DURBAN UNIVERSITY OF TECHNOLOGY

THE NATURE OF DIVE TOURISM IN KWAZULU-NATAL AND ITS IMPACT ON ENVIRONMENTAL SUSTAINABILITY

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OCTOBER 2022

THE NATURE OF DIVE TOURISM IN KWAZULU-NATAL AND ITSIMPACT ON ENVIRONMENTAL SUSTAINABILITY

Submitted in fulfilment of the requirements of the

Master of Management SciencesSpecializing in Hospitality and Tourism

in the

Faculty of Management Sciences

at the Durban University of Technology

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OCTOBER 2022

APPROVED FOR EXAMINATION

30 October 2022

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Ph.D.: Geography and Environmental Science

Date

ABSTRACT

Any form of diving if not properly managed can cause considerable damage to the marine ecosystem. Dive tourism aims to encourage conservation, generate revenue, and support the development of local neighbourhoods. Understanding its connections with ecological factors are vital in the perspective of sustainability. Dive sites are threatened by the impacts of diving, and constant research is necessary to evaluate diving impacts, diver behaviour and environmental awareness of such sites.The aim of this study is to delve into the profile of dive tourists in KwaZulu-Natal, and to examine the impacts of dive tourism on the sustainability of the environment. The human perception in understanding what types of strategies need implementation in dive management to ensure future sustainability is extremely vital. This study will therefore be highly valuable towards the improvement and reinforcement of dive rules and regulations and will advance the need for environmental education and awareness towards achieving sustainability among current and future divers. A mixed method approach will be used in the study, and the use of interviews and questionnaires will allow for quantitative and qualitative data to be collected. The target population for the study includes divers, dive instructors and dive site owners. The study found that most respondents said they were mindful of the negative environmental impacts of specific diving methods. Divers were also aware of the mostcommon dive practices that help sustain the marine environment whilst diving. Recommendations were made in terms of the sustainability of the industry based on the responses from the data collected.

DECLARATION

I, Trimeira Naidu herewith affirm that this dissertation is my individual work conducted under the guidance of Dr Reshma Sucheran. The work in this study embodies my own work and outcomes apart from were indicated and that all references to the best of my knowledge are precisely documented. This work has not been presented at any otheruniversity.

Trimeira Naidu 28 October 2022

DEDICATION

- I would like to dedicate this dissertation to my late Dad who was an avid professional angler who passed away on the 20th of January 2023, he never went a day without waiting in anticipation for the results of this dissertation. I owe my education and all my achievements to both my parents who worked very hard to give me the best in life.
- Lastly, I would like to dedicate this dissertation to all ocean lovers and divers out there. Hoping this helps to gain insight into sustaining our oceans and the dive industry!

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to the individuals who were instrumental in the completion on this study, without their support and guidance this research wouldnot have been possible:

- My supervisor, Dr Reshma Sucheran, where do I even begin! I am eternally grateful for your unending support and guidance. I am extremely blessed to have had you take me under your wing during this period. I carelessly dropped the ball so manytimes, but you never gave up on me and were always there to give great advice and motivation. This dissertation would not have been possible without you! You were there from start to finish, through thick and thin, a thank you a million times over would not be enough to show my gratitude!
- My parents for their love, understanding and constant support during this period.
- My ex-colleague, Siphiwe William for motivating me to climb the academic ladder with him, and for all the help and advice in the years that we were friends.
- My primary school colleague, Nathisvaran Govender for the constant help and motivation. You played a very big role in the foundation of getting my study started.
- My American Host Family (The Ross/Buttenheim clan) Simon and Paulette for allowing me to use their PC equipment for an easier uptake in getting my work completed and for being extremely accommodating and understanding.
- Aliwal Dive Centre and Umhlanga Scuba for your participation and support throughout my data collection period.
- Last, but not least- A very big thank you to Zak from South Africa and Dougal from the United States of America, for keeping me company during some late nights ofworking on this dissertation.

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LIST OF ACRONYMS

CCA	Carrying Capacity Approach
DAN	Divers Alert Network
DEAT	Department of Environmental Affairs and Tourism
DEMA	Diving Equipment and Marketing Association
DPV	Diver Propulsion Vehicle
GNP	Gross National Product
KZN	Kwa-Zulu Natal
LAC	Limits of Acceptable Changes
MPA	Marine Protected Area
MWT	Marine Wildlife Tourism
NAUI	National Association of Underwater Instructors
PADI	Professional Association of Diving Instructors
SCUBA	Self-Contained Underwater Breathing Apparatus
SDT	Scuba Diving Tourism
SPSS	Statistical Package of the Social Sciences
USA	United States of America
WSCD	White Shark Cage Diving
WTO	World Tourism Organization
YMCA	Young Men’s Christian Association

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CHAPTER ONE: INTRODUCTION

1.1 Introduction

Globally, dive tourism remains one of the most widespread marine leisure events in marine and coral reef tourism. However, its potential is being jeopardized as a result of ecological, societal, political, and commercial influences (Burgoyne et al., 2018; Burke et al., 2011; Canty, 2007; Richmond, 2011). Research indicates that there is a significant damaging impact of individual dive tourists on the biophysical circumstances of coral reefs. Divers move, break, and stand on coral, stirring up residue, hitting reefs with weak buoyancy and picking and taking corals, shells, and other marine creatures as mementoes. Divers with exceptional levels of experience have various effects on coral reefs. Like all leisure industries, diving demands examining whether and how it lies on the pillar of ecological sustainability (Lucrezi et al., 2017). Dimmock and Musa (2015) states that most research surrounding dive tourism has mainly focused on two characteristics. One is environmental, which focuses on the collaboration of divers and the natural undersea environment and the future effects. The second is the organic management of diving tourism, with prominence laid on the consideration of the conservation insights of divers and their commitment to delivering marine conservation.

This study will be undertaken on dive tourism and aims to explore dive tourists' environmental awareness, attitudes, and customs, concentrating on the significant issues regarding the sustainability and safeguarding of the reef flora and fauna (Leujakand Ormond, 2007; Needham, 2010; Ong and Musa, 2012).

1.2 Background of the study

A dive tourist is any diver, snorkeler, or free diver/scuba diver who loves to travel. Divetourism is a type of marine tourism (Orams, 1999). It is deemed an inexpensive essential industry, as demonstrated by the number of locations motivated to develop into dive destinations (Dimmock and Musa, 2015) and dive tourism hotspots (Dimopoulos, 2019). This is particularly apparent in

growing countries' coastal tropical and sub-tropical zones, predominantly dependent on foreign investment through tourism activities (Burke et al., 2011; Spalding et al., 2017). When selecting a dive destination, divers mostly seek high-quality coral reef environments, rich coral and fish variety, an ocean with high visibility free of contamination and residue, and resort-style hideaways (Dimmock, 2003). Dive tourists can be of any age and nationality and dive practically everywhere. A dive tourist often supports dive facilities that consider the coastal management rules and regulations to ensure conservation. Dive tourists have the best diving experiences and are assured that their money has been used for industry conservation and employment (Anon., 2020).

Sodwana Bay in South Africa is graded amongst the top 20 dive locations globally. The diving market across South Africa is intensifying whilst opposition is rapidly spreading. This is due to Sodwana Bay not being the only dive site in South Africa; it competes with further well-known dive spots, namely Cape Town, Gaansbaai, Mossel Bay and Umkomaas/Aliwal shoal in KZN, Durban, with the leading number of operators in KwaZulu-Natal (Dive Advisor, 2013). A significant tourist attraction for tourists visiting South Africa is South Africa's marine life. This can be discovered at several resorts beside a coastline extending over 3000 kilometers (Valderrama et al., 2022), thus offering pleasurable leisure experiences for locals and foreigners.

1.3 Problem statement

South Africa has locations scattered all along its coast that are possibly well known for sharks and additional important marine life, but also has a broad array of smaller fish and invertebrates. The coastline sites vary from tropical coral reefs in the north of KwaZulu-Natal, where the fish are distinctive Indo-pacific tropical species and very vibrant in colour, to cold moderate hard reefs on the West Coast, where the fish life iscomparatively dull, but the invertebrates offer the color. The yearly sardine run along the east coast is understandably renowned, and the less significant known chokka (squid) breeding also invites large numbers of predators but deprived of needing as much hunting around to be at the correct spot. Therefore, there are numerous problems that the dive industry face, of which we will be unpacking. Our dive industry faces threat

every single time a diver uses the water for a dive. These impacts are both physical and ecological. There are countless wrecks all along the coast, some of which are considered as good dive sites. The central sites are typically utilized for teaching, technical and cave diving. South African diving is usually more physically demanding than the more popular destinations. Dependent on the region, it may consist of cold water, surf launches, and massive swell or robust currents. Hence, a greater capability and skill level are necessary to enjoy the experience to its fullest. For people wanting more secure and gentle environments, there are two large aquariums where divers can appreciate warmer water and uncomplicated entry and are promised to experience numerous aquatic life. In response to the escalating pressures of dive tourism, observational and experimental studies have been conducted to collect data on the environmental influences of diving and to determine organic levels in marine ecosystems subject to extreme diving (Camp and Fraser, 2012; Di Franco et al., 2009; Krieger 2012; Worachananant et al. 2008).

1.4 Aims and objectives

Marine tourism that involves recreational activities and interface with diverse underwater ecosystems has grown globally over the last few decades s (Cisneros- Montemayor et al., 2013; O'Malley et al., 2013). Therefore, leaving behind environmental impacts. This study aims to explore the profile of dive tourists in KwaZulu-Natal and to examine the types of impacts of dive tourism on the sustainability of the marine environment. Scuba diving has increased enormously over the last decade. Scuba (Self-contained underwater breathing apparatus) is among one of the greatest trendy oceanic activities loved along the shoreline of SouthAfrica.

The objectives of the study are:

- To examine the profile of dive tourists in KwaZulu-Natal regarding their socio-demographic characteristics and environmental behavior.
- To ascertain the level of awareness and knowledge of dive tourists on the sustainability of the diving environment in KwaZulu-Natal.
- To explore the perceived environmental effects of dive tourism on the

marineecosystem in KwaZulu-Natal.

- To propose measures on how dive tourism in KwaZulu-Natal can contribute toenvironmental sustainability.

1.5 Significance of the study

Coastline and aquatic ecosystems are amongst the globe's most valuable ecosystems (Barbier, 2012). Fruitful coastal wetlands, plentiful maritime sources, water transport, fundamental principles and visual attraction have encouraged coastal habitat. As a result of the variety of essential services that coastal and marine ecosystems offer humanity, reliance on coastal regions remains expanding worldwide (Barbier, 2012). In conjunction with the idea that the destruction of scuba diving tourism ultimately compensates the benefits of reef protection, long-term investigations were conducted in identifying the qualities of scuba diver behaviour. To support executives and local establishments in evolving and executing interventions to lessen such effects effectively, preserve reef ecosystems and guarantee the continuance of diving tourism, studies have remained focused primarily on the direct observation of divers' underwater behaviour (Di Franco et al., 2009; Heyman et al., 2010; Rouphael and Inglis, 2001; Uyarra and Côté, 2007). Coral reefs are marine environments which offer an assortment of essential benefits to people, as well as fisheries, raw resources, habitation, coastal safety, nutrient cycling, and tourism (Moberg and Folke, 1999).

Despite the ever-increasing attention to such research, reefs are compromised by an expanding risk of human caused impacts. These consist of resource manipulation, climate change and ocean acidification (Hoegh-Guldberg et al., 2007). Marine Tourism is one of the tourism trade's speediest-developing markets globally (Moskwa, 2012). Throughout the centuries, marine tourism has progressed into a multi-dimensional industry which consists of a broad selection of events to brag about, namely surfing, diving, kayaking, deep-sea angling and yachting (Garrod and Wilson, 2003).

Luck (2003), states that Marine tourism is very prevalent in South Africa, which

posesan array of marine events and commodities. Marine tourism takes place in a legal natural environment to a great extent distinct from the legal environment on land. In distinction to land-based tourism, marine tourism takes place in a natural setting for which individuals are not physically capable of. Consequently, the variety of marine-tourism events is much more reliant on technological developments than in the case of land-based tourism (Vrancken, 2011).

According to Scuba Diving in South Africa (2013), South Africa's coast is lush in coraland has a few of the most distinct and best locations. Scuba diving in South Africa can be experienced year-round because their weather is generally good, range of aquatic life and ocean conditions, making South Africa considerably attractive (Scuba diving in South Africa, 2013). SCUBA (Self-contained Underwater Breathing Apparatus) dive tourism, one of the trades in the coastline sectors, has prospered amongst individuals whose concern rests in marine events. Technology is primarily liable for this transformation because of the constant innovation of more effective and safer apparatus and means of transport (Musa and Dimmock, 2013). In addition to technical developments, an enhanced appeal in nature and environmental appreciation (Burke et al., 2011), and the ease of access to secluded coral reef areas (Davis and Tisdell, 1995), diving in coral locations has developed a highly substantialelement of the global travel market (Wongthong and Harvey, 2014). The American dive market is close to 50% of the worldwide market (Kieran, 2019). There are matters concerning the effect of diving on reef biology.

Investigations performed on the impacts of divers on coral reefs has concentrated on both the prospective influence of the quantity of links divers have created with a reef and evaluations of coral subjected to various stages of diver contact (Lamb et al., 2014). These studies revealed the coral cover was reduced on heavily dived sites (Zakai and Chadwick-Furman, 2002) and a change in coral structure, with more strong corals growing to be dominant (Perry et al., 2015). According to Kieran (2019), in 2018, there were 2.8 million scuba diving contestants in the USA, the majority of whom remained informal divers.

The profile and behaviour of divers are crucial to knowing diving affects for the reason that they may immediately impact the levels and forms of damage caused to marine reef organisms. Damage to reef benthonic zones by divers happens largely due to direct contact, which can rupture the rigid emaciated formations or scrape the soft tissues of marine organisms (Chung et al., 2013). Diving tourists vary extensively according to their demographic credentials and socio-economic position, their prior diving capability and objectives for the diving vacation, their requirements, and prospects, how they deal with the diving tourism product, and many other ways. Even so, comparatively little attempt has been put into consideration of the extent and nature of such variety (Azzopardi et al., 2016). According to (Gibson, 1998), divers generally have a high household income, are highly trained, and lead an effective, wholesome way of life. The typical dive trip of European divers has a length of 10 days.

According to Shokri and Mohammadi (2021), the intricacy and attractiveness of coral reefs make them an appealing and beneficial source for ecotourism. However, many corals are fragile and susceptible to damage. Allahgholi (2014), states that even though the impacts of other human being actions on coral reefs have been well investigated (e.g., coral mining and dynamite fishing), only some findings have concentrated on the detrimental effects of diving as a sport. Most of the exploration on dive tourism has concentrated on two aspects. One is the environmental focus, together with the collaboration of divers and the underwater natural environment and probable environmental influences (Bruno et al., 2020). The other is the organic organisation of dive tourism, with awareness placed on the environmental experiences of divers and their eagerness to promote marine preservation (Hillmer-Pegram, 2014). However, these aspects fail to depict dive tourism holistically and evaluate its sustainability. Dive tourism must be efficiently controlled to guarantee that any impactsinitiated to ecosystems do not offset their positive impacts.

An ever-increasing amount of literature has revealed that diving events, predominantly on highly visited sites, can destructively affect marine life,

especially in delicate marine organisms such as corals, sponges, sea moss and gorgonian coral (Kathiresan, 2015). Since the early 1990s, worldwide studies have also shown high concentrations of reef destruction at destinations that get rigorous diver visitation (Lucrezi et al., 2019). The South African National Spatial Biodiversity Assessment 2004's report indicates that diving has been recognized as a possible risk to aquatic biodiversity. Leisure diving has been rated 7th out of 9 classifications in this report of hypothetically damaging "non-extractive recreational activities". Coral and Coral (2015) indicated that diving and the accompanying events with diving could trigger substantial harm to coral populations because of negative contact (damage by dive boats and anchorage), resuspension of residues (when sand is kicked up from the seabed), and by hand-to- coral contact. However, the evaluation also argued that due to the endangered status, the central diving spots that harm coral groups are low. This was observed upon evaluations of the reefs in the Greater St Lucia Wetland Park. The review determined that while destruction is evident in maritime biomes due to the intrusive activity of diving, the impact is marginal as the marine security laws are comparatively robust in South Africa.

1.6 Limitations and delimitations

The results attained from this research cannot be generalized to the rest of South Africa because all nine provinces face unique challenges and opportunities in terms of the growth and sustainability of the dive sector. Also, a lack of participation and lack of preciseness and truthfulness from the respondents serve as the limitation of the study. Another limitation of the study is the low number of dive center owners and instructors available to be included in the study. This study is geographically limited to the KwaZulu-Natal Province. Due to time constraints, the researcher is focusing solely on 2 dive sites in Kwazulu-Natal

1.7 Outline of this dissertation

Chapter One: Introduction

This chapter introduces the reader to the study. It describes the background, the problem statement, the purpose of the study, the study's objectives, the

research questions, and the significance of the study.

Chapter Two: Literature review

This chapter presents the literature review. It includes the various definitions and explanations of critical thinking from the experts in the field of dive tourism and the environmental consequences of dive tourism. The chapter also explores the profile ofdive tourists.

Chapter Three: Research methodology

This chapter focuses on the research design, study setting, study population, research instrument, the data collection process, method of data analysis and the ethical considerations that will be addressed.

Chapter Four: Data analysis

This chapter will present the data that will be analysed, the interpretation of the data and the tests used. The data in this chapter is presented in graphs and tables.

Chapter Five: Conclusions and recommendations

This chapter will present the final discussions, implications, recommendations, and conclusions based on the study's findings.

1.8 Conclusion

This chapter presented the study which examines "The nature of dive tourism in Kwa- Zulu Natal and its impact on environmental sustainability". Notably, the chapterconcentrated on the problem statement, the study's aim and objectives, the study, the significance of the study, limitations and delimitations, and a summary of the ongoingchapters. The following chapter will introduce a review of the literature based on dive tourism as well as describe various themes relevant to this study.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The previous chapter presented background knowledge to the study and discussed essential aspects: the study's aim and objectives, problem statement and the significance of the study. This chapter provides an overview of the literature on dive tourism and its impacts on the natural environmental. In particular, this chapter aims to evaluate the diving industry and the attributes of divers using a review of pertinent literature focused on dive tourism, tourism characteristics, impacts caused by diving and the industry's sustainability. This chapter aims to deliver insights into the industry and the managing of this ecological niche market through a comprehensive literature review.

2.2 Marine tourism

Several studies describe marine tourism as leisure activities performed away from the tourists' normal setting with a focus on the "marine environment and coastal zone" asits host (Kurniawan et al., 2016:308). Marine tourism, as stated by Orams and Lueck (2016), incorporates the events that take place on, in, and beneath the sea, as well asthose which are established along the coastline but where the main appeal is sea centered. Common marine tourism interests include snorkeling, water-skiing, boat- based fishing, picturesque boat sailing, surfing, kitesurfing, stand-up paddle boarding and scuba diving (Gounden, 2020).

2.2.1 Definitions of marine tourism

Nulty et al. (2007:141) state that Marine Tourism is identified as the segment of the tourism trade that is centered around tourists and guests taking part in either active or passive leisure and holiday pursuits or traveling on or in sea waters and their coastlines. Numerous explanations encompassing the idea of Marine Tourism are represented in Table 2.1.

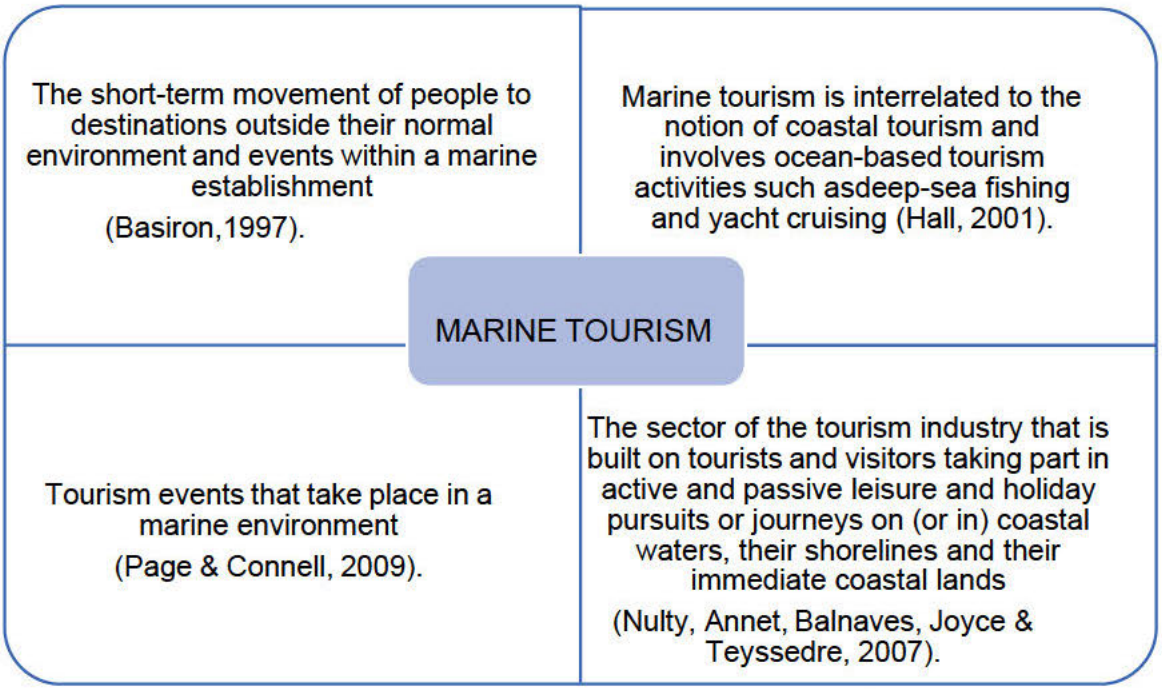

Figure 2.1: Definitions of Marine Tourism

Table 2.1 summarizes Marine Tourism to be an activity which is not permanent but rather temporary, it takes place along the coastline and all activities are based surrounding the water. Marine Tourism consists of activities which are performed by tourists outside of their normal environments and now within a marine environment.

2.2.2 Marine tourism activities

Marine tourism encompasses various activities in different sectors, including cruise, beach, dive, special interest, aquatic, and island tourism (Figure 2.1).

Figure 2.3: Activities associated with Marine Tourism
Source: Authors' compilation

Dive tourism

Dive tourism has been identified in figure 2.3 as a marine activity and defined by Garrod and Gossling (2008) as people travelling around from their normal place of habitation, spending at least one night away and enthusiastically taking part in one ormore events, together with scuba diving, snorkeling or the use of inhaling equipment.It is frequently simpler for divers to dive in the tropics, where most the world's coral reefs lie (Anon, 2020). According to Mograbi and Rogerson (2007), dive tourism is deemed a niche market in South Africa. Sodwana Bay in Maputoland, KwaZulu-Natal,has been ranked as the 20th most excellent location to dive in the world with 58 868 dives being introduced in 2011 (Hart, 2018). Sodwana Bay lies in the Greater St. Lucia Wetland Park (iSimangaliso), and as stated by SA Venues, (2012) it was recorded as South Africa’s first World Heritage site in December 1999 in acknowledgment of its outstanding, true beauty and distinctive, global standards.

Cruise tourism

Cruise tourism has been identified in figure 2.3 as a marine activity and according to Marquez (2006), ships and sailing have existed for periods of time, but the idea of sailing as a tourist hobby arose in the 1980s. Cruise tourism is one of the fastest- expanding divisions of global tourism (Mak, Sheehey and Toriki, 2010). Ellis (2021) described Cruise Tourism as a multi-centre vacation where you take your resort with you from start to finish. Lucrative cruise corporations include the MSC; Oceania Cruises, Seabourn Cruises; Celebrity Cruises; Crystal Cruises; and Azamara Cruises. Cruise tourism is an ever-increasing industry which is vital in employment as well as developing economies. Modern day cruise tourism caters for food, beverage, accommodation, shopping, and other recreational tourist services. Many cruise liners would offer special packages which may be fully inclusive depending on the type of package and is rate dependent (Tourism Notes, 2018).

Beach tourism

Beach tourism has been identified din figure 2.3 as a marine activity and Romaniv (2021) states that the advertising or marketing of ‘sun, sand and surf experiences and the growth of beach resorts have headed to the growing reputation of marine tourism (for example, fishing, scuba diving, windsurfing, and yachting). One of the important aspects of the beach experience is the potential it provides for real, close- up contact with the physical, natural environment. Picken (2017), affirms that beach tourism is one of the earliest and most modern forms of tourism. This kind of tourism usually takes place at coastal resorts and is derived from the beach as the main attraction. It all began with cool beaches, spreading to the warmer beaches, wealthy persons would partake in beach tourism as a ‘cure’ and families would take train rides from different cities to visit the beach. However, nowadays, the term beach tourism can consist of sun, sea and surf.

Island tourism

Island tourism as identified as a marine activity in figure 2.3 and identified by Dane (2022), states that islands have always been places of attraction for

tourists. Islands appeal to tourists who wish to feel secluded and to get away from the city life. An island resort regrettably does not have the capacity to cope with a massive number of visitors due it being in a delicate environment, inadequate resources and other facilities. Garcia and Carter (2022), state that many marine tourism activities connect with islands as mass tourism or as more intense pursuits. They further imply that with the convenience of activity choices, and from the point of view of tourism organizers, improvement possibilities will make island tourism an important component of the tourism industry. Examples of flourishing tourist atolls are Palm Island in Dubai (the palm-shaped man-made island), Cyprus in Europe and Bali in Asia.

Aquatic tourism

According to Karydis (2011), various aquariums have been constructed and assembled globally for the period of the last three decades. The sequential plan of comparatively small, quadrilateral concrete tanks has been replaced by less large, sporadically designed tanks intended at mimicking natural habitats. Aquarium operations have also been expanded to incorporate research, preservation and training. Marcy (2020), states that aquariums are important for the reason that the high standards they depict in animal conservation and welfare by protecting endangered species, repairing ecosystems and rehabilitation. Aquarium tourism includes theamenities of uShaka Marine World in Durban, KwaZulu-Natal and the Two Oceans Aquarium in Cape Town, Western Cape.

Special interest tourism

It was established by (Swarbrooke et al., 2012) that Special Interest Tourism (SIT) is quickly reaching a spot in the general perspective of tourism and marine tourism. He further goes on to divide Special Interest Tourism into four categories, which are listedand discussed below:

- **Nature tourism:** Entails feeling organic places, usually through ecological outdoor activities in terms of their influence on the natural environment Tourism New South Wales (2012). This contains all from bushwalking and adventure tourism events to sightseeing, scenic driving, beach encounters and wildlife watching. Bouchet, Lebrun and Auvergne (2004) state that most tourists will

only participate in 'naturetourism' if contact with nature is part of their discovery. Natural areas (sea, lakes, deserts, mountains) or picturesque sites (caverns, waterfalls and glaciers) have become critical attractions of sport tourism.

- **Scuba diving:** DeeperBlue.com (2022), states that there are various ways to describe scuba diving. It can be classified as a sport or lifestyle, as well as a tourism activity. Wholistically, scuba diving is an underwater experience where the core activity is where you dive underwater for the experience of the ocean beneath us. This can be done whilst on holiday as a tourist or as a hobby for a professional diver.
- **Sports fishing:** This can be described as angling performed with a rod and reel for sport or leisure and has been renowned for being one of the newest embellishments to the marine-based leisure market (Sportfishing Lures, 2020). Instances of sport fishing contests in South Africa involve The Algoa Bay Tuna Classic in Port Elizabeth, The Bass Equaliser Tournament Trail and Extreme Angler.
- **Yachting, boating, and sailing:** The acquisition of leisure crafts enhanced the amount of money spent on marine sports gear over the past few centuries (Fawad, 2019). Substantial amounts of money have been devoted into the amenities, such as harbors and waterfronts, required to provide for the increasing number of yachts and boats (Fawad, 2019). There are several harbors in South Africa, such as Zululand Yacht Club, TuziGazi Moorings and the Royal Cape Yacht Club.
- **Marine Ecotourism:** Marine Ecotourism is a mixture of both marine nature-based tourism and environmental marine tourism. The concept of Marine Tourism encompasses the full array of tourism, leisure time and recreationally positioned interests in the shoreline zone and seaward coastal sea waters (Hall, 2001). Cressey (2014) states that Marine Ecotourism events can vary from watching whales, dolphins and other marine mammals and fish; bird watching; scuba diving; beach walking; rock pooling; snorkeling; walking on coastal trails and exploring trips by shallow boat, submarine or airplane.

Drawing from the information discussed above, Marine Ecotourism can be classed as tourism to some extent untouched area in a marine ecosystem where

numerous marine activities are held. From the above, Marine Tourism comprises of several distinctive aspects. It, therefore, develops a critical component in understandingthe environment in which these diverse varieties of Marine Tourism occur.

2.2.3 Dive tourism

Navarra and Connolly (2014), defined dive tourism as persons moving from their usualplace of abode, spending at least one night away and actively partaking in one or more events, including scuba diving, swimming or the use of breathing equipment. Dive tourism occurs worldwide, but most of these activities occur in less developed countries where the sea waters are warm, the sea is dark blue with excellent visibility,and environments are regularly relaxed. It is a lot simpler for divers to dive in the tropics, where the majority of the world's coral reefs sit (Anon, 2020). As the world is progressively being explored and a few formerly unidentified destinations are left overfor tourists to discover, there is a change to travel to extraordinary 'territories'. Therefore, according to WTO (2001) underwater tourism is gaining attraction within the industry. Thus, diving forms a niche role inside the tourism industry (Townsend, 2008:143).

2.2.4 Activities associated with dive tourism

There are various types of dive tourism, a few of which have been identified below:

- **Free diving and snorkeling**

  These are two important types of diving. Free diving (or 'breath-hold') and snorkeling usually necessitate minimum gear, such as a swimming mask, snorkel, flippers, and some weights (Lippmann, 2019). The pair further state that the distinction amongst free diving and snorkeling is that snorkelers remain predominantly on the exterior of the water while free divers go down, holding their breathing for one or two minutes.

- **Scuba diving**

  SCUBA is the abbreviation for Self-containing Underwater Breathing Apparatus and has developed the common name to define diving with air assistance (De Wet, 2018). Scuba diving includes transportable air resources to stay submerged underwater for lengthy periods and achieve great depths

(Ostrowski et al., 2012).

- **DPV (diver propulsion vehicle)**

  Other brand-new machineries consist of the DPV or scooter and sledge, which are hauled along the water's exterior by a vessel (Anam et al., 2016). Divers cling on to either one of the machines, enabling them to travel more rapidly and much further whilst underwater.

2.2.5 Diving as a marine tourism activity

Ecotourism World (2021), state that diving plays a vital role in leisure interests in several marine tourist spots, thus creating new prospects for the many investors in the dive market. When exercised recreationally as a leisure industry activity, diving createspart of marine tourism because the site of the activity is in a marine ecosystem. This, in turn, promotes the preservation of the natural environment and inspires oceanographic discovery (Benjamin, 2016). Marine tourism, as defined by Tegar and Gurning (2018), is a form of tourism connected to and dependent on the sea and the marine environment. However, he further states that the water component is not the only principle, as marine tourism entails that "consumers travel away from their placeof residence and be actively involved with the sea". Recently, greater attention has been given to the possibilities of using the sea for numerous conventional and unconventional activities. Bearing in mind the substantial number of dive sites internationally, it is conspicuous that the support of preservation developments upheldby several funders, permits for new and prevailing diving destinations to mature and host divers more reliably, thus demonstrating growth in this industry and indorsing marine tourism (Huang, 2022).

The most important rule when diving, both for dive safety and dive efficiency, as statedby Gibb (2019), is never to hold your breath and to breathe continuously. A diver whoholds his breath underwater will not decrease his air consumption or prolong his dive.He will merely increase the concentration of carbon dioxide in his lungs, making him feel out of breath. Furthermore, a diver who holds their breath risks a lung over- expansion injury if he ascends.

2.3 The growth of dive tourism

Rumpoko et al., (2019) states that recreational diving originated in 1825 when William H. James invented the first open-circuit scuba system. Problems concerning mobility for divers breathing underwater were solved due to this system; it then inspired Henry Fleuss and Robert Davis to develop a closed-circuit oxygen rebreather system in 1878. Table 2.2 presents a detailed timeline of the development of diving as a recreational activity.

Table 2.1: The history and development of scuba diving as a recreational activity

YEAR	DEVELOPMENTS
1530	The first diving bell was used for under waterwork.
1667	Robert Boyle recorded the first observation of decompression sickness.
1690	Edmund Halley patented a diving bell with barrels filled with air. It can be refilled from the surface.
1788	John Smeaton refined the diving bell to introduce an effective hand-operated pump to provide fresh solid air and a non-return valve to keep air from going back up the hose when pumping halts.
1823	Charles Anthony Deane invented a smoke helmet for fighting fires. This led Charles and his brother John Deane to market the helmet with a 'diving suit'. The suit is attached by straps which may lead the diver to drown when bending over.
1825	Williams James invented the first workable SCUBA. It consists of a cylindrical belt around the diver's waist that serves as an air reservoir.
1837	August Siebe seals the Deane brother's helmet (see the year 1823) to a watertight rubber suit. This closed diving suit (e.g. The helmet and suit) attached to an air pump on the surface develops the first functional diving dress.
1839	Siebe's diving suit is used during the salvage of the British warship HMS Royal George. This salvage recorded the first use of the 'buddy system' for diving.
1843	Divers suffered from decompression sickness from using Siebe's suit.
1865	The 'Áerophore', an underwater breathing apparatus, was patented by Benoit Rouquayrol and Auguste Denayrouse. It consisted of a horizontal steel tank filled with compressed air, carried on divers' backs, with a mouthpiece.
1876	The first workable (closed-circuit) self-contained diving rig that uses compressed oxygen (rather than compressed air) was developed by Henry Fleuss.
1878	A 100-page study called La Pression Barometique and published by Paul Bert, which was researching the physiologic studies of pressure changes, showed that decompression sickness is due to the formation of nitrogen gas bubbles and suggests gradual ascents when divingas a way to prevent this risk.
1920	Research in the USA began to use helium-oxygen mixtures for deep dives.
1924	The USA Navy and Bureau of mines conducted the first helium-oxygen experimental dive.
1930	Guy Gilpatric pioneered the use of rubber goggles with glasses for diving.
1933	The bottom Scratchers, the first sport diver club, started in California, USA. Yves Le Prieur combined a demand valve with a high-pressure tank to give the diver freedom from restricting hoses and lines. Louis de Corlieu patented fins.
1934	William Beebe and Otis Barton descend 3028 feet (approximately 923m) in a bathysphere near Bermuda. This dive sets a deep-sea diving depth record that remains unbroken for 14 years.

1936	Yves Le Prieur founded the world's first scuba diving club; he called it the club of Divers and Underwater Life.
1940	Owen Churchill's swim fins were introduced and produced commercially.
1942	Jacques-Yves Cousteau and Emile Gangan worked together to redesign a car regulator that automatically provides compressed air to the diver with the intake of breath.
1943	Cousteau and Gangan created Aqua Lung after attaching the regulator to hoses, a mouthpiece, and a pair of compressed air tanks andtesting the valve regulator in the Marine River (outside Paris). Over 500 deep sea dives were made by Cousteau and two of his friends with the use of the aqualung whilst gradually increasing the depths to which they dive.
1946	The Aqua Lung is marketed commercially in France.
1947	Dumas makes a record deep sea dive with the Aqua Lung to 307 feet in the Mediterranean Sea.
1950	The Aqua Lung is marketed commercially in Great Britain.
1951	This year included the Aqua Lung marketed commercially in Canada and the first issue of skin diver magazine appearing.
1952	The Aqua Lung is marketed commercially in the USA.
1954	Zale Perry becomes one of the first scuba diving instructors in the USA.
1957	Sea Hunt, a television series starring Lloyd Bridges as an underwater adventurer, had inspired thousands of people to take up diving as a hobby.
1959	Young Men's Christian Association (YMCA) begins the first national USA-organised course for diving.
1960	National first aid training agencies are formed in the USA to train and certify divers as accident rates for diving increase.
1966	PADI (Professional Association of Diving Instructors) is formed.
1967	PADI trained 3226 divers in its first year of operation.
1968	John J. Gruener and R. Neal Watson dive to 437 feet breathing compressed air, off the coast of Grand Bahama Island.
1970	Certification cards are introduced to indicate a minimum training level and a minimum requirement for refills and dive equipment rental.
1980	Duke University founds Divers Alert Network (DAN), a non-profit organisation, to promote safe diving.
1983	The Orca Edge, the first commercially available dive computer, is introduced. Dive computers have become standard equipment among recreational divers.
1993	Divers (using Siebe's suit) suffer from decompression sickness.
1994	The 50^{h} anniversary of modern scuba diving is celebrated globally, and PADI certified 515000 new divers worldwide.
2005	Risk factors for decompression sickness were studied. The factors included age, gender, body mass index, cardiovascular disease, years since certification, dives in the last year, dive depth, nitrox use, and dry suit use.
2009	NAUI approves the first standard diving dress (also known as a stiff hat, copper hat equipment, or heavy gear) recreational diving course in Australia.

2014	The record for the deepest dive was by Ahmed Gabr from Egypt when he reached a depth of 1090.4 feet (332.35m) in the Red Sea.
2016	A prototype for an underwater navigation system that guides divers for scientific reasons (visualising his/her georeferenced position with a 3D map) is tested.
2017-Present	With the help of the Sports and Fitness Industry Association, the diving equipment and marketing association verified that there are as many as 6 million active scuba divers worldwide.

Researcher's Compilation Adapted From (Bellis, 2017; Dema, 2017; Dimmock And Cummins, 2013; Kesling, 2011; Lück, 2016; Sanford, 2013 And Shapiro, 2011).

As depicted in Table 2.2, it is established that the history of scuba diving commenced when the diving bell was invented. Thereafter, similar equipment started being designed and was used as a test before confirming its functionality and manufacturing the equipment for sale. The first SCUBA was invented inn 1825 which allowed for an easier way of performing the sport. It wasn't until almost 200 years later that people started taking to diving as a sport due to updated and functional equipment which allowed for longer breathing periods underwater. The equipment that was manufactured had to go through many processes and tests as well as requiring approval from certain organizations. Today, modern scuba diving is a massive industry which entails several different dive courses, and tons of new and improved equipment which allows for a safer and easier dive.

2.3.1 Dive tourism worldwide

Lucrezi et al. (2017) state that annually, many individuals' scuba dive, whether for a basic dive, accreditation, or since they previously obtained their diving license. Although it is impossible to assess precisely, roughly 6 million active divers take part in this pursuit (Nyquist, 2022). Recreational diving has been developed to the extent that there are many diver-certifying organisations and thousands of professional diving educators worldwide. The scuba diving industry is projected to be valued at $1.5 billion internationally. The trade is increasing at a pace of 5% per year. There remain an anticipated 15 million scuba divers globally. The immense majority of scuba divers (80%) are recreational divers, whilst the remaining 20% are commercial divers (Huhn,2022).

According to Musa et al. (2011), Professional Association of Diving Instructors (PADI) revealed that the overall number of qualified divers in 2008 was 17.8 million, as opposed to 2.5 million in 1988. A report published by PADI (2017) states that since 1967, the organization has awarded over 25 million diver accreditations globally. PADI (2017) also states that by 2017 they had released diver qualifications in over 200 countries and regions worldwide. It is significant to note that even though further than 900 000 certifications are issued per annum, PADI (2017) states that it is hazardous to undertake that all of these

accreditations are 'new' divers as opposed to divers alsoprogressing their current certifications or the renewal of certifications to inactive divers who have now continued with the activity.

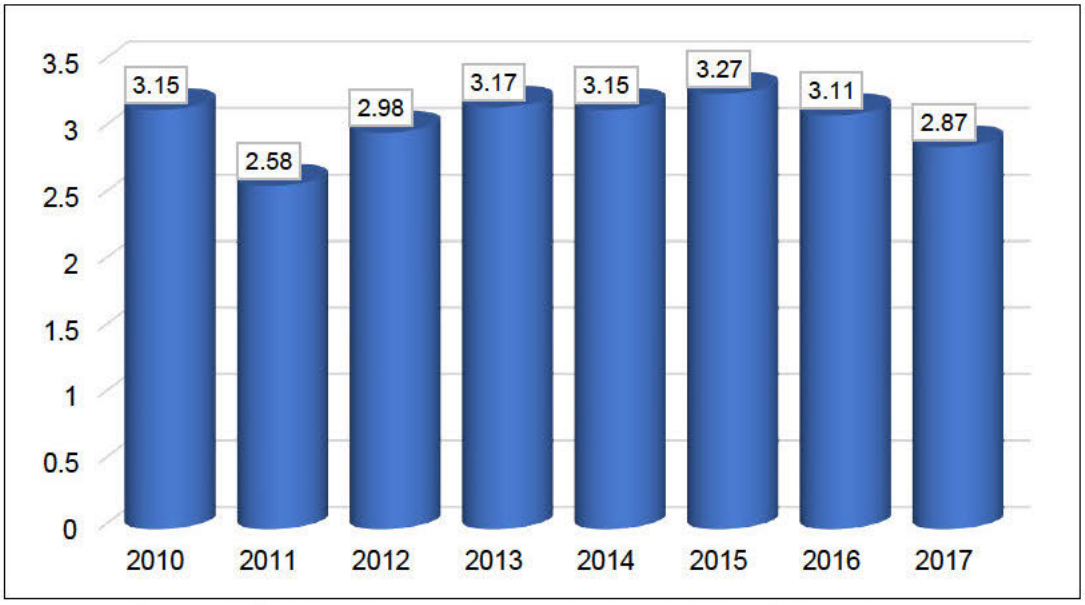

Figure 2.5: Number of divers in the USA (millions)
Source: (Mordor Intelligence, 2020)

Kieran (2020) states that there are an approximate 2.8 million active divers in the USA, between 3 million and 4 million active divers in Europe and an estimated 6 million active divers worldwide. A book called The Business of Diving, published in 1995, quotes a statement made by DEMA (Diving Equipment Marine Association), which indicated an estimation of global dive sales at $3.5 billion contrasted to $1 billion in the USA. In light of this fraction, American transactions would be a little less than one-third of global sales (Kieran, 2020). Within the same book, PADI assesses around 2000 dive centres in the USA and about 4000 centres worldwide. PADI states in the Business of Diving book that about 1 million new divers are certified annually, of which nearly half are based in the USA. Moreover, PADI estimates the number of snorkelers worldwide to be between 6 to 7 million compared to 3 to 4 million in the USA (Kieran,2020). This estimate would mean that the American market would also be about 50% of the worldwide market.

2.3.2 Dive tourism in South Africa

According to Dimopoulos et al. (2019), scuba diving is increasing considerably in South Africa. Scuba diving interests throughout South Africa are growing even as competition is expanding. Sodwana Bay is one of several dive sites in South Africa. However, it is the most extremely popular one. It participates with other well-known locations, such as Cape Town, Gansbaai, Mossel Bay and Umkomaas/Aliwal Shoal in Durban, which have got the greatest intensity of dive operators in KwaZulu-Natal (Dive Advisor, 2013). The Aliwal Shoal first received recognition from the scientific community when Belderson (1961), recommended an aeolian source. Belderson (1961) also observed that the Aliwal Shoal depth delineations are comparable to the Durban Bluff landscape and proposed that the coast parallel offshore reefs on the eastern continental border of South Africa are calcareous surfaced seaside sand dunes that too shape during lower sea levels (Bosman, 2012). PADI (2017) asserts that dive events in South Africa vary from large sharks to crowds of miniscule sardines. The north-eastern tropical reefs and moderate stony reefs in the west add to the assortment of this destination, which additionally incorporates diving in chillier water, strong tides and launching from the shoreline (PADI, 2017). Scuba divers in South Africa mostly dive at certain sites to conquer fear, to take pictures of marine life since the location is deemed a "world-class diving spot," to understand more about aquatic life, develop new abilities and discover new destinations (Geldenhuys et al., 2014; Saayman and Saayman, 2014; Schoeman et al., 2016; Van der Merwe et al., 2011). In South Africa, adventure tourism has grown rapidly since the end of apartheid in 1994.

In recent years, there has been a revolution in the adventure tourism and recreation divisions. Previously small and specific, more people are now pursuing exhilarating experiences and exclusive connections with nature. Tourism is frequently understoodas a means for monetary growth, mainly among countries exclusive to the global South, including South Africa. Adventure tourism has been an imperative economic funder of the economies of several small towns throughout South Africa. McKay (2016) states that in the instance of shark cage diving, it has carried substantial weight in terms of income to the small town of Gansbaai in the Western Cape, where shark cage diving cruisers

launch to discover what is known as “shark alley” a common spot for observing great white sharks. These variations have also been deceptive within the SCUBA diving industry. Scuba diving is the one activity which has occurred for quite some time and is considered to be one of the most popular adventure tourism activities(Giddy, 2018).Table 2.2: Popular dive sites in South Africa

DIVE SITE	DESCRIPTION
ALIWAL SHOAL	Aliwal Shoal gained Marine Protected Area status in 2005. 50km south of Durban, the small town of Umkomaas on the south coast of KwaZulu-Natal, is where you would find Aliwal Shoal. They are well-known for their ragged tooth sharks most seen in winter. The probability of Tiger and Hammerhead sharks on dives in the summer is extremely likely.
FALSE BAY	Acting as a home for kelp forests, gravelly walls, and grimy bottoms, this is where the water is warmer than that of the nearby Atlantic coastline. Cape fur seals, leopard catsharks, puffadder shy sharks, red and orange sea fans, feather stars and sea slugs are some of the inhabitants of this region.
MOSSEL BAY	Mossel Bay is located in the Western Cape and is famous for the richness of great white sharks in its waters. Reefs, terraces, depressions, and shelf sands are some of this location's geomorphological features.
SODWANA BAY	The reefs in Sodwana Bay are nicknamed in correspondence to their distance from Jesser Point: Quarter Mile, Two Mile, Five Mile, Seven Mile and Nine Mile. Sodwana Bay is situated roughly 500 km north of Durban and 100 km from the southerly border line of Mozambique.

Source: Adapted From (PADI, 2022)

PADI (2022) described that visibility "varies quite a bit," and clarity beyond 20 m is decent. Conditions are relaxed, with water temperatures to be more or less from 27°Cat Sodwana Bay to 14°C at False Bay. With the diverse geography in South Africa, numerous climate regions varying from desert to subtropical are present. Mediterranean-like temperatures with wet winter seasons (May to August) and hot, drysummers (November to March) can be experienced in Cape Town (Fallows, 2016). Winter temperatures can reach 0 °C and 30 °C in the summer (PADI, 2017). Fallows (2016) indicates that "South Africa is the best location for a chance to see Great White Sharks, and considering the country's marine and terrestrial diversity, it is an outdoor explorer's utopia." Marine protected areas limit human activities for the conservation/protection of natural properties and it is of substantial social interest to assess the risks related with

diver impacts. The Kwazulu-Natal shoreline of South Africa boast two ecotourism areas namely the Sodwana Bay and St. Lucia (Vetrimurugan, 2018).

2.3.3 The economic benefits of dive tourism

There are endless financial advantages of marine tourism. They entail offering work prospects (e.g., in the case of scuba diving, dive masters, captains, sales representatives, scuba coaches and hoteliers, to name a few), creating foreign exchange, growing the gross national product (GNP), emerging substructure, and subsequently inspiring the conservation of the infrastructure, expanding the economy and growing government incomes (Goeldner and Ritchie, 2012). In various areas, the presentation and expansion of tourism provide the local community an opportunity foreconomic and learning development that would not be accessible if not for tourism (Kettunen and Ten Brink, 2013). (Lucrezi et al., 2017; Musa and Dimmock, 2012; Wongthong and Harvey, 2014) scuba diving is one of the globe's fastest-developing recreational activities, enticing masses of visitors worldwide. It outlines a necessity for gear rentals and preservation organizations as well as lodging amenities and encourages local operators to approach these services and expand and grow their existing offerings (Camp, 2011). The author further claims that "loyal visitors" are a financial advantage of scuba divers to a destination exclusively due for heightened tourist visits. This leads to an increase in spending on the specific destination, addingto the "direct increase" of the "economic value" of scuba diving as a tourism result. Scuba diving is practiced in rural and developed locations (Lee, Jan and Tseng, 2017).A widespread misunderstanding around rural sites are that such locations do not possess the amenities to offer "proper" scuba diving encounters. Nevertheless, theseplaces are not as "populated by tourists" as others and therefore present a further organic and genuine diving experience that entices a distinct type of diver who is still eager to pay for such an experience (Hampton and Jeyacheya, 2014; Lee et al., 2017). These rural locations (like Ponta do Ouro in Mozambique, South Africa) profit economically from tourism, which provides the agricultural and additional service divisions an added source of revenue, whereby it is seen as an opportunity to appreciate the economic worth of explicit high-quality locally manufactured food goods, and the chance to re-assess their heritage

backgrounds and distinctiveness ofthe location (Lucrezi et al., 2017; Zhou, Chan and Song, 2017). Economic growth with new sources of income is the result of the benefits.

A study by Zimmerhackel et al. (2019) found that shark divers in the Maldives contributed about US$14.4 million to the local economy in 2016. It was anticipated that the annual economic value of shark diving in the Maldives to be US$2.4 million, a value equivalent to US$7.9 million in 2016. Today, the tourism industry is the main economic driver in the Maldives, and much of its employment is generated through this. Harris et al., (2020) states that the most popular tourism activities in the Maldives are diving and snorkeling. Gross (2021) states that a vital component of the dive industry is the observation of manta rays and sharks. In 1992, approximately US$2.3 million in direct business revenue was generated by shark diving, as compared to the local shark fisheries' annual revenue of US$0.5 million Zimmerhackel et al. (2019). Due to the increased number of shark divers on a global scale, this income generated by tourism is likely to be much greater today.

2.4 A profile of dive tourists

A diver who dives more than eight times a year is known as a Core diver, while a casual diver is deemed somebody who dives anywhere between one to seven times per annum. Collins (2019) stated that:

- One percent of casual and 57% of core participants are among the ages of 25 and 54.
- Seven percent of casual and 21.2% of core participants are younger than 25.
- Two percent of casual and 21.8% of core participants are older than 54.

This distribution reveals a comparable style in age ranges that are evident in both women and men, being the greatest contribution among the ages of 18 and 44. This dissemination also indicates that men of all ages predominately take part in the sport. Albayrak et al. (2021) also stated that additional demographic attributes of both core and casual divers include:

- They tend to be wealthy, as diving is a costly hobby/sport to practice. There are high costs for certification, gear, dive trips and insurance.
- Divers are often involved in other sports as being unfit results in injuries whilstdiving.
- As a diver, caring for the environment comes naturally to them.
- These include environmental advocates, researchers, dive experts, scholars, veterans, filmmakers, and professional underwater photographers.

Results from a study that was undertaken in Pacific Harbour, Fiji, by Altobeli et al. (2009) reveal that shark tourists travel from far and wide, they are highly educated, youthful, and for the most part, consider themselves exclusive to other tourists, as they are adventure seekers and intrigued vacationers who find pleasure in viewing the sharks in their natural environment. Altobeli et al. (2009) discovered that, through observations and conversations with shark divers, an honest eagerness to take part in the research was felt, which leans toward a need to add to additional causes, such as shark conservation and research. According to Rocha et al. (2020), the marine environment has seen a significant growth in the number of tourists engaging in wildlife viewing activities (e.g., swim with, snorkel with, dive with, and land and boat-based observation activities).

Dimmock and Musa (2015) state that there are supposedly a great number of certified divers around the world. Nevertheless, many feel diving as a major aspect of a vacation or a one time-off pursuit (Wilks, 2006). Therefore, new divers are famous for essential security and ability development. The advancement of diving activities depends on what the diver may or can encounter underwater and the scenery of a specific dive site (Dimmock and Musa, 2015). Divers look for chances to view and encounter different dive sites and scenes (Musa, 2002). They create a demand for the dive tourism industry through their inspiration and desire for marine tourism.

In another study conducted by Smith et al. (2014), it was stated that marine wildlife tourism (MWT) has recently undergone extraordinary development and necessity for prospects in which individuals want to observe and interact with

free-ranging marine megafauna. Regional and national economies benefit from marine tourism, as stated by Sorice et al. (2006); this is, through the alternatives provided to consumptive purposes of the natural ecosystem (e.g., Whale watching versus whaling). Bejder et al. (2006) promote contributors to implement a pro-environmental attitude and behaviour, which can help environmental preservation. Smith et al. (2014) found that most of the dive tourists interviewed were recreational divers with previous grey nurse shark encounters. Data was compiled from 78 individual divers who dove with grey nurse sharks at the researched sites. The percentages of scuba divers of varying gender, age groups, ethnic group, preferred dialects, and prior experience diving withgrey nurse sharks did not change drastically among sites. Most of the scuba divers at all sites were Australian, English-speaking males. Age categories changed amongst sites, but 85% of contributors across all sites were 26 to 51 years old. The number ofdivers knowledgeable of the appropriate legislation and the Code of Conduct for Divingwith Grey Nurse Sharks was similar amongst locations.

In another study conducted by Ong and Musa (2011) on the five most popular scuba diving islands, namely, Langkawi, Perhentian, Tioman, Redang and Mabul and Sipadan (four islands from Peninsula Malaysia and one island from East Malaysia). The study revealed that most of the divers (57.6%) were males, while females represented 42.4%. Moreover, 59% of the respondents were between the ages of 18and 30, and 29.8% were between the ages of 31 and 40. Foreign divers accounted for 62% of divers. Ong and Musa (2011) further confirmed that the encouraging link between diving attitude and underwater accountable behaviour suggested that as diving attitude intensified, accountable underwater behaviour also intensified. Regarding underwater accountable behaviour dimensions, the diving attitude was positively linked with typical diving behavior.

Rangel et al. (2015) conducted a study on eco-touristic snorkeling routes at Marinha beach (Algarve) and concluded that effects on marine ecosystems were due to divingactivities. Further research confirms that snorkelers can damage the sessile fauna andflora by trampling (Plathong et al.,2000), contact made with fins

(Hawkins and Roberts, 1997), raising of sediments (Zakai and Chadwick-Furman,2002) or by upsetting vagile fauna (Hawkins et al., 1999). According to Claudet et al. (2010), the implementation of snorkeling routes aims to increase diver's environmental awareness by encouraging responsible underwater behaviour and gathering them in a less sensitive area, as well as to increase the understanding of the marine surroundings. It is also being used to reduce damaging impacts in defined areas. Following the information regarding Marina Beach, the self-guided snorkeling routes were provided during the pre-dive briefing. Once the diver enters the water, acrylic slates attached to buoys provide detailed information on the surrounding environment. Claudet et al. (2010) points out that the primary objective of the paths, in harmoniousness with the Mediterranean underwater paths of the Cerbère-Banyuls Natural Marine Reserve, was to enhance environmental consciousness in the expectations of reducing potential effects on marine features.

As Vanhooren et al. (2011) believes that maintaining ecosystems and raising visitors' understanding are two vital aspects of beach tourism management that should be enhanced. According to Kautish and Sharma (2020), environmentally responsible behaviour or pro-environmental behaviour could be demarcated as any individual or group act aimed at doing what is environmentally responsible for the protection of the environment. This behaviour requires a conscious awareness of environmental problems by individuals and, at the same time, reveals insight and sensitivity concerning the importance of environmental quality.

2.5 Impacts of dive tourism on the natural environment

According to Nag (2018), tourism is generally considered an advantage to a country’s economy. Tourism creates fortune for the region and retains the locals of the area. However, when tourism grows to be unmanageable, it can have devastating environmental effects. When tourism is promoted in an area with insufficient reserves, it will destructively impact the area's environment. In such areas, the local flora and fauna might be disadvantaged of the resources necessary to prolong their lives (Nag,2018). Every ecosystem works on a fragile

natural sense of balance. Every variety in the ecosystem has a particular role to play in the structure. However, Nag (2018) stated that tourism regularly disrupts this fragile balance and brings about a huge catastrophe in the ecosystem. When the tourist industry involved in a region is completely profit-minded, it pays little attention to the needs of nature. Unsustainable traditions by the tourism industry can thus lead to desertification, sand corrosion, loss of species, fluctuations in sea currents and coastlines and obliteration of habitats (Nag,2018). Tourists breaking off corals in the course of snorkeling or scuba diving activities can similarly impact the ecosystem degradation. Industrial gathering of corals for sale to tourists also triggers destruction to coral reefs. Even the anchorage of cruise ships to coral reefs can destroy substantial segments of the reef (Nag, 2018).

2.5.1 The ecological makeup and vulnerability of a dive site

Recreational coastal events are controllable within nature preservation plans. Thus, significant attempts are being embarked on to examine the effects and advantages of their assimilation into protected areas' management plans (Claudet et al., 2010; Lucrezi et al., 2017; Rangel et al., 2014). According to Maccarthy et al. (2006) Self- Contained Underwater Breathing Apparatus (SCUBA) diving associates its economic value as a leisure coastal activity with the sustenance of conservational awareness as an observation activity and it is regularly familiar in multiple-use marine protected areas (MPAs) as a foundation of income (Planas et al., 2021).

The scientific public agrees that one of the main aims of continental and marine preservation plans is biodiversity protection (Briscoe et al., 2016; Wedding et al., 2016). Although with different meanings, diving hotspots and conservation hotspots Briscoe et al. (2016), appear to contribute to the same biologic focus values. According to Uyarra et al. (2009), Ramos et al. (2006), Mundet and Ribera (2001) and Ditton et al. (2002), recreational SCUBA divers appraise high fish abundance, the encounter of rare species, the size of the fish, high-level biodiversity, coral abundance, and fascinating geomorphologic elements. Dive sites' reliability depends on the efficient administration of leisure diving, one that takes advantage of the environment's natural, cultural, and esthetic principles

without compromising their management and safety (Dimmock and Musa, 2015).

Results from a study conducted by Cardoso-Andrade et al. (2020) on assessing the land- and seascape determinants of recreational diving in Portugal, presented a constructive response concerning features that normally specify high biological variety, both in the underwater panorama and developed scenery, such as areas under the effect of waterlines and individual wetland arrangements or multifaceted rock constructions, consistent with biodiversity observation as one of the main determinations of recreational diving. Rock and wetland landscape variables are correlated with high species of variety. Cardoso-Andrade et al. (2020) stated that the antagonistic relation among beach landscape and dive site variables could be described by the low depth related with beaches, the disruption triggered by wave action, and the tidal effect. These circumstances add to the loss of visibility due to the interruption of residue and disrupt the diver's immovability Cardoso-Andrade et al. (2020). Azmi (2021), state that the tourism sector, concerning small island developing states and territories (SIDST), is susceptible to climate change. The physical characteristics of small island states “make them especially vulnerable to the effects of climate change, sea-level rise, and extreme events”. Ocean dynamics caused by environmental alteration can pose serious risk to dive sites. Underwater mass tourism activities can make shipwreck locations susceptible to harm, particularly physical andbiochemical damage (Ridwan, 2019).

Tropical coral reefs offer highly prevalent resources for dive tourism (Lachs and Oñate- Casado, 2020). The general observation within the international diving community is that these sites deliver extremely necessary dive experiences on visually remarkable reefs, with warm water, good water visibility and, comfortable conditions permitting expected convenience (Tierney and Tierney, 2006; Jackson, 2013). Most of these divers dive sporadically, choosing to dive on holidays in tropical regions (Garrod, 2008). Due to the sporadic nature of their SCUBA diving patterns, these divers frequently lack self-confidence and resilience skills (Negi et al., 2022). Hence, the extent of physical contact being made with the reef is theoretically more substantial at such sites. Tropical coral

reefs in common tourist regions are some of the highly frequently dived reefs in the world (McClanahan, 2020). Therefore, a comprehensive variety of investigation has been performed on diver collisions at tropical reef locations,with most of this research achieved between the 1990s to early 2000s. For example, a study undertaken in the Gili Matra Water Tourism Park in Indonesia by Solihin et al.,(2020), found that 15% of divers damaged or broke corals, with divers' fins being the prominent cause (95%) of all destruction. Underwater photographers were more proneto cause harm than divers not using photographic apparatus. A study on the level of diver impact centered on three reef topographies (steep slope, gently sloping, and near-horizontal reef benthos) found no connection among a certain topography and the extent of diver impact (Hammerton, 2018).

2.6 Measures to ensure environmental sustainability of dive sites and divetourism

- **Carrying capacity approach (CCA)**

  The CCA model is used to estimate the environmental number of dives on a particular reef, with the individual intent of being able to assist diver-based tourism without an influence on the environment in question. This methodology was promoted in the 1990s for use within MPAs (Lucrezi et al., 2019). The theory behind this prototype was that ecological disruption is retained at a level that ecological methods could restore.

- **Limits of acceptable change (LAC)**

  The Limits of Acceptable Change model (LAC) are built on an adequate concentration of environmental change within a threatened area (Burns et al., 2020). The particular administration aims establish this model for each site within a protected area, quantifiable limits are identified, and the essential management measures are executed to guarantee ecological transformation beyond these standards is prevented.

- **Percentile approach**

  Andrello et al. (2022) proposed 'the percentile approach', particularly for use on coral reefs. This is a percentile-trigger-based methodology designed from the Australian and New Zealand Environment and Conservation Council to evaluate water quality. This method shuns the use of a 'fixed default value of resource

condition' and recognizes 'the need for multiple reference sites rather than a single reference site'. Trigger values are determined instantly, without the mandatory two-year waiting period for water quality evaluation (Brdesee, 2022).

- **Dive marshals**

  In 2012, Julian Hyde, the General Manager of Reef Check, Malaysia, placed a call out for evidence and consciousness of the use of dive officers to oversee divers underwater, with twenty subjective responses acknowledged from geographically varied countries - Africa, Belize, the Caribbean, Mexico, Red Sea and Southeast Asia (Lau, 2019). Only six documented the effective use of dive officers with the ability to eradicate divers from the water who did not conform with the 'no touch, no take' policies. The outstanding replies indicated no such executive approach was utilized but that it was a good concept.

- **Diver education**

  Environmental training and analysis have been perceived as a way to decrease diver impacts; though, its examined efficiency has produced mixed results. Lucrezi et al. (2021) found that a 45-min pre-dive seminar which contained information on reef biology, the role of marine protected areas, the destruction caused to the reef by diver contacts, and a follow-up in-water experiment, resulted in divers making fewer contacts in the course of the successive dives. During the seminar, divers were presented living and non-living substrata to demonstrate areas of the reef which may possibly be affected. Studies accessing training to decrease diver contact on tropical reefs have indicated that substantial declines are achievable with proper pre-dive briefings (Lucrezi et al., 2021). However, when divers are requested to abstain from making contact with the benthos, many require the suitable skill base to conform with such a request. Therefore, speciality teaching in Low Impact Diving concentrating on buoyancy, horizontal trim, streamlining, and low-impact propulsion techniques would be useful for offering recreational divers with training and skills to conform with the 'no touch' policy necessary at many diving sites. The growth and international recognition of a new diver-training curriculum in Low Impact Diving that is presently available to all qualified divers delivers an example of how further training can successfully translate the results of this research into practical usage. Benefits also exist for diving specialists and the industry through

upskilling staff and the economic benefits of offering courses that may be promoted to all 154 certified divers. Internationally, learn-to-dive programs being performed within marine parks would profit from course supplies being more concentrated on the significance of MPAs. Such site-based explanatory programmes present a highly viable intervention strategy. This research demonstrated that irrespective of a diver's certification and experience level, education approaches are significant ways to diminish diver contact with reef benthos considerably.

- **Dive site rating system**

  More exceptional management of divers by dive managers has been shown to considerably impact contact with the reef and decrease intrusion with fish and sharks (Butcher et al., 2021). Strategic dive tour paths can also prevent vulnerable environments like narrow trenches and caves, which are more prone to diver contacts (Hammerton, 2018). When guides avoid such areas, they significantly support in reducing diver effect at certain locations (Lucrezi et al., 2021). Popular diving sites could be evaluated based on a sensitivity index, as in the Mediterranean Di Franco et al. (2009) and only reachable to divers with suitable experience and education. Divers are by now familiar with certification-based limitations. For example, open-water divers are confined to depths of less than 18 metres (PADI, 2014); divers desiring to discover caves need a cave certification (CDAA, 2014). Introducing a rating method based on the intricacy and understanding of the reef, merged with the divers' level of skills, would lessen diver impacts, e.g., a cave diving classification system (CaveAtlas.com, 2014). Introductory-level divers could be constrained to patchy reef developments with large sandy areas. Inexperienced divers could put into practice buoyancy and trim whilst examining the reef from the edges. This would offer motivation and incentive for those concerned in discovering the reef away from the sand to maintain training to the suitable level (Carvache-Franco et al., 2019).

- **Marine Protected Areas (MPAs)**

  Marine Protected Areas (MPAs) are used to encourage marine conservation. An MPA (Marine Protected Area) has been defined by Giakoumi et al. (2018) as an area recognized as 'special' to achieve long-lasting protection. This recognition pertains to each of the environmental and cultural sources within that region.

Hopkins et al. (2020)stated that Marine Protected Areas (MPAs) throughout the world had been executed as a managing tool in meeting aims and objectives for maritime biodiversity management. The accomplishment of MPAs in attaining biodiversity preservation objectives is greatly contingent on successful management (Hopkins et al., 2020). Various definitions regarding an MPA have been discussed in Table 2.4.

Table 2.3: Definitions of an MPA

AUTHOR	DEFINITION
Barker and Roberts (2008)	The focus of an MPA provides knowledgeable insight into preservation management and regulatory supervision of tourist movements that is executed from an ecological management viewpoint.
Dixon and Sherman (1990)	A particular status title was given to any area of the marine environment to protect most or all of the organic and cultural resources within that same area.
Fabinyi (2008)	MPAs have been created over the years by various organisations and institutions; this is in particular for scuba diving sites.
Page and Connell (2009)	Protective policies are implemented for marine life within a water-based reserve/area.

Source: Authors' compilation

Reflecting on the definitions mentioned above, the following characteristics are evident:

- Barker and Roberts (2008) agree with Fabinyi (2008) and Dixon and Sherman (1990) report but include that the guidance of tourist activities should be executed.
- Dixon and Sherman (1990) refer to an MPA as a particular status title given to any part of the marine ecosystem in bid to safeguard most or all of the natural and cultural properties within that same territory.

Lucrezi et al. (2021) suggest that marine events, particularly the dive industry, rely on MPAs. Recreational scuba diving has commonly been identified as an endeavor with low ecological influence. It has been indicated by Fabinyi (2008) that MPAs are perceived as an outstanding tool by environmentalists and

holidaymakers. Barker andRoberts (2008) acknowledge that boasting an MPA at a specific location, gives that site a competitive edge.

For marine park organizations, reef preservation and resource conservation must be respected in tandem with environmental tourism practices. To date, overseeing diver effects has concentrated on restricting the number of divers gaining access to sites Giglio et al. (2020) or avoiding diver access within marine parks except for the bordersof the park (Lloret et al., 2006).

2.7 The situation in South Africa

Brand South Africa (2020) states that if it is the assortment you seek, South Africa has an immensely lengthy coastline stretching from about 35°S to 27°S, which is not entirely within the usual range for tropical diving. With the Mozambique current running through the south coast, it brings warm tropical water, and further up the south, we have the coral reefs in Sodwana Bay. The underwater environment changes gradually as you head down the coast; once you have reached Cape Town, you can expect to dive into icy but beautiful kelp forests (Brand South Africa, 2020). There are three significant types of kelp, and a small percentage of the Western Cape is the only exclusive place in the world where they all flourish simultaneously. When diving in the kelp, it will feel like strolling in a forest, and you will float below the cover and marvel at the surprisingly vibrant reef existence below you. A thick wetsuit with a constraining hood and gloves will be required due to the cold temperatures (Brand South Africa, 2020). Just off Cape Town, regularly seen by divers are windflowers in pigments varying from electric blue or deep red to pale pink, sea slugs of nearly every colour possible, and an array of tiny creatures in as well as around the bright orange and sulphur yellow sponges. According to Brand South Africa (2020), there are dive schools in just about every centre, with a large amount in landlocked Johannesburg. Individuals complete their coaching in Johannesburg and proceed to Sodwana Bay fortheir qualifying dives.

Mozambique and South African coastlines range from warm waters to waters as cold and choppy as the waters in Europe. According to Fallows (2016), these locations are so inexpensive and balanced. Bearing in mind the remainder of

Africa's scuba diving ability, an array of dive locations is popular for overflowing with exotic aquatic life. According to PADI (2018), more African countries thriving with aquatic flora and faunawhich are great for diving consist of Tanzania, Kenya, Madagascar and Mozambique;this is evidenced by the 58 exclusive and primeval diving destinations of the continent, which offer spots to suit divers of all qualifications.

2.7.1 Diving legislation in South Africa

According to the legislation by the Department of Environmental Affairs (DEA) (2011)implemented guidelines and policies which stated that White Shark Cage Diving (WSCD) is a motion linking the observation of a free-swimming White Shark (Carcharodon carcharias) from inside a water-logged protecting cage. It forms a meaningful and beneficial exploration tourism activity in many territories worldwide, with an anticipated local economy varying from $1.3 to 18 million US dollars (DEA, 2011). The WSCD has established in five significant zones globally: California,Mexico, South Africa, South Australia and New Zealand. This activity largely transpiresin areas where the species instinctively gather. It takes advantage of the certainly higher local profusion of white sharks due to the existence of one of their most favored food sources, specifically seals, rather than enticing sharks to areas where they would not easily appear. DEA (2011) stated that in South Africa, the WSCD waslaunched in 1991 as an unregulated movement until a plan was established in July 2008. Identifying the rising attention in witnessing sharks in their natural setting and the prospects for economic, educational and environmental profits, the formerly knownDepartment of Environmental Affairs and Tourism (DEAT) officially nominated five (5) sites amongst Cape Town and Port Elizabeth (DEAT) where WSCD procedures can be acceptable in the South African ocean environment. In 2011, the Department of Environmental Affairs assigned WSCD 11 licenses valid for five years at Seal Island, False Bay; Dyer Island, Gansbaai; Quoin Rock, Quoin Point; Seal Island, Mossel Bayand Algoa Bay, Port Elizabeth.

According to the Gazette (2001), the minister of Labour had made regulations within the schedule. These regulations will apply to all diving operations and all

persons engaged in diving operations in South Africa. No person may train another person if they themselves do not have the proper qualifications. The chief inspector may designate a medical practitioner for medical exams of divers or prospective divers, provided that the practitioner is registered with the Health Professionals Council of South Africa. A diver shall be required to produce a medical certificate stating their fitness levels as well as their personal information. If a diver is unfit to dive for a period of fourteen days or more, they shall not be allowed to participate in diving until a medical certificate is produced. The diver's employer shall be liable for any costs involved with a diver's medical examination. If an employer is not a diving supervisor, they may not take charge of all diving operations. An employer shall, after consultation with the employees, ensure that an operations manual is compiled and made available to each diving team. Prior to commencing diving operations, an employer shall ensure that a risk assessment and a hazard identification is conducted to identify the risks and hazards to the health and safety. An employer shall ensure that no matches, cigarette lighters, smoking requisites, or any other flammable articles likely to cause a fire or explosion are at any time taken into or stored in the compression chambers. No person shall use, order or permit the use of any compression chamber or bell unless it has been designed and manufactured in accordance with the health and safety standard incorporated into these Regulations. An employer shall ensure that all diving equipment and machinery which is used in connection with any diving operation or underwater work are designed, manufactured, and maintained in accordance with Health and Safety Standard. The chief inspector shall establish a Council for diving, and in consultation with the Council, make or amend rules for the conduct of examinations and syllabi for such examinations as occasion may require. Any person who satisfies the chief inspector that he or she is at least eighteen years old, can be deemed a learner. Any person who satisfies the chief inspector that he or she received appropriate training in diving operations with an organisation approved for diver training. The above Regulations shall be called the Diving Regulations, 2001.

2.8 The diving certification process

The following process for obtaining dive certification has been adapted from (PADI Open Water Certification, Pro Dive, 2020), which states that the most popular and widely recognized dive course is the PADI open water diver course. PADI open water divers are qualified to dive to a maximum depth of 18 metres, acquire air fills, lease or buy scuba gear and take part in dive activities maintain dive education by finalizing the PADI Advanced Open Water Diver certification and taking specialty diver courses. The course encompasses Knowledge Development (online, individual study or in a teaching space) to grasp the fundamental principles of scuba diving, Restricted Water Dives to understand basic scuba skills and Open Water Dives to make use of your skills and explore. The course pre-requisites are that the applicant is ten years or older, has sufficient swimming skills and should be in great physical health. No former familiarity with scuba diving is necessary. The duration of the course is about four days. The following elements are included in the course:

- Open Water Touch Online Manual (a tablet app, complete with videos and interactive training material)
- Instruction by an internationally certified PADI instructor
- Pool sessions (heated swimming pool)
- Four Sea Dives
- All gear is provided for the entire length of the course
- Air fills
- Registration with PADI (International Qualification)
- Certification Card on successful accomplishment of the course

2.9 Conclusion

Considering the above information of this literature review, it is known that the fame of leisure scuba diving has amplified in current times to the extent that scuba diving and the business motion supportive of it becoming a vital tourism subdivision motivating a billion-dollar world-wide industry (Garrod, 2008). Constant necessity for scuba diving has been propelled by divers' longing to observe and experience marine nature (Cater and Cater, 2007). At the same time, greater access to attractive underwater sights through innovations in

technology, training, education, and apparatus has produced aflourishing Scuba Diving Tourism (SDT) industry that encourages diving activities (Dimmock and Cummins, 2013). The SDTS are dependent on ease of access, prudent management, and reliable use of the marine natural environment. The industry's dependence on value of marine environments is apparent in the frequent use of Marine Protected Areas (MPAs), which are a substantial benefit because of the excellence of underwater scenes they present. However, MPAs are founded predominantly to conserve marine flora and fauna (Eriksson et al., 2019); therefore, safeguard from human impacts is crucial. Dimmock and Musa (2015) initiate that guaranteeing the sustainable future of scuba diving tourism necessitates an understanding of the matters which result from divers' yearning to amplify their experiences, the industry labours to permit these experiences while accomplishing profitable goals, the host community needs and urgencies, and the essentials to preserve unspoiled environments and conservation standards in the long term. As stated by Dimmock and Musa (2015), scuba diving in delicate and frail scuba diving locations demands efficient management to defend ecological and cultural principles and make certain the sustainable use of resources. Marines' environmental sustainability is a vital global concern which, nonetheless, has the capability to be a considered business prospect for host communities and the scuba diving tourism industry that pursues to entice tourists to a destination (Dimmock and Musa, 2015). The following chapter introduces the research techniques that were utilized to reach this study's aim and objectives.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter concentrates on the research design utilised in this study. Information inthis chapter incorporates attributes relating to the study's research design, study area, population, the sampling method used, sample size, data collection tools, and data collection methods. The final segment of the chapter examines the analysis of the data, reliability and validity of the study based on this study.

3.2 Research Design

This study used a mixed-method approach to gather data. Questionnaires and interviews were conducted in the data collection of this study, qualitative and quantitative data was compiled. Mixed methods studies support possibilities for the incorporation of a range of hypothetical perceptions. A mixed-method approach is a process for collecting, evaluating, and applying qualitative and quantitative methods within the same study to gain a more in-depth understanding of the research problem (Ivankova et al. 2011:263a). Various studies state that using a mixed method approach is favored when different groups of participants are targeted, as this will ensure that the research goals are adequately met. A triangulated research design allowed the researcher to obtain different but complementary information. It will assist the researcher in meeting the research objectives successfully (Welman, Kruger and Mitchell 2005:97). Furthermore, Roshan and Deeptee (2009:7) further justify the use of qualitative research techniques due to their potential to explore several ideas of human behaviour that cannot be quantified. On the other hand, quantitative research describes the correlation between patterns and how they relate to dependent and independent variables (Ivankova et al.2011:263b).

3.3 Study area

This research was based on dive sites in South Africa, within the KwaZulu-Natal Province. The sites selected for this study were Umkomaas and Umhlanga, South Africa. These two dive sites were chosen because they are in close

proximity to the researcher, and these were the two dive operators who agreed to participate in this study.

Umkomaas: The Aliwal Shoal, located in Umkomaas, is a stony reef which is the remnants of an archaic sand bank roughly 5 kilometres off the coast of KwaZulu-Natal, South Africa. The reef is populated by many hard and delicate corals and a variety of tropical and subtropical fish groups. They offer reef, shipwreck and shark dive charters, scuba training and shark cage snorkeling, and here you can expect to dive with Ragged Tooth Sharks, Tiger Sharks, Manta Rays, Dolphins and Whale Sharks.

Umhlanga: A breath-taking assortment of tropical fish and coral reefs are spread along the Umhlanga coastline, producing an excellent diving and snorkeling destination. Umhlanga offers some surprising diving, from shipwreck diving and rockyreef formations that take you through exciting canyons to patch reefs over sparkling white sand. Marine life is far from lacking, with an abundance of invertebrates and crustaceans, reef fishes that thrive, and the chance encounter with an apex predator in the form of the Zambezi shark.

3.4 Population

The research consists of three populations: dive instructors, dive tourists and dive center owners. According to Roy (2019), a population is a complete collection of observations to be studied. Sekaran and Bougie (2016) describe a population as the entire group of individuals the investigator wishes to examine. The following table indicates the population size for each category of respondents to be included in the study. Below are the population sizes used in this study of people that were involved inthe collection of data via interviews and questionnaires.

Table 3.1: Population size

Dive Centre	Dive tourists	Dive instructors	Dive centre owner/s
Aliwal Dive Centre	250-300	1	2
Umhlanga Scuba	150-250	6	1

Source: Authors' compilation

3.5 Sampling method and sample size

A sample is a representation of the population to observe so that one can estimate something about the whole population (Thompson 2012). According to Sekaran and Bougie (2016) the reason for sampling is that research involves many elements. So,it would only be possible to examine some elements. In this case, the researcher usedthe convenience and saturation sampling methods. In this study, the researcher refersto 0Krejcie and Morgan (1970) sample size table to determine an appropriate samplesize from a predetermined population. Based on the tables of detriments, a minimum sample size of 242 participants was deemed adequate to conduct this study.

3.5.1 Dive instructors and dive centre owners

Purposive and convenience (census) sampling will be adopted to include seven dive instructors and three dive centre owners in the study. Purposive sampling is confined to the categories of people who can offer the preferred information, either for the reason that they are the only ones who have it or since they adapt to certain principles set by the investigator (Sekaran and Bougie 2016:248). In this instance, it would be explicitly aimed at dive instructors and dive centre owners.

3.5.2 Dive tourists

The sampling method chosen for this population is convenience (census) sampling. According to the dive centres chosen for this study, approximately 650 dive tourists form part of the database of these centres. This figure was derived from the total number of dive tourists from both dive centres combined. A minimum sample size of 242 dive tourists was targeted for this study per Krejcie and Morgan's (1970) table for deciding the sample size for a particular

population. The dive centre owners were reluctant to disclose the contact details of these dive tourists. However, they have agreed to have the online survey questionnaire administered to all dive tourists on their database. The COVID-19 pandemic, which was at its peak during the time of thisstudy, resulted in limited tourism activity at the time. It was therefore not possible to hand out questionnaires directly to tourists. The online survey questionnaire was therefore selected and given that the owners have a database of contact details of dive tourists, the dissemination of the online will be made possible. Quantitative and qualitative methods will also be used to analyze the data obtained from these questionnaires.

3.6 Measuring instruments/ data collection tools

A measuring instrument is a general term researchers use for measurement devices. They are utilized by researchers to assist in the evaluation or assessment of subjects. The methods are used to measure or collect data on a range of variables.

Table 3.2: Data collection instruments

Population	Measuring Instrument
Dive Tourists	Structured online questionnaire
Dive instructors and dive centre owners	Semi-structured interviews

Source: Authors' compilation

3.6.1 Structured Questionnaire

The data from dive tourists was compiled utilizing online survey questionnaires. The dive centre owners have a database of dive tourists. The researcher will forward the questionnaires to the dive centre owner, who will forward them to the dive tourists. The owners have agreed to assist with administering the questionnaire in this way. Given the current COVID-19 pandemic outbreak, there are restricted tourism activities, and it was not possible for the researcher to administer the survey directly to tourists. Theonline survey was the most suitable method to use during this period. According to Cargan (2007:117), self-

administered online questionnaires have numerous advantages. Questionnaires can be collected after completion within a short period, and respondents from a wide geographical area can be easily targeted. The questionnaire contained a mix of scaled and open-ended questions, focusing on dive tourist's demographical data and diver's environmental behaviour and environmental impacts. The structured questionnaire was piloted to 15 divers and was adjusted based on the feedback from the pilot study.

3.6.2 Semi-structured interviews (dive instructors and dive centre owners)

Semi-structured interviews were conducted via video call (MS Teams, Zoom) with the Dive instructors and dive centre owners. Using an interview approach, participants were asked open-ended questions to meet the research objectives efficiently. Semi- structured interviews allowed the researcher to retrieve as much information as possible and provide answers to uncertainty immediately. There was also greater flexibility in this method because it allowed the interviewer to rephrase questions to enhance understanding of the question (Sekaran and Bougie 2016). Dive instructors were chosen for this part of the data collection because they are the ones relatively responsible for educating the dive tourists on dive etiquette to ensure everything runs smoothly on the dive and that the dive tourists are aware of what is acceptable and not. They are responsible for leading the dives with groups of dive tourists and can comment on what they observe while underwater. Dive centre owners were interviewed to gain insight from the organisation owner's perspective in terms of environmental sustainability. The key themes in the interview were the challenges owners and instructors face in diving, the environmental impacts/ sustainability produced by socio-economic circumstances, and their responses to overcoming them. The recruiting of the dive instructors and dive centre owners was confirmed as the researcher had already chosen two dive centres on which this study was based in terms of participant responses. The researcher contacted the relevant persons from each dive centre and explained the process and the study and obtained their permission to participate in the study.

3.7 Data analysis

Data collected from the online questionnaire will be analyzed using the 'Statistical Package of the Social Sciences (SPSS). Measuring levels were a

combination of nominal and ordinal scales. Data was illustrated in the form of graphs and tables. The key sections of the questionnaire were demographic profiles of the respondents, theirdiving awareness, diving principles, diving rules and regulations, attitudes towards conservation principles and the assessment of the impact of diving. The qualitative data was analyzed using Thematic Content Analyses using texts and interview transcripts. The researcher closely analyzed the qualitative data and deduced common themes and patterns of meaning, which was then incorporated into the dataanalysis text. Mixed methods consist of the deliberate compilation of both quantitativeand qualitative data and the blend of the strengths of each to answer investigation questions, and therefore this approach was adopted in this study.

3.8 Validity and reliability/trustworthiness

Validity is an assessment of how well a tool that is established measures accurately the idea it is expected to measure (Sekaran and Bougie 2016). To ensure validity, content validity will be adapted. Subject matter validity guarantees that the gauge incorporates an ample and descriptive set of elements that utilize the theory (Sekaran and Bougie, 2016). Reliability is a measure that indicates the degree to which it is without bias (error free). Reliability indicates the steadiness and uniformity with which the instrument measures the notion and aids in assessing the integrity of a measure (Sekaran and Bougie, 2016). Data was collected with extra caution to ensure minimal errors. Tools used for data capturing and analysis prove reliable due to the popularity of the software used in research. Repeat measurement was used to promote the reliability of the outcome. The growth or degradation of the dive industry will be more apparent once different studies have been compared to this current study. Trustworthiness within the research from a qualitative point of view will be consideredand valued in terms of respondent confidentiality.

3.9 Ethical considerations/ anonymity and confidentiality

Information given by the respondents will remain confidential and their identities. Personal information will not be solicited, and should it need to obtain personal information, and it will be tapped with high sensitivity. No one will be forced to respondto the questionnaires and interviews without their consent or willingness.

There will be no falsification or misrepresentation in describing the data compiled for the duration of the study.

3.10 Conclusion

This chapter intended to uncover elements of the research design that were used to put together the methodology to unravel the research problem and address the aim and objectives of this study. Tools such as the questionnaire and structured interviews were designed systematically, coherently, and methodically. They were used to explore stakeholder opinions on the subject of "The nature of dive tourism in KwaZulu-Natal and its impact on environmental sustainability". Empirical questions set up in this study were solved using the mixed methods research design. The chapter also explored and refined elements of the research design, including sampling technique, questionnaire design, data analysis, reliability, validity, and ethical issues. The following chapter will discuss the presentation, interpretation, and discussion of results.

CHAPTER FOUR: DATA PRESENTATION, INTERPRETATION ANDDISCUSSION OF RESULTS

4.1 Introduction

The preceding chapter identifies and justifies the research methodology and design elements. This chapter discusses the data analysis and results for the study in the context of the study's aim and objectives. This chapter will begin by discussing the characteristics of the respondents in terms of gender, age, race, dive certification level, occupation, frequency of beach visits and the activities that the respondents partake in. Results on the respondent's dive ethics, general environmental education on diving, and understanding of the dive industry will then be discussed.

4.2 Profile of dive tourists

This section required the respondents to indicate their demographic profile in terms ofgender, age, type of tourist, nationality, and current level of education. Moreover, thissection will discuss the diving behavior of respondents.

4.2.1 Socio-demographic characteristics of dive tourists

Most respondents (52.4%) were female, and 47.6% were male. In terms of the age ofthe respondents, 46.6% were between the ages of 26-35 years old, 24.3% were between the ages of 36-45 years old, 11.7% were between the ages of 46-55 years old, 10.7% were between the ages of 56-65 years old and 6.8% were more than 65 years old. According to Mundet and Ribera (2001), the reason for this can be associated with the fact that diving requires a specific level of financially able individuals (which is not always attainable by the younger group) as well as a physical fitness level which is not always commonly found among the elder groups. Accordingto PADI (2022), the minimum age to dive is ten years old. All Dive center owners andmajority of instructors were male. Divers younger than 15 years old fall into the PADI Junior Open Water Diver certification category, which upon reaching 15 years, they may upgrade to the PADI Open Water Diver certification. Parent or guardian permission is required to enroll children under 13. However, the maximum age for diving is debatable, although PADI states that there is no required maximum age. Themaximum age for diving

may vary from 60-80 years. Depending on specific country rules and regulations, some dive destinations will not allow an 80+-year-old to dive.

The key factor for divers 45 years old and above should be that they are in excellent physical and mental health (PADI, 2022). All Dive center owners were above the ageof 45 and dive instructors were between the ages of 25-45 years old.

Table 4.1: Socio-demographic characteristics of dive tourists in KwaZulu-Natal

Dive tourist characteristics		Frequency	Percent
Gender	Male	49	47.6
	Female	54	52.4
Age group	26-35 years	48	46.6
	36-45 years	25	24.3
	46-55 years	12	11.7
	56-65 years	11	10.7
	More than 65 years old	7	6.8
Race	African	1	1.0
	Indian	9	8.7
	White	93	90.3
Occupation	Employed	76	7.3
	Pensioner	7	6.8
	Student	12	11.7
	Unemployed	8	7.8
Level of education	Bachelor's degree	44	42.7
	Certificate	7	6.8
	Diploma	23	22.3
	High school	15	14.6
	Masters	8	7.8
	Other	6	5.8

In terms of the racial composition of respondents, the majority (90.3%) were White, 8.7% were Indian, and 1.0% of respondents were African. According to a demographicanalysis conducted in 2018 by the Diving Equipment and Marketing Agency (DEMA), a mere 11% of divers nationwide are Black. An article titled *"The diving industry. Our future depends on making them uncomfortable"*, stated

that the dive industry has been run and run majorly by white folk. Aliwal consisted of white dive center owners whereas Umhlanga Scuba is owned by an Indian. Among both centres, majority of the instructors were of White ethnicity whilst the balance was African. Post-covid brought about many challenges; the most popular was business survival in terms of finances. This immediately brought about thoughts and ideas to be more open-minded and invite people of other races and cultures to join the dive industry to be more diverse and stay afloat (Griffin, 2022).

With regards to the occupation status of the respondents, 73.8% were employed, 6.8% were pensioners, 11.7% were students, and 7.8% were unemployed. The data further revealed that more than half of the respondents (50.5%) have a postgraduate degree,6.8% have a certificate, 22.3% have a diploma, and 14.6% completed high school. The majority (84.5%) of the respondents were residents, and 15.5% were tourists, of which 2.9% were international tourists and 14.6% were local tourists. The data indicates that 1.0% of international tourists were American, 1.0% were Canadian, and 1.0% were Zimbabwean. All dive center owners had an education further than a diploma. Instructors stated that they have been employed for more than 1-2 years.

4.2.2 Respondents' diving behavior

This section required the respondents to provide information about where they usually dive, how many years they have been diving in certain areas, their number of logged dives, and their current diving certification.

Table 4.2: Characteristics of diver behaviour

Characteristics of diving behaviour		Frequency	Percent
Usual diving location	Aliwal	43	41.7
	Umhlanga	7	6.8
	Both	21	20.4
	Other	32	31.1
The number of years diving inKZN?	Less than a year	19	18.4
	1-3 years	26	25.2
	4-6 years	15	14.6
	7-9 years	6	5.8
	10-12 years	5	4.9
	More than 12 years	32	31.1
Current diving certification	Other	4	3.9
	Dive guide	12	11.7
Diver level	Rescue diver	12	11.7
	Dive instructor	14	13.6
	Beginner	21	20.4
	Advanced	40	38.8
The number of logged divesto date? (KZN)	11-15	3	2.9
	16-20	7	6.8
	5-10	7	6.8
	Other	10	9.7
	Less than 5	17	16.5
	More than 20	59	57.3
The number of logged divesto date? (Umhlanga)	16-20	2	1.9
	5-10	5	4.9
	Other	5	4.9
	More than 20	27	26.2
	Less than 5	64	62.1
The number of logged divesto date? (Aliwal)	11-15	6	5.8
	16-20	6	5.8
	5-10	10	9.7
	Other	10	9.7

	Less than 5	28	27.2
	More than 20	43	41.7
Average dive duration basedon a single dive?	1 hour	42	40.8
	More than 3 hours	2	1.9
	2 hours	2	1.9
	3 hours	6	5.8
	30 minutes	17	16.5
	45 minutes	34	33.0
	1 hour	42	40.8
What is the best time in theyear to dive into KZN?	Spring (August- mid-October)	10	9.7
	Winter (May- July)	21	20.4
	Autumn (Mid-February-April)	26	25.2
	Summer (Mid-October-February)	46	44.7

The findings from Table 4.2 reflect the diver's diving behaviour and characteristics. Respondents dive at various sites in KwaZulu-Natal, such as Aliwal (41.7%), Umhlanga (6.8%), and both Umhlanga and Aliwal (20.4%). Respondents also used other dive sites in the province (31.1%). The study confirmed that most respondents dive at Aliwal, which according to SA-venues (2020), is rated one of the world's top 10dive sites. Aliwal Shoal boasts its beauty above and beneath its surface as it attracts visitors from across the globe. Aliwal Shoal is accommodating to every level of diver. Although the site is widespread throughout the year, it is prevalent during the winter due to the humpback whale migration, which attracts many divers due to the sound of the migration. A large proportion of Aliwal divers (41.7%) confirmed having more than 20 confirmed logged dives to date, while 27.2% claimed to have less than five logged dives. Dive center owners have indicated that their best times of business is during the summer months and whenever a diver requires new dive gear, as table over the years have become expensive.

A lesser proportion of respondents (6.8%) indicated that they dive at Umhlanga. This may be attributed to the fact that Aliwal Shoal is made up of an 80,000-year-old duneand has been selected as one of the top 10 dive sites in the world, offering everythinga diver would expect on a dive. As a diver, you would be able to experience the presence of ragged tooth sharks, Tiger sharks and Hammerheads at this location (Cortelezzi, 2022). The data regarding the number of logged dives in Umhlanga indicates that overall, 26.2% of respondents had more than 20 logged dives, and 62.1% had less than 5 logged dives.

The data reveals that respondents had varied diving experience in terms of years. Most respondents (31.1%) had more than 25 years of diving experience, 25% had between 1 to 3 years of experience, and 18.4% had less than one year of diving experience. Moreover, 38.8% of respondents said they were at the advanced diving stage, 20.4% said they were beginners, 11.7% were dive guides, 13.6% were dive instructors, and 11.7% were rescue divers. Advanced dive certification means divers can now dive at a depth of 100 feet/30 meters as

opposed to beginners, who are only allowed to dive up to 10 meters (Anon, 2021). According to PADI (2022), to become an advanced diver, you must take an eLearning course as an independent study ranging from 6-8 hours. This course includes collaborative courses on 13 popular specialty dives: Boat, altitude, drift, digital underwater imaging, fish ID, dry suit, buoyancy, night, wreck diving, underwater naturalist, and search and recovery. Secondly, you are required to perform the physical aspect of the dive. This is performed with an instructor in a pool setting and includes five dives: a deep dive below 18m/60f, a navigation dive, and three specialty dives. In turn, you will gain experience discovering your diving abilities while building your confidence. The duration of this course is usually 3 to 4 days (PADI, 2022).

The duration of a single dive amongst respondents varied. Most respondents (40.8%)indicated that their dive duration was one hour, 1.9% stated that it was 2 hours, 5.8%said 3 hours, 16.5% said 30 minutes, 33.0% stated 45 minutes and 1.9% said more than 3 hours. When asked which was the best time in the year to dive in KZN, 25.2%indicated Autumn, 9.7% said spring, 44.7% said summer and 20.4% said winter. The possible reason for this outcome is that KZN was never known for its dive destination popularity. Hence operators would seldomly use it as a site. However, over the years, conditions have become relatively decent throughout the year, although the best time to dive here would be between November and February, which are the summer months. Boshoff (2022) states that summer land temperatures are inviting at 17-30 degrees Celsius, winter land temperatures vary between 11-25 degrees Celsius, and summer water temperatures are 20–25-degrees Celsius while winter water temperatures are between 15-20 degrees Celsius. KZN has beautiful shipwrecks and reefs, which become even more eye-catching when viewed during the correct period and in comfortable water temperatures.

4.3 Environmental behavior of dive tourists

This section required the respondents to indicate their knowledge and views on certain diving practices, marine environmental damage, and ethical, environmental practices.

4.3.1 Divers environmental knowledge and awareness of diving practices

The findings from Table 4.3 reflect the respondent's environmental behaviour in diving. Most (92.2%) of the respondents stated that protecting the marine environment from environmental damage is very important, and 5.8% stated it is relatively significant. Protecting the marine environment could range from several things/practices. Anon (2019) states that divers are aware that their actions could harm the environment, and the savvier divers would make the most effort to try and practice conservation and minimize their impact. Protecting the marine environment could be checking that your equipment is not broken or faulty before a dive, monitoring your buoyancy, picking up floating trash along your dive and doing extensive research before a dive to know what to expect underwater (Anon, 2019). Dive center owners and instructors stated that it is a requirement that the divers attend a pre-dive brief to ensure the above is adhered to. Most respondents (89.3%) stated that they were aware of certain negative environmental impacts of specific diving practices on the environment. Respondents were made aware of such environmental impacts via a dive instructor (35%), social media (25.2%), their research (9.7%), colleagues (5.8%) and newspapers and magazines (2.9%). Instructors stated that not all divers are aware of the environmental impacts of diving and these divers fall under the beginners or inexperienced dive category. According to Senger (2009), as a dive instructor, there is no one else who would better suit the role than to teach and convey the proper information to learner divers who will learn to dive based on this; therefore, the more experience the instructor has in teaching, he or she will have a greater understanding of how to masterit, hence allowing for an effortless teaching technique. Dive center owners stated that they make it their duty to educate their staff and instructors on the updated laws and regulations surrounding diving as this retains their reputation and aids in conservation. Instructors indicated that are always up to date with the do’s and dont’s of the sport as they are ultimately responsible for the diver’s behavior and knowledge whilst on the dive. The importance of social media in terms of awareness is that if it is appropriately used, accurate information can reach the correct target audiences, people become more knowledgeable and positive word of mouth is

spread (Simplilearn, 2022).

Table 4.3: Environmental behavior of divers

Characteristics of divers based on environmental behavior		Frequency	Percent
How important is it that the marineenvironment is protected from environmental damage?	Fairly important	6	5.8
	Important	1	1.0
	Not at all important	1	1.0
	Very important	95	32.2
Have you been aware of the impacts of certain diving practiceson the environment?	Yes	11	10.7
	No	92	89.3
If yes to the above, how were youmade aware of such impacts?	Colleagues	6	5.8
	Dive instructor	36	35.0
	Newspaper/Magazine	3	2.9
	Other	12	11.7
	Own internet research	10	9.7
	Social media	26	25.2
When participating in KZN, have you always been briefed by the diveoperator's pre-dive?	Yes	89	86.4
	No	14	13.6
Were you briefed on safety issues?	Always	90	87.4
	Never	1	1.0
	Sometimes	12	11.7
Were you briefed on environmentalissues?	Always	51	49.5
	Never	10	9.7
	Sometimes	42	40.8
Are you familiar with the ethical and environmental practices whilstdiving	Yes	101	98.1
	No	2	1.9

The study confirmed that most of the divers (86.4%) always received a pre-dive briefing. Of these, 87.4% stated that they received pre-dive briefings on safety issues. Approximately half of the respondents (49.5%) confirmed that they 'always' have pre-dive briefings on environmental issues, while 40.8% stated that they received pre-dive environmental briefings 'sometimes.' The data demonstrates that 98.1% of the respondents are familiar with ethical and

environmental practices while diving, and 1.9% are not. All instructors indicated that they were responsible for a pre and post dive briefing to ensure all divers are aware of the impacts of their actions. Dive center owners stated that there is a form which needs to be signed by the diver before commencing with the dive which indicates that they have been briefed and all rules and regulations have been explained thus not holding the center accountable for any defaults conducted by the diver. As a diver, being ethical underwater and above water means that you are to be in harmony with the ocean, not damage the marine ecosystem, and respect the sea life. What you would not do on land- do not do underwater, and you do not force your way into touching sea life that does not want to be encountered- because a good diver knows that if a creature enjoys confrontation, they will come back for more (Halstead, 2017). A diver must know that he or she should contribute to protecting the environment. Every diver should be fully aware of the most important aspects of diving in terms of sustainability; these are never touching any corals or marine life, never leaving any items behind underwater (what goes down must come back up), and proper buoyancy control a must to avoid unwanted problems whilst on the dive (The Scuba Page, n.d.). Dive instructors should be very alert on dives and report any destructive behaviour of the divers/tourists. This will contribute tokeeping irresponsible divers out of the water and further protecting the marine environment. Instructors stated that whilst on dives, they prefer to correct the wrong doings of the divers there and then before permitting it to continue and cause further harm to the environment. This was stated to be a better way for the diver to learn in the moment as they continue to dive. Dive the ocean (2011) states that minimal effort is required to provide to environmental awareness, as some good old common sensegoes a long way. Taking underwater writing equipment on the dive is also a good idea, as the diver can document any environmental issues along the way.

Table 4.4: Diver's level of environmental awareness and knowledge of environmental practices

Dive practices	Not aware	Somewhat aware	Very aware
Breathe continuously	5.8%	1.0%	93.2%
Keep your hands to yourself when encountering marine life	1.0%	3.9%	95.1%
Do not apply reef-damaging sunscreen before diving	7.8%	30.1%	62.1%
Ensure that you are familiar with your dive gear	1.0%	2.9%	96.1%
Ensure that your gear is secure	1.0%	3.9%	95.1%
Chumming affects the marine environment	7.8%	29.1%	63.1%
Gear that goes down must come up	1.0%	2.9%	96.1%
Prohibitions of the touching and handling of coral reefs	1.0%	3.9%	95.1%
No spearfishing	13.6%	18.4%	68.0%

Table 4.4 reflects the data on the respondent's level of awareness and knowledge of environmental practices. Overall, respondents were aware of most practices and, to a lesser extent, of the effects of chumming and the impact of reef-damaging sunscreen. According to Godoy (2022), chumming can harm the marine environment because this technique includes throwing live bait and bloody water overboard in the hopes of attracting fish. This technique is not natural and changes the behaviour of the fish. Instead of allowing the fish to hunt for their food naturally, this encourages them to create a 'pack' mentality which can damage the ecosystem. Dive center owners stated that chumming in their organizations were used only when fishing expedition charterswould be booked, and not used for diving. Breathing continuously whilst diving is essential for the diver's safety and efficiency. Holding their breath will not prolong his/her dive. It will merely increase the carbon dioxide in the lungs, which will have him/her feeling starved for air (Gibb, 2019). Instructors indicated that one of the must haves on the dive is extra oxygen tanks as a precautionary measure of preventing therunning out of additional air. A diver should never touch marine life because some animals have spines that are not visible to the naked eye, which can be very fragile and harmful if mishandled. Besides being fragile, most marine animals like corals and fish have layers of mucous covering their bodies which act as anti-bacterial screens which help them fight infections and keep them

healthy, so when they are picked up or touched, it removes this layer, making them vulnerable to health issues (Rutger, n.d.). Dive center owners and instructors indicated that whilst on dives, there is a no touch policy within their organization, and this helps to keep the ecosystem in place and prolonged. James (2022) states it takes one drop of most sunscreens in 15 million liters of water to damage a reef. Therefore, places such as Hawaii and Thailand have banned certain sunscreens.

Devanney (2016) believes that diving awareness can be broken down into three segments- namely, self-awareness which refers to you as a person- your mindset and acknowledgement of your equipment. Global awareness refers to your attention spanas a diver and being consciously aware of where and what you are performing on the dive, and finally, situational awareness which speaks to the diver knowing when to stop the dive and knowing when they have gone over the limit or acknowledging a close to finish mark. These segments all contribute to the dive industry's required future actions and sustainability.

4.3.2 Divers awareness of Marine Protected Areas (MPAs)

The following section will show results based on when respondents were asked about MPAs and their awareness surrounding them and the sustainability of the environment due to the presence of MPAs. An MPA is a section of the sea on which the governmenthas placed a limit. Many MPAs allow human activity such as diving, swimming and other activities which do not involve damage to the environment. Some MPAs ban fishing and do not permit human activity (National Geographic Society, 2022). MPA's were established to protect the ecosystems that posed a threat of extinction.

Table 4.5: Awareness of MPAs

Statement	Yes	No	Unsure
Are you aware of what an MPA is?	91.3%	4.9%	3.9%
Creating more MPAs will contribute to environmental sustainability	89.3%	3.9%	6.8%
Have you dived at an MPA location?	88.3%	3.9%	7.8%
If yes to the above, were you required to produce a valid dive permit?	77.7%	13.6%	8.7%

Table 4.5 indicates the awareness of MPAs amongst divers. Most respondents (91.3%) were very aware of an MPA, and 89.3% favored having more MPAs to help contribute to environmental sustainability. While 88.3% of respondents have dived at an MPA location, 13.6% were unaware that a valid permit was required. The goals ofan MPA may differ based on the site's location. However, the main constant goal is to protect and preserve a particular habitat. Some MPA's may focus on conserving historic shipwrecks, others may focus on ensuring that resources do not run out and are sustainable by requiring permit access, whilst others may be established to support the variety of life the site may contain (National Geographic Society, 2022).

Cape Town Magazine (2022) states that in 2004, the South African government announced that they would declare 5 MPAs. These include the Aliwal Shoal (adjacent to Umkomaas, KwaZulu-Natal), Namaqualand (Northern Cape), Bird Island (Algoa Bay), the coastal and marine environment adjacent to the Pondoland (Eastern Cape)and the Cape Peninsula (Western Cape). These five anticipated MPAs result in 19% of South Africa's coastline falling within a protected area. In order to be allowed to dive legally into these MPAs, an MPA permit would be required. Permits are attainable from your local post office at a fee of R75, valid for 12 months. Alternatively, you could purchase a temporary permit from your local dive shop for a fee of R45, valid for one month. An identification card/book is required along with your annual or temporary permit to be allowed to dive (Cape Town Magazine, 2022). Aliwal operators stated thatthey were lucky in the sense that Aliwal Shoal is an MPA. They indicated that the

divers who dove here were knowledgeable regarding the regulations and all divers possessed permits.

4.4 Perceived impacts of dive tourism on the marine environment

This section summarizes the impact factors that the respondents consider when diving. Respondents were asked to rate the level of impact based on specific statements.

Table 4.6: Impacts of diving on the environment

Diving impacts	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree	Mean
Walking can cause seabed damage.	5.8%	11.7%	15.5%	31.1%	35.9%	3.83
Negligent use of dive equipment can cause harm to the environment.	12.6%	7.8%	9.7%	42.7%	27.2%	3.67
Sunscreen affects marine life.	9.7%	12.6%	35.9%	26.2%	15.5%	3.29
Diving causes damage to coral life	13.6%	7.8%	44.7%	21.4%	12.6%	3.09
Dive groups of 5 or more can be harmful	15.5%	30.1%	34.0%	15.5%	4.9%	2.68
Photography damages marine flora and fauna	21.4%	46.6%	22.3%	7.8%	1.9%	2.26

Table 4.6 reflects the impacts of diving on the environment on a scale from 1 to 5, where '1' reflects 'strongly disagree' and '5' reflects 'strongly agree'. The mean scores confirm that most respondents agreed (mean=3.83) that walking causes damage to the seabed, the negligent use of dive equipment damages the marine environment (mean=3.67), and sunscreen affects marine life (mean=3.29). The data shows lesser levels of agreement with diving causing damage to coral life (mean=3.09), dive groups of five or more can be harmful (mean=2.68) and photography damages marine faunaand flora (mean=2.26).

According to The Reef-World Foundation (2020), coral reefs are susceptible to damage by divers because they are living organisms. Divers who are not weary of their surroundings usually cause coral to become damaged and break off due

to either touching or kicking them. In addition to this, when sand is kicked underwater, not only can it cover and smother the reefs causing extensive damage, but it also causes damage to the seabed. A study conducted by Siladen Resort and Spa (2022) states that underwater photography is an exciting and gratifying way of enhancing your dive experience and showing friends and family what you have been up to on your dive. However, the drive to get the perfect shot usually harms the reef and the marine life inhabiting it. Most divers entice marine life to get movement for the perfect shot, which is known as critter manipulation. There is a substantial indication that this can cause considerable stress and alter the animal's behaviour (Siladen Resort and Spa, 2022). Dive instructors have indicated that they noticed the most damage occurring due to divers touching and not being able to control their buoyancy levels, disrupting marineecosystems by underwater photography.

According to Matt (2013), diving looks relatively easy if you are a bystander hoping to do the same. However, looks can be deceiving, as it is tricky if you are unfamiliar with your dive gear and equipment. Each little gadget and accessory have a specific purpose in helping to make the dive successful. If the diver is not familiar with their gear, or the uses of the gadgets, the dive is bound to go wrong, resulting in underwater damage and disturbances to marine life. A study by De Brauwer (2018) states that dive tourism is a resource of sustainable revenue for several coastal neighborhoods but can also cause damage to the reef infrastructure. De Brauwer (2018) further states that it is vital for management authorities to properly manage these dive sites and diverbehavior to minimize the impact imposed. Dive center owners have expressed their concern regarding both dive sites being poorly managed in terms of governments laws and regulations in terms of a lack of monitoring the sites to prevent unwanted individuals and access into restricted areas. Owners have also stated that if these sites were managed thoroughly, the sustainability and status of the locations would be easier to track. Divers who practice dive photography are more likely to damage the environment as they are the ones who touch marine life the most. Their camera flashlight disrupts the ecosystem, which causes the animals to stress and requires management authorities to conduct research in the area (De Brauwer, 2018). Instructors have indicated that they do not promote individual

underwater photography, however, they take their own photography equipment along on the diveand film the entire dive which is then available for sale to those who wish to purchaseit post dive, this in turn supports the dive center financially. According to Mellen (2021), getting to know every little aspect of your dive gear would make you a responsible and safe diver. You should be familiar with your equipment, from your regulator, the different hose pipes it contains, the air tank/cylinder, and your dive computer to your fins and face mask. She further states that one should be prepared to pay money for proper and reliable dive equipment and gear. Instructors have mentioned that an introductory dive explanation is conducted before divers get onto the boat.

4.4.3 Level of degradation in terms of biodiversity/health of the dive site inKwaZulu-Natal

Table 4.7 presents divers' perceptions of the level of degradation at the dive sites in KZN according to various characteristics. A scale from 1 to 4 was used to present the data, where '1' relates to high degradation and '4' relates to no degradation. The mean scores are used to discuss the findings for this variable. As depicted, divers perceived the highest level of degradation was related to the presence of game fish (mean=2.33) and crustaceans (mean=2.35). The lowest perceived degradation was related to the presence of small fish (mean=2.67) and water visibility (mean=2.64).

Table 4.7: Level of degradation of the dive sites in KZN

Characteristics of thedive site	1 (High degradation)	2 (Medium degradation)	3 (Low degradation)	4 (No degradation)	Mean
The water quality	15.5%	28.2%	38.8%	17.5%	2.55
The water visibility	7.8%	35%	39.8%	17.5%	2.64
The aesthetic appearance of the coral	7.8%	45.6%	33%	13.6%	2.51
Presence of crustaceans	23.3%	32%	33%	11.7%	2.35
Presence of small fish	11.7%	26.2%	45.6%	16.5%	2.67
Presence of game fish	16.5%	44.7%	29.1%	9.7%	2.33
Presence of predators	14.6%	33%	42.7%	9.7%	2.47
Presence of mammals	14.6%	34%	37.9%	13.6%	2.49
Presence of reptiles	10.7%	35%	42.7%	11.7%	2.54
Other	12.6%	17.5%	30.1%	39.8%	3.00

To a lesser extent, respondents found degradation around water quality (mean=2.55), the presence of reptiles (mean=2.54), the appearance of coral (mean=2.51), the presence of mammals (mean=2.49), the presence of predators (mean=2.47) and other(mean=3.00). PADI (2022) states that KZN is well known for its marine biodiversity, which includes bright, soft corals, large schools of pelagic fish, starfish, seahorses, and anemones. KZN is therefore known for its endless summers and blue, crystal clearwarm Indian ocean currents, which make this divers paradise. South Africa's coral reefs have come to be endangered due to contamination, overfishing and acidification.

With 10% of the coral reefs already becoming extinct worldwide and 60% presently vulnerable, management authorities have declared all South Africa's coral reef sites as MPA's (Living Water, 2019). The majority (33%) stated low degradation of the presence of crustaceans and 45.6% of respondents said there was low degradation in the presence of small fish. The majority (42.7%) of respondents said there was low predator degradation. Anon (2021) states that the coast of KZN is a diver's paradise due to all the sea life and activity one can experience on just one dive. The cooler months are welcome in the Sardine

Run, which brings with it whales, sharks, and birds. A major attraction on Aliwal Shoal is the famous 'Raggie cave ', which allows divers to swim among numerous ragged tooth sharks (Anon, 2021). Dive center owners indicated that the above-mentioned events are pea times which require extra attention to sustainability and management of the locations. They stated that additional temporary staff are hired during these times to assist with day-to-day operations and allows for extra sets of eyes to monitor divers whilst out on dives, ensuring manageable sustainability.

4.5 Measures on how dive tourism can contribute to environmental sustainability

This section required the respondents to confirm their knowledge of measures relatingto the environmental sustainability of the dive industry.

Table 4.8: Measures to ensure environmental sustainability

Whilst on your dive where you briefed on the following:	Yes	No	N/A
Not to litter whilst out at sea	82.5%	15.5%	1.9%
No feeding the fish	74.8%	22.3%	2.9%
No collecting marine life	91.3%	7.8%	1%
Do not chase or touch the marine life	93.2%	5.8%	1%
Whether or not the site was an MPA	81.6%	11.7%	6.8%
Do not touch or step on coral	86.4%	10.7%	2.9%
Do not interfere with the ecosystem to take pictures	76.7%	19.4%	3.9%

Based on Table 4.8, the majority (93.2%) of respondents said they were briefed on notchasing or touching marine life, and 82.5% stated that they were briefed on not littering whilst out at sea. DiveIn (2009) mentions that a responsible diver knows that everything that goes down must come back up. Concerning no feeding fish, 74.8% said they were briefed on this, and 91.3% of respondents said that they were made aware not to collect marine life. DiveIn (2009) states that a diver should take only pictures and leave only bubbles. This means that a diver should not be picking up shells or rocks because it may seem like it would not make a difference, but this is notthe case when not only one, but thousands of divers do the same- the impact would be greater. Both owners and instructors

stated that in terms of sustainability, divers are required to fill out certain forms before participating on a dive and this ensures that the diver I aware of all the above-mentioned impacts. Many of respondents (81.6%) they were either aware of the site being an MPA or not. The majority (86.4%) of respondents said they were briefed on not touching or stepping on coral, and (76.7%) of respondents said they were made aware of not interfering with the ecosystem for the sake of a picture. DiveIn (2009) states that a good dive technique for divers would be to watch their fins. This will eliminate disturbing the underwater habitat and reduce the risk of accidentally destroying sensitive coral reefs. Instructors stated that once divers are out at sea, the instructor would dive in first to demonstrate to divers how and why certain methods and techniques of dives should be carried out, ensuring sustainability.

4.5.1 Dive sites and environmental conservation

Respondents were asked what they think dive tourism leads to; below are the responses.

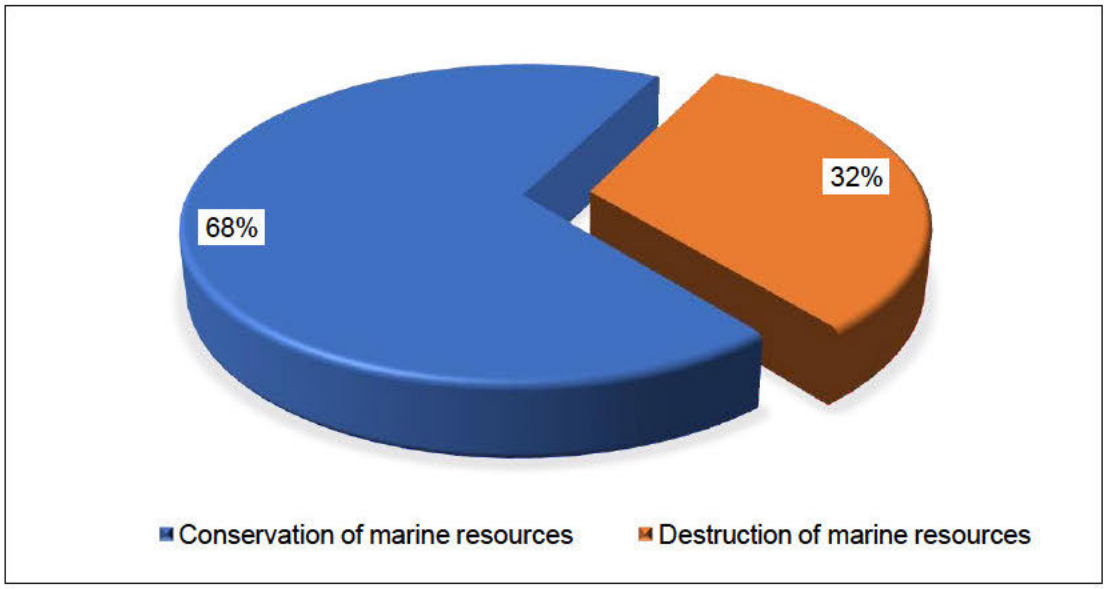

Figure 4.1: Impact of dive sites on marine resources

According to the date presented in Figure 4.1, the majority (68%) of respondents stated that they believed that dive tourism leads to the conservation of marine resources. According to Dieterich (2013), the encouragement of dive tourism to achieve broad-scale conservation of ecosystems warrants the implementation of strategies and increased environmental education, restrictions on tourism, and fines across the global dive arena. Maximizing public awareness and the value of wildlife whilst keeping human impacts at a sustainable level is a challenge that still requires attention. The designing and executing the process of these global dive managementactivities can be a powerful tool to finance the conservation of marine species, supportlocal economies, and provide rich wildlife encounters for divers (Dieterich, 2013).

Respondents were asked to indicate which dive sites in KZN in terms of environmentalconservation. This data is depicted in Figure 4.2.

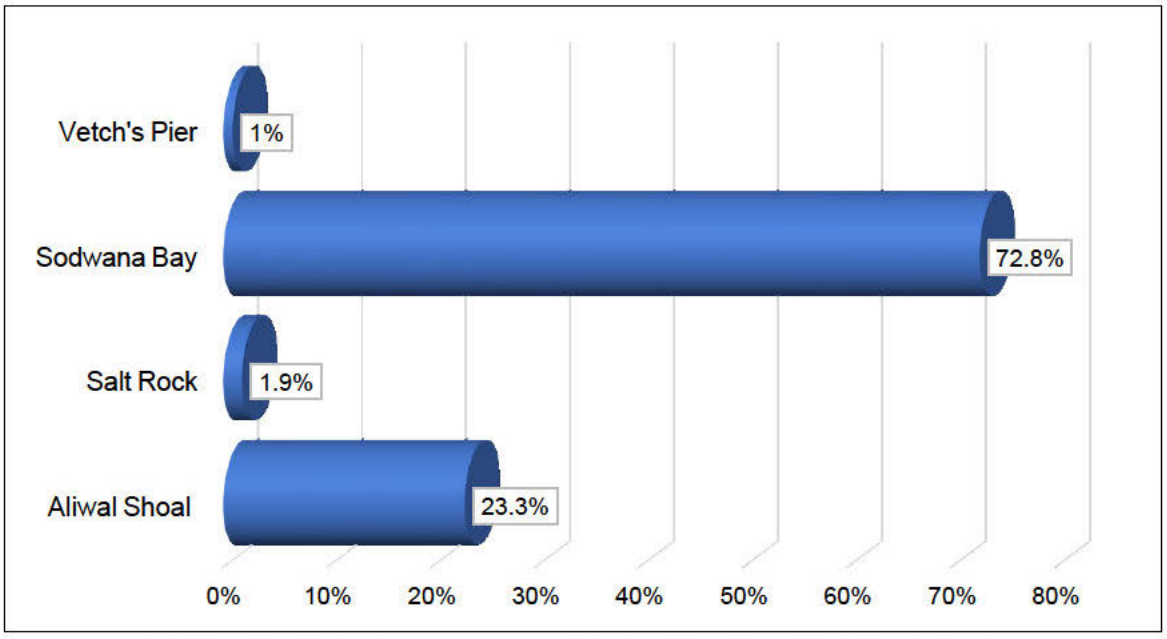

Figure 4.3: The most environmentally sustainable dive sites

According to the above, Vetch's pier as well as Salt rock were included into the options of dive sites as these are in close proximity to each Sodwana and Aliwal Shoal. Figure 4.2 shows that the majority of respondents (72.8%) perceive Sodwana Bay to be the best dive site in terms of environmental conservation. Sodwana Bay is an MPA known for its rich coral and animal life ecosystems.

Few people can travel to get there, so the area is somewhat 'untouched' and preserved. The winter water temperatures in Sodwana Bay have been around 22-23 degrees hence the vis rarely exceeds 30 meters (Timm, n.d). The annual humpback usually migrates past the Sodwana coast for a few months along with its calves. According to Anon (n.d), the park covers 332 000 hectares of property where you can discover no less than eight interconnecting environments, 25000-year-old coastal dunes, more than 2000 plant types, 100 types of butterflies, five turtle species, the top frog total in the country and 526 bird species.Wild dogs, buffalo, oribi, cheetahs, black and white rhinos, lions, and some of the giant Tusker elephants in South Africa can all be found here. Dive owners and instructors stated that the top 3 dive sites in South Africa are: Sodwana Bay, Aliwal Shoal and Port St. Johns.

4.5 Conclusion

Conclusively, the chapter produced study results using SPSS and interview content analysis. Since the purpose of the study is descriptive, the data presented was described, and illustrations were given. The chapter was also devoted to understanding and discussing results. The chapter focused on confirming connectionsbetween the primary and secondary data and the study's goals. In interpreting the data, primary and secondary data were significant factors. The outcome of the data met the aims and objectives of the study successfully. The following chapter focuses on suggestions, recommendations, limitations, future research, and a general conclusion for this study.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The aim of this study on 'The nature of dive tourism in KwaZulu Natal and its impact on environmental sustainability was to examine the impact that diving has on the sustainability of the environment. This chapter will represent the conclusions from the data analyzed, and recommendations will be provided concerning the study objectives. The structure of the chapter is described according to the below critical objectives of the study:

- To examine the profile of dive tourists in KwaZulu-Natal regarding their socio-demographic traits and environmental conduct.
- To ascertain the level of awareness and knowledge of dive tourists on the sustainability of the diving environment in KwaZulu-Natal.
- To explore the visual effects of dive tourism on the marine ecosystem in KwaZulu-Natal.
- To recommend measures on how dive tourism in KZN can contribute to environmental sustainability.

The study's overall results indicate that there is room for improvement with regards to the environmental conservation of dive sites. A large portion of the results provides the pros and cons of diving and the influence on the environment and the industry's sustainability. However, many challenges were realized among the knowledge of divers and dive center instructors. The study also indicated the industry's challenges and the measures that can be established to prevent damage to the marine environment.

5.2 Summary of key findings

This section intends to encapsulate the critical findings of this research with each research objective mentioned above. The intent is to focus on and give answers to the research questions. These findings will make provision for the recommendations andachieve the intention of this study.

5.2.1 Objective one: The profile of dive tourists in KwaZulu-Natal regarding theirsocio-demographic characteristics and environmental behavior.

This objective aimed to examine the profile of dive tourists in KZN about their socio- demographic characteristics and environmental behaviour. This objective helps understand the relationship between the diver's socio-demographic characteristics and environmental behaviour and how it impacts the dive industry.

Divers' socio-demographic characteristics

Most respondents were female, and most were between the ages of 26-35. The reason for the age group of respondents could be because the younger/middle-aged are more fit and can impose a lot more strain on their bodies than the older groups. The bulk of respondents fell within the white race group, and the majority obtained a bachelor's degree. In terms of numbers, the majority of respondents were employed. This could be attributed to diving being an expensive sport. Therefore, one would needto have some income to perform the sport or take it up as a hobby.

The study's outcome can be attributed to most respondents being KZN residents, offering first-hand and accurate information based on their dive experience at the different dive sites. This is also an advantage because this means that these divers have been diving into these two sites on numerous occasions, making it an accurate indication of the impacts of the industry over time.

Divers' environmental behaviour

As discussed in Chapter 4, Aliwal Shoal, compared to Umhlanga, has more advantages in terms of being a popular dive site due to Aliwal having more to offer concerning a dive experience. Therefore, most respondents stated that their usual place of dive is, in fact, Aliwal Shoal and that most respondents have more logged dives in Aliwal as opposed to Umhlanga. Most respondents were advanced regardingcertification, and the majority have been diving for between 1

to 3 years. This indicates that to pass beginner and intermediate levels, one would need to dive for a maximum of 2-3 years to advance to an advanced certification level.

Most respondents indicated that they have more than 20 logged dives in KZN and themajority stated that their average duration based on one single dive was 1 hour. This can be attributed to the excellent weather and ocean current conditions that KZN offers, hence the study found that the majority of divers found that summer is the besttime to dive in KZN.

Divers' environmental knowledge and awareness of diving practices

In terms of the environmental awareness and knowledge of the respondents toward dive practices, the study's results indicated that the divers were best made aware and well-informed of the environmental implications of diving through pre-dive briefings and self-learning. The study confirmed that most divers learned about being ethical and having sustainable dive practices through self-learning and dive instructors pre- and post-dive. This indicates that it is vital for dive center owners to educate their staff(dive instructors) and continue to do so on an annual or monthly basis, as well as offer adequate training and education programmes. This result also emphasizes the importance of the dive instructors' role in educating the dives for a sustainableenvironment.

5.2.2 Objective two: To ascertain dive tourists' level of awareness and knowledge on the sustainability of the diving environment in KwaZulu-Natal.

The aim of this objective was to establish the diver's level of understanding in terms of sustainability towards the dive industry. It aimed to identify how divers perceive dive information about sustaining the dive environment. Most divers highlighted that protecting the marine environment is very important to them. This indicates that because of these beliefs, divers will be savvier whilst diving and keeping in mind the ethical practices taught to sustain the environment.

Most respondents said they were mindful of the negative environmental impacts

of specific dive methods on the environment. This could be attributed to dive centers' strict rules and regulations enforcing education on divers to help maintain the environment. Divers were very aware of the most common dive practices that help sustain the marine environment whilst on a dive. The majority were deeply knowledgeable about what to do and not to do whilst on a dive and were aware of the implications on the marine environment. This indicates that dive center owners are doing an excellent job of educating their staff. Most respondents expressed that they were aware of what an MPA is. Due to this knowledge, divers agreed that creating more MPAs will contribute to environmental sustainability. Most respondents stated that they had dived at an MPA site and were required to produce a valid dive permit.

5.2.3 Objective three: To explore the visual impacts of dive tourism on themarine environment in KwaZulu-Natal.

This objective aimed to determine the evident impacts of diving on the marine environment. The purpose of this objective was to establish the link between dive tourism and the impact it has on the industry. Divers, dive center owners and dive instructors agreed that walking on the seabed and negligent use of dive equipment can cause the most damage to the reef. This leads to sand and silt being uplifted, changing the marine environment and disturbing many ecosystems. Negligent use of dive gear was strongly agreed upon in terms of impacts on the environment becausemany things could go wrong whilst on the dive, causing significant harm and interference underwater as well as putting marine life at risk due to dive gear breaking off or getting left behind. Hence, divers should be well-informed and trained to use their dive gear. The study indicated that divers stated the most level of degradation among the presence of game fish and crustaceans. This can result from irresponsible overfishing and a lack of monitoring of the sites by the relevant dive law and regulationdepartments. Divers expressed that lower degradation was found in the presence of small fish and water visibility.

5.2.4 Objective four: To recommend measures on how dive tourism in KZN cancontribute to environmental sustainability.

This objective aimed at determining what measures can be put into place to contribute towards the sustainability of the marine and dive environment. Most respondents stated that they were briefed pre-dive on not chasing or touching marine life and not to litter whilst at sea. Many respondents also stated that they knew to refrain from collecting marine life and not to feed the fish. These responses can be attributed to great management strategies by the dive center owners and instructors. Most respondents said they knew about the dive site being an MPA before the dive. This is excellent and can be a great way to keep divers mindful of the laws and regulations surrounding an MPA regarding the dos and dont's, thus encouraging further caution leading to sustainability. Respondents strongly agreed that dive tourism could lead tothe conservation of marine resources rather than their destruction of marine resources.This can result from encouraging broad-scale conservation of ecosystems and could also be attributed to the maximization of public diver awareness. When given an optionout of 4 dive sites, respondents chose Sodwana Bay as the best dive site in KZN. Thiscan be because Sodwana Bay is an MPA which is beautifully managed and monitoredand offers the best weather and dive conditions all year round.

5.3 Recommendations

Based on the findings of this study, the following recommendations are made:

- Although there is good literature on diving, there is limited literature on the currentimpacts that diving may cause. It is recommended that future studies focus on thecurrent issues faced by diving in dive environments.
- Municipalities or relevant dive organisations recommend proper planning and management strategies to ensure sustainability and proper procedures are being adhered to.
- Facilitation of education programmes is recommended for divers, dive instructors and any other personnel involved in the process of conducting a successful dive. These programmes are recommended to be held once or twice a year and offer a certificate of participation that people can use as motivation to either attend futureworkshops or move up on the dive awareness

ladder. Divers, as well as dive centerowners and instructors, are encouraged to join the Green Fins Organisation; becoming a member will put them at an advantage in keeping up to date with the measures and implementation techniques to ensure a sustainable environment.

- Dive center owners could form a dive club which allows divers and instructors to join, and this will serve as a safe space for the niche family in terms of forming a dive community to discuss challenges faced pre and post-every dive as well as aplatform for each other to educate others in the group.
- The current potential concerning the topic of sustainability should be used to growadditional sustainable diving proposals in the future and could contribute to a comprehensively sustainable dive tourism industry. Additional studies on the subject are required to approve the conclusions in this study, and to spread them to diving visitors from other countries in order to make evaluations. An international standpoint on diving tourism as a globally presented form of active sports tourism is recommended as a next step.
- Additionally, shifting the tactic to other active sports travelers (e.g., skiing, biking, or hiking) would be valuable to identify if sports tourists overall are concerned about sustainability, or if there are variances between distinct sports. Constructed aroundthe discoveries, the subject of sustainability ought to also be progressively merged into sports tourism propositions outside of diving tourism. Certificates for employers and employees who oblige themselves to conform with environmental and communal ethics would be advantageous, as these, as a collective with the customers' readiness to pay, potentially brings about an enhanced market position.

5.4 Implications for future research

Built on the conclusions from this study, it is advised that future focus on the following:

- Challenges experienced by PADI worldwide in terms of compliance and education.
- Data on whether diving contributes negatively or positively toward conserving the marine environment.
- The impact that diving has and its influence on the choice of dive site based on theimpacts at that site, and
- Management of legal divers and accredited dive centres of whom both should

holddive permits to ensure responsible actions are conducted.

5.5 Concluding remarks

This study discovered the knowledge, awareness and perceptions of divers and dive center owners and instructors based on the impacts that diving causes on the sustainability of the marine environment. The perceptions, challenges and impacts of diving were explored. The study also identified approaches to enhance the educationand awareness of diving and the impacts it may have on the public, as well as ways to reduce the challenges that the sport creates. This study will likely contribute to South African literature, KwaZulu-Natal and specifically in the dive tourism industry, where there is an existing lack of information about the current impacts due to diving. In addition, it is projected that this study will promote more research in the province as further investigation will benefit the province, divers, dive center owners and the nationat large.

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APPENDIX 1: QUESTIONNAIRE

Faculty of Management Sciences

Department of Public Management & Economics

Dear Participant

I, Trimeira Naidu am a master's student at the Durban University of Technology. You are kindly invited to participate in academic research entitled: "The nature of dive tourism in KwaZulu- Natal and its impact on environmental sustainability". This study is motivated and informed by the prevalence of the lack in knowledge and guidelines in place that need to be followed by divers to sustain the dive industry. The research seeks to find out the perceptions, attitudes, awareness, and knowledge of divers based on the type of tourist category they fall into and how each diver aims at practicing responsible diving to sustain the industry. The information and ratings you provide by filling out the questionnaire will go a long way in helping the researcher assess the awareness and knowledge of divers and responsible diving practices. Through your participation, the researcher hopes to examine the effects of the current problem facing the dive industry in terms of sustainability and damage caused to coral reefs and marine life based on how and what practices divers are portraying. The researcher also hopes to examine the role of dive instructors in informing and educating fellow divers on appropriate and responsible dive practices.

Your participation in this project is voluntary. All information shared is subject to the confidentiality clause. This serves to note that the information you will share in this questionnaire will not be shared with anyone under any circumstances.
Your assistance would be highly appreciated in making this study a success.

Researcher: Trimeira Naidu/ 076 361 8650/ trimeira@icloud.com Supervisor: Dr. Reshma Sucheran/ 0313735508/ reshma@dut.ac.za

Section A – Dive tourist demographical data

1. Are you a tourist?

   Yes ☐ No ☐

2. If yes, tick the box most appropriate to you:

   Local Tourist ☐ International Tourist ☐

3. If you are an international tourist, what is your nationality?

   _____

4. What type of accommodation did/will you choose for your stay? Tick the relevant bullet.
   - Friend's house
   - Hotel
   - In-house lodging
   - B&B
   - Other

5. Where are you planning to dive?

   Umhlanga ☐ Aliwal ☐

6. What is your gender?

   Male ☐ Female ☐

7. What is your age?

   16-21 ☐ 22-34 ☐ 35-44 ☐ 45-54 ☐ 65+ ☐

What is your race?

African ☐ Indian ☐ White ☐ Coloured ☐ Other ☐

8. If other, please specify:

   _____

9. What is your current occupation status?

   Employed ☐ Temporary employment ☐ Student ☐ Pensioner ☐ Unemployed ☐

10. What is your current level of education?

High	Diploma	Bachelor	Masters	Doctorate	OtherSchool
☐	☐	☐	☐	☐	☐

11. How many years have you been diving in KZN?

_____

12. What is your current diving certification level? Tick the relevant bullet.

- ○ Beginner
- ○ Advanced
- ○ Rescue Diver
- ○ Dive guide
- ○ Dive instructor
- ○ Other- if so, specify: _

13. What is your number of logged dives in KZN?

_____

14. What is your average dive duration based on a single dive?

1-hour	1½ hours	2 hours	2½ hours	3+ hours
☐	☐	☐	☐	☐

Section B- Diver actions and environmental impacts

15. As a diver, are you familiar with the ethical practices whilst diving?

Yes	No
☐	☐

16. If yes, please tick which of these are familiar to you from the list below:

- ○ Breathe continuously
- ○ Keep hands to yourself when encountering marine life
- ○ Do not apply reef-damaging sunscreen before diving
- ○ Respect marine life encounters
- ○ Ensure that you are familiar with your dive gear
- ○ Ensure that your gear is secure and there are no dangling parts
- ○ Dive by fate and not bait
- ○ Gear and equipment that go down with you, must come up
- ○ It is vital to have some sort of dive certification before attempting an open water dive
- ○ Other

17. If you ticked other, please list a few other practices familiar to you below:

_____

18. Have you been made aware of the impacts of certain diving practices on the environment?

Yes	No
☐	☐

19. If yes, how were you made aware of such impacts? (Please tick the relevant bullet)
- Social media
- Dive instructor
- Own internet research
- A friend
- Newspaper/Magazine

20. From the following statements, please circle yes (Y) or no (N) and indicate the level of impact caused by recreational diving using a scale of: *1 (Strongly Disagree), 2 (Disagree), 3 (Neutral), 4 (Agree) And 5 (Strongly Agree).*

Are you aware that diving can accidentally harm coral? Y / NI
f yes, using the above scale please indicate the level of impact.

1 2 3 4 5

Are you aware that diving can deliberately cause harm to coral? Y / N
If yes, using the above scale please indicate the level of impact.
1 2 3 4 5

Are you aware that walking on the seabed while diving can cause significant harm to themarine environment? Y / N
If yes, using the above scale please indicate the level of impact.
1 2 3 4 5

Are you aware that underwater photography negatively effects marine flora and fauna? Y /N
If yes, using the above scale please indicate the level of impact.
1 2 3 4 5

Are you aware of the negative impacts of shore diving? Y / N
If yes, using the above scale please indicate the level of impact.
1 2 3 4 5

Are you aware of the detrimental impact of using sunscreen whilst diving? Y / N
If yes, using the above scale please indicate the level of impact.
1 2 3 4 5

Are you aware that diving in groups of 5 or more can be harmful to the marine environment?Y / N
If yes, using the above scale please indicate the level of impact.
1 2 3 4 5

Are you aware that the negligent use of dive equipment can negatively contribute to themarine eco-systems? Y / N
If yes, using the above scale please indicate the level of impact.
1 2 3 4 5

21. Which would you consider the best time of the year to dive in KZN: *(mark with an 'X')*

Spring (August-mid October)	
Summer (Mid October- mid February)	
Autumn (Mid-February- April)	
Winter (May- July)	

22. When you dive, do you:

S*tick around other divers and boats* Yes ☐ No ☐

Try to get away from other divers and boats Yes ☐ No ☐

23. When participating in diving in KZN, have you always been thoroughly briefed by dive operators predive?

Yes ☐ No ☐

24. Are you aware of what an MPA (Marine Protected Area) status is?

Yes ☐ No ☐

25. On a scale of 1-5 (where 5 is very important and 1 is not important), how important is it to you whenselecting a dive location that it has MPA status? *(circle one)*

1 2 3 4 5

26. When diving at an MPA location, have you ever been required to be in possession of a Valid Dive Permit?

Yes ☐ No ☐

27. If yes, what was the location of the dive?

_____

28. From the following options, in your opinion, please indicate the level of degradation, using the following scale of: *1 (Bad), 2 (Below average), 3 (Average), 4 (Above average) And 5 (Good).*

STATEMENT	**RATING**				
	1	2	3	4	5
Regarding your dive experience, please indicate the level of biodiversity/health of dive site in KZN, based on the following:					
The water quality					
The water visibility					
The aesthetic appearance of the coral					
The presence of crustaceans (Crabs, lobsters, and prawns)					
The presence of small fish (Blacktail, Cape Stumpnose, Bronze Bream etc.)					
The presence of game fish (Tuna, Yellowtail, Garrick, Kingfish etc.)					
The presence of predators (Various types of sharks)					
The presence of mammals (Dolphins and whales)					
The presence of reptiles (Sea snakes and turtles)					
Other, (Please specify):					
Which type of coral do you think is most fragile:					
Hard coral (Dead coral)					
Soft coral (Live coral)					
When do you think diving may cause the most damage to the reef? Please choose yes (Y) or no (N)					
Diving causes the most damage during the day	Y	N			
Diving causes the most damage during the night	Y	N			
Diving causes the most damage regardless of time	Y	N			

29. What would you consider a safe distance to avoid contact with coral?
- o 250 cm
- o 500 cm
- o 1 meter
- o 1.5 meters
- o 2 meters

- Other – State distance: _____

30. What would you consider as a safe distance to avoid contact and disturbance to marine wildlife?
- 250 cm
- 500 cm
- 1 meter
- 1.5 meters
- 2 meters
- Other – State distance: _____

31. Which would you say is the best dive site in KZN, and why?

_____

_____

32. If you had to formulate your own rules for diving, which current rules would you amend? And why?

_____

_____

_____

_____

33. Do you have any suggestions to improve the sustainability of the dive industry?

_____

_____

_____

_____

***** THANK YOU FOR YOUR TIME AND PARTICIPATION*****

APPENDIX 2: INTERVIEW SCHEDULE

DIVE CENTRE OWNER

1) Gender
2) Age
3) Level of education
4) Any diving qualifications?
5) How long have you been in the business?
6) What is your role and duties in terms of running a successful diving business?
7) Do you as a business follow any diving rules and regulations that need to be followed when thediver enters the water to ensure conservation and no damage to marine ecosystems?
8) How are management protocols ensured at dive sites?
9) How often do you monitor diving activities to ensure rules are being followed, and how is this done?
10) What would you say are challenges faced by dive centre owners in terms of overseeing diveoperations?
11) In terms of sustainability, what are you as an owner doing to promote this to your dive tourists,and do you practice this? Please explain how?
12) In terms of conservation, what are you doing to promote this, and do you practice it? Pleaseexplain how?
13) In a year- which period would you say is the peak time for your business?
14) Are there extra precautions put into place to ensure activities are effectively managed during peakperiods?
15) What would you say as a dive center owner and from your diving encounters and experience causes the most damage to marine life and threatens the sustainability of the dive industry in South Africa?
16) Which would you recommend as the top 3 dive sites in South Africa?

DIVE INSTRUCTOR

1. Gender
2. Age
3. Level of education
4. Any diving qualifications?
5. How long have you been a dive instructor?
6. What is your role and duties in terms of diving?
7. What are the diving rules and regulations that need to be followed when the diver enters the waterto ensure conservation and no damage to marine ecosystems?
8. Do you manage protocols at dive sites?
9. How often do you monitor diving activities to ensure rules are being followed, and how is this done?
10. What would you say are challenges faced by dive instructors in terms of overseeing dive activities?
11. In terms of sustainability, what are you doing to promote this to your dive tourists, and do youpractice this? If yes, please explain how?
12. In terms of conservation, what are you as a dive instructor doing to promote this, and do youpractice it? If yes, please explain how?
13. In a year- which period would you say is the peak in diving activities?
14. Are there extra precautions put into place to ensure activities are effectively managed during peakperiods?
15. What would you say from your diving encounters and experience causes the most damage tomarine life and threatens the sustainability of the dive industry in South Africa?
16. Which would you recommend as the top 3 dive sites in South Africa?

APPENDIX 3: PERMISSION TO CONDUCT RESEARCH

Hospitality and Tourism
Department(Ritson Campus)
Durban,
South
Africa
4000

REF: PERMISSION TO CONDUCT RESEARCH

I hereby apply for permission to conduct academic research within your dive centre as well as assistance in distributing online questionnaires to your database of clients. I am a Master of Management Science student from the Durban University of Technology. My research focuses on dive tourism and the environmental sustainability of the industry.

Online Questionnaires: Online questionnaire to be send will be anonymous and the data collected will only be reported in a summary fashion. Individual responses will be held in strict confidence by the researcher. The researcher will investigate, summarise and analyse resultsfor his study.

Respondents: Respondents will not be forced to supply any personal or sensitive information i.e., trade secrets that they might find in the questionnaire/survey. The questionnaire will remain anonymous, and results will be in summary form. In the event that respondents decide to withdraw from participating in the research they may do so freely and will not be inclined togive reason(s).

For additional information regarding the research or if you have any queries feel free to contactTrimeira on (+27) 76361 8650; trimeira@icloud.com; 21513452@dut4life.ac.za or the researcher's supervisor on (+27) 31 373 5509.

Thank you for your time and serious consideration.

Yours Sincerely
Trimeira Naidu(Researcher)

21513452@dut4life.ac.za

APPENDIX 4: GATEKEEPERS LETTER 1

Shop M02 Ushaka Marine World.
1 Bell Street, Durban, 4001
Telephone: +27 31 332 1153
Mobile: +27 82 469 4699
Email: vinayak@umhlangascuba.co.za

Dear Dr. Sucheran and Trimeira Naidu

Date 09/07/2020

Thank you for choosing Umhlanga Scuba as an entity to conduct your research study toward obtaining your Master of Science Degree.

This is to confirm that Umhlanga Scuba has granted you permission to work with the entity on your research titled: "The nature of dive tourism in Kwazulu-Natal and its impacts on environmental sustainability".

Umhlanga Scuba wishes you all the best as you embark on this journey. We hope that we will be of value to you.

Regards.

Vinayak Maharaj

CEO Umhlanga Scuba

APPENDIX 5: GATEKEEPERS LETTER 2

2 Moodie Street
PO Box 430
Umkom
aas
4170
South Africa

VAT: 4830165389

Tel: +27 (0) 39 973 2233
Fax: +27 (0) 39 9732133
Cell No: 082 893 2852

dive@aliwalshoal.co.za
www.aliwalshoal.co.za

09 July 2020

Dear Dr. Sucheran and Trimeira Naidu

Thank you for choosing Aliwal Dive Centre as an entity to conduct your research study toward obtaining yourMaster of Science Degree specializing in Hospitality and Tourism Management.

This is to confirm that Aliwal Dive Centre has granted you permission to work with the entity on your research titled:

"The nature of dive tourism in Kwazulu-Natal and its impacts on environmental sustainability".

Aliwal Dive Centre wishes you all the best as you embark on this journey. We hope that we will be of value to you.Kind Regards

Aliwal Dive Centre Team

Directors: CP Ackermann & K Rossouw Aliwal Dive Centre Pty (Ltd) 1997/000029/07

APPENDIX 6: TURNITIN REPORT

I, Dr Reshma Sucheran, acknowledge the Turnitin Summary Report, and I am satisfiedwith the result.

_____

Dr Reshma Sucheran 30 October 2022

THE NATURE OF DIVE TOURISM IN KWAZULU NATAL AND ITS IMPACT ON ENVIRONMENTAL SUSTAINABILITY

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APPENDIX 7: EDITORS REPORT

PROOF-READING AND EDITING REPORT

STUDENT: Trimeira Naidu

QUALIFICATION: Master of Management Sciences Specializing in Hospitality and Tourism

TOPIC: The Nature of Dive Tourism in Kwazulu-Natal and Its Impact on Environmental Sustainability

EDITOR: Dr V. Moodley

The dissertation has been reviewed and detailed comments have been made in the dissertation document. In particular, the following issues must be considered and adjusted accordingly:

- Correct all typos as highlighted in the document, including punctuation and grammar.
- Ensure consistency of your spelling (UK or US)
- Rewrite all poorly presented sentences (as highlighted in the dissertation) document, to improve readability and understanding. I have provided some suggestions.
- Ensure that your referencing style is correct and consistent, both in-text and in the reference list.
- Ensure that references included in the text are referenced and vice versa.
- The literature review needs to be updated with more emphasis on the environmental impacts of diving.
- Data from the semi-structured interview must be integrated into that data analysis. There is no evidence of such data in your writeup.
- Some references are outdated. Please ensure that references are updated and recent.
- In some instances, you need to improve word use and sentence structure. These have been highlighted in your document.
- Generate the table of contents page and list of figures and graphs using Word functions.
- Ensure that your style and captions of figures and tables are consistent. I have highlighted those that require adjustment.
- There are few references in your reference list that are incomplete. Ensure that these are completed as per the required format.
- Ensure consistency of heading levels and styles. Use the Word functions to automatically generate headings.
- Ensure that your figures and tables must be placed within the text, as close to their first mention as possible.
- Define abbreviations upon first appearance in the text.
- Where highlighted in the document, re-structure the workflow and organize the content, to ensure all sections of the paper are coherent. Some sections are incoherent.
- Ensure that the overall formatting of the dissertation is consistent with the submission guidelines of DUT.

Signed:

28 October 2022

Dr V Moodley

Date

APPENDIX 8: ETHICS CLEARANCE

Professor Fulu G. Netswera
Executive Dean
Faculty of Management Sciences
Durban University of Technology

P O Box 1334, Durban, 4000,
South Africa

26th November 2020

Student number: 21513452

Dear Ms T. Naidu

MASTER OF MANAGEMENT SCIENCES: HOSPITALITY & TROURISM

This serves to confirm the approval of your research proposal by the Faculty Research Committee, at its meeting on **26th November 2020**, as follows:

1. Research proposal and provisional dissertation title:
   The nature of dive tourism in KwaZulu-Natal and its impact on environmental sustainability.

   Supervisor: **Dr R. Sucheran**

   Co-supervisor: **N/A**

   Please note that any proposed changes in the thesis/dissertation title require the approval of your supervisor/s, the Faculty Research Committee, as well as ratification thereof by the Higher Degrees Committee.

2. Research budget to the amount of **R10 000.00**
   Please note that this funding is not a scholarship or bursary and is therefore not paid directly to you, but is controlled by the Faculty. Any proposed changes to the use of this funding allocation requires the approval of your supervisor and the Dean. Please note that funding will be reimbursed to you after the provision of receipts.

The Institutional Research Committee has stipulated that:

(a) This University retains the ownership of any Intellectual Property (patent, design, etc.) registered in respect of the results of your Masters/Doctors Degree in Technology studies as a result of the award and the provisions of the above Act;
(b) Should you find any of the terms above not acceptable then you are given the option to decline the Research budget award to your project in writing.

May we remind you that in terms of Rule G25(2)(b), if you fail to obtain the Masters/Doctors degree within the maximum time period allowed after first registering for the qualification,

Senate may refuse to renew your registration or may impose any conditions it deems fit. You may apply to the Faculty Research Committee for an extension.
Please note that you are required to convert your registration from the informal to the formal course and re-register each year.

Please note that the following must be adhered to:

Registration:

1. Ensure formal registration has taken place ***(the onus is on the student and the supervisor to ensure registration takes places at the beginning of each year whilst the student is currently engaged with his/her Masters or PhD qualification)***
2. Ensure that application for Conferment of Status has been made in the event of your undergraduate qualification being different to this application. ***Your attention is drawn to the fact that Conferment of Status is required for registration.***
3. Ensure that your supervisor has submitted your proposal to the Faculty Research Officer (FRO) for IREC clearance (institutional research ethics committee). This is in the case of Ethics level 2 IREC and level 3 IREC (in the case of a study dealing with vulnerable populations). See guideline attached. ***It is the researcher's responsibility to check the Ethics requirements and submit to the relevant bodies irrespective of the reviewer's recommendation.***

Dissertation submission for examination:

1. Ensure that you submit the intention to submit form **(PG 5)**, signed by the HOD and Supervisor
2. Ensure that the signed checklist is submitted with the **PG 5**
3. Once your dissertation is submitted to the supervisor for examination purposes, communication from here on will only be with you supervisor and not with the faculty.
4. Your supervisor MUST nominate the examiners three months prior to submission of the dissertation/thesis for examination.
5. On submission for examination, please note that three ring bound signed copies must be submitted to your supervisor along with the completed and signed **PG 7** form, **FMS Checklist** and **Turn it in report**.
6. Feedback will be provided to your supervisor regarding the examination result after the result is ratified by the Higher Degrees Committee (HDC).
7. In the event of a resubmission the reports will be submitted to the supervisor who will communicate with you for revision. Once revision has taken place your supervisor will submit to the FRO for resubmission to the examiners.
8. In the case where there is a discrepancy in examiners results, an Arbiter will be nominated via the HOD and supervisor and tabled at FRC and ratified at HDC.
   On completion of this process, the Arbiters report will be tabled at FRC and ratified at HDC.
9. Results of the Arbitration process will be communicated to your supervisor

Graduation requirements:

1. Ensure that you submit a completed signed PG10 form
2. one hard bound dissertation/thesis with a pdf version on CD
3. response to post graduate examination form
4. completion of study form (IREC form)

Should you experience any problems relating to your research, your supervisor must be informed of the matter as soon as possible. If the difficulties persist, you should then approach your Head of Department and thereafter the Faculty Research Coordinator.
Please refer to the 2020 General Rule Book and the Postgraduate Students' Guide 2020 concerning the rules relating to postgraduate studies, which include *inter alia* acceptable minimum and maximum timeframes, submission of thesis/dissertations, etc. Please do not hesitate to contact this office for any assistance. We wish you success in your studies.

Kind regards,

Professor FG Netswera

Faculty of Management Sciences