

ARE OCEAN USERS OCEAN LITERATE? A CASE STUDY OF RECREATIONISTS AND TOURISTS IN CAPE TOWN, SOUTH AFRICA

SERENA LUCREZI

TREES, North-West University, Potchefstroom, South Africa

ABSTRACT

Non-consumptive recreation and tourism in or by the ocean, from scuba diving to snorkelling, have been regarded as generating memorable wildlife interactions, place attachment, nature connectedness, awareness of environmental problems, concern for environmental degradation and ocean literacy. The latter is the understanding of the influence of the ocean on people and of people on the ocean. Ocean literacy can foster environmental stewardship, and more responsible use of blue spaces for tourism and recreation, including fragile ecosystems. However, it is not guaranteed that marine tourists will be adequately ocean literate. This study evaluated levels of ocean literacy among 83 ocean-based recreationists and tourists in Cape Town, South Africa. This location offers numerous opportunities for ocean recreation and tourism such as scuba diving, free diving and snorkelling. A semi-structured interview was used to collect data at a tourism organisation offering these activities between January 2023 and January 2024. The participants' narratives, audio-recorded with their consent, were coded and analysed using thematic analysis and descriptive statistics. The participants were generally ocean literate, although some principles of ocean literacy were more familiar than others. Participants were mostly aware of provisioning ecosystem services of the ocean and human impacts on the ocean. The results of this study demonstrate that while ocean-based recreationists and tourists acknowledge the general importance of the ocean, more education is required to generate awareness about the inextricable link between the ocean and humankind, with a focus on the total dependence of people on the ocean and the need to be a part of strategies to mitigate damage to the ocean, its features, and ecosystems.

Keywords: environmental knowledge, eco-tourism, marine ecosystems, ecosystem services, ocean threats, environmental education, ocean stewardship.

1 INTRODUCTION

The oceans and coastal environments are a vital source of food and home to a great proportion of the earth's biodiversity but are facing several threats and problems that need to be acknowledged, from climate change to overfishing, pollution and tourism [1]–[3]. The oceans, seas and marine life need to be recognised as a conservation concern, and ocean conservation through the mitigation of human impacts is paramount to preserving biodiversity, ensuring food security, and maintaining carbon storage, among other ecosystem services provided by the ocean [4]. In line with this impinging need, in 2021 the United Nations (UN) announced the Decade of Ocean Science for Sustainable Development (hereon referred to as the UN Ocean Decade) to ensure that oceans are restored by the end of 2030 and that major efforts are implemented to address the decline in ocean health, create awareness about ocean issues and improve the relationship between people and the ocean in terms of attitude, awareness and behaviour [5], [6]. Part of the UN Ocean Decade's goals and objectives include identifying required knowledge for sustainable development, generating comprehensive knowledge and understanding of the ocean, increasing the use of ocean knowledge and also a deeper understanding of the relationship between people and the ocean [6]. If users view the ocean, seas and marine life as valuable and recognise the many negative impacts that affect the ocean, their emotional involvement, attitudes towards marine



sustainability and pro-environmental behaviour can change positively, fostering ocean stewardship [7].

The ocean literacy movement [8] is closely connected to the UN Ocean Decade and is critical to its success [9]. First developed in 2004 by ocean scientists and educators in the USA, ocean literacy is generally defined as ‘an understanding of the ocean’s influence on you, and your influence on the ocean’ [10]. The movement began to endorse the introduction of the ocean sciences in formal education [11]. Ocean literacy is characterised by seven principles [8]:

- The Earth has one big ocean with many features (OL1);
- The ocean and life in the ocean shape the features of Earth (OL2);
- The ocean is a major influence on weather and climate (OL3);
- The ocean made the Earth habitable (OL4);
- The ocean supports a great diversity of life and ecosystems (OL5);
- The ocean and humans are inextricably interconnected (OL6);
- The ocean is largely unexplored (OL7).

Ocean-literate people would be considered people capable of understanding the importance of the ocean for humankind, meaningfully communicating about the ocean, and embracing pro-ocean behaviours [12]. The ocean literacy movement is now recognised globally and targets all levels of society, with the assumption that ocean-literate people ought to have strong relationships with the ocean and embrace ocean stewardship through respectful and responsible behaviours [13], [14]. Recently, authors have developed new ocean literacy models shifting away from a knowledge-centric paradigm to include other concepts such as ocean connectedness, perceptions, and active participation in ocean stewardship [13]. These shifts highlight the importance of ensuring that ocean literacy is not simply understood to underpin enhanced awareness of the connection between people and the ocean and that its complexity and multi-dimensionality are properly addressed to create truly ocean-literate societies [13], [15].

As previously stated, there has been a growing call to ensure that ocean literacy is accessible to various groups of society, from indigenous communities to tourists [14]. For instance, people who participate in ocean-based recreation, such as snorkellers, scuba divers and surfers, can be important advocates for ocean conservation [16]. However, tapping the potential of ocean-based recreation groups requires a thorough investigation of these groups to evaluate awareness, attitudes and ultimately, pro-ocean behaviours, since these cannot be guaranteed based on the simple use of or proximity to the ocean [14]. Studies have revealed different levels of knowledge-based ocean literacy among ocean-based recreationists, who may be more familiar with certain principles than others, resulting in varying degrees of pro-ocean attitudes and behaviours [14], [17], [18]. Although ocean literacy is complex and requires the consideration of different constructs [13], an evaluation of awareness and knowledge of ocean literacy principles among ocean-based recreationists can represent the foundation for work to improve and deepen connections with the ocean, as well as foster true ocean stewardship through pro-environmental behaviour. Additionally, there is a call to increase research into the relationship between blue spaces and society, considering that ocean-based recreation is a major ecosystem service [14] and that this type of research is still scant compared to research evaluating relations between people and green spaces [19].

Based on the above, this study aimed to assess the awareness and knowledge of ocean literacy principles among ocean-based users including recreational and tourist groups, to guide strategies to create ocean-literate communities among ocean users and to support

pathways towards ocean stewardship among these groups. The location selected for this study was Cape Town in South Africa. The coastlines of South Africa present many recreation and tourism opportunities supporting economic growth [20], [21]. The coastlines around Cape Town offer different types of ocean-based recreation and tourism, including activities like surfing, snorkelling, scuba diving, freediving, and kayaking; and eco-tourism, edu-tourism and scientific tourism [22], [23]. Based on this scenario, it was assumed that ocean-based recreation and tourism experiences in the area would be stimulating enough to foster good connections with the ocean and a basic understanding of ocean facts through education, interpretation, briefings and experiential learning, possibly resulting in decent levels of basic ocean literacy.

2 METHOD

This study used qualitative research and a phenomenology approach. According to Sokolowski [24], phenomenology is ‘the study of human experiences and of the way things present themselves to us through such experiences’. A semi-structured interview (Table 1) was used to collect the data. The interview guide was developed by the researcher and validated by the scientific and ethics committees of the researcher’s institution, as well as one marine biologist based at an international academic institution. It included basic demographic questions (e.g. gender, age, ocean-based activities practised by the participants); and one generic question (the core of the interview guide) asking the participants to describe the relationship between humankind and the ocean. To extract as much information as possible from the participants in answer to this question, probes were used to stimulate the conversation. The interview guide ended with a question asking the participants whether they wished to add anything to the conversation.

Table 1: Semi-structured interview guide.

Category	Question
Demography	1. What is your gender? 2. What is your age? 3. What is your country of origin? 4. Are you local to this area? 5. What is your highest level of education? 6. What kinds of ocean-based activities do you regularly partake in?
Ocean literacy	7. Can you describe the relationship between human beings and the ocean? <u>Probes:</u> What is the influence that the oceans have on people? What is the influence that people have on the oceans? Can you describe some ocean ecosystems?
Final thoughts	8. Do you wish to add anything about people and the ocean, or these questions?

The population in this study included people engaging in ocean-based recreational and tourism activities recruited in Simon’s Town, Cape Town. Recruitment took place at an eco-tourism establishment offering day and overnight visitors scuba diving and snorkelling trips on both the Indian Ocean and Atlantic Ocean sides of Cape Town. The establishment had a Memorandum of Understanding with the researcher formalising the research collaboration. Interviews were conducted once every two months from January 2023 to January 2024, for

a total of six 4-day sampling trips. On each sampling day, the researcher randomly approached visitors at the eco-tourism centre, normally after they had participated in snorkelling or scuba diving and invited them to take part in the study. Agreeing participants were invited to sit with the researcher in a comfortable environment at the centre, where they could feel relaxed and free to speak. Before the start of the interview, the participants were provided with a letter explaining the purpose of the study and asked to provide informed consent to be interviewed and audio recorded. The interviews were conducted according to the ethical guidelines of the researcher's institution. The interviews lasted 20–40 minutes, with the participants being free to speak as much as they wanted or leave the research at any moment without having to explain why (although this never happened during the study). After conducting 25 interviews, the researcher began to analyse the data to look for data saturation, which was achieved when approximately 70 people were interviewed. To ensure that data saturation had been achieved, the researcher conducted another 13 interviews, after which sampling was interrupted. The final sample size was 83 participants.

The recordings were transcribed verbatim into Microsoft Excel. The participants were coded using pseudonyms (Participant 1–Participant 83). Numerical and categorical answers, including demographic ones, were analysed with TIBCO Statistica (Version 14, 2020) using basic statistics including frequency tables and averages. The transcribed data (mainly the narratives in answer to Questions 7 and 8 in Table 1) were first analysed using manual thematic analysis, which is a method used in research to identify, sort, and get meaning from patterns or themes that are found when doing qualitative research [25]. The analysis was first performed deductively, with the researcher using the seven principles of ocean literacy (OL1–OL7) as themes to assess whether these would emerge in the participants' narratives. The analysis was also performed inductively, to assess whether additional themes emerged from the narratives (ocean threats, and ecosystem services provided by the ocean). These themes were also coded to establish response frequencies for every theme among the participants. The data were thus reported both numerically and as rich-text quotes by the participants.

3 RESULTS

3.1 Demographic profile and ocean-based activities

The participants ($N = 83$) included 59% females and 41% males, aged 37 years on average (min–max = 18–77, $SD = 13.48$, $SE = 1.48$). A large proportion (39%) were local to the area and South African citizens, while 3% were South Africans from outside the area and the remaining 58% came from overseas, mainly from Europe and the USA. The highest level of education for most participants (87%) was tertiary (28% having a STEM qualification), while 13% possessed the equivalent of a high school diploma. The participants enjoyed mainly non-consumptive ocean-based activities including snorkelling and free diving (52%), surfing, kite surfing and kayaking (43%), scuba diving (41%), swimming (24%), walking on the beach (22%) and boating (13%).

3.2 Ocean literacy

In answer to the question of what the relationship between people and the ocean is, the participants provided answers which were coded to assess if, what, and with what frequency principles in ocean literacy were mentioned and described. As indicated in Fig. 1(a), all principles in ocean literacy were mentioned by more than one participant. The most



mentioned principle (81% of participants) was OL6: The oceans and humans are inextricably interconnected. The main narrative associated with this principle was that humankind is severely and negatively affecting ocean environments and ecosystems through a series of impacts (Fig. 1(b)). For example, Participant 6 explained: ‘I think we don’t have the best influence on the ocean. I know there are so many different instances of harm that we do to it. Whether it’s the emissions from the vehicles we drive or things we use that have been produced with carbon-emitting technologies.’ Participant 45 elaborated: ‘Humanity is not good for ocean life. The way we fish, the way we mine, the way we drill for oil, the way we do business with the boats and everything, it’s all very bad and there are ways to do it better but it’s not easy, so I think the immediate danger is people just breaking the ocean without really realising it.’

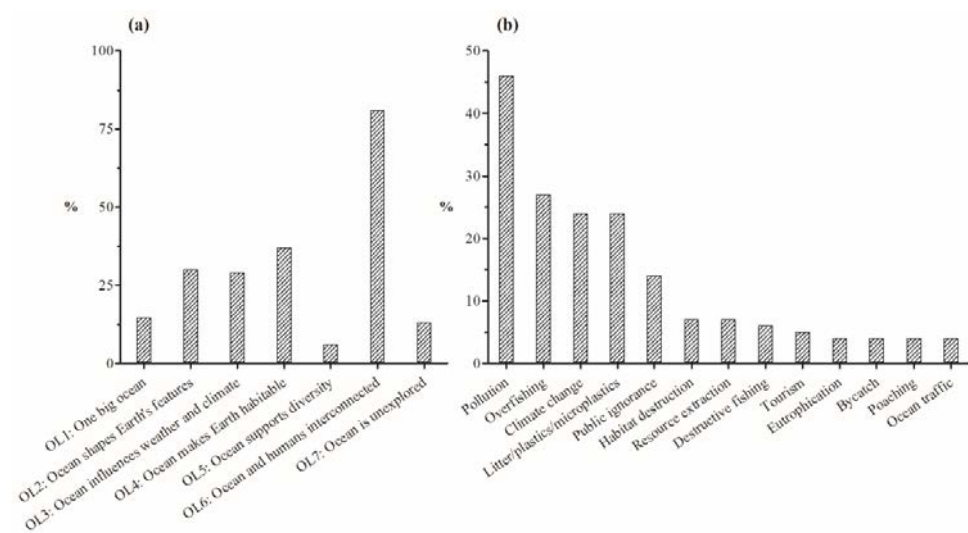


Figure 1: (a) Frequency distribution of ocean literacy principles mentioned by the participants; and (b) Frequency distribution of human impacts on ocean environments.

Human impacts on the ocean were described in detail including pollution (46% of participants), overfishing (27%), climate change (24%) and litter/plastics/microplastics (24%), among others (Fig. 1(b)). Some participants (14%) also explained that public ignorance and abstraction should be considered to have an indirect negative impact on the ocean, as it can result in support for bad environmental policies and practices, or inaction to endorse ocean conservation. For example, Participant 32 explained: ‘Public ignorance is a problem. Just think of sharks, false beliefs are the reason why we’re losing them. Shark culling and finning are driven by false beliefs and ignorance about them. If people have the right knowledge, they’ll understand that they’re doing damage.’ Participant 39 added: ‘Unless you live by the ocean and are connected to it every day, you ignore it. I think that people think of the oceans as vast but not functional in their lives. So they ignore it.’ Another, more positive narrative associated with OL6 was that the ocean provides many ecosystem services (e.g. food, livelihood, transport) (Fig. 2). This narrative also underpinned awareness of other ocean literacy principles, as later described.

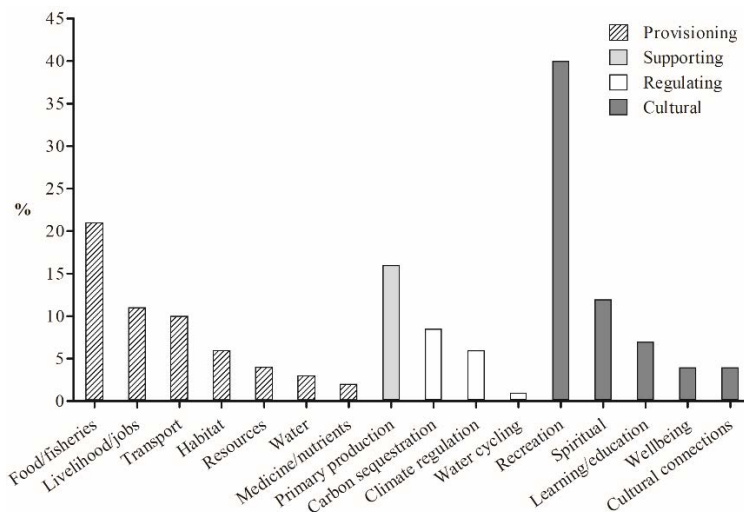


Figure 2: Frequency distribution of ecosystem services provided by the ocean per category.

The second most mentioned principle (37% of participants) was OL4: The ocean makes Earth habitable, with the participants mainly describing how the ocean is responsible for most of the primary production generating oxygen. Participant 18, for example, explained: ‘People always consider the rainforests, for instance. They don’t realise the importance of the oceans, most of the air we breathe comes from the algae there.’ Participant 32 also stated: ‘The ocean is considered the lungs of the planet. It’s impossible to think of human life without the ocean. Human life started in the ocean. Even to this day, we are highly dependent on it.’

The third most mentioned principle (30% of participants) was OL2: The ocean and life in the ocean shape the features of the Earth. Here, however, the participants were not able to provide specific elaborations and explanations, and their narratives stayed generic. For example, Participant 17 claimed: ‘Let’s consider that the planet is made almost entirely of water and it’s necessary to get that understanding that without the ocean, we cannot survive.’ Participant 45 also stated: ‘The world is one big machine and if one thing stops working such as the oceans everything just starts. I think the best example is the polar ice caps, they are one major part of the ocean and as soon as we see changes there you know that we will see changes everywhere.’

Concerning the fourth most mentioned principle (29% of participants), which was OL3: The ocean is a major influence on weather and climate, all that the participants could say was that the ocean plays a role in climate regulation but could not further elaborate with any specific narratives; only a small percentage (<10%) mentioned carbon sequestration as an important process carried out by the ocean. The least familiar principles were OL1: Earth has one big ocean with many features (14.5% of participants), OL7: The ocean is largely unexplored (13% of participants), and OL5: The ocean supports a great diversity of life and ecosystems (6% of participants). In support of OL1 and OL7, Participant 30 stated: ‘It’s something so vast and there is still so much to learn about it and from it.’ Participant 37 added: ‘There’s a lot of mystery around the ocean that sparked a lot of curiosity and research into it. There are ecosystems that we probably haven’t even come across yet underneath, like within water that’s been sitting without sunlight for millions of years, like within the Mariana

Trench.’ While only a small number of participants mentioned OL5 when asked to list ocean ecosystems they were familiar with they were able to mention several including coral reefs (25%), kelp forests (22%), rocky shores (13%), sandy beaches (10%), mangroves (9%), the pelagic zone (8%), seagrass (6%), and others like thermal vents, the surf zone and ice ecosystems.

As previously mentioned, when asked to describe the relationship between humankind and the ocean, the participants focused a large part of their descriptions on the ecosystem services of the ocean, which are listed in Fig. 2. The participants (70%) listed 16 ecosystem services, especially cultural and provisioning ones. Concerning cultural ecosystem services, the participants mainly acknowledged how the ocean is a place of recreation (40%), although some also explained that humans have spiritual and cultural connections with the ocean and that the ocean contributes to human wellbeing and learning. Regarding provisioning ecosystem services, the participants mostly explained that the ocean provides food and supports fisheries (21%), but some added livelihood and jobs, transport, habitat, resources, water, medicine, and nutrients. Participant 5 stated: ‘I think we get a lot of enjoyment out of the ocean. For us, it brings food and jobs. Recreationally we’ve got scuba diving, all the water sports.’ Participant 71 added: ‘I think for many people it’s like a sort of healing because not only do you get some exercise, but you also feel refreshed, it clears your mind, it makes you happier.’ Participant 78 claimed: ‘The ocean means a lot to humankind. We have a spiritual connection with the ocean because a lot of people go to the ocean for a sense of calm and peace, and many indigenous communities have cultural, religious and spiritual bonds with the ocean. Most people live by the ocean and get work from the ocean, through tourism for example. The ocean is a source of food and supports the fisheries, especially for countries that heavily rely on fish.’

The only supporting ecosystem service mentioned by the participants (16%) was primary production, while regulating ecosystem services included carbon sequestration (8.5%), climate regulation and water cycling. For example, Participant 9 stated: ‘The ocean takes in so much carbon and provides oxygen; we always talk about the forest and deforestation, but more attention should be paid to the ocean and what happens if its functions are compromised.’

4 DISCUSSION AND RECOMMENDATIONS

The results of this study depict a profile typical of ocean-based recreational and tourist groups visiting both the area of study and South Africa in general, to engage in ‘soft’ adventure including also eco-tourism and edu-tourism [26], [27]. The participants’ origin (mainly international but in large part also South African) mirrors a recovering recreation and tourism reality following the travel and movement restrictions associated with the COVID-19 pandemic.

The results of this study concerning the basic level of ocean literacy among ocean-based recreation and tourist groups in the case study are not easily comparable to previous work, since similar research is presently scanty [14], [19]. However, Fox et al. have recently started measuring ocean literacy among groups including surfers [17], yielding findings that can help with the interpretation of the outcomes of this research. The participants generally possessed some basic awareness of the seven principles of ocean literacy, however, there was more familiarity with certain principles (OL6, OL4, OL2 and OL3) compared with others (OL1, OL7, OL5). These results are partly aligned with work done on surfers, where principles including OL6 and OL3 were better known compared with principles including OL1 and OL7 [17].



Narratives related to OL6 were primarily connected to the awareness that human beings are severely damaging ocean environments through a series of impacts. These narratives are recurrent in several studies of ocean users' perceptions of the ocean, and it is understood that ocean connectedness, which in this case is offered by recreational and tourism activities, has a strong influence on these perceptions [17], [27], [28]. Additionally, the level of awareness of different human impacts mirrors that encountered in other studies of ocean users' understanding of marine environmental problems, where pollution, overfishing, climate change and litter (particularly plastics and microplastics) are normally ranked most relevant [27], [28]. Some participants believed public ignorance is indirectly a threat to the ocean and an impediment to conservation, a result that has been encountered in similar research on perceptions of ocean threats, also in South Africa [29]. Although the participants provided passionate narratives about the negative impacts of human activities on the ocean, only a small number acknowledged tourism to be a part of these impacts. Similar work has suggested that ocean and coastal users may generally underestimate the potential damage caused by recreation and tourism activities on ocean environments, which is an oversight calling for particular attention [28]–[30].

Narratives linked to OL6 also revolved around the ecosystem services offered by the ocean, particularly recreation. This finding is not new in the literature, particularly in studies of ocean users' perceptions of the benefits of the ocean to humankind [17], [29], [31]. Tourists tend to value intangible ocean ecosystem services supporting their wellbeing, including the scenery, peace, and setting to engage in their preferred activities (e.g. walking, swimming, diving, and relaxing) [31], [32]. In line with the positive narratives regarding OL6, the participants were aware of supporting ocean ecosystem services, specifically primary production (OL4). Other research, including work conducted around Cape Town, has highlighted how recreational ocean users can perceive the role of the ocean and ocean ecosystems in carrying out essential processes that make life on Earth possible [27], [29]. This result is also positive in comparison with previous work done on surfers, who were unable to describe the characteristics of OL4 in much detail [17].

While a third of the participants in this study could mention that the ocean and life within it shape the features of the Earth (OL2), they could not pinpoint exactly how nor provided concrete examples. This result concurs with the research by Fox et al. [17] who demonstrated a lack of basic knowledge of OL2 among surfers and suggests that recreational ocean users do not yet possess a sophisticated understanding of how visible processes like erosion and waves, or intangible ones like tectonic movement and geochemical cycles, are governed or controlled by the ocean. Similarly, although a third of the participants were aware of OL3, they could not go beyond stating that the ocean has a role in climate regulation, with a few people mentioning carbon sequestration. This result is in slight contrast with research showing that surfers could better elaborate on OL3, for example, describing the ocean's power to regulate the atmospheric temperature, pressure and wind [17]. The least mentioned principles were OL1, OL7 and OL5, partly in line with previous research on surfers [17]. These results suggest that recreational ocean users may take for granted certain ocean characteristics, such as how it covers most of the planet and supports a vastity of ecosystems and life forms. This is indicated by how the participants, when probed, were able to list several ocean ecosystems. Therefore, possibly the participants did not see certain ocean characteristics as signifying the relationship between humankind and the ocean or being instrumental to supporting human life on Earth.

Generally, the results of this study suggest that recreational ocean users possess basic knowledge of the principles of ocean literacy. Considering that they attached intrinsic and extrinsic values and benefits to the ocean, especially connected to recreational activities, it



can be argued that these activities constitute a mechanism for ocean literacy development. However, Fox et al. [17] stated that it is debatable whether this mechanism is reliable and consistent enough to produce truly ocean-literate communities. Ocean-based recreation activities like scuba diving, snorkelling, and surfing have the potential to increase knowledge of the ocean by improving the connection between people and the sea through experiential engagement and learning, as well as increasing awareness of global environmental problems [14], [16], [17]. However, for ocean literacy to be truly incorporated into ocean-based recreational experiences, more efforts are required [16]. For example, considering mass tourism forms such as scuba diving or marine wildlife watching, the challenge would be to ensure that educational aspects are present in the operational environment, from posters and information sheets to pre- and post-activity briefings and interpretation. The work of tourist centres alone may also be insufficient to guarantee shifting mindsets among tourists and recreational groups, thus the involvement of different stakeholders is required to support knowledge acquisition. For instance, in marine protected areas, where recreational ocean-based activities are popular, governing bodies and researchers ought to support education aimed at improving ocean literacy as part of their conservation mandate. The support of external entities like meta-governance bodies, non-governmental organisations and academic/research institutions can foster education interventions and promote public participation in conservation and scientific activities, like marine restoration and citizen science, which are known to promote reflections on the ocean and how it is affected by human activities [26]. In this context, tourist centres offering scientific tourism, eco-tourism and edu-tourism activities have a particular responsibility to deliver the goals of raising awareness and educating tourists, as well as engage them proactively in activities that can stimulate reflection and intentions towards pro-environmental behaviours. Guaranteeing shifting mindsets and meaningful transitions towards a mentality of ocean stewardship remains a challenge to attain and measure, especially when long-term changes in attitude and behaviour are considered [33]. It is important, however, to strive for partnerships to support efforts toward ocean literacy among recreational ocean users, and to conduct research that will measure the long-term effects of specific interventions and initiatives on people's awareness, knowledge, attitudes and behaviours.

The results of this study highlight limited awareness and understanding of ocean literacy principles, as well as specific facts about the ocean underlying some of these principles. This lack of awareness and understanding can be addressed in communication, education, interpretation and experiential engagement as part of tourism activities or through the channels normally used to disseminate facts about the ocean (e.g. social media, television programmes). Overall, there should be a better emphasis on several aspects underpinning the inextricable connection between people and the ocean, such as overlooked ecosystem services; the dynamics of the ocean shaping the features of the Earth; and the importance of ocean exploration and science. More generically, the narratives revolving around ocean literacy should be well connected with various global agendas, such as the UN Ocean Decade, Sustainable Development Goals, Aichi Biodiversity Targets, and the Ocean Panels and Sustainable Ocean Plans. More specifically, narratives should be well connected with local ocean landscapes and ecosystems; especially in contexts of eco-tourism and edu-tourism, ocean users should be able to use their experiences with local environments and species as a channel for a greater understanding of how the ocean works and provides for humankind. An overarching goal of improving ocean literacy, at least among recreational ocean users, should be to establish and strengthen bonds between people and the ocean, or ocean connectedness [9], to the point where people would feel compelled to commit to ocean stewardship as a way to safeguard the activities they hold dear and contribute to their wellbeing. Reducing the level



of abstraction felt even by ocean users towards the ocean would be key to removing the perception that human lives would be unaffected if ocean ecosystem services were compromised [34]. One way to do so would include specific campaigns aimed at demonstrating how human life on Earth would not be possible without the ocean.

5 CONCLUSION AND STUDY LIMITATIONS

This study aimed to shed light on the basic awareness and knowledge of ocean literacy principles among ocean-based users including recreational and tourist groups, to guide strategies to create ocean-literate communities among ocean users and to support pathways towards ocean stewardship among these groups. The results show that while recreational ocean users possess some basic understanding of ocean literacy principles, more work is required to improve ocean literacy, with the expectation that this will result in positive behaviour towards ocean protection and ocean stewardship. The tourism and recreation sector is in an advantageous position to support strategies to create ocean-literate communities. People can better understand the connection between the ocean and humankind, the complex dynamics underpinning this connection, and the vulnerability of the ocean to human impacts, through experiential engagement and learning-by-doing experiences. These experiences can allow ocean users to observe ocean environments and acknowledge the diversity of ecosystems and species and human impacts threatening the functioning of the ocean (e.g. pollution, and habitat degradation). It is acknowledged that this study has several limitations. For example, it was conducted in a specific geographical area and targeted only some ocean-based recreation and tourist groups. Additionally, this study only focused on the measurement of basic awareness and knowledge of ocean literacy principles, not considering the greater complexity of the ocean literacy construct. Nevertheless, the results presented here offer some valuable insight into the opportunities to be exploited and gaps to be filled concerning the creation of ocean-literate societies, starting with ocean-based users.

ACKNOWLEDGEMENTS

Special thanks go to the participants in the study, and to Mike Barron (Cape RADD) and Michael du Plessis for their assistance. The research was approved by the Research Ethics Committee of the Faculty of Economic and Management Sciences at the North-West University, South Africa, under the ethics code NWU-00559-23-A4. This paper reflects only the author's view. The North-West University accepts no liability in this regard.

REFERENCES

- [1] Campbell, L.M. et al., Global oceans governance: New and emerging issues. *Annual Review of Environment and Resources*, **41**, pp. 517–543, 2016. <https://doi.org/10.1146/annurev-environ-102014-021121>.
- [2] Lincoln, S. et al., Marine litter and climate change: Inextricably connected threats to the world's oceans. *Science of The Total Environment*, **837**, 155709, 2022. <https://doi.org/10.1016/j.scitotenv.2022.155709>.
- [3] Sumaila, U.R. & Tai, T.C., End overfishing and increase the resilience of the ocean to climate change. *Frontiers in Marine Science*, **7**, 523, 2020. <https://doi.org/10.3389/fmars.2020.00523>.
- [4] Sala, E. et al., Protecting the global ocean for biodiversity, food and climate. *Nature*, **592**(7854), pp. 397–402, 2021. <https://doi.org/10.1038/s41586-021-03371-z>.
- [5] Ryabinin, V. et al., The UN decade of ocean science for sustainable development. *Frontiers in Marine Science*, **6**, 470, 2019. <https://doi.org/10.3389/fmars.2019.00470>.



- [6] UNESCO, The Ocean Decade. <https://oceandecade.org/>. Accessed on: 6 May 2024.
- [7] Pecl, G.T., Alexander, K.A., Melbourne-Thomas, J., Novaglio, C., Villanueva, C. & Nash, K.L., Future seas 2030: Pathways to sustainability for the UN Ocean Decade and beyond. *Reviews in Fish Biology and Fisheries*, **32**(1), pp. 1–7, 2022. <https://doi.org/10.1007/s11160-022-09705-y>.
- [8] UNESCO, The seven principles of ocean literacy. <https://oceanliteracy.unesco.org/principles/>. Accessed on: 6 May 2024.
- [9] Kelly, R. et al., Connecting to the oceans: Supporting ocean literacy and public engagement. *Reviews in Fish Biology and Fisheries*, **32**(1), pp. 123–143, 2021. <https://doi.org/10.1007/s11160-020-09625-9>.
- [10] UNESCO, Ocean literacy for all. <https://www.unesco.org/en/node/82173>. Accessed on: 6 May 2024.
- [11] Santoro, F., Selvaggia, S., Scowcroft, G., Fauville, G. & Tuddenham, P., *Ocean Literacy for All: A Toolkit*, UNESCO Publishing, 136 pp., 2018.
- [12] Cava, F., Schoedinger, S., Strang, C. & Tuddenham, P., Science content and standards for ocean literacy: An ocean literacy update. National Geographic Society, 2005. https://www.coexploration.org/oceanliteracy/documents/OLit2004-05_Final_Report.pdf. Accessed on: 6 May 2024.
- [13] McKinley, E., Burdon, D. & Shellock, R.J., The evolution of ocean literacy: A new framework for the United Nations Ocean Decade and beyond. *Marine Pollution Bulletin*, **186**, 114467, 2023. <https://doi.org/10.1016/j.marpolbul.2022.114467>.
- [14] Worm, B. et al., Making ocean literacy inclusive and accessible. *Ethics in Science and Environmental Politics*, **21**, pp. 1–9, 2021. <https://doi.org/10.3354/esep00196>.
- [15] Stoll-Kleemann, S., Feasible options for behavior change toward more effective ocean literacy: A systematic review. *Frontiers in Marine Science*, **6**, 273, 2019. <https://doi.org/10.3389/fmars.2019.00273>.
- [16] Garcia, O. & Cater, C., Life below water; challenges for tourism partnerships in achieving ocean literacy. *Journal of Sustainable Tourism*, **30**(10), pp. 2428–2447, 2022. <https://doi.org/10.1080/09669582.2020.1850747>.
- [17] Fox, N., Marshall, J. & Dankel, D.J., Ocean literacy and surfing: Understanding how interactions in coastal ecosystems inform blue space user’s awareness of the ocean. *International Journal of Environmental Research and Public Health*, **18**(11), 5819, 2021. <https://doi.org/10.3390/ijerph18115819>.
- [18] Holland-Smith, D., Love, A. & Lorimer, R., British surfers and their attitudes and values toward the environment. *Ecopsychology*, **5**(2), pp. 103–109, 2013. <https://doi.org/10.1089/eco.2013.0020>.
- [19] Gascon, M., Zijlema, W., Vert, C., White, M.P. & Nieuwenhuijsen, M.J., Outdoor blue spaces, human health and well-being: A systematic review of quantitative studies. *International Journal of Hygiene and Environmental Health*, **220**(8), pp. 1207–1221, 2017. <https://doi.org/10.1016/j.ijheh.2017.08.004>.
- [20] Gounden, R., Munien, S., Gounden, D. & Perry, N., Visitor profiles of coastal and marine tourism sites in the Eastern Cape, South Africa. *African Journal of Hospitality, Tourism and Leisure Geography and Planning*, **9**(6), pp. 1060–1075, 2020. <https://doi.org/10.46222/ajhtl.19770720-68>.
- [21] Saayman, A. & Saayman, M., Forecasting tourist arrivals in South Africa. *Acta Commercii*, **10**(1), pp. 281–293, 2010. <https://hdl.handle.net/10520/EJC11382>.



- [22] Munien, S., Gumede, A., Gounden, R., Bob, U., Gounden, D. & Perry, N.S., Profile of visitors to coastal and marine tourism locations in Cape Town, South Africa. *Geo Journal of Tourism and Geosites*, **27**(4), pp. 1134–1147, 2019.
<https://doi.org/10.30892/gtg.27402-421>.
- [23] Pfaff, M.C. et al., A synthesis of three decades of socio-ecological change in False Bay, South Africa: Setting the scene for multidisciplinary research and management. *Elementa: Science of the Anthropocene*, **7**, 32, 2019.
<https://doi.org/10.1525/elementa.367>.
- [24] Sokolowski, R., *Introduction to Phenomenology*, Cambridge University Press: New York, 238 pp., 2000.
- [25] Braun, V., Clarke, V. & Terry, G., Thematic analysis. *Qualitative Research on Clinical and Health Psychology*, eds P. Rohleder & A.C. Lyons, Palgrave Macmillan: New York, pp. 95–113, 2014.
- [26] Cilliers, C.D., A critical assessment of marine wildlife voluntourism in Southern Africa. Doctoral dissertation, North-West University, 2022.
- [27] Lucrezi, S. & Du Plessis, M.J., Cold-water recreational diving experiences: The case of kelp forests. *WIT Transactions on Ecology and the Environment*, vol. 256, WIT Press: Southampton and Boston, pp. 27–38, 2022.
- [28] Lucrezi, S., Public perceptions of marine environmental issues: A case study of coastal recreational users in Italy. *Journal of Coastal Conservation*, **26**(6), 52.
<https://doi.org/10.1007/s11852-022-00900-4>.
- [29] Lucrezi, S., Characterising potential participants in kelp monitoring in the recreational diving community: A comparative study of South Africa and New Zealand. *Global Ecology and Conservation*, **28**, e01649, 2021.
<https://doi.org/10.1016/j.gecco.2021.e01649>.
- [30] Gkargkavouzi, A., Paraskevopoulos, S. & Matsiori, S., Public perceptions of the marine environment and behavioral intentions to preserve it: The case of three coastal cities in Greece. *Marine Policy*, **111**, 103727, 2020.
<https://doi.org/10.1016/j.marpol.2019.103727>.
- [31] De Juan, S., Gelcich, S. & Fernandez, M., Integrating stakeholder perceptions and preferences on ecosystem services in the management of coastal areas. *Ocean and Coastal Management*, **136**, 38–48, 2017.
<https://doi.org/10.1016/j.ocecoaman.2016.11.019>.
- [32] Wood, L.E., Vimercati, G., Ferrini, S. & Shackleton, R.T., Perceptions of ecosystem services and disservices associated with open water swimming. *Journal of Outdoor Recreation and Tourism*, **37**, 100491, 2022.
<https://doi.org/10.1016/j.jort.2022.100491>.
- [33] Brennan, C., Ashley, M. & Molloy, O., A system dynamics approach to increasing ocean literacy. *Frontiers in Marine Science*, **6**, 360, 2019.
<https://doi.org/10.3389/fmars.2019.00360>.
- [34] Schuldt, J.P., McComas, K.A. & Byrne, S.E., Communicating about ocean health: Theoretical and practical considerations. *Philosophical Transactions of the Royal Society B: Biological Sciences*, **371**(1689), 20150214, 2016.
<https://doi.org/10.1098/rstb.2015.0214>.

