

Scuba diving tourism and the challenge of sustainability: evidence from an explorative study in North African-Mediterranean countries

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Abstract

Purpose – Scuba diving tourism is reputed to be a potential low-impact recreational activity that allow environmental conservation and socioeconomic benefits for local communities. Few studies have addressed the issue of sustainability of scuba diving tourism through the simultaneously investigation on the economic and socio-cultural aspects and its implications for tourism development. This study aims to examine the scuba diving tourism in three under-explored North African tourism destinations with high ecotourist potential. The authors present an exploratory picture of scuba diving tourist demand, divers' preferences, motivations for recreational diving experiences and their propensity towards conservation.

Design/methodology/approach – The authors developed a case study research strategy collecting profile data on 123 divers. Furthermore, regression analysis was performed to investigate the divers' preferences, motivations and propensity towards conservation.

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Summary: A satisfying scuba diving experience is linked to the appreciation of marine life and healthy ecosystems. This study examines divers' preferences, motivations for recreational diving experiences and their propensity toward conservation in three scarcely explored North Africa tourist destinations. A limited flow of divers, together with a moderate propensity toward conservation, affects the ability of diving tourism segment to generate significant socioeconomic benefits for the local development in these three destinations. However, establishing an MPA could drive the diving sector toward sustainability, improving conservation awareness and increasing the satisfaction of divers.



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Findings – The divers' limited number, the presence of mainly local seasonal tourists and a moderate propensity towards conservation influence the potential of the diving tourism segment to generate significant socioeconomic benefits for local sustainable development in these destinations. However, establishing a marine protected area (MPA) could foster the development of a long-term strategy for scuba diving tourism, improve conservation awareness and increase divers' satisfaction.

Practical implications – Diverse profiles, preferences and motivations can provide tools to sustainably manage and preserve coastal and marine biodiversity, while also maximising the quality of the recreational experience. One of the most effective site-based strategies to orient the diving sector towards sustainability involves the design and strengthening of MPAs.

Originality/value – The research provides an original contribution to the debate on sustainable tourism strategies by demonstrating how the study of economic and socio-cultural aspects of scuba diving could provide guidelines to orient the tourism development of marine and coastal areas towards the principles of sustainability (also through the establishment of MPAs). The findings present an overview of the sustainability of the scuba diving tourism segment by investigating the preferences, motivations and inclination towards conservation among tourists for whom the diving experience is not a core holiday activity.

Keywords Divers' profile, Socio-economic factors, Sustainable development, Conservation propensity, Marine protected areas, Regression analysis

Paper type Case study

1. Introduction

The environmental and cultural attributes of tourist destinations attract numerous visitors. This can often result in increased tourism infrastructure and, in some cases, environmental degradation (Stefánica *et al.*, 2021). Sustainable tourism is a holistic managerial perspective that provides environmental conservation and socioeconomic benefits for local communities (McNaughton *et al.*, 2020; Del Vecchio *et al.*, 2022). According to this viewpoint, a tourism destination can be sustainable if it serves the demands of present and future tourists, as well as those of residents (Nadalipour *et al.*, 2019). In marine and coastal areas, scuba diving has attracted increasing interest within the broader segment of sustainable tourism. Although the diving industry has spread globally, many of its most popular destinations are in developing countries (Townsend, 2008). Scuba diving is a potential low-impact recreational activity, while positively impacting environmental conservation, generating revenue and supporting local communities (Arcos-Aguilar *et al.*, 2021). However, some authors have questioned the feasibility of scuba diving destinations to provide satisfying recreational experiences for tourists (Marconi *et al.*, 2020) and support the well-being of local communities (Wongthong and Harvey, 2014; Emang *et al.*, 2020).

An empirical case study is presented, drawing an exploratory picture of the sustainability of scuba diving tourism in three North African tourist destinations located in two under-explored nations (Algeria and Tunisia). Scuba diving segments have developed in these regions due to their biodiversity and richness of marine species and ecosystems (Niccolini *et al.*, 2019). Specifically, we aimed to (1) describe divers' demographics and the characteristics of the scuba diving segment; (2) study divers' motivations and preferences and explore factors underlying dive site selection; (3) identify variables associated with positive attitudes towards conservation; and (4) investigate the implications of a sustainability-oriented strategy. The debate around the sustainability of scuba diving tourism is conducted by focusing on the recreational underwater experience of the dive tourists. The findings will contribute to outline the divers' profiles, as well as provide a knowledge base for the diving sector. Furthermore, the results are relevant to understand how sustainable tourism can help to restore and conserve coastal and marine ecosystems by managing the interdependent goals of recreation and resource conservation. Understanding the social science dimension of recreational underwater experiences will ultimately improve sustainability, helping policymakers and managers in the process of development of effective management of scuba diving tourism destinations.

Despite extensive academic contributions and field research on scuba diving tourism, few studies have provided a comprehensive picture of the sustainability of this niche market (Dimmock and Musa, 2015). To date, there is a general lack of academic literature that simultaneously focuses on the economic and sociocultural aspects of sustainable diving tourism and its implications. Furthermore, few studies have examined motivations and propensity towards conservation of tourists for whom underwater experience is not the core activity of the holiday, but one of the many carried out during their holidays (Albayrak *et al.*, 2021). Moreover, the tourism destinations of our exploratory study lack quantitative data; thus, we investigate the identified under-analysed contexts through replicable quantitative methods. The results of this study may be relevant to understand the role of diving in a sustainability-oriented tourist strategy for under-explored regions.

The rest of the paper is structured as follows: the second section provides a literature review regarding scuba diving tourism and the issue of sustainability of this tourism segment; the third section presents the case study description, while the fourth and fifth sections discuss the methodology adopted and the data analysis description. Then, the main findings of the research are presented in section six. Section seven describes theoretical and managerial implications of the study and conclusions are presented in section eight.

2. Literature review

Sustainability in tourism is a paradigm that researchers and practitioners have long debated (Bramwell and Lane, 1993; Koens *et al.*, 2009; Mondino and Beery, 2018; Wondirad *et al.*, 2020). Ecotourism, nature-based tourism, heritage tourism come from the management perspective of sustainable tourism (Zolfani *et al.*, 2015) and promote a win-win scenario (Ardoin *et al.*, 2015) in which the visitors are guaranteed a quality experience, the living standards for local communities are improved, and an ecologically oriented and profit-generating activity is promoted (Lim and McAleer, 2005). A broad spectrum of academic study focuses on tourists' connection with the recreational environment, paying attention to the cognitive aspects and social psychological drivers behind the adoption of a pro-environmental behaviour (Imran *et al.*, 2014; Martin *et al.*, 2017; Kim *et al.*, 2018).

In coastal and marine destinations, divers are often the main or at least a relevant category of ecotourists (Lucrezi *et al.*, 2017) as they contribute to generating economic benefits, especially in contexts characterised by peripheral, mono-structured economies (Garrod and Gössling, 2008). In the past two decades, many researchers have conducted studies on scuba diving tourism, which is depicted as a young, expensive and niche sector focused on the enjoyment of underwater marine environment and wildlife (Dimmock and Musa, 2015). According to Hodeck *et al.* (2021), the sustainability of scuba diving tourism is an important factor to consider with regard to a tourist destination's competitive advantage (Apostolakis *et al.*, 2015; Nadalipour *et al.*, 2019). Thus, scuba diving achieves sustainable outcomes and effective tourism management (Plummer and Fennell, 2009). To address the issue of a scuba diving tourist destination's sustainability, it is useful to consider the academic literature related to environmental, economic and socio-cultural aspects (Marconi *et al.*, 2020).

Sustainable scuba diving tourism begins with marine conservation. The richness and variety of marine biodiversity increase the attractiveness of a scuba diving tourism destination, which represents the main motivation for a dive (Edney, 2012). A particularly prolific branch of research has explored divers' impacts on the natural environment (Nurbaidura *et al.*, 2013; Hammerton, 2017; Giglio *et al.*, 2015, 2018; Lucrezi *et al.*, 2019, 2021; Edney *et al.*, 2021), highlighting future implications for biodiversity and, consequently, the loss of the tourist destination's appeal (Musa and Dimmock, 2013). Nurbaidura *et al.* (2013) examine the relationship between divers' specialisation and underwater behaviour, while Lucrezi *et al.* (2019) investigate the influence of the divers' experiences on their perceptions of

the environment's health. [Ong and Musa \(2012\)](#) studied the impact of divers' experience and personality in explaining their underwater behaviour. Some studies have focused on how effective interpretation and educational strategies promote pro-environmental behaviours ([Townsend, 2008](#); [Johansen, 2013](#); [Hammerton, 2017](#); [Giglio et al., 2018](#)). This information is critical to manage diving destinations.

[Musa and Dimmock \(2013\)](#) provide evidence of the economic contribution of diving tourism to local development. The growing popularity of scuba diving destinations in Thailand, Australia and Malaysia has prompted researchers to investigate tourist demand for scuba diving experiences and issues related to the assessment of its economic value ([Arcos-Aguilar et al., 2021](#)). Strategies to increase revenue and better manage scuba diving destinations and preserve and enhance biodiversity are increasingly needed. Studies, such as those by [Schuhmann et al. \(2013, 2019\)](#), [Emang et al. \(2016\)](#), [Trujillo et al. \(2016\)](#), have investigated the factors that drive the willingness to finance conservation projects.

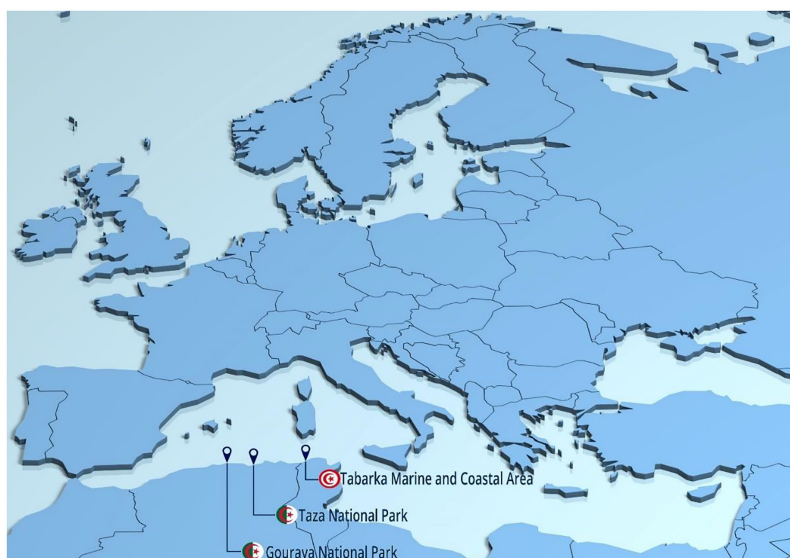
Other studies have focused on key aspects (such as preferences, motivations and expectations) related to tourists' perception of the underwater environment and their inclination towards environmental conservation ([Cater, 2008](#); [Dodds et al., 2010](#); [Wong et al., 2013](#); [Hermoso et al., 2019](#)). [Albayrak et al.'s \(2021\)](#) study on holiday tourists who had scuba diving experiences in Kemer, Antalya-Turkey, shows that "exploration" and "excitement to dive" are the key push motivations, while "safe" and "accessibility" are the most important pull motivations. Certain authors have explored the attributes of scuba diving experiences that affect satisfaction ([Mundet and Ribera, 2001](#); [Musa, 2002](#); [Musa et al., 2006](#); [Suardana, 2016](#); [Marconi et al., 2020](#); [Cater et al., 2021](#)). The literature review reveals that most of these authors have depicted the divers' socio-demographic profile with a non-homogeneous diving segment and differences in preferences, motivations and experience levels ([Edney, 2017](#)). Examining divers' motivations and preferences could inform the development of sustainable tourism strategies to manage the interdependent goals of recreation and resource conservation.

3. Research context

Our study was conducted in three areas along the North African coast in the southern Mediterranean ecoregion, the Taza and Gouraya National Parks in Algeria and the Tabarka Marine and Coastal Area in Tunisia ([Figure 1](#)).

The three tourist destinations are suffering environmental degradation related to a rapid growth of development without any formal planning. These areas were selected specifically as case study ([Yin, 2003](#); [Xiao and Smith, 2006](#)) worthy of research for a number of reasons ([Niccolini et al., 2019](#)): (1) Owing to their unique biodiversity, these three areas have the potential to become major marine ecotourism attractions; (2) The diving sector offers the opportunity to promote ecotourism activities and stimulate local sustainable development; (3) These areas have recently experienced large-scale tourism development, which could compromise the conservation of marine and coastal ecosystems if it is not properly regulated; (4) All three tourist destinations have yet to finalise the institutional process of fully establishing a marine protected area (MPA). [Table 1](#) presents a summary of key institutional, legal and managerial aspects.

In addition, the case study approach has been chosen as suitable methodology to understand and deepen complex phenomena ([Larsson, 1993](#); [Stake, 1995](#)) such as the promotion of sustainable oriented strategies and practices in destinations affected by strong coastal mass tourism. More precisely, the case study methodology applied to these three tourist destinations in North Africa allows the investigator to define which are the main factors (linked to the three pillars of sustainability) that could have an impact on the sustainability of diving tourism. Starting from the description of processes and results



Source(s): Figure created by authors

Figure 1.
Location of the study's
three destinations:
Gouraya, Taza and
Tabarka

achieved in real contexts characterized by particular socio-cultural and economic dynamics linked to tourism development, the case study methodology allows to learn management tools to guide tourism development towards paths of sustainability.

4. Materials and methods

Due to the exploratory nature of this study, we did not consider the use of random sampling techniques essential. Given the time and resource constraints, we chose convenience sampling (Bailey, 1994; Bohrnstedt and Knoke, 1994), a method that is used when direct relationships with members of the target population and a greater propensity for collaboration from participants can be relied upon (Etikan *et al.*, 2016). A quantitative method has been adopted for research design and analysis. Within the case study framework, data were collected through a questionnaire administered to scuba diving tourists after their recreational diving experience at the three tourist destinations. The interviewers approached the divers and asked them whether they would participate in the questionnaire. Before administering the questionnaire, they explained the study aims and clarified that the data would be anonymous. A total of 167 questionnaires were printed and distributed to divers. Analysis was limited to respondents who completed all questions in the questionnaire. We received 123 valid responses during two sampling periods: August 2017 and March to October 2018. Of the 123 completed questionnaires, 31 came from Gouraya, 48 from Taza and 44 from Tabarka. The response rate was 74%. The exploratory nature of the research is connected to the lack of literature and data on the three geographic areas considered and the relative difficulty in obtaining a representative sample of the target tourists at these destinations. In these areas, scuba diving is practiced by a relatively small number of tourists, who are not always willing to be interviewed, particularly after a diving experience. Therefore, gathering information through individual interviews for this study has been costly and time-consuming. Thus, the data collected in this study are valuable and extremely useful to outline the first cognitive representation of the local diving segment.

	Gouraya	Taza	Tabarka
Area	7,842 ha on the western side of the Gulf of Bejaïa, part of the municipality of Bejaïa	9,603 ha on the north-east coast of Algeria	327,855 ha on the north-west coast of Tunisia
Ecosystem of international relevance	Mediterranean Sea shore ecosystem, cliffs, beaches and sea caves, marine algae	Marine and terrestrial ecosystem with rocky coast, sandy beaches, grottos and springs; underwater columnar basalt	Remarkable biological richness thanks to the presence of rare Mediterranean species; underwater landscape that alternates between posidonia meadows on rocks and sand, photophilous algae and gorgonians
Representative marine species	Sperm whales, harbour porpoises, some dolphins	Colonies of different types of corals (black, red) and precious algae forests	Tursiops truncatus, <i>Delphinus delphis</i> , <i>Stenella coeruleoalba</i> , <i>Pinna nobilis</i> , <i>Cystoseira caespitosa</i> , <i>Cystoseira compressa</i>
Major threats	Anthropogenic pressure due to its proximity to the city of Bejaïa (184,000 inhabitants), consistent port traffic and mass tourism in the summer months	Over-exploitation of marine resources like fish, corals and shells; mass tourism in the summer	Coral exploitation and marketing, poaching, large numbers of boaters and divers; increased anthropogenic pressure with the creation of a track that connects the village of Maaloula to its bay
Tourism key features	Mainly domestic, seaside and seasonal tourism (3 million visitors annually)	Mainly domestic, seaside and seasonal tourism; consistent flow of visitors (7 million) in the Jijelian coastal region	Seaside and seasonal tourism, with the presence of both national and international tourists (Slovaks, Czechs, Algerians)
Official international recognition	UNESCO – Biosphere Reserve (2004)	UNESCO – Biosphere Reserve	–
Legal date of establishment (gazetted, for terrestrial areas)	Decree no 84-327 of 3 November 1984: “Création du Parc National de Gouraya (Wilaya de Bejaïa)”	Decree no 84-328 of 3 November 1984: “Création du Parc National de Taza et de Banc des Kabyles Marine Reserve”	Projected
Legal national framework	Law no 11-02 (PAs classification and management) Law no 02-02 (protection of the coastal areas)	Law no 11-02 (PAs classification and management) Law no 02-02 (protection of the coastal areas)	Law no 88-20 of 13 April 1988: “Code forestier” Law no 94-122 of 28 November 1994: “Code de l’aménagement du territoire e de l’urbanisme” Law no 2009-49 of 20 July 2009: “Aires marines et côtières protégées”

Table 1.
Key aspects of the
three case studies

(continued)

	Gouraya	Taza	Tabarka
Zoning	<ul style="list-style-type: none"> • Area of ecological interest • Economic exploitation zone • Buffer zone 	<ul style="list-style-type: none"> • No-take zone • Peripheral zone • Buffer zone 	Projected
Governance authority	Directorate General of Forests (DGF)	Directorate General of Forests (DGF)	–
Staff capacity	–	–	–
Budget capacity	–	–	–
Management plan	–	–	–

Source(s): Adapted from [Niccolini *et al.* \(2019\)](#)

Table created by authors

Table 1.

We developed a questionnaire comprised of five parts that took approximately 15 min. The first part was aimed at gathering information about the key features of the travel experience, including the place of stay and reason for visiting. Certain questions linked the diving experience to the MPA concept, such as respondents' awareness levels related to conservation issues and more general issues regarding future MPAs. The second section focuses on nature-based experiences and the factors that affect respondents' choice of diving site. The third section gathers information on scuba divers' expenditure. The fourth section explores divers' willingness to pay (WTP), in addition to their usual expenses, to fund sustainability initiatives, including marine conservation projects, and how they would allocate these funds. The final section collected general demographic information such as age, occupation, nationality and education. The questionnaire is available in both French and English ([Table 1](#), Supplementary Material). The items of the questionnaires have been developed by the authors after a comprehensive review of the related literature ([Eagles, 1992](#); [Millennium Ecosystem Assessment, 2005](#); [Tao *et al.*, 2004](#)). They have been modified to be applicable to the study context and to cover dimensions related to the attitudes towards the MPA establishment. In the process of questionnaire design, we interviewed and consulted five university academicians with scuba diving experience in the three areas under study to test the construct validity of the instrument. Before starting the survey, we organized a pre-testing to assess the clarity of the questionnaire. The only issue encountered during this phase was related to the different approaches used in the questionnaires' administration. Therefore, to avoid future misunderstanding, we shared guidelines for all the involved interviewers.

5. Data analysis

Our analysis focused on the economic and sociocultural aspects of sustainable scuba diving tourism, as we recognise that marine biology and ecology scholars have largely explored the divers' impact on the natural environment.

First, we conducted a descriptive analysis of scuba divers' profiles with respect to socio-demographic characteristics, motivations and preferences for dive site selection. In addition, we analysed divers' motivations for spending time and money on an underwater experience to provide an explorative evaluation of the contribution of scuba diving to the local economy. On the other hand, divers' spending behaviour can influence the profitability of the scuba diving tourism destination. This approach allows to identify the extent to which scuba diving can contribute to the well-being of the local community ([Saayman and Saayman, 2018](#)).

R software (R Core Team, 2019) was used to analyse the collected data on motivations and preferences for dive site choice, and divers' propensity towards conservation. The divers were profiled using summary statistics, and the relationships between variables were investigated using graphical analysis and regression models. The dependent variables were as follows:

- (1) Choice of diving site: Six dummy variables were set up from the responses to a question related to the first three motivations and preferences that affected the respondent's choice of diving site.
- (2) WTP: based on the respondent's desire to fund conservation projects.

We treated the motivations for choosing a particular diving site and WTP as inextricably interrelated, because both are partly driven by the propensity towards conservation, which is unobservable. Divers with greater environmental propensity are expected to choose a diving site for its natural beauty and, equally, be willing to fund conservation projects. Therefore, the motivations for choosing a diving site emerge as predictors in the regression model, which explains the WTP level and vice versa. This was performed in a simple exploratory manner without any claim of causality.

The definitions of all independent and dependent variables considered in the analysis are provided in Table 2.

6. Results

6.1 Scuba diving tourist demand: demographic and socio-economic factors

As demonstrated in Table 3, the profile of the typical divers in all three destinations is young, highly educated and employed. The majority of respondents were aged between 31 and 40 years across all destinations (52% in Gouraya, 56% in Taza and 34% in Tabarka), followed by those between 21 and 30 years in Gouraya (29%) and Tabarka (23%), and between 41 and 50 years in Taza (21%). The three destinations primarily received domestic tourists (97% in Gouraya, 62% in Taza and 77% in Tabarka), albeit with few differences. Merely 3% of the divers in Gouraya were foreigners (from France), whereas 38% of those in Taza were international visitors (from France). Approximately 23% of the divers in Tabarka were international tourists, specifically, French (14%), Dutch (5%), German (2%) and Italian (2%). Most respondents in all three destinations had university-level education (84% in Gouraya, 79% in Taza and 75% in Tabarka) and were employed (61% in Gouraya, 50% in Taza and 39% in Tabarka). The most prevalent categories were beginners (77% in Gouraya, 69% in Taza and 86% in Tabarka), followed by those who were moderately experienced in Gouraya (13%), Tabarka (7%) and somewhat experienced in Taza (27%), as shown in Table 4. Only Tabarka has a low percentage of experienced divers (2%).

The analysis of the average number of annual divers in the three tourist destinations (Figure 2) suggests that scuba diving is a niche segment in the early stages of development in Taza and Gouraya with a modest number of annual divers. In Tabarka, the higher number of scuba diving tourists shows the potentially important role of scuba diving in local development towards sustainability.

The underwater experience appears to be one of the holiday activities and is not the focus of the holiday itself. As shown in Table 5, in Gouraya and Taza, the participants reported spending five and seven days on vacation, respectively, of which two or three days were reserved for diving. Although in Tabarka the average duration of stay was longer, only nine days were spent on dives. The respondents were also asked to estimate their approximate holiday expenditure. The results in Table 5 confirm that the diving tourism in Tabarka is more developed and potentially contributes to the local economy.

Variable	Description	Values
<i>MPA awareness</i>		
AWARPA	Awareness of the existence of a PA (to be established)	1 if Yes, 0 if No/I don't know
PA&DIVEXPER	The existence of a PA (to be established) influences the decision to come and dive here	1 if Yes, 0 if No/I don't know
MPA FOR CONSERV	The existence of an MPA ensures ecosystem conservation	1 if Yes, 0 if No/I don't know
<i>Preferences/motivations regarding choice of diving site</i>		
F_WATQUAL	Water quality	1 if selected, 0 otherwise
F_SPECTSPEC	Spectacular species	1 if selected, 0 otherwise
F_AB&DIVFISH	Abundance and diversity of fish	1 if selected, 0 otherwise
F_UNDERSCEN	Underwater scenery	1 if selected, 0 otherwise
F_SAFE	Safety	1 if selected, 0 otherwise
F_OPPACT	Opportunity to do other activities	1 if selected, 0 otherwise
F_PROXACC	Proximity to accommodation	1 if selected, 0 otherwise
F_PA	Protected area	1 if selected, 0 otherwise
<i>Willingness-to-pay variable</i>		
WTP	Maximum amount the respondents would be willing to pay, in addition to the usual expenses, to fund conservation projects of the marine ecosystem	Nothing, €1–2 per dive, €3–5 per dive, €6–10 per dive, more than €10 per dive
<i>Fund allocation for conservation projects</i>		
ENFREG	Enforcing regulations	1 if selected, 0 otherwise
REDWATPOLL	Reducing water pollution	1 if selected, 0 otherwise
ENVEDUC	Promoting environmental education	1 if selected, 0 otherwise
SCIENPRES	Enhancing monitoring and scientific research	1 if selected, 0 otherwise
IMPFAC	Improving facilities	1 if selected, 0 otherwise
STRICTAREAS	Creating strict conservation areas	1 if selected, 0 otherwise
OTHERACT	Other activities	1 if selected, 0 otherwise
<i>Divers' characteristics</i>		
DEGSKILL	Number of dives per year	Quantitative variable classified, where necessary, as annual average of dives: beginner (1–25), somewhat experienced (26–50), moderately experienced (51–100) and experienced (>100)
LOCSTAY	Location of stay	Gouraya; Taza; Tabarka
T_TOUR	Type of tourist	0 if domestic, 1 if international
AGE	Age of the respondent	Less than 21 years old, between 21 and 30 years old, between 31 and 40 years old, between 41 and 50 years old, between 51 and 60 years old, over 60 years old
STDEG	Study degree	Primary school certificate, middle school diploma, high school certificate, university degree, postgraduate degree
OCC	Occupation	Freelance professional, entrepreneur, employee worker, student, retired, other
Note(s): From field survey		
Source(s): Table created by authors		

Table 2.
Variable definitions

Variable	Total sample (%) (N = 123)	Gouraya (%) (N = 31)	Taza (%) (N = 48)	Tabarka (%) (N = 44)
<i>Age</i>				
Less than 21 years old	5	–	2	11
Between 21 and 30 years old	23	29	19	23
Between 31 and 40 years old	47	52	56	34
Between 41 and 50 years old	18	16	21	16
Between 51 and 60 years old	4	–	2	9
Over 60 years old	3	3	–	7
<i>Type of tourists</i>				
Domestic	76	97	62	77
International	24	3	38	23
<i>Occupation</i>				
Freelance professional	7	3	8	9
Entrepreneur	17	13	25	11
Employee worker	49	61	50	39
Student	16	13	13	23
Retired	5	3	–	11
Other	6	6	4	7
<i>Study degree</i>				
High school certificate	12	3	13	18
University degree	79	84	79	75
Postgraduate degree (PhD, Master's degree . . .)	9	13	8	7

Note(s): From field survey
Source(s): Table created by authors

Table 3.
Divers' socio-demographic characteristics

Level of experience	Total sample (%) (N = 123)	Gouraya (%) (N = 31)	Taza (%) (N = 48)	Tabarka (%) (N = 44)
Beginners	77	77	69	86
Somewhat experienced	15	10	27	5
Moderately experienced	7	13	4	7
Experienced	1	–	–	2

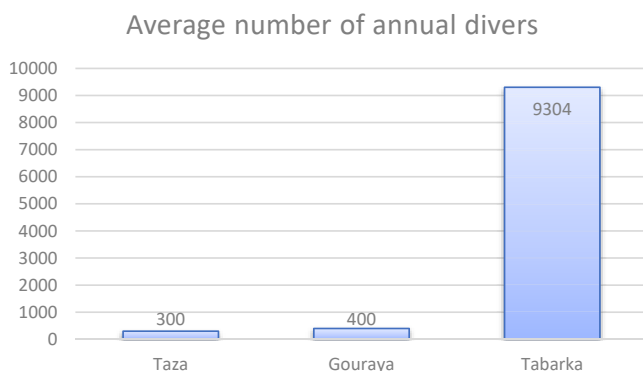
Note(s): From field survey
Source(s): Table created by authors

Table 4.
Divers' level of experience

6.2 Divers' preferences and motivations

To investigate the divers' preferences and motivations related to the recreational diving experience, each respondent was required to select three different characteristics that influence their choice of diving site from the eight that were listed: "water quality", "presence of spectacular species", "abundance and diversity of fish", "presence of particular underwater scenery", "safety", "opportunity to do other activities", "proximity to accommodation", "presence of a protected area (to be established)".

The data show that the respondents appreciated the natural aspects of the site, and in particular, water quality and the presence of underwater scenery were the most important factors driving their choice in 22% and 21% of cases, respectively (Table 6). A certain importance was also given to the safety factor, especially in Gouraya and Taza, where it was identified as a key factor by 25% and 19% of the divers, respectively. By contrast, most



Source(s): Figure created by authors
Niccolini *et al.* (2019)

Figure 2.
Average number of
annual divers

	Gouraya	Taza	Tabarka
Average length of vacation (days)	5	7	20
Average number of diving days during the holiday (days)	2	3	9
<i>Average expenditure</i>			
Annual diving expenditure (€)	91	92	273
Daily diving expenditure	10	11	26
Daily accommodation expenditure (€)	55	33	156
Daily food expenditure (€)	3	7	26
Daily other expenditure (€)	1	2	26

Note(s): From field survey
Source(s): Table created by authors

Table 5.
Information on the
holiday features and
expenditures

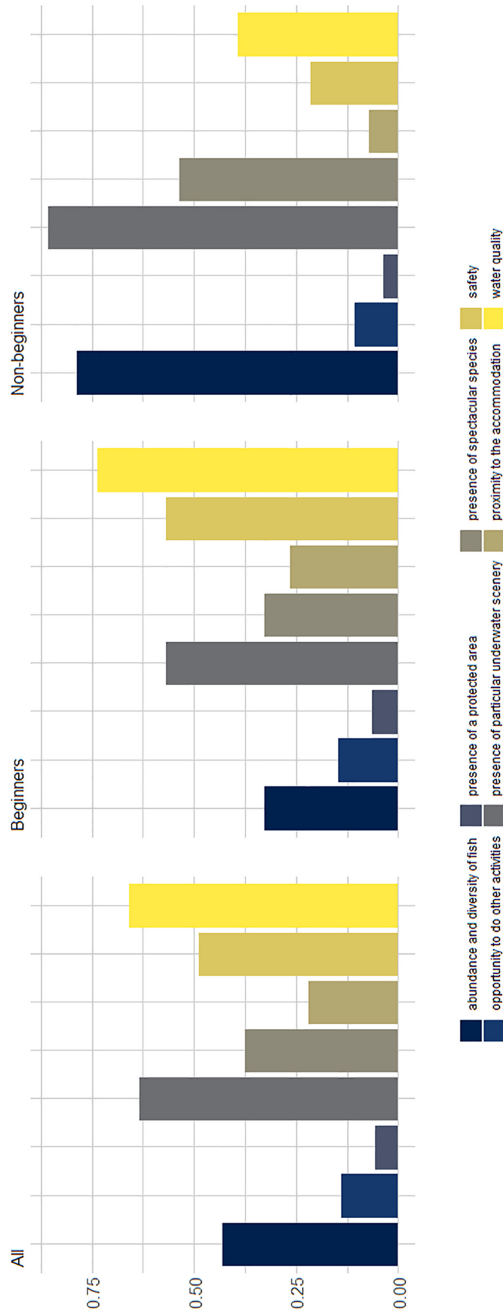
Motivation and preferences of dive site choice	Total sample (%) (N = 123)	Gouraya (%) (N = 31)	Taza (%) (N = 48)	Tabarka (%) (N = 44)
Water quality	22	22	22	23
Spectacular species	12	15	8	15
Abundance and diversity of fish	14	5	17	18
Particularly underwater scenery	21	23	23	18
Safety	16	25	19	8
Opportunity to do other activities	5	6	2	6
Proximity to accommodation	7	4	8	8
Protected Areas	2	–	1	5

Note(s): From field survey
Source(s): Table created by authors

Table 6.
Factors influencing the
choice of diving site
(percentage of times
each attribute was
indicated as the most
important motivation
for choosing the
diving site)

divers in Tabarka do not consider safety as a determining feature when choosing a diving site.

Figure 3 depicts the analysis for each of the eight characteristics selected by the entire sample and separately for beginners and non-beginners (somewhat experienced, moderately experienced and experienced divers are collapsed into a single category because of their low frequency in the sample). As expected, the degree of experience affected divers' preferences.



Source(s): Figure created by author

Figure 3.
Selection percentages
of different
characteristics
influencing the choice
of diving site across the
whole sample and for
beginner and non-
beginner divers

Considered together, the trio of characteristics, water quality, safety and proximity to accommodation constituted the most selected for beginners (19%) and one of the least selected for non-beginners (4%), making this trio the most valuable to beginners. In contrast, 36% of non-beginners selected the presence of specific underwater scenery and spectacular species and the abundance and diversity of fish as more relevant characteristics compared to 6% of beginners, making it the preferred trio for the more experienced category. Interestingly, the presence of a protected area is rarely considered a choice-driving characteristic that is independent of the degree of experience.

To deepen the investigation of divers' preferences and motivations related to recreational diving experiences and their association with other variables that describe the travel experience, divers' degree of awareness of conservation issues and their demographic characteristics, a logistic regression model was applied to the data. Each characteristic influencing the choice of diving site was considered as a dependent variable and converted into a dummy variable with a value of one if the respondent selected it and zero otherwise. "Opportunity to do other activities" and "presence of a protected area" were excluded from the analysis because very few respondents chose them, which unbalanced the sample for both variables. The independent variables considered as predictors are listed in [Table 2](#). A stepwise procedure was used to determine independent variables that best explained the probability of selecting a particular characteristic. The results of the analysis are summarised in [Table 7](#). The intercept was included in each model; however, it was not reported owing to space constraints.

As noted in [Figure 3](#), dive choice preferences related to appreciation of natural beauty and scenery are mostly expressed by expert divers. The independent variable "diver experience", expressed as the number of dives per year, displays a positive and significant influence on the probability of selecting "spectacular species", "abundance and diversity of fish" and "underwater scenery" as motivations for choosing the diving site. In contrast, it has a negative and significant effect on the motivations "water quality" and "safety", thereby reducing their probability of being selected. Its effect on selecting "proximity to the accommodation" is also negative, albeit only slightly significant (p value < 0.1). WTP is another relevant variable that explains the motivation for choosing a diving site. A higher WTP is associated with a significantly higher probability of choosing a site for its underwater scenery and its abundance and diversity of fish and a significantly smaller probability of choosing it for its proximity to the accommodation. This finding underscores the link between divers' appreciation of natural beauty and the importance they attach to conservation projects. Moreover, divers who are willing to fund MPA management projects that support scientific research have a significantly higher probability of choosing a diving site for its spectacular species and a slightly lower probability of choosing it because of its water quality or proximity to accommodation. However, the diving site selection attributed to the knowledge of the MPA establishment has a less clear link with divers' preferences. In fact, it indicates contrasting relationships with two naturalistic motivation features: a positive correlation with the presence of spectacular species and a negative correlation with underwater scenery.

6.3 Propensity towards conservation

Propensity towards conservation is a broad concept that encompasses multiple sociocultural aspects related to divers' tendency to have positive attitudes towards conservation ([Dodds et al., 2010](#)). We explore the association between key variables that contribute to positive attitudes towards conservation, such as divers' motivation and preferences, WTP and MPA awareness. Findings from statistical analyses are useful to assess divers' propensity towards conservation and make managerial considerations.

Dependent variable	Predictor	Coefficient	Std. Error	t-value	p value
Water quality	Scientific research	-0.845	0.443	-1.906	0.0567
	Diver experience	-0.027	0.010	-2.765	<i>0.0057**</i>
Model fit statistics	Hosmer and Lemeshow goodness-of-fit test: $\chi^2 = 5.006$, df = 8, <i>p</i> value = 0.757 McFadden pseudo R^2 : 0.105				
Spectacular species	MPA establishment and decision to dive	1.344	0.471	2.854	<i>0.0043**</i>
	Diver experience	0.023	0.010	2.323	<i>0.0202*</i>
	Scientific research	0.950	0.454	2.093	<i>0.0363*</i>
Model fit statistics	Hosmer and Lemeshow goodness-of-fit test: $\chi^2 = 12.374$, df = 8, <i>p</i> value = 0.135 McFadden pseudo R^2 : 0.147				
Abundance and diversity of fish	Diver experience	0.047	0.013	3.500	<i>0.0005***</i>
	MPA role for ecosystem conservation	-1.287	0.720	-1.787	0.0740
	Type of tourist (international)	0.961	0.500	1.923	0.0545
	Gouraya	-3.086	0.862	-3.580	<i>0.0003***</i>
	WTP	0.164	0.067	2.447	<i>0.0144*</i>
Model fit statistics	Hosmer and Lemeshow goodness-of-fit test: $\chi^2 = 4.300$, df = 8, <i>p</i> value = 0.829 McFadden pseudo R^2 : 0.270				
Underwater scenery	MPA establishment and decision to dive	-1.235	0.494	-2.497	<i>0.0125*</i>
	Diver experience	0.038	0.015	2.571	<i>0.0101*</i>
	WTP	0.118	0.060	1.979	<i>0.0479*</i>
Model fit statistics	Hosmer and Lemeshow goodness-of-fit test: $\chi^2 = 9.499$, df = 8, <i>p</i> value = 0.302 McFadden pseudo R^2 : 0.123				
Safety	Diver experience	-0.048	0.014	-3.401	<i>0.0007***</i>
	Water pollution reduction	1.318	0.516	2.555	<i>0.0106*</i>
	Type of tourist (international)	0.947	0.544	1.742	0.0816
	Occupation (student)	1.357	0.720	1.885	0.0594
	Gouraya	1.647	0.663	2.483	<i>0.0130*</i>
	Tabarka	-2.304	0.615	-3.747	<i>0.0002***</i>
Model fit statistics	Hosmer and Lemeshow goodness-of-fit test: $\chi^2 = 10.483$, df = 8, <i>p</i> value = 0.233 McFadden pseudo R^2 : 0.346				
Proximity to accommodation	Awareness of MPA establishment	1.728	0.754	2.293	<i>0.0219*</i>
	MPA establishment and decision to dive	-1.995	0.899	-2.218	<i>0.0265*</i>
	Diver experience	-0.041	0.024	-1.709	0.0874
	Scientific research	-1.445	0.861	-1.679	0.0932
	Type of tourist (international)	-2.116	0.832	-2.542	<i>0.0110*</i>
Model fit statistics	WTP Hosmer and Lemeshow goodness-of-fit test: $\chi^2 = 6.348$, df = 8, <i>p</i> value = 0.608 McFadden pseudo R^2 : 0.346				

Table 7.
Predictors of motivation for choosing the diving site

Note(s): From field survey

Values in italic are significant at the 5% (*), 1% (**), and 1% (***), levels

Source(s): Table created by authors

The top panel in Figure 4 represents the distribution of WTP for divers who selected a diving site based on the establishment of an MPA and those who did not. Divers who value the establishment of an MPA indicate a greater WTP and a higher probability to pay up to 15 euros more to fund conservation projects in addition to the usual diving expenses. Similarly, the bottom panel of Figure 4 presents the WTP distribution, which is conditional to the importance attributed to MPAs as a means of protecting the ecosystem. In this case, it is more evident that divers who believe in the efficacy of MPAs have a WTP distribution that shifts

towards the right compared to those who do not consider MPAs relevant for ecosystem conservation.

To provide a more detailed description of the key aspects associated with divers' propensity towards conservation, regression analysis was performed to investigate the influence of the variables related to tourists' motivations for dive site choice, their awareness of conservation issues, travel experience and socio-demographic characteristics on WTP. The WTP for conservation project funds is expected to be linked to divers' awareness of conservation issues. In addition, a stepwise procedure was adopted to select the model that best explained the variability observed in WTP. Table 8 presents the results, and Table 2 provides the complete list of variables considered as predictors. As noted above, there is a statistically significant relationship between WTP and the variables related to conservation awareness. Divers who claim that an MPA in the establishment phase has an impact on their choice of diving site are willing to pay on average two euros more than divers who did not

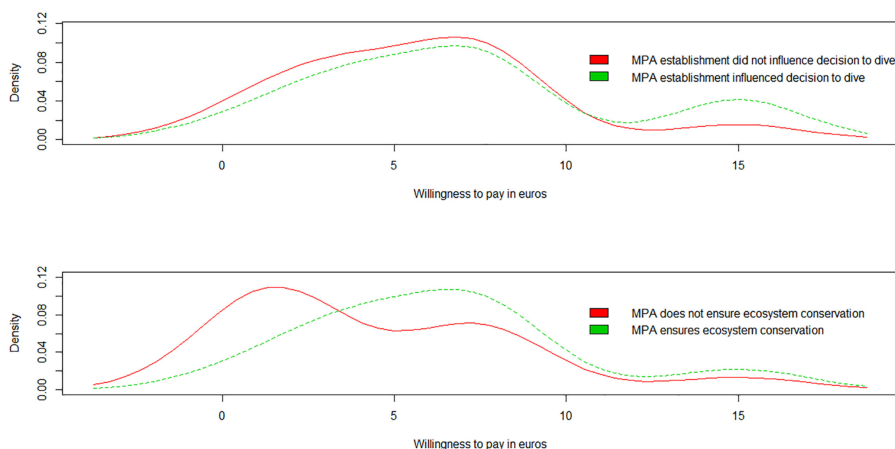


Figure 4. Sample distribution of the WTP, conditional to the importance attached to the establishment of an MPA when choosing the diving site (top panel) and the relevance given to MPAs for ecosystem conservation (bottom panel)

Source(s): Figure created by authors

WTP	Coefficient	Std. Error	t-value	p-value
Intercept	-2.145	1.606	-1.336	0.1843
Abundance and diversity of fish or underwater scenery	3.015	0.754	4.000	0.0001***
MPA establishment and decision to dive	2.337	0.753	3.102	0.0024**
MPA role for ecosystem conservation	1.971	0.909	2.169	0.0322*
Age	0.088	0.033	2.701	0.0080**
Occupation (student/other)	2.051	0.805	2.548	0.0122*
Gouraya	2.953	0.758	3.894	0.0002***
Tabarka	-2.026	0.733	-2.763	0.0067**
Model fit statistics	Residual Standard Error: 3.224 on 115 degrees of freedom			
	Multiple R ² : 0.348			
	Adjusted R ² : 0.309			
	F-Statistic: 8.783 on 7 and 115 degrees of freedom, p value: 1.274e-08			

Note(s): From field survey

Values in italic are significant at the 5% (*), 1% (**), and 1% (***) levels

Source(s): Table created by authors

Table 8. Regression of WTP on marine life preferences, conservation awareness and socio-demographic characteristics

make this claim. Similarly, albeit at a lower level of significance, those who believe that MPAs play a role in conservation are willing to pay an average of almost two euros more than those who do not think that the MPA establishment can help protect marine ecosystems.

Additionally, variables related to naturalistic beauty indicate a significant positive effect on WTP. Divers who appreciate the abundance of marine species and underwater scenery are willing to pay an average of three euros more than those who place greater emphasis on other factors of recreational experiences. For visitors' demographic variables, WTP increases with age and is higher for students, which confirms their greater ecological awareness. Finally, divers interviewed in Gouraya have, on average, a WTP three euros more than that of divers in Taza, whereas the WTP of divers in Tabarka is two euros less.

7. Discussion

This study presents the first overall picture of scuba diving tourism in three North African tourist destinations that are characterised by a high ecotourism potential and threatened by growing anthropogenic pressure.

The main question that revolves around this research idea is whether scuba diving at these three destinations can pursue the challenge of sustainable tourism.

As [Lucrezi et al. \(2017\)](#) note, preservation of the marine environment is a key issue for the sustainability of the diving segment. A healthy marine ecosystem attracts divers and provides satisfactory underwater experiences ([Nurbaidura et al., 2013](#)). The findings of this study indicate that divers appreciate the natural environment and emphasise safety, which is in line with [Albayrak et al. \(2021\)](#). Data analysis and interpretation allowed us to identify a relation between divers' preferences about site dive choice, the level of experience and WTP. Our study has revealed that preferences of dive site choice vary between divers and depend on their level of experience; firstly, experienced divers are much more interested in seeing marine life as an abundance and diversity of fish, and to discover particular underwater sceneries; secondly, novices view the underwater experience much more as a leisure activity. Similar to other studies, our findings highlight that the natural features of the marine environment are among the most important factors in choosing a dive site for experienced divers ([Mundet and Ribera, 2001](#); [Musa, 2002](#); [Musa et al., 2006](#); [Giglio et al., 2015](#)). Several findings in the literature on scuba diving show that experience affects underwater behaviour among divers. [Musa et al. \(2006\)](#) and [Ong and Musa \(2012\)](#) demonstrate that novices are more likely to have a negative impact on a marine ecosystem. Although our exploratory study did not attempt to study the relationship between the level of experience and the underwater behaviour (and, therefore, the possibility that divers harm marine ecosystems), the study of the human dimensions of natural resources can be useful to make some considerations on the importance of the educational aspects and good practices regarding responsible underwater behaviour. As several scholars ([Townsend, 2008](#); [Hammerton, 2017](#); [Giglio et al., 2018](#)) have suggested, linking the attractiveness of the diving sector to the fascination of learning about underwater life can promote education to the conservation of underwater ecosystems and a more sustainable orientation of the tourism development, thus enhancing a positive loop that can improve the quality of the underwater recreational experience.

In the three destinations analysed, diving tourism is a relatively new sector, and many divers have little previous experience. The socioeconomic profile reveals the presence of primarily local seasonal tourists who are characterised by short stays or daily visits ([Gounden et al., 2020](#)). Furthermore, in line with [Albayrak et al. \(2021\)](#), diving is not the primary motivation for holidays. These findings could affect the ability of diving tourism segments to generate significant socioeconomic benefits for the local community ([Niccolini et al., 2019](#)).

Given the above dynamics, the sustainable governance of coastal and marine resources necessitates additional efforts. Therefore, the establishment of an MPA can foster the development of a sustainability-oriented strategy for the scuba diving segment (Lucrezi *et al.*, 2017). This study has several theoretical and managerial implications.

7.1 Theoretical implications

From a theoretical point of view, this study provides an original contribution to the debate on sustainable tourism strategies by demonstrating how the study of economic and sociocultural aspects of scuba diving could provide guidelines to orient the tourism development of marine and coastal areas towards the principles of sustainability (Dimmock and Musa, 2015). According to Lucrezi *et al.* (2019), tourists' motivations for and preferences regarding recreational experiences influence how natural resources can be protected and managed, becoming key elements in the development of a sustainable tourism strategy. Therefore, an overall assessment of the sustainability of the diving tourism segment should be accompanied by a preliminary background on the visitors' profiles to shape strategies and plans in order to strike a more equitable balance between the ecological, economic and tourism interests for marine conservation (Dodds *et al.*, 2010). This approach provides an opportunity to qualify tourism sector through tourist segmentation, enhancing its long-term sustainable development.

7.2 Managerial implications

This study offers several managerial implications as well. The richness and variety of biodiversity preserved by the MPAs attract a wide range of tourists, improve the destination's appeal and positively influence scuba's diving tourist demand. Many of the most popular diving destinations are MPAs and, in some cases, the existence of MPAs increases visitor satisfaction (Lucrezi *et al.*, 2021). The results reveal the relationships between the opportunity to observe the richness and variety of underwater life and a greater willingness to fund conservation projects. Divers who appreciate the abundance and variety of marine species and enjoy discovering specific underwater scenarios during their recreational experiences are willing to allocate funds for biodiversity conservation.

We found that the greater the knowledge of MPA establishment at these three destinations, the higher the level of WTP. Additionally, greater WTP is observed among those who believe that MPAs are important for marine conservation. Several studies emphasise that the implementation of a user fee system not only enhance effective marine conservation and sustainable funding for MPAs (Schuhmann *et al.*, 2013, 2019; Emang *et al.*, 2016; Trujillo *et al.*, 2016) but also provide economic benefits for the local community.

People with a high conservation propensity who are aware of MPA missions and roles are more likely to support biodiversity conservation, as shown in other studies (LaRiviere *et al.*, 2014; Yu *et al.*, 2018). MPA authorities, in collaboration with academic institutions and NGOs, can play an important role in disseminating the importance of preserving the biodiversity divers appreciate during their recreational experience and raising awareness of the positive impacts related to marine conservation (Lucrezi *et al.*, 2017). In Taza and Gouraya, the terrestrial national park authorities have established formal collaborations with local NGOs and diving centres to share the responsibility of implementing education and awareness-raising programs and co-manage underwater trails for snorkelers. In Tabarka, NGOs and local diving centres within the border of the future MPA designed a voluntary regulation zone for diving (World Wildlife Fund [WWF] Mediterranean, 2020). These socioeconomic findings, together with a moderate divers' propensity towards conservation, imply that the establishment of an MPA can be helpful in leading the local scuba diving tourism segment towards the valorisation and sustainability of marine and coastal resources.

7.3 Research recommendations

This research highlights the relevance of studying the scuba diving sector from a systemic perspective that encompassed the environmental, economic and socio-cultural aspects.

Based on our findings, we recommend the stakeholders involved in the management of the marine environment to improve collaboration and knowledge sharing in a way that benefit the entire scuba diving sector. The creation of an MPA could incorporate the different stakeholders' perspectives, improving effective management practices and promoting sustainable futures. These results and implications would be useful for policymakers and local institutional actors to design MPA-related strategies oriented to the diving sector. Specifically, our indications would help increase the potential contribution of divers and related stakeholders to the sustainable development of the investigated locations, as well as in other areas where the MPA establishment process is underway.

8. Conclusions

In this exploratory study, we examined the demand for scuba diving tourism and its suitability to contribute to the conservation of valuable local marine biodiversity.

In recent years, the three analysed tourist destinations, Taza, Gouraya and Tabarka, have experienced growing domestic mass tourist development that could have a negative impact on marine and coastal ecosystems, which are of high value, so much so that they are the subject of a process in MPA establishment. Our findings reveal an interesting, albeit embryonic, demand for ecotourism experiences with a specific analysis of divers' profiles; in particular, we highlight an increasing number of domestic visitors interested in diving activities. Therefore, there is a clear need to identify tools for sustainable management and preservation of coastal and marine biodiversity (Hayes *et al.*, 2017; Ayad, 2021). This study highlights the need to maintain the attractiveness of the marine ecosystem as a starting point for sustainable development, not only of the diving sector but also of the entire tourist destination. Those interested in promoting sustainable tourism should attempt to understand the real benefits that diving could bring to the local economy and competitiveness of the destination (Nadalipour *et al.*, 2019). The lack of tools and structures to develop an effective natural resource conservation strategy could lead to the unsustainable development of mass scuba tourism, as is happening in some tourist areas in the Red Sea (Shaalán, 2005). To effectively activate the process of sustainable scuba diving tourism development, however, a "start-up, leap forward" should be made by creating MPA authorities and providing them with adequate human and financial capacities (Gill *et al.*, 2017). This can enable them to activate not only enforcements and scientific monitoring but also proactive programs of education and key stakeholder engagement for sustainable development. In this scenario, a positive loop can be initiated, whereby the scuba diving sector is progressively implemented and plays a specific role in orienting the local tourism system in a more sustainable and conservation-oriented direction.

8.1 Limitations and future research

This study has some limitations. The small sample size of divers, owing to a general lack of data on the reference population, and time and resource constraints, influenced the representativeness of the study findings, thus, restricting an in-depth comparative analysis between the three case studies. The findings may also be subject to respondent bias and acquiescence and social desirability effects, particularly for issues regarding conservation awareness and WTP. It is difficult to gauge how respondents think about MPA; moreover, some questions may have been misunderstood or may have generated a positive response because it is considered more socially acceptable. To limit the respondents' bias, surveys were

administered by qualified researchers who might have resolved the eventual unclear interpretations of the questions.

Further studies could extend this analysis to a larger sample size to test its representativeness. We also suggest expanding the analysis to encompass other recreational users of marine environments, such as snorkelers and recreational fishers. This study was limited to a few explanatory variables; therefore, the next step could be to build a more elaborate model of explanatory variables that might explain the propensity towards conservation and MPAs.

Finally, the present study focused on a survey in three North African tourist destinations that are experiencing a growing mass tourism and finalising the process to establishing an MPA. On the other hand, the analytical approach of this study may not be applicable to other scuba diving tourism destinations that have already ending the MPA establishment phase but have not been able to implement sustainable-oriented tourism strategies. Future research should compare different scuba diving tourist destinations at different stages of MPA establishment process to further validate the results. Moreover, further research needs to deepen the suitability of the “Western idea” of MPA for resources conservation in explaining tourism internal dynamics and human well-being in developing countries.

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Motivations and key features of travel experience		
Variable	Survey questions	Potential responses
Place of stay	Where are you staying?	The town or city as a place of stay
MPA awareness	Are you aware of the existence of a Protected Area (to be established) here?	Yes/No
MPA establishment as choice factor	Did the existence of a Protected Area (to be established) influence your decision to come and dive here?	Yes/No/I don't know
General information on dives		
Diving experience	How many diving experiences did you have this year in total?	N ^o of dives per year
Diving site choice factors	What influenced the choice of this dive site? Please, indicate the three most important features	98 = missing value 1 = Water quality 2 = Presence of spectacular species (gorgonians, red corals, lobsters, . . .) 3 = Employee worker 4 = Abundance and diversity of fish 5 = Presence of particular underwater scenery (caves, cliffs) 6 = Safety 7 = Opportunity to do other activities (fishing, trekking, sailing, . . .) 8 = Proximity to the accommodation 9 = Presence of a protected area (to be established)
MPA role for conservation	Do you think the existence of a marine protected area ensures ecosystem conservation?	Yes/No/I don't know
Evaluation of logistics and costs		
Variable	Survey questions	Potential responses
Type of accommodation	What type of accommodation did you choose for your stay?	98 = missing variable 1 = Hotel 2 = Second home property 3 = Rented house 4 = Camping 5 = Other (specify)
Mean of transport	How did you reach the accommodation?	98 = missing variable 1 = By car 2 = By plane 3 = By train 4 = Other (specify)
Travellers	How many people are travelling with you and are sharing the same budget?	List #

(continued)

Table A1.
Survey questions related to the demographics and socio-economic characteristics of divers

Evaluation of logistics and costs		
Variable	Survey questions	Potential responses
Expenditures	What is approximately the budget for your holiday (considering also the people that travel with you)?	List # Annual expenditures for diving activities (gear, license, insurances, other expenditures) Daily expenditure of diving Accommodation expenditures Daily average expenditures for transportation and parking Daily average expenditures for food Other daily expenditures
Willingness to fund conservation projects		
Variable	Survey questions	Potential responses
WTP for conservation	Which is the maximum amount you would be willing to pay, in addition to the usual expenses, to fund conservation projects of marine ecosystems?	98 = missing variable 1 = Nothing 2 = € 1-2 per dive 3 = € 3-5 per dive 4 = € 6-10 per dive 5 = More than € 10 per dive
Reason for "Nothing"	If you answered "Nothing", please check the reason that fits you best	98 = missing variable 1 = No need to promote conservation projects 2 = Ecosystem conservation is a responsibility of the government 3 = Diving has no impact on marine ecosystem 4 = I don't want to have additional financial charges 5 = Other reason (specify) 6 = I don't know
Fund allocation	If you had to decide how to allocate some funds to support marine protected area management projects, how would you distribute these funds over the following activities? Please, indicate the three most important ones	98 = missing variable 1 = Enforcing regulations 2 = Reducing water pollution 3 = Promoting environmental education 4 = Enhancing monitoring and scientific research 5 = Improving facilities (restrooms, garbage bins, . . .) 6 = Creating strict conservation areas 7 = Other activities (specify)
Demographic information		
Variable	Survey questions	Potential responses
Age	What is your age group?	98 = missing value 1 = Less than 21 years old 2 = Between 21 and 30 years old 3 = Between 31 and 40 years old 4 = Between 41 and 50 years old 5 = Between 51 and 60 years old 6 = Over 60 years old

Table A1.

(continued)

Demographic information		
Variable	Survey questions	Potential responses
Gender	Interviewee's gender	Male/Female
Place of residence	Where do you live?	City/State/Province as place of residence
Occupation		98 = missing value 1 = Freelance professional 2 = Entrepreneur 3 = Employee worker 4 = Student 5 = Retired 6 = Other (specify)
Study degree	What is your highest level of education completed?	98 = missing variable 1 = Primary school certificate 2 = Middle school diploma 3 = High school certificate 4 = University degree – Bachelors or higher 5 = Post Graduate Degree (PhD, Master degree, ...)

Source(s): Table created by authors

Table A1.

Variable	Total sample (%) (N = 123)	Gouraya (%) (N = 31)	Taza (%) (N = 48)	Tabarka (%) (N = 44)
<i>ENFREG</i>				
Selected	73	84	75	64
Not selected	27	16	25	36
<i>REDWATPOLL</i>				
Selected	48	42	44	57
Not selected	52	58	56	43
<i>ENVEDUC</i>				
Selected	59	42	56	75
Not selected	41	58	44	25
<i>SCIENTRES</i>				
Selected	27	23	23	34
Not selected	73	77	77	66
<i>IMPFAC</i>				
Selected	44	52	46	36
Not selected	56	48	54	64
<i>STRICTAREAs</i>				
Selected	45	58	50	30
Not selected	55	42	50	70
<i>OTHERACT</i>				
Selected	2	0	4	2
Not selected	98	100	96	98

Source(s): Table created by authors

Table A2.
Frequency distribution
of qualitative variables
not already provided in
the paper

Variable	Mean	Standard deviation	Median	Skewness	Kurtosis
<i>Total sample</i>					
WTP	6.2	3.9	5.9	0.8	3.4
DEGSKILL	17.1	28.1	7.0	3.6	21.2
AGE	35.3	10.3	35.7	0.6	3.9
<i>Gouraya</i>					
WTP	8.3	4.0	8.0	0.6	2.3
DEGSKILL	18.1	250.3	7.0	1.5	3.9
AGE	34.7	8.8	35.1	1.2	5.4
<i>Taza</i>					
WTP	5.9	2.7	6.4	0.2	3.86
DEGSKILL	15.1	17.7	6.5	1.2	3.1
AGE	35.2	70.6	36.2	-0.1	3.2
<i>Tabarka</i>					
WTP	5.0	4.3	3.9	1.2	3.7
DEGSKILL	18.5	37.9	6.5	3.5	16.5
AGE	35.9	13.6	35.7	0.4	2.5

Table A3.
Summary statistics for
quantitative variables

Source(s): Table created by authors

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