson and Loomis, 2011; Ha et al., 2020; Salim et al., 2013; Thapa et al., 2005, 2006). A study in Florida found that the recreational specialization of divers could predict their marine-based conservation behaviour (Thapa et al., 2006). The author indicated that a decrease in divers' environmentally insensitive contact behaviour was associated with an increase in their level of their specialization. This was consistent with the results of Anderson and Loomis (2011), who revealed that highly specialized divers in Florida felt a greater obligation to refrain from touching corals and expressed more significant embarrassment when losing buoyancy control or contacting marine mammals than less specialized divers. In addition, Ha et al. (2020) revealed that divers' general marine-based diving behaviours were significantly associated with their specialization, suggesting that divers with a greater degree of specialization seemed to exhibit more extraordinary diving skills, such as better fin technique and buoyancy control. However, Anderson and Loomis (2011) further noted that the norms of diving behaviour did not vary by level of recreational specialization under most conditions, and divers felt the same levels of embarrassment concerning the violation of 8 of the 12 behaviours regardless of their level of specialization. The discrepancies in the earlier findings may be due to differences in geographical location and measurement attributes within the various research designs. However, results of previous studies generally exhibit an association between recreational specialization and conservation behaviour. Therefore, the third research hypothesis is proposed as follows:

H3. Divers' level of recreational specialization is positively correlated with their marine-based conservation behaviour intentions.

2. Methodology

2.1. Study areas

Hong Kong is located at a latitude of 22°N and contains 1050 km^2 of water area and approximately 800 km of coastline (Fabricius and McCorry, 2006) under subtropical climate conditions with a maximum annual average temperature of approximately 27.5 °C (HKO, 2022). Its favourable geographical location and climatic conditions have enabled the development of a rich marine biodiversity (Ng et al., 2017), which has resulted in the successful development of scuba diving tourism in Hong Kong. Generally, divers are more motivated to dive under better physical and biological marine environmental conditions. Under these circumstances, the eastern waters of Hong Kong, where Hoi Ha Wan Marine Park, Tung Ping Chau Marine Park, Sharp Island, and the Ung Kong Group have always been the most popular and traditional dive sites due to their excellent underwater visibility and abundant marine species (Zhang et al., 2023). Therefore, to ensure that the sample of recreational divers was adequately approached, Hoi Ha Wan Marine Park, Tung Ping Chau Marine Park, Sharp Island, and Ung Kong Group were used as the study sites to which qualified recreational divers were invited to participate in this study (Fig. 1). The scientific findings of this study can provide practical management strategies for authorities and stakeholders to prepare further management plans and safeguard the prosperity and resiliency of MPAs.

2.2. Development of the research instrument

A structured questionnaire was used to collect data to address the proposed research hypothesis for this study. The survey was divided into four subsections involving recreational specialization, pro-environmental attitudes, marine-based conservation behaviour, and the sociodemographic features of scuba divers. The first section examined scuba divers' recreational specialization by drawing on previous studies through the use of seven statements that measure three dimensions (behavioural, cognitive, and affective) of specialization regarding such indicators as equipment investment, expertise (self-rated), and life centrality (Bryan, 1977; Cheung et al., 2017; Dyck et al., 2003; Hvenegaard, 2002; McFarlane, 2004; Oh and Ditton, 2006, 2008; Oh et al., 2012; Thapa et al., 2005, 2006). The second section regarding the measurement of divers' pro-environmental attitudes adapts from previous research on understanding of nature-based tourists' pro-environmental attitudes. The question items have been modified to suit the current study to explore the pro-environmental attitudes of recreational divers. Some questions were modified based on the study of Luo et al. (2020) to access recreational divers' pro-environmental attitudes include “I pay attention to what I do in diving,” “I feel a responsibility to follow diving regulations,” “I will feel guilty if I do not act responsibly when diving,” and “I feel a responsibility to protect the environment of diving sites.” The third section included four statements that were established based on previous literature and practical advice from professional divers to measure divers' marine-based conservation behaviour (Cheung et al., 2017; Cheung et al., 2020; Luo et al., 2020; Thapa et al., 2005, 2006). Example questions include “I would engage in marine conservational education,” “I would engage in marine conservational practices,” “I would donate to an organization for marine conservation,” and “I would join consultations and petitions on marine conservation.” All these statements were assessed using a five-point Likert scale ranging from “strongly disagree” (1) to “strongly agree” (5). The last section of the questionnaire gathered the sociodemographic characteristics of the local Chinese recreational divers, particularly their sex, age, educational background, and monthly household income status.

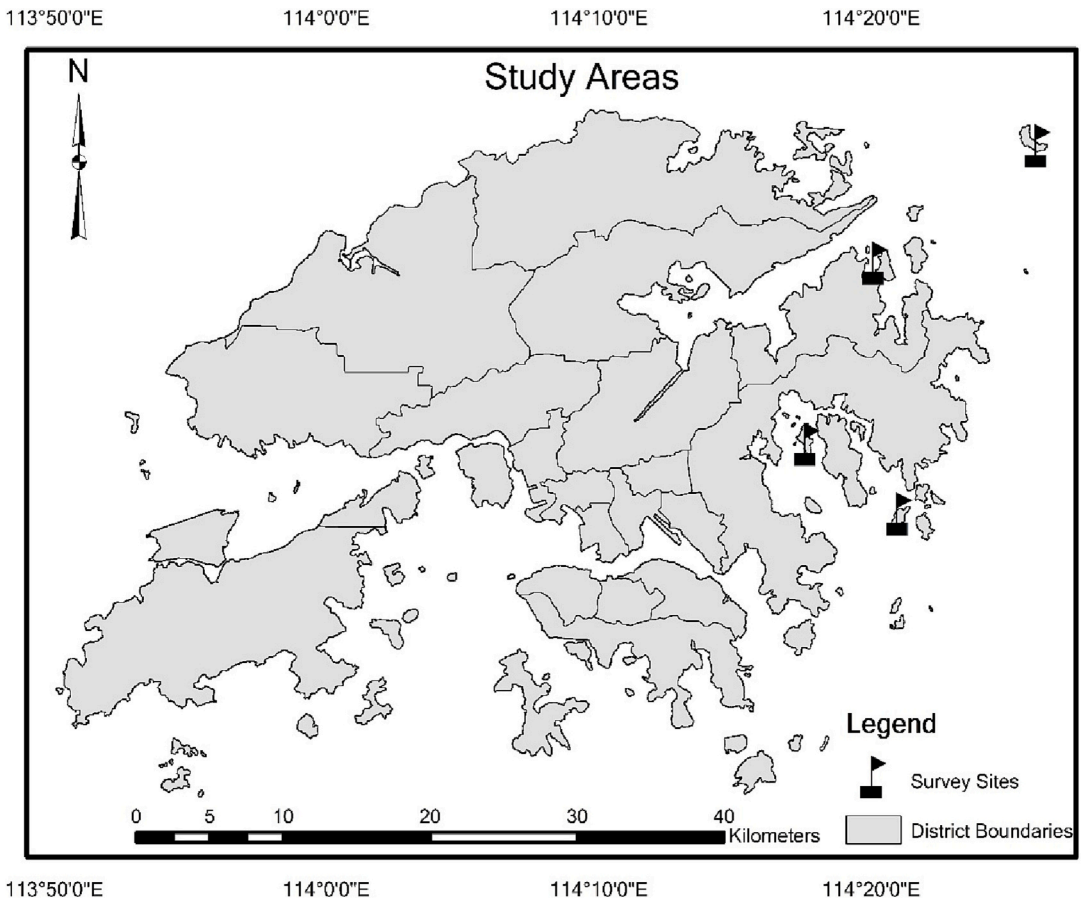

Fig. 1. Study areas for data collection in Hong Kong.

2.3. Sampling and data collection

An on-site questionnaire survey was conducted at the most popular dive sites in Hong Kong, including Hoi Ha Wan Marine Park, Tung Ping Chau Marine Park, Sharp Island, and the Ung Kong Group (Fig. 1) between the summer of 2021 and 2022. This study adopted a convenience sampling method to survey all recreational divers encountered at the sites while seeking assistance from various diving clubs, diving instructors, and business vendors to locate target respondents and facilitate the data collection process. Those who responded to this questionnaire were over 18 years old and had previous scuba diving experience. The participants spent an average of 10 to 15 min voluntarily completing the questionnaire without any reward. Five hundred fifty questionnaires were successfully distributed, and approximately 420 responses were received from our target respondents. Eventually, the actual number of valid questionnaires was calculated to be three hundred and ninety-eight ($N = 398$), resulting in a response rate of 76 % after reviewing and eliminating incomplete or invalid questionnaires.

2.4. Data analysis

The statistical data analysis was conducted using descriptive and inferential statistics. First, SPSS 28.0 was applied to determine the descriptive statistics, while Cronbach's alpha and exploratory factor analysis (EFA) was used to examine our data's internal reliability and validity (Samuels, 2017; Suhr, 2006). Second, confirmatory factor analysis was performed using Amos 28.0 to assess our proposed model's observed variables and their underlying latent constructs through various measurement criteria, such as model fit, convergent validity, discriminant validity, and reliability (Suhr, 2006). Finally, a structural equation model was built and evaluated based on the satisfactory CFA results to examine the theoretical hypotheses by referring to the parameters of the maximum likelihood estimation under the path analysis (Collier, 2020).

3. Results

3.1. Descriptive statistics

The distribution of respondents' demographic attributes is displayed in Table 1. Regarding distribution by sex, there were female respondents with 51 % and male respondents with 48 % of the total respondents, among whom half of the respondents were aged between 18 and 29 (45.7 %), followed by respondents aged 30–39 (31 %). In comparison, those aged 50 or older comprise only 7.8 % of the total sample population. Regarding educational background, 80.7 % of respondents had a bachelor's degree or above, and the remaining divers were all clustered at the secondary level, demonstrating that most of our respondents were well educated. Regarding monthly salary, more than half of the respondents (55.6 %) had a low monthly household income of HK $20,000–29,999 or even less. In contrast, relatively few respondents had a household income of HK $40,000 or above.

Notably, a previous study tracking the socioeconomic background of recreational divers in Hong Kong reported that the majority of divers in Hong Kong waters were male (>65.8 %), young (98.7 %), highly educated (university or above) (72.7 %) and had a low income of HK $29,999 or below (45.6 %) (Chung et al., 2013). Comparatively, the current study results in a more even distribution between the sexes, with respondents generally being younger, indicating that the present study may represent a slightly more diverse group of respondents than the earlier study in Hong Kong. This could be due to the sample size in this research being significantly larger than that used by Chung et al. (2013).

Table 1
Demographic characteristics of respondents.

Variables	*n*	%
Sex		
Male	193	48.5
Female	205	51.5
Age group		
18–29	182	45.7
30–39	123	30.9
40–49	62	15.6
50–59	27	6.8
60 or above	4	1.0
Educational level		
Primary	0	0
Secondary level	77	19.3
Undergraduate	229	57.5
Post-graduate	92	23.1
Salary (HKD)		
9999 or below	24	6.0
10,000–19,999	92	23.1
20,000–29,999	104	26.1
30,000–39,999	54	13.6
40,000–49,999	32	8.0
50,000–59,999	17	4.3
60,000 or above	23	5.8
Retired	26	6.5
No answer	26	6.5
Total	398	100

Similarly, the sociodemographic characteristics of the recreational divers who participated in this study were more consistent with some of the previously documented nature-based tourist backgrounds in terms of having younger ages, higher levels of education, and lower monthly income levels (Cheung et al., 2020; Ma et al., 2021).

3.2. Exploratory factor analysis

EFA was performed to identify which latent variables needed to be integrated into the measuring scale to limit the number of latent variables that share a common variance when determining the fundamental dimensions of the final measurement constructs (Yong and Pearce, 2013). The EFA analysis method for the present study was similar to that of Chen et al. (2018), who used the Bartlett test of sphericity and the measure of sampling adequacy (MSA) to confirm whether the study sample could be integrated with the follow-up factor analysis. With regard to the validity value of the measurement index, the Kaiser-Meyer-Olkin (KMO) score for sampling adequacy in this study was 0.79, in conjunction with a value of 3029.527 for Barlett's sphericity test and a degree of freedom of 105 (p *value* = 0.000), which emphasized that the value of MSA was above 0.6, as suggested by Kaiser (1974). These results indicated the validity of using factor analysis for our research design and in conducting further statistical analysis.

Based on an assessment of the factor loading scores (Table 2), the measurement items with a factor loading of above 0.4 and an eigenvalue of >1 for the rotated factors were deemed appropriate elements to apply to an assessment of the hypothesis (Chen et al., 2018; Tinsley and Kass, 1979). Consequently, the measurement scale confirmed three sub-dimensions representing the three-factor model, reaching 61.97 % of the total explained variance. Among them, recreational specialization was confirmed as the first factor and obtained the highest level of explained variance (26.883 %) using a 7-item structural measurement, followed by marine-based conservation behaviour intentions as the second factor using a 4-item structural measure to define the variance (18.358 %). Comparatively, the pro-environmental attitude had the lowest explained variance (16.729 %), was equipped with a 4-item structural measurement and was approved as the last factor.

Table 2
Exploratory factor analysis.

Construct	Measurement	Factor loadings		
		1	2	3
Recreational specialization	RS1: I consider myself a professional diver.	0.754		
	RS2: I want others to consider me as a diver.	0.716		
	RS3: I can truly be myself when I am diving.	0.689		
	RS4: I would rather go diving than do anything else.	0.701		
	RS5: Most of my outdoor activity revolves around diving.	0.774		
	RS6: I have acquired much diving equipment.	0.816		
	RS7: I have invested a great deal of money in diving equipment.	0.800		
Marine-based conservation behaviour intentions	CB1: I would engage in marine conservational education.		0.893	
	CB2: I would engage in marine conservation practices.		0.886	
	CB3: I would donate to an organization for marine conservation		0.640	
	CB4: I would join consultations and petitions on marine conversation		0.815	
Pro-environmental attitude	PA1: I pay attention to what I do at diving sites.			0.833
	PA2: I have a responsibility to follow the regulations.			0.843
	PA3: I would feel guilty if I didn't act responsibly when diving.			0.641
	PA4: I have a responsibility to protect the environment.			0.766
Eigenvalue		4.032	2.754	2.509
% Of variance explained		26.883	18.358	16.729
Cronbach alpha		0.873	0.838	0.704

Variance explained = 61.97 %, KMO = 0.79, via the Varimax Rotation Method.
Abbreviation: RS = recreational specialization; CB = marine-based conservation behaviour intentions; PA = pro-environmental attitude.

Regarding the reliability of the final measurement scales, the use of Cronbach's alpha was employed to assess the coefficient values for the three dimensions. Under this condition, the alpha coefficient values of our study yielded values of 0.873, 0.838, and 0.704. They were all predicted to be 0.70 or above according to the recommended benchmark value suggested by Cortina (1993), indicating the reliability of the three suggested structures in the EFA analysis. Therefore, recreational specialization, pro-environmental attitude, and marine-based conservation behaviour intentions were selected as the principal components for future investigation, given the significant findings of the EFA and the reliability tests.

3.3. Confirmatory factor analysis

CFA was undertaken to test the validity and reliability of the theoretically based measuring constructs, as it allows the researcher to overcome several restrictions associated with the EFA model (Byrne, 2005). Particularly, the CFA model has the advantage of simultaneously

analysing multigroup data and assessing the equivalence of factor loading estimates across groups from the same or different populations over the EFA model (Byrne, 2005). This study focused on three-structural measurements using the robust maximum likelihood method to validate our proposed research hypothesis (Anderson and Gerbing, 1988). On the basis of the measurement models, 15 items were grouped into three different factors, showing that all of these items met the convergent criterion with statistically significant factor loadings that exceeded the minimum recommended fair value of 0.45 ($p < 0.001$) (Comrey and Lee, 1992; Tabachnick et al., 2007) (Table 3). Regarding the fit indices of the proposed constructs, the fit values for the model structure were $\chi^2 = 567.145$, $df = 87$, $\chi^2/df = 6.519$, $p < 0.001$, Root Mean Square Error of Approximation (RMSEA) = 0.118, Comparative Fit Index (CFI) = 0.838, Incremental Fit Index (IFI = 0.839), and Normed Fit Index (NFI) = 0.816, indicating that the measurement model had an insufficient fit to the data because the overall fit indicators did not exceed the recommended levels (Bentler, 1990; Hu and Bentler, 1999; MacCallum et al., 1996; Marsh and Hocevar, 1985). To improve the model fit of the CFA, modification of the model was conducted by adding the error covariance between RS1 & RS2 and between RS6 & RS7 to avoid a slight change in the loading factor due to an unreliable measure for the respective factor as indicated by the high value of the error variance items (Hox and Bechger, 1998). Eventually, the fit values for the adjusted model were switched to $\chi^2 = 286.122$, $df = 85$, $\chi^2/df = 3.366$, $p < 0.001$, RMSEA = 0.077, CFI = 0.932, and NFI = 0.907, as these values demonstrate a good fit of the measurement model to the data (Bentler, 1990; Hu and Bentler, 1999; MacCallum et al., 1996; Marsh and Hocevar, 1985) (Table 3). However, scholars have also highlighted that the chi-square test in the CFA might be sensitive when the sample size is above 200, which could result in accepting or rejecting misleading model estimations due to a decrease in the *p*-value in the analysis (Anderson and Gerbing, 1988; Cheung et al., 2020).

For this reason, studies have employed a series of comparative fit indicators to supplement the chi-square test to mitigate research bias. Among them, convergent and discriminant validity were the most common methods used to test the internal consistency of the latent variables and the structural validity of the proposed model (Bollen and Lennox, 1991). In this case, the average variances extracted (AVEs) along with the composite reliability (CR) were evaluated to assess the extent to which observed items may adequately represent each construct in our model (Bollen and Lennox, 1991). Correspondingly, Table 3 summarizes the AVE and CR values for the structural research variables and demonstrates that the AVE and CR scores all surpassed their respective minimum acceptable values of 0.45 (Bollen and Lennox, 1991) and 0.6 (Fornell and Larcker, 1981). This further confirms that the three-factor structure of our model is valid and reliable for the subsequent SEM analysis.

Table 3
Confirmatory factor analysis.

Construct	Measurement	Factor loading	AVE	CR
Recreational specialization	RS1: I consider myself a professional diver.	0.654	0.50	0.86
	RS2: I want others to consider me as a diver.	0.652		
	RS3: I can truly be myself when I am diving.	0.687		
	RS4: I would rather go diving than do anything else.	0.732		
	RS5: Most of my outdoor activities revolve around diving.	0.794		
	RS6: I have acquired much diving equipment.	0.664		
	RS7: I have invested a great deal of money in diving equipment.	0.628		
Marine-based conservation behaviour intentions	CB1: I would engage in marine conservational education.	0.933	0.59	0.85
	CB2: I would engage in marine conservation practices.	0.923		
	CB3: I would donate to an organization on marine conservation	0.472		
	CB4: I would join consultations and petitions on marine conversation	0.658		
Pro-environmental attitude	PA1: I pay attention to what I do at diving sites.	0.799	0.50	0.79
	PA2: I have a responsibility to follow the regulations.	0.827		
	PA3: I would feel guilty if I didn't act responsibly when diving.	0.504		
	PA4: I have a responsibility to protect the environment.	0.647		

AVE - average variance extracted; CR - composite reliability.
Abbreviations: RS = recreational specialization; CB = marine-based conservation behaviour intentions; PA = pro-environmental attitude.
Model fit statistics: $\chi^2 = 567.145$, $df = 87$, $\chi^2/df = 6.519$, $p < 0.001$, RMSEA = 0.118, CFI = 0.838, IFI = 0.839, and NFI = 0.816.
Adjusted model fit statistics: $\chi^2 = 286.122$, $df = 85$, $\chi^2/df = 3.366$, $p < 0.001$, RMSEA = 0.077, CFI = 0.932, and NFI = 0.907, IFI = 0.933.

3.4. Structural equation model analysis and hypothesis testing

Upon confirming the satisfactory CFA results (Fig. 2), the structural components of the hypothesized model were tested by referring to the chi-square statistics and other goodness of fit indices, such as the Comparative Fit Index (CFI), Tucker–Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA). According to the recommendation of Bentler (1990), MacCallum et al. (1996) and Hu and Bentler (1999), the value of CFI should be >0.90, that of GFI should be >0.90, that of NFI should be >0.90, and that of RMSEA should be smaller than 0.08 to verify the fitness of the SEM. In comparison, our model (Fig. 2) achieved a CFI value of 0.932, GFI value of 0.910, NFI value of 0.907, TLI value of 0.916, IFI value of 0.933, and RMSEA value of 0.077, demonstrating that the hypothetical model fits well with the data. Specifically, Table 4 shows the path relationship of the structural modelling for our proposed hypothesis, which found that recreational specialization was positively related to both pro-environmental attitudes ($\beta = 0.03$, $p < 0.05$) and marine-based conservation behaviour intentions ($\beta = 0.26$, $p < 0.001$). This discovery demonstrates that the level of divers' recreational specialization could effectively predict their pro-environmental attitude and their marine-based conservation behaviour intentions; thus, H1 and H3 are supported. However, a nonsignificant association between divers' pro-environmental attitude and marine-based conservation behaviour intentions was confirmed ($\beta = -0.22$, $p = 0.23$), indicating that the level of divers' pro-environmental attitude had no bearing on their marine-based conservation behaviour intentions; thus, H2 is rejected. Additionally, path analysis yielded squared multiple correlations for evaluating the endogenous latent variables under the SEM. On the one hand, the value of the squared multiple correlations for pro-environmental attitudes was 0.02, showing that recreational specialization can explain 2 % of the variance in pro-environmental attitudes. On the other hand, the squared multiple correlations for marine-based conservation behaviour intentions were 0.09, indicating that 9 % of the variance in marine-based conservation behaviour intentions can be predicted by both recreational specialization and pro-environmental attitudes.

4. Discussion

This study applies the theory of recreational specialization to

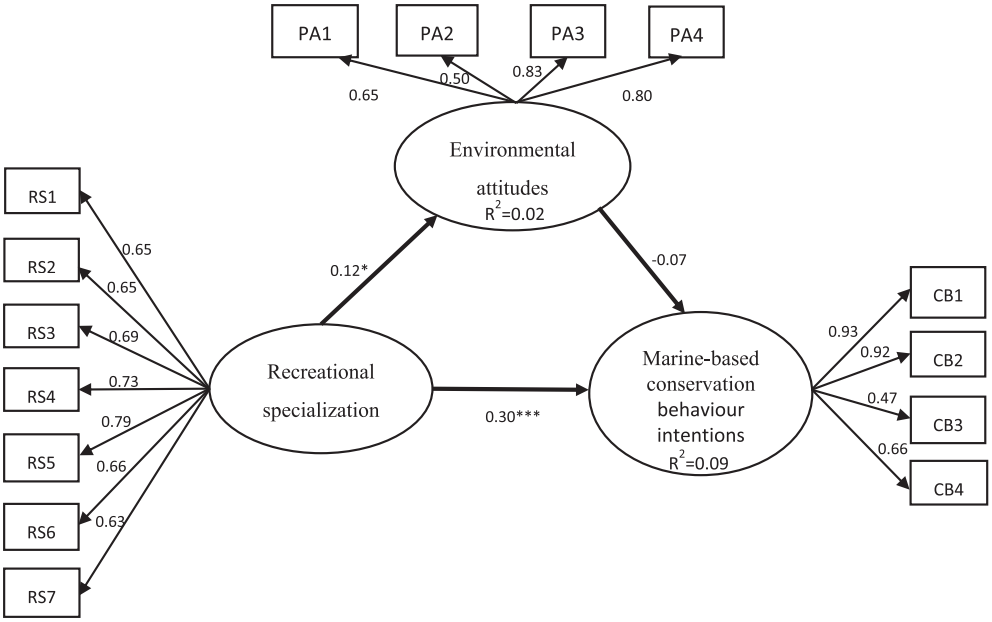

Fig. 2. The proposed structural equation model with standardized coefficients.

Table 4
Hypothesis results.

Hypothesized paths	β	S.E.	*p*	Support
H1. Recreational specialization → pro-environmental attitudes	0.03	0.02	0.04*	Supported
H2. Pro-environmental attitudes → marine-based conservation behaviour intentions	−0.22	0.18	0.23	Not supported
H3. Recreational specialization → marine-based conservation behaviour intentions	0.26	0.18	0.00***	Supported

*** Significance at 0.001 level, * Significance at 0.05 level.

examine scuba divers' pro-environmental attitudes and their marine-based conservation behaviour intentions when diving in MPAs in Hong Kong. According to the structural equation modelling results, three research hypotheses were developed based on the research framework, in which hypotheses regarding the association between divers' specialization and their pro-environmental attitudes as well as their marine-based conservation behaviour intentions were supported. However, the study did not significantly discover the hypothesis concerning the divers' pro-environmental attitudes and their marine-based conservation behaviour intentions. These results revealed that divers' specialization could significantly predict their pro-environmental attitudes and marine-based conservation behaviour intentions, indicating that specialized Chinese divers would exhibit more exceptional conservation awareness while behaving more ecologically responsibly when diving in MPAs in Hong Kong.

Specifically, hypothesis (1), which concerns the relationship between divers' specialization and their pro-environmental attitudes, was consistent with the previous results of Cheung et al. (2017), who suggested that birdwatchers' specialization could significantly predict their pro-environmental attitudes. In addition to recreational birdwatching, Oh and Ditton (2008) reported that anglers' specialization could significantly predict their willingness to pay concerning environmental conservation, indicating that specialized anglers were more willing to pay for ecological preservation compared with less specialized anglers. However, our study contradicts the findings of Salz and Loomis (2005), who asserted that anglers' attitudes toward their catch-and-release behaviour for fishing in marine protected areas did not differ according to their level of specialization. Specifically, the authors discovered that specialized anglers were less likely to accept more restrictive regulations than casual anglers to marine protected areas. While considering the different research findings regarding the measurement of recreational specialization, Williams and Huffman (1986) further revealed that the discrepancy of different study results could be due to the difficulty in measuring environmental attitudes by the degree of recreational specialization. In particular, a nonspecialist in one activity may be an expert in another and already have well-established positive ecological attitudes.

Similarly, hypothesis (3), which concerns the relationship between divers' specialization and their marine-based conservation behaviour intentions, was consistent with the previous findings of Thapa et al. (2006), who claimed that divers' marine-based conservation behaviour intentions improved as their level of specialization increased. In addition to the scuba diving context, Bryan (1977) observed that anglers' attitudes and behaviours toward environmental conservation would be significantly enhanced as they become more specialized. However, our findings also challenge the results of Cheung et al. (2017), who suggested that birdwatchers' specialization did not significantly predict their ecologically responsible behaviour. In particular, the authors pointed out that cultural variations among recreationists may contribute to the disparity in study findings regarding different types of nature-based tourism. In the same research, Cheung et al. (2017) further emphasized that the findings might also differ because of the heterogeneity of measurement indicators included in the proposed research methodology. In addition to the perceived methodological variation that may cause the scientific difference in the research findings, the nature of the activities can be another factor leading to the dis-alignment of the results between Cheung et al. (2017) and our study. In comparison, birdwatching is one of the types of outdoor recreation that allows birdwatchers to participate in the activity without much technical restriction, unlike scuba diving which typically requires formal training before allowing the divers to engage in diving in marine protected areas. The level of specialization of birdwatcher can be more easily affected by the financial investment to the birdwatching equipment as some Chinese birdwatchers invest large amount of money on equipment such as powerful binocular or spotted scope and costly camera with tele lens for taking bird photos. However, they may not necessary behave environmentally responsibly in taking bird photos. Their objective is to take

beautiful bird photos thus sometimes may misbehave.

Notably, our study revealed the absence of a relationship between Chinese divers' pro-environmental attitudes and their marine-based conservation behaviour intentions, despite an observed significant positive relationship between divers' specialization and their pro-environmental attitudes. However, this result contradicted the results of Oh and Ditton (2008), who demonstrated that anglers' conservation attitude (WTP) could predict their conservation behaviour, suggesting that anglers with greater WTP are more likely to support planning and control conventions as a proxy for conservation behaviours. In addition, Lin and Lee (2020) demonstrated that hikers' ecologically responsible behaviour was substantially impacted by their environmental attitudes, suggesting that hikers with more robust environmental awareness may behave more environmentally while hiking. The discrepancy between the results of the current investigation and those of earlier research findings could be due to various unforeseen circumstances. For instance, divers may inadvertently damage coral and marine environments due to unexpected physical causes such as severe cramping or other emergency issues. This could explain the nonsignificant relationship between divers' pro-environmental attitudes and their marine-based conservation behaviour intentions. In addition, divers may unintentionally trample and damage coral reefs due to their lack of diving skills and experience by losing buoyancy control, even though they may have a great sense of pro-environmental attitudes while diving. This is consistent with previous research, which showed that less specialized divers might have a lower sense of embarrassment from breaching behaviour norms concerning losing buoyancy control than specialized divers (Anderson and Loomis, 2011; Salim et al., 2013).

5. Conclusion and implications

This study investigates the relationship between divers' recreational specialization and their marine-based conservation behaviour intentions and the relationship between divers' pro-environmental attitudes and their marine-based conservation behaviour intentions, intending to develop useful management guidelines for improving the sustainability of the marine environment and dive tourism in Hong Kong. The results of the study indicate that (1) there is a positive relationship between divers' recreational specialization and their pro-environmental attitudes, in which a higher level of recreational specialization is associated with greater levels of environmental consciousness of recreational divers; (2) there is no statistically significant relationship between divers' pro-environmental attitudes and their marine-based conservation behaviour intentions; and (3) there is a positive relationship between divers' recreational specialization and their marine-based conservation behaviour intentions, in which a higher level of recreational specialization is associated with greater ecologically responsible marine-based conservation behaviour intentions.

Thus, the proposed structural equation model suggests that divers' levels of specialization could accurately determine their pro-environmental attitudes and marine-based conservation behaviour intentions, a fact which has not yet been sufficiently investigated among Chinese divers in Hong Kong. In particular, these findings conceptualized the theoretical relationship between divers' specialization, pro-environmental attitudes, and marine-based conservation behaviour intentions by contributing to expanding the academic knowledge in the field of nature-based tourism. More crucially, these findings may serve as scientific evidence to aid authorities in designing appropriate management strategies to enhance divers' pro-environmental awareness while promoting their marine-based conservation behaviour intentions by analysing their levels of recreational specialization in Hong Kong.

Based on the earlier discussion, several management suggestions were presented to further support nature-based tourism and marine conservation management in Hong Kong. First, the study results revealed that divers' recreational specialization could predict their pro-environmental attitudes, suggesting that divers with a higher level of recreational specialization exhibit greater environmental protection awareness while diving in MPAs in Hong Kong. For this reason, the relevant authorities should consider offering environmental education videos or public seminars to recreational divers (especially to the less professional ones) to help them understand the associations between the marine ecological crisis and a lack of environmental awareness. This could prove useful in raising pro-environmental awareness while understanding the importance of inappropriate behaviour among recreational divers to encourage them to engage in marine conservation for protection against further environmental degradation in Hong Kong.

Second, the results indicated that the recreational specialization of divers could influence their marine-based conservation behaviour intentions, demonstrating that divers with a higher level of recreational specialization could engage in more ecologically responsible marine-based conservation behaviour intentions. Therefore, divers who aspire to dive in MPAs should be asked to quickly respond by completing the questionnaire, which was designed based on the recreational specialization framework, before being assigned to sites according to their resulting scores. More specifically, divers with higher levels of recreational specialization (e.g., divers with more advanced diving equipment or greater financial investment in diving equipment) should be allowed to diving sites with high biodiversity density. In contrast, divers with low levels of recreational specialization (underequipped divers) should only be allowed to relatively less crowded and less ecological sensitive dive sites unless they are accompanied by an experienced diver or a diving instructor. Such an arrangement can be considered by the authority of the marine protected areas in order to mitigate the potential damage of the coral communities in the ecologically sensitive sites.

The main reason for consulting the recreational specialization framework is to assess divers' potential conservation attitudes and behaviour based on the positive relationship between their recreational specialization and marine-based conservation behaviour intentions. This measurement may help authorities understand the effects of different levels of recreational specialization on divers' potential conservation awareness and behaviours to help manage and protect the marine ecosystem while maintaining divers' recreational enjoyment.

However, although the study supported some of the hypotheses, there are research limitations that need to be adequately addressed to prevent bias in continued research. First, the sample size of the current study is limited to local divers in Hong Kong, which may result in the study having low external and internal validity. Future studies should be conducted on foreign divers while employing a comparative methodology to examine the difference between local and foreign divers' marine-based conservation behaviour intentions while diving in Hong Kong.

Second, the convenience sampling technique utilized in this research may not correctly facilitate the entire sampling population due to its underrepresentation or overrepresentation of the study population (Whitehead and Whitehead, 2016). In contrast, a systematic sampling method has a significant advantage in strengthening the representativeness of the research sample and is easier to carry out than a simple random sampling technique (Taherdoost, 2016). Thus, alternative sampling methods should be considered to replace the convenient sampling method used here to improve the objectivity of further findings.

Third, it is logically foreseeable that a quantitative survey might end up with a possible social desirability bias, resulting in unreliable responses from participants to answer the research questions due to their appreciation of satisfying the moral value standards as recognized by the public, particularly when measuring respondents' behaviour and attitude toward desired actions or occurrences within certain events and activities (Krumpal, 2013). Invariably, the current study was conducted based on a quantitative survey to investigate the relationship between divers' specialization and their pro-environmental attitude as well as their marine-based conservation behaviour intentions. The designated methodology may face the possible social desirability bias of

understanding divers' actual environmental attitude and their marine-based conservation behaviour intentions because the collected responses might be inaccurate for those divers who did not act responsibly diving behaviour while diving in the marine protected areas as the preservation of marine ecological sustainability has been recognized as the common sense of obligation and norms for divers to obey and regulate themself. In other words, divers who engage in inappropriate diving behaviour while diving may respond inaccurately to the survey questions because they are concerned that the public could judge and criticize their responses for the reason that they are contrary to the publicly accepted standards of social values. To remedy the limitation of social desirability bias in the quantitative survey, Krumpal (2013) suggests that researchers should ensure that their target respondents are anonymous in answering the research survey and should also make sure to create a place where respondents can focus and be comfortable participating in the study to avoid being interrupted by other interviewers and bystanders as much as possible during the data collection process. Equally important, researchers should also keep active and effective communication with the respondents to encourage them to provide truthful answers based on their actual situations, as their responses are significant to contribute to the scientific development of the research paper while delivering valuable research findings after analysing their responses from the data. In addition to improving the operational specifications in the data collection process, we suggest that future studies could go beyond quantitative findings by using alternative research methods, such as in-depth interviews and direct underwater observations, to make amends for the shortcoming of the quantitative research method along with comparing quantitative and qualitative results to gain an exhaustive overview of the experimental results with the goal to develop management strategies for achieving tourism and environmental sustainability.

Last, this study explores divers' marine-based conservation behaviour intentions by using only two research variables. In contrast, previous studies have applied the concept of recreational specialization in conjunction with several other research variables such as knowledge, subjective norm, and perceived behaviour control under the theory of planned behaviour to study recreationists' conservation behaviour (Ha et al., 2020; Lee and Lee, 2021). Therefore, future studies should add additional research variables that comply with the theory of planned behaviour to help better understand the potential factors that may influence divers' marine-based conservation behaviour. Regardless, scuba diving as nature-based ecotourism is inseparable from the sustainable development of marine ecosystems; protecting marine ecosystems requires not only the consideration of the environmental attitudes and behaviour of individual tourists but also the management strategies imposed by relevant authorities. The successful implementation of ecotourism strategies depends on cooperation among stakeholders, and a lack of practical cooperation may make ensuring the sustainable development of tourism and ecological conservation challenging (Wondirad et al., 2020).

CRediT authorship contribution statement

Conceptualization, L.T.O.C. and K.Z.; methodology, L.T.O.C. and K.Z.; validation, L.T.O.C., K.Z. and A.T.H.M.; formal analysis, L.T.O.C., K.Z. T.W.L.L., L.F. and A.T.H.M.; investigation, L.T.O.C., K.Z. and A.T.H.M.; writing—original draft preparation, L.T.O.C. and K.Z.; writing—review and editing, L.T.O.C., K.Z., T.W.L.L., L.F. and A.T.H.M.; supervision, L.T.O.C and L.F.; funding acquisition, L.T.O.C. and L.F. All authors have read and agreed to the published version of the manuscript.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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