More than an adrenaline rush: A study of white shark cage-dive participants in Australia and the potential to encourage a conservation ethic

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More than an adrenaline rush:
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Photo 1. Cage-dive tourists observing white shark at the Neptune Islands. Photo: Andrew Wright

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A Thesis submitted in fulfilment for the degree of Doctor of Philosophy
January 2018
Statement of Originality

I certify that the work presented in this thesis is, to the best of my knowledge and belief, original, except as acknowledged in the text, and that the material has not been submitted, either in whole or in part, for a degree at this or any other university. I acknowledge that I have read and understood the University's rules, requirements, procedures and policy relating to my higher degree research award and to my thesis. I certify that I have complied with the rules, requirements, procedures and policy of the University (as they may be from time to time).

Date: 28th January 2018

Kirin Apps
Abstract

Wildlife tourism is often promoted by government and industry as an activity which supports conservation by enhancing participant environmental knowledge, attitudes and behaviour. Despite speculation as to the conservation potential of wildlife tourism, empirical evidence to support such claims is limited. Globally, many shark species are facing significant population declines, yet conservation programs are often hampered by negative public perceptions. Sharks are one group of marine species which could benefit from the conservation potential of tourism. However, despite the rising popularity of shark-based tourism over the past two decades, little academic attention has focused on the human dimension of the experience. To address this gap in knowledge the aim of this thesis is to explore the human dimension of shark tourism, and to investigate the conservation potential of the activity.

A case study approach was adopted using white shark cage-dive tourism at the Neptune Islands, South Australia. As the only white shark cage-dive site in Australia and one of only five sites worldwide, this study is the first to investigate the participant experience at the Neptune Islands. Mixed-method research was used to collect qualitative and quantitative responses from participants on-board the three cage-dive operations between March 2014 and July 2016. Data was collected during four phases: 1) an application of the theory of planned behaviour to determine participants beliefs related to the cage-dive experience (n=86), 2) an exploration of the role of on-tour education and interpretation (n=607), 3) an investigation of the social value of the tourism site (n=675), and 4) an examination of participants attitude and behaviour towards shark conservation post-tour (n=136).

Results demonstrated that cage-dive participants valued the tourism activity and site as an educational opportunity, with demand for additional information focused on shark biology, habits and conservation. Post-tour responses identified a positive shift in participants attitudes and concern for sharks, and increased participation in conservation-related behaviour. A synthesis of findings from the four research phases reveals the significance of education/interpretation and an emotional engagement in the experience, as key themes contributing to the conservation potential of white shark cage-dive tourism. This research concludes that in order for wildlife tourism to build a motivated constituency of people who support conservation, it is necessary for operators to combine the emotional response of viewing wildlife with the educational benefits of a specifically designed interpretation programme.
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To my amazing husband Will, thank you for your love and support. Your patience and reassurance have been crucial in helping me to complete this thesis. To all the children in my life; Bodhi, Lani Willow, Connor, Gracie, Dylan and our two-week-old baby girl, Ayanna. Please believe me when I say, ‘your dreams can come true’. All my life I wanted to work with sharks, I hope my experience has encouraged you all to ‘dream big!’
List of publications

I, Kirin Apps, state that the manuscripts appearing in Chapters 2, 3 and 5 of this thesis have been peer-reviewed prior to publication in international academic journals. Evidence for this is provided in Appendix E. The manuscript in Chapter 4 is currently under review (details below). I warrant that I have obtained, where necessary, permission from the copyright owners to use any third-party copyright material reproduced in the thesis (e.g. questionnaires, artwork, unpublished letters), or to use any of my own published work (e.g. journal articles) in which the copyright is held by another party (e.g. publisher, co-author).

Kirin Apps

Chapter 2

Chapter 3

Chapter 4
The following manuscript is under review in an international journal.

Chapter 5
Statement of contribution of others

The purpose of this statement is to summarise and clearly identify the nature and extent of the intellectual input by the candidate and the co-authors. A signed statement from each of the co-authors is included in Appendix F.

Chapter 2


The nature and extent of the candidate’s intellectual input was the following:

<table>
<thead>
<tr>
<th>Nature of contribution by K. Apps</th>
<th>Extent of contribution (%)</th>
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<tbody>
<tr>
<td>Conception, literature search, ethics approval, survey design, data collection, analysis and manuscript preparation.</td>
<td>85%</td>
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The following co-authors contributed to the work:

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<th>Name</th>
<th>Nature of contribution</th>
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<tr>
<td>David Lloyd</td>
<td>Supervision and manuscript editing</td>
<td>5%</td>
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<tr>
<td>Kay Dimmock</td>
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<tr>
<td>Charlie Huveneers</td>
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Chapter 3


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Chapter 4

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<td>Charlie Huveneers</td>
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Chapter 5

The nature and extent of the candidate’s intellectual input was the following:

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<th>Nature of contribution by K. Apps</th>
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<td>Charlie Huveneers</td>
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</table>

Signed: Candidate: Kirin Apps

Signed: Principal supervisor: David Lloyd
List of additional publications

The following are relevant to the thesis, but are not included in it.

Peer reviewed journal articles


Report


Conference presentations


Chapter 1 – Introduction

Photo 2. Tourists on-board a white shark cage-dive tour at the Neptune Islands, South Australia.

Photo: Kirin Apps
1.1 General introduction

Marine wildlife tourism has experienced rapid growth in recent decades (Higham & Lück, 2008; Hoover-Miler et al., 2013; Burgin & Hardiman, 2015). Today, numerous opportunities exist for tourists to observe and interact closely with animals such as whales (García-Cegarra & Pacheco, 2017; Lopez & Pearson, 2016), dolphins (Filby, Stockin & Scarpaci, 2015; Mayes & Richins, 2009), and sharks (Hammerschlag, Gallagher, Wester, Luo & Ault, 2012; Huveneers et al., 2017; Ziegler, Dearden & Rollins, 2015). Alongside this rise in interest in tourism, many marine species face threats to their conservation, necessitating public attention to avoid critical population declines (Arthington, Dulvy, Gladstone & Winfield, 2016). While tourism alone does not represent a panacea for protecting marine species, it may offer some economic and conservation value, including enhanced public education and awareness (Mayes, Dyer & Richins, 2004; Moscardo, 2008; Packer & Ballantyne, 2012; Powell & Ham, 2008; Zeppel & Muloin, 2008) and revenue for protected areas and local communities (Bentz, Lopes, Calado & Dearden, 2016; Huveneers et al., 2017; Macdonald et al., 2017; Vianna, Meekan, Pannell, Marsh & Meeuwig, 2012).

Many shark species are facing significant population declines (Dulvy et al., 2014) and, when combined with their often poor public image, have much to gain from improved understanding and awareness provided by wildlife tourism. An estimated one-quarter of chondrichthyan fishes (sharks, rays, and chimaeras) are threatened with extinction according to IUCN Red List criteria (Dulvy et al., 2014). While the principal source of chondrichthyan mortality is targeted commercial fisheries, driven predominantly by the shark fin trade, sharks and rays are also often caught as bycatch (Dulvy et al., 2014; Oliver, Braccini, Newman & Harvey, 2015; Worm et al., 2013), targeted in recreational fishing, and caught in bather protection measures such as beach meshing, baited drum lines, and shark culling programs (Crossley, Collins, Sutton & Huveneers, 2014; Dulvy et al., 2014). While these drivers for human induced population decline of sharks are frequently discussed, understanding the impact of negative public attitudes towards sharks and their conservation is only recently gaining attention (Friedrich, Jefferson & Glegg, 2014; Neff, 2012; 2014; 2015; Neff & Hueter, 2013; O’Bryhim & Parsons, 2015; Pepin-Neff & Wynter, 2017).

This research refers to various forms of tourism, and while there may be varied alternative descriptions, the following definitions apply to the context of this thesis.

Wildlife tourism as defined by Higginbottom (2004, p.2), is ‘tourism based on encounters with non-domesticated (non-human) animals’, either in captivity or in situ, utilising the
animals’ natural environment (Dobson Jones & Botterill, 2005). Activities include observation, photography, feeding, hunting and fishing. These can occur as unguided and independent activities, such as viewing birds as part of a nature walk, or in association with tourism providers, such as a night spotlighting tour.

*Marine wildlife tourism* is a major form of wildlife tourism and is defined as ‘a form of non-consumptive tourism that focuses on the observation of marine species and habitats, and in some cases even direct human-animal interaction’ (Trave, Brunnschweiler, Sheaves, Diedrich & Barnett, 2017, p.212). Popular forms of marine wildlife tourism include, cetacean-watching, shark watching, SCUBA diving/snorkelling and observing marine birds, pinnipeds and turtles on land and in the water (Trave et al., 2017).

*Shark-based tourism* is a growing niche market within the marine tourism sector. Although shark-based tourism can include fishing, and land or onboard observations, literature investigating this form of tourism typically focuses solely on viewing sharks underwater by either snorkelling or SCUBA diving (Dicken, 2014; Gallagher & Hammerschlag, 2011, Gallagher et al., 2015).

### 1.2 Rationale for the research

Sharks are iconic predators with a fearsome reputation and a long history of demonisation and persecution (Boissonneault, 2011; Dobson, 2008; Dobson et al, 2005; Pollard, Lincoln Smith & Smith, 1996). While there is growing support for shark conservation, their negative public image has often resulted in insufficient public concern for population declines and has acted as an obstacle for adequate management and conservation priority (Altobelli, 2011; Crossley et al., 2014; Friedrich et al., 2014; Neff, 2015; Neff & Yang, 2013; O’Bryhim & Parsons, 2015; Whatmough, Van Putten & Chin, 2011). Shark-based tourism has, however, considerable potential to contribute to pro-conservation attitudes by enhancing participant’s knowledge, dispelling myths and exposing tourists to sharks in their natural habitat (Dobson, 2007; Dobson et al., 2005; Topelko & Dearden, 2005).

Interest in observing sharks of all temperaments and sizes has grown rapidly since the early 1990s (Cater, 2008; Dearden, Topelko & Ziegler, 2008) with an estimated 590,000 tourists participating in global shark watching activities in 2011 (Cisneros-Montemayor, Barnes-Mauthe, Al-Abdulrazzak, Navarro-Holm, & Sumaila, 2013). An investigation of internet website by Gallagher and Hammerschlag (2011) found 376 established shark ecotourism operations in 29 countries targeting a number of different species including reef...
sharks, whale sharks and white sharks. The economic benefits from shark tourism have also been recognised, with observations by Cisneros-Montemayor et al. (2013) suggesting the number of shark watchers will double within 20 years as tourist expenditures generate an estimated USD 780 million. These tourist experiences range from diving in aquariums, to swimming with whale sharks (García-Cegarra & Pacheco, 2017; Ziegler et al., 2015), and in-water experiences observing large predatory species including bull sharks (Brunnschweiler, Payne & Barnett, 2017), tiger sharks (Hammerschlag, Gutowsky, Gallagher, Matich & Cooke, 2017), and white sharks (Huveneers et al., 2013). The rising popularity of shark-based tourism (Dearden et al., 2008; Gallagher et al., 2015; Haas, Fedler & Brooks, 2017) highlights the potential of the industry to raise awareness of the threats to shark populations and stimulate a conservation ethic amongst participants (Dobson, 2007; 2008; Dobson et al., 2005; Techera & Klien, 2013; Topelko & Dearden, 2005; Ward-Paige, 2014).

Promoting tourism as a conservation tool for threatened shark species remains controversial, as potential negative and positive impacts on shark conservation are debated in the literature (Gallagher et al., 2015; Macdonald et al., 2017). To date, research has focused on the effects of tourism on sharks such as physical effects from divers (Smith, Scarr, & Scarpaci, 2010), investigating the physiological impacts of provisioning (Maljković and Côté, 2011), changes in seasonality, residency or abundance (Bruce & Bradford, 2011; Brunnschweiler, Abrantes, & Barnett, 2014; Meyer, Clark, Papastamatiou, Whitney, & Holland, 2009), changes in spatial use (Huveneers et al., 2013), and changes in vertical activity (Fitzpatrick, Abrantes, Seymour & Barnett, 2011; Huveneers et al., 2013). Such potential for negative impacts to animal welfare has been suggested to work against conservation by exacerbating human wildlife conflict or leading to detrimental consequences for participating animals (Burns & Howard, 2003; Newsome et al., 2015).

The argument in favour of shark tourism includes the change in economic importance of sharks from a fisheries product to a more valuable tourism resource (Gallagher et al., 2015; Haas et al., 2017; Pires, Garla & Carvalho, 2016; Vianna et al., 2012). Vianna et al. (2012) determined approximately 100 sharks were interacting with the dive industry, over five sites in Palau. They estimated that over the life span of these grey reef and white tip sharks (16 years), the revenue derived from these sharks interacting with the dive industry was approximately US$200 million, compared to their consumptive value of approximately US$10 800 when caught for the international market.
In addition to economic benefits, the proponents of wildlife tourism cite a number of potential conservation benefits such as increased understanding and/or emotional responses to wildlife encounters which may lead to offsite benefits including greater environmental awareness and philanthropic support for nature conservation (Packer & Ballantyne, 2012; Powell & Ham, 2008; Zeppel & Muloin, 2008). However these claims remain largely untested (Ardoin, Wheaton, Bowers, Hunt & Durham, 2015; García-Cegarra & Pacheco, 2017; Hughes, 2013; Macdonald et al., 2017; Packer & Ballantyne, 2012) with researchers calling for better understanding of tourists participating in wildlife tourism activities (Newsome & Roger, 2008; Powell & Ham, 2008; Zeppel & Muloin, 2008), including those participating in shark-based tourism (Gallagher & Hammerschlag, 2011; Simpfendorfer, Heupel, White & Dulvy, 2011; Whatmough et al., 2011; Ziegler, Dearden & Rollins, 2012). If shark-based tourism is to foster awareness and knowledge, engender pro-conservation attitudes, and support visitors to become involved in conservation initiatives, visitor research is needed to inform the delivery of a tourism experience that continues to attract and inspire visitors (Ballantyne, Packer & Hughes, 2008). With an estimated 590,000 tourists participating in shark watching activities each year (Cisneros-Montemayor & Sumalia, 2014), these experiences provide more opportunities than to simply entertain. Given the increasing popularity of shark tourism (Gallagher & Hammerschlag, 2011; Gallagher et al., 2015; Topelko and Dearden, 2005) and the ongoing decimation of shark populations by commercial fishing, putting many species in danger of extinction (Dulvy et al., 2014), understanding the potential for tourism to contribute to shark conservation is a timely area of research that warrants further investigation (Dobson, 2008; Gallagher et al., 2015; Whatmough et al., 2011).

1.3 Research context

An overview of the research design is provided below. This is intentionally brief to avoid unnecessary repetition, as comprehensive overviews of the theoretical framework and methodology are included in the introduction of each chapter.

The research uses qualitative and quantitative evidence within a case study of participants cage-diving with white sharks at the Neptune Islands, South Australia, to portray and examine the many variables of a wildlife tourism experience. This method is a frequent mode for thesis and dissertation research in many disciplines and fields (Yin, 2003). As one of only five locations worldwide for tourists to observe white sharks, and the only site in Australia, this
study is the first survey of tourists on cage-dive tours at the Neptune Islands. This case study of white shark cage-diving in Australia is used to explain, describe, and explore the experience of shark-based tourism in the context of the particular setting and the potential of the experience to contribute to the conservation of sharks.

The theoretical framework of this thesis is guided predominantly by concepts and theories defined in;

1. Wildlife tourism and environmental interpretation (Ballantyne, Packer & Falk, 2011; Ballantyne, Packer & Sutherland, 2011; Ham, 2007; Hughes 2013; Lück 2003; 2008; 2015; Powell & Ham 2008; Powell, Brownlee, Kellert & Ham, 2012),
2. Social value (Brown & Reed, 2000; Clement & Cheng, 2011; Rolston & Coufal, 1991; Sherrouse, Semmens & Clement, 2014), and

While later stages of the research adopted a mixed methods approach to data collection, the initial foundation of the study applied a qualitative approach within the theory of planned behaviour (TpB) (Ajzen, 1991; Ajzen & Fishbein, 1980). As one of the most frequently cited and influential models for understanding human beliefs, attitudes, and behaviour in recreation and wildlife situations (e.g. Aipanjiguly, Jacobson & Flamm, 2003; Campbell, 2012; Lackey & Ham, 2003; Sakurai & Jacobson, 2011), the TpB emphasises beliefs as the foundation for behaviour which aligns with the focus of this study, understanding the behaviour, beliefs and attitudes of white shark cage-dive participants.

1.4. Case study: White shark cage-diving in Australia

1.4.1 Introduction

The white shark (*Carcharodon carcharias*), the quintessential shark, often referred to as ‘great white’ or ‘white pointer’, has had a long history of demonisation and persecution mainly due to interactions with surfers, swimmers and divers that have resulted in human injury and/or death (Dobson et al. 2005; Dobson 2008). However, in recent times white shark tourism has become a popular recreational activity (Dobson, 2008; Kempster & Collin, 2014), with opportunities existing in only a few countries where these sharks can be reliably observed, including: Guadalupe, Mexico; the Farallon Islands, California; the Western Cape of South Africa; the Neptune Islands, South Australia; and Stewart Island, New Zealand.
White shark cage-diving relies on attracting sharks to the boat (Dobson, 2008) predominantly by the use of berley, otherwise known as chum, which is generally a mix of chopped or minced fish and fish oil mixed with seawater (Bruce & Bradford, 2011). It is deployed throughout the day creating a continuous burley trail that increases the likelihood of shark presence around the vessel. To increase visible contact time, sharks are drawn closer to the vessel with tethered baits of tuna sections or gills and entrails. While white sharks are not permitted to be deliberately fed, they occasionally outmanoeuvre bait handlers and obtain baits (Huveneers et al., 2013; Author, direct observation). Other stimuli to which sharks may respond include the schools of finfish attracted to the berley, in-water cages with divers, and the general presence of the vessel including the associated physical and electrochemical signatures (Bruce & Bradford, 2013). Acoustics such as noise and/or music can also be used to attract sharks to the vessel, taking advantage of their natural curiosity (M. Waller, personal communication, March 15, 2014).

Internationally, white sharks are listed as ‘Vulnerable’ under the International Union for the Conservation of Nature (IUCN) Red List and ‘Vulnerable and Migratory’ under the Australian Government’s Environment Protection and Biodiversity Conservation Act 1999. They are also listed under the Convention on International Trade in Endangered Species (CITES – Appendix I + II), and the Convention on Migratory Species (CMS – Appendix I + II) to which Australia is a signatory. White sharks are protected in all states and territories in Australia. In South Australia, where cage-diving tourism occurs, they are protected under the Fisheries Management Act 2007 (Commonwealth of Australia, 2013; DEWNR, 2016).

Australia has seen an increase in serious and fatal shark bites over the past five years with incidents occurring in Western Australia and Northern NSW (Pepin-Neff & Wynter, 2017). In response to these incidents State Government bodies have initiated several measures to address shark bite fatalities. In WA the Government pledged AU$13.65 million over four years towards increased awareness and extended research (Government of Western Australia, 2012). Shark bite mitigation included non-lethal measures such as research into shark deterrence and detection, and lethal measures such as baited drum lines with the mandate of catching and shooting white, bull (Carcharhinus leucas), and tiger (Galeocerdo cuvier) sharks over 3m in length. Due to the conservation status of white sharks as a protected species, an exemption was sought and granted from the Federal Government to allow the state to catch and kill white sharks (Catlin, Hughes, Jones & Jones, 2014).
In 2015, the NSW Government announced trialling a number of new technologies and measures under the AU$16 million NSW Shark Management Strategy (NSW Government, 2016). This included, aerial surveillance, drone trails, a shark tagging program, VR4G listening stations, SMART (shark management alert in real time) drumlines and sonar technology ‘Cleaver buoy’. Other measures included community education and awareness and the SharkSmart Mobil App which includes real time tracking of tagged sharks and provide alerts when a shark is spotted (NSW Government, 2018). Non-lethal initiatives have been generally supported in both states, however lethal measures have been contentious amongst the public with both support and condemnation for these initiatives being widespread (Catlin et al., 2014, Pepin-Neff & Wynter, 2017).

The large size of white sharks and the potential for human fatality makes this species both an object of curiosity and fear. It is these characteristics which have led to the development of white shark tourism with close-up interactions via cage-diving experiences (Catlin et al., 2014). White shark cage-diving involves a protected and potentially dangerous species, and the activity is not without controversy (Bruce & Bradford, 2013; Cater, 2008; Dobson et al., 2005). Some marine user groups and local residents speculate on the potential for white sharks to make associations between food and humans or vessels and as a result blame the industry for increasing the risk of shark attacks. The industry often attracts media attention following human-shark incidents, with the media emphasising that sharks are conditioned to humans through cage-diving activities (Dobson, 2008; Muter, Gore, Gledhill, Lamont & Huveneers, 2013). Opposition to the white shark cage-diving industry also includes concerns for the welfare of sharks interacting with operators and the potentially negative impacts that the activity may have on shark behaviour. Several studies on various shark species have established regular interactions with human activity and provisioning of sharks may lead to changes in the behaviour and health of both target and non-target species (Barker, Peddemors & Williamson, 2011; Bruce & Bradford, 2013; Cubero-Pardo, Herrón & González-Pérez, 2011; Hammerschlag et al., 2012; Maljković & Côté, 2011; Smith, Scarr & Scarpaci, 2009).

The controversy surrounding the cage-diving industry and the potential for negative impacts on white shark behaviour has resulted in increased management and governance of the industry (Commonwealth of Australia, 2013; DEWNR, 2016). Wildlife tourism managers have a dual mandate to ensure activities do not significantly alter the natural environment, while ensuring that these activities provide satisfying visitor experiences (Packer & Ballantyne, 2012). The challenge facing the cage-diving industry is to find a balance between
reducing impacts on shark behaviour and habitat, while maintaining a white shark cage-diving experience that fulfils tourist expectations, contributes to local economies, and provides a platform for future research and education (Bruce & Bradford, 2013). While ongoing studies into the impacts of cage-diving on white sharks are being conducted at the Neptune Islands, no research to date has explored the visitor experience.

1.4.2 White shark cage-diving at the Neptune Islands

Commercial white shark cage-diving has been conducted in South Australian waters since the late 1970s and is the only locality in Australia where white shark cage-diving is permitted. Since 2002, cage-dive activities have been confined to the Neptune Islands Group (Ron and Valerie Taylor) Marine Park (35°16.72’S; 136°5.48’E) 60–70 km south of Port Lincoln (Figure 1; DEWNR, 2012). These island groups support the largest aggregations of pinnipeds in Australia, including breeding colonies of long nose fur Seals (Arctocephalus forsteri) and Australian sea lions (Neophoca cinerea). The presence of these colonies was a catalyst for the site to be designated a Conservation Park in 1967 (Baker, 2004; Shaughnessy, Goldsworthy & Mackay, 2015), which was later extended to two nautical miles from the low water mark under the National Parks and Wildlife Act 1972 (SA). The wide range of flora and fauna including many species of conservation importance, such as the white shark, led the Neptune Island Conservation Park to be proclaimed the Neptune Island Group (Ron and Valerie Taylor) Marine Park on the 29th of November 2012 (DEWNR, 2012). The management plan (DEWNR, 2012) for this area includes a sanctuary zone (SZ) around North Neptune Island where commercial and recreational fishing was phased out by October 2014.

![Figure 1. Location of the study site.](image-url)
At present most of the cage-diving activities are focussed on the North Neptune Island Group (Bruce & Bradford, 2013; Author, direct observation). The site has seen an increase in cage-diving effort since 2007, with the mean annual number of days rising from 124 days (2000–2006) to 265 days (2008–2011) (Bruce & Bradford, 2013). This sustained and rapid increase in activities coincided with a change by one operator from multi-day irregular timed trips to regular day trips operations. By 2011, a third operator began operations also conducting regular single day tours (Bruce & Bradford 2013; Bradford & Robbins, 2013). These changes led to a four-fold increase in the number of cage-diving days at the Neptune Islands. During 2011, the industry accommodated 5241 passengers, with 4,861 of these tourists participating in the single-day tour (Bradford & Robbins, 2013). In response to this increased effort, and research indicating changes in white shark residency and swimming behaviour (Bruce & Bradford, 2011; Huveneers et al., 2013), the South Australian governing body, the Department of Environment, Water and Natural Resources (DEWNR) limited the number of activity days (10 days per fortnight), and restricted licences to three operators (DEWNR, 2012; 2016; Techera & Klein, 2013). The most recent estimate of annual participant numbers and expenditure was conducted in 2014, showing that 10,236 passengers contributed an estimated $7.8 M in direct costs to the 2013–2014 regional economy (Huveneers et al., 2017).

Operators are licensed for up to 10 years under updated licensing policies effective from July 1, 2017. Two operators are permitted to use fish based attractants (burley/chum) with each subject to a 100 kg daily limit. The third operator is authorised to use acoustic attraction by projecting sound via underwater speakers (DEWNR, 2016). Operators are required to adhere to strict licensing restrictions including reporting of daily activities, such as the number and description of sharks sited, any instances where a shark has taken bait, made contact with the boat or cage, and the quantity of bait and burley used. Depending on the severity, any breaches of regulations can result in formal warnings, expiation, suspension or termination of the licence. Operator fees are inclusive of a $35 marine park fee for each tourist payable to DEWNR. This fee increases annually and contributes to the management, research and compliance costs associated with the industry.

Currently, there are three licenced operators, with two offering day trip operations (approximately 12 hours in duration) and one offering multi-day tours (2-10 days). Tours operate 260 days a year (weather permitting), with dates decided on in advance by DEWNR. A typical day trip involves a full day, embarking (6.30am) and disembarking (6-9pm) from the Port Lincoln marina. The voyage to the cage-dive site takes between 2.5 to 3 hours travelling along the coastline of the Lincoln National Park before heading offshore to the
Neptune Islands. Once at the site, a safety and site brief is given to participants including some information about the white sharks, such as pointing out the breading colony of seals which is the driver for sharks visiting the Neptune Islands. Over the course of the day participants can view sharks from inside a custom-built cage, from the deck of the vessel, or on one vessel from a submersible viewing pod known as the ‘aqua sub’. During the tour, tourists are encouraged to ask questions with information predominantly focussed on shark-related facts and stories, identification of individual sharks and information on the local area. Written material, information on iPads (Figure 2) and audio/visual displays such as documentaries are available for interested participants. On-tour interpretation does not specifically include a call for action, conservation messages, or suggestions for pro-conservation actions and there is no comprehensive education and interpretation model in place. While the window of communication opportunity may be greater for staff on-board the multi-day tour, there are many opportunities for interpretive encounters on-board each of the tours.

![Figure 2. An example of on-board interpretative material.](image)

Photo: Kirin Apps

Cage-dive operators in Australia offer a varied tourist experience, as detailed on the following pages. As stipulated in the ethics application for this research the identity of operators and participants would remain anonymous. Therefore, the operators will be referred to as Operator One (O1), Operator Two (O2), and Operator Three (O3).


*Operator One* has been hosting cage-dive tours since 1976 and were the first operation in the world to do so. They offer the only live-on-board white shark tour in Australia with exclusive rights to go ashore the Neptune Islands. They also offer the only ocean floor (approximately 20m deep) white shark dive in the world for certified scuba divers. While each of the operators contribute to shark research, O1 has been particularly involved in various research and established a research foundation in 2001. Individual white sharks are photographed and catalogued, with a database comprised of thousands of images and over 1000 individual sharks identified in the past 15 years. Other research conducted on board includes tissue sampling and deployment of tracker tags on individual sharks. With research conducted on most tours, paying guests can experience shark research for themselves. A shark research talk is also presented on this first evening in addition to the onboard safety and dive briefings.

This operator conducts multi-day trips from two to eight nights, depending on the tour. Most tours are three to four days with an itinerary that includes, ocean and surface cage-diving, with possible additions such as swimming with sea lions, and a walk on the Neptune Islands. At any one time up to four divers can participate in the surface cage or three divers and a staff dive professional in the ocean floor cage. The duration of each dive is typically 30-45 minutes. Dives are planned on a daily basis according to weather conditions and the experience level of participants. There are multiple opportunities throughout the tour to observe the sharks both above and below the surface. Approximately 35 expeditions are run each year depending on interest with each trip having the capacity for 12 tourists (six double cabins). A multiday trip, such as a four-day tour is $1995 for a spectator, and $2795 for a diver.

*Operator Two* was founded in 1990. Overtime their attention turned from shark fishing to shark cage-diving offering 3–4 day itineraries. By 2007, with new owners, O2 introduced one-day shark cage diving charters. Increase in demand from 2009 saw the operation begin the process of building a bigger boat. In 2011, the new boat was launched with the capacity for 45 passengers. Over the 2014-15 summer, O2 ran a twilight tour ‘trial’ from their original boat. This vessel took 25 passengers to the Neptune Islands and begin cage-diving when the larger day boat retrieved their cage from the water. This successful trial ended in February 2015 and, twilight tours have continued to run during December and January. The duration of the twilight tour is approximately 10 hours, boarding the vessel at
1.15pm. A ‘combo tour’ is also available where tourists can swim with sea lions and cage-dive with white sharks (at two different locations) on the same day. This tour operates between September and May.

While at the Neptune Islands groups of up to eight participants spend approximately 30-45 minutes in the cage, dependent on shark activity and weather conditions. No dive qualifications are necessary with a full briefing and practice on the surface before the dive. There is no age limit however there are additional conditions for those under 18, such as a supervising adult is required to be in the water at all times. Children under eight are only allowed to enter the water at the discretion of the skipper on the day. The tour cost for an adult is $395 for a spectator / $495 for a diver, and for those under 16, $295 for a spectator and $395 for a diver. Spectators can upgrade to dive on the day if they decide.

Operator Three began tours in 2007 offering tourists a bait and berley free experience, using acoustic attraction in its place. According to their website, the benefit of using sound is that it travels in all directions and is eco-friendly. This tour is also promoted as Australia’s first Advanced Eco-certified shark cage-diving experience. Up until December 2014, O3 used a vessel with the capacity for 16 passengers. In December 2014, they launched a new vessel, the ‘Shark Warrior’, which has capacity for 27 passengers. This vessel also includes the world’s first ‘Aqua sub’ for those participants who wish to stay dry while viewing the sharks in their natural habitat (Figure 3). Once at the site a safety briefing is delivered and includes information about the Neptune Islands, white sharks and any other animal species the guests may see such as birds and seals. The sub and the cage are then lowered into the water. The sub allows participants to climb down a ladder and sit below the surface enjoying a 360-degree underwater view. Six guests can sit in the sub, while another six can be in the cage at any one time.

A day trip onboard the shark warrior costs $395/$295 for an adult/child (5-15 years) observer. This can be upgraded on the day to gain access to the cage or aqua sub for $125. This operator also offers off peak rates (adult/child observer $294/$195) during the low shark sighing months of February, March and August. Underwater viewing is less regimented than on O2 with multiple changes to get in and out of the cage and aqua sub.
The Australian white shark cage-dive industry can at present accommodate 19140 participants (O1 =420, O2 =11 700 (not including the twilight tours), and O3 (7020). The most recent estimate of annual participant numbers conducted by Huveneers et al., (2017) determined that 10,236 tourists participated in cage-dive tours at the Neptune Islands in 2014. Being under capacity, this is likely to be the result of reduced customer demand during the winter months, weather conditions preventing tours and periods of no sharks sighted resulting in reduced or cancelled bookings. Previous to the 2014 participant figures, Bradford and Robbins (2013) found the Australian cage-dive industry accommodated 5241 passengers in 2011. Comparing these figures demonstrates an almost doubling of tourists in three years. This increase in tourist participation, the expansion of tours offered (twilight tours, combo tours) and a larger vessel for O3, suggests continued growth within the industry. This increased demand corresponds with estimates of Cisneros-Montemayor et al. (2013) suggesting continued expansion and interest in shark tourism and a doubling of global shark watchers within 20 years. The growth in shark tourism suggests demand to observe sharks is unlikely to subside in the foreseeable future. Research to ensure the sustainability of both the white shark cage-dive industry and the resource is a timely area of investigation that warrants further examination.
1.5 Significance of this thesis

This research investigates a number of themes relating to the human dimensions of wildlife tourism, with the research outcomes having theoretical and practical relevance to natural resource managers and the tourism industry. The findings contribute to current knowledge on wildlife tourism and in particular address a number of gaps in the shark-based tourism literature, which includes:

1. Human dimension information is missing from current shark-based tourism research;
2. The potential for shark-based tourism to have a positive impact on tourists’ knowledge, awareness and conservation behaviour has not yet been explored; and
3. The elements of the shark-based tourism experience that contribute to knowledge, awareness, and conservation behaviour are unknown.

1.5.1 Human dimension information is missing from current shark-based tourism research

Understanding the attitudes and behaviour of people interacting with the environment are key ingredients for smooth implementation of conservation and management strategies designed to minimise negative impacts and encourage positive outcomes (Moscardo & Saltzer 2004; Whatmough et al., 2011; Wolch, Gullo & Lassiter, 1997). While various research exploring the human dimensions of wildlife tourism has contributed to management strategies (Burns, 2006; Hoover-Miller et al., 2013; Sandbrook & Semple, 2006), little academic attention has focused specifically on the shark tourist (Altobelli, 2011; Brena, Mourier, Planes, & Clua, 2015; Gallagher & Hammerschlag, 2011; Simpfendorfer et al., 2011; Whatmough et al., 2011; Ziegler et al., 2012).

Although the number of shark research papers has been increasing, studies classified under the theme of human dimensions are predominantly socio-economic analyses (Gallagher et al., 2015). These studies typically demonstrate the contribution of the shark diving industry to local, regional, and national economies (e.g., Dicken & Hosking, 2009; Huveneers et al., 2017), and/or attempt to estimate the economic value of individual animals with the aim to contrast consumptive verses non-consumptive values (e.g., Clua, Buray, Legendre, Mourier, & Planes, 2011; Vianna et al., 2012). While this research has helped to shift the value of sharks from a fisheries product to an important tourism resource, and in some cases has contributed to the establishment of shark sanctuaries (i.e., Palau, Bahamas) and Marine
Protected Areas (i.e., Guadalupe Island, Fiji Shark Reef) other areas of human dimension research, such as studies on user experience, are less prevalent (Gallagher et al., 2015). Understanding the beliefs, attitudes, and behaviours of the people who interact with sharks is essential for understanding the potential conservation benefits and can contribute important information when structuring ‘best practice’ tourism policy (Hammerschlag et al., 2012). E.g., what motivates tourists to get into the water (in a cage) with an apex predator? What benefits, if any, do they (and sharks in general) receive from the experience?

1.5.2. The potential for shark-based tourism to have a positive impact on tourist’s knowledge, awareness, and conservation behaviour has not yet been explored

Wildlife tourism is often promoted as an activity that contributes to conservation by enhancing participant’s environmental knowledge, attitudes, and behaviour through interpretive messaging and meaningful first-hand experiences with wildlife (Ardoin et al., 2015; Ballantyne, Packer & Sutherland, 2011; Powell & Ham, 2008; Zeppel, 2008). While some researchers acknowledge the potential for tourism operators to engender a conservation ethic amongst participants, others suggest tourists’ main motivations are consumption and entertainment, and that assumed increased support for conservation is unwarranted (Ardoin et al., 2015; Powell & Ham, 2008). Despite potential linkages between wildlife tourism and change in participants’ attitudes and behaviour, empirical evidence to support such claims is limited (Ardoin et al., 2015; Hughes, 2013; Powell & Ham, 2008). The potential for wildlife tourism to lead to pro-conservation knowledge and behaviour has been investigated in tourism experiences such as safari and zoo tourism (Skibins, Powell & Hallo, 2013) and marine tourism experiences such as those involving whales (Lopez & Pearson, 2016), dolphins (Mayes & Richins, 2009) and sea turtles (Eagle, Hamann & Low, 2016; Tisdell & Wilson, 2005). However, research on the potential for shark-based tourism to positively impact participants’ knowledge, awareness, and conservation behaviour has not yet been undertaken. As whales and dolphins do not suffer from the same negative public image as sharks, it could be argued that research into generating public support for sharks is of greater significance than investigations focussed on marine mammals. By focusing on the activity of cage-diving with white sharks, this thesis can make an evidence-based addition to our understanding of the opportunity for shark-based, and wildlife tourism in general, to contribute to conservation.
1.5.3 The elements of the shark-based tourism experience which contribute to awareness, attitudes, and conservation behaviour are unknown

Visitor research is needed to understand the operational elements of the tourism activity which are likely to foster understanding of conservation, engender pro-conservation attitudes, and to encourage visitors to become personally involved in conservation initiatives. Previous research has highlighted the influence of education and interpretation (Lück, 2003; Jacobs & Harms, 2014; Zeppel & Muloin, 2008), and the role of emotional engagement in the experience (Ballantyne, Packer & Sutherland, 2011; Hughes, 2013; Skibins et al., 2013) as potential drivers for conservation support. While a number of studies have focused on marine wildlife tourists (Ballantyne, Packer & Falk, 2011; Hughes, 2013; Jacobs & Harms, 2014), knowledge of the shark-based tourism experience remains limited.

If wildlife tourism is to foster understanding of conservation, engender pro-conservation attitudes, or encourage visitors to become personally involved in conservation initiatives, visitor research is needed to inform the design and delivery of a tourism experience that continues to attract and inspire visitors. This thesis investigates the potential for a white shark cage-dive experience to prompt tourists to increase their shark conservation behaviour.

1.6 Research aims

The aims of this thesis were developed from the gaps in shark-based tourism literature summarised above. Specifically, this study aims to explore the human dimension of shark-based tourism and describe the potential for the activity to contribute to conservation. It endeavours to identify the features of the tour which maximise conservation outcomes. The following questions guide the different components of the thesis:

1. What are the salient beliefs of tourists with regard to shark-based tourism? (Chapter 2)
2. What is the role of on-tour education and interpretation about sharks? (Chapter 3)
3. How do participants value the shark tourism site? (Chapter 4)
4. Can the tourism experience promote change in participants’ conservation behaviour? If so, which elements of the white shark cage-dive tour are associated with a positive shift in conservation behaviour? (Chapter 5)
Figure 4 illustrates how each chapter contributes to the thesis aim and the research questions addressing the identified gaps in knowledge.

**Thesis aim**

- Explore the human dimension of wildlife tourism and describe the potential for the activity to contribute to conservation.

**Knowledge gap addressed**

1. Human dimension information is missing from current shark-based tourism research.

2. The potential for shark-based tourism to have a positive impact on tourist’s knowledge, awareness and conservation behaviour has not yet been explored.

3. The elements of the shark-based tourism experience that contribute to knowledge, awareness, and conservation are unknown.

**Research question & corresponding chapter**

- What are the salient beliefs of cage-diving tourists with regard to shark-based tourism? (Chapter 2)

- What is the role of on-tour interpretation? (Chapter 3)

- How do participants value the tourism site? (Chapter 4)

- Can the tourism experience promote change in participants’ conservation behaviour? If so, which elements of the tour are associated with a positive shift in conservation behaviour? (Chapter 5)

**Figure 4.** A diagram illustrating the connection between the thesis aim, the research questions, each chapter and the knowledge gap addressed.

### 1.7 Structure of the thesis

This thesis consists of six chapters including an introduction chapter (chapter 1), four data chapters (chapters 2–5), and a discussion and conclusion chapter (chapter 6). An overview of how the research questions have been structured within the thesis chapters with each chapter
contributing to the overarching aim of the thesis and the identified gaps in knowledge was presented in Figure 4.

Chapter 1 introduces the research and positions the study by summarising what is already known in the field of wildlife and marine tourism, identifying knowledge gaps related to shark-based tourism, introduces the case study, and defines the thesis aims and research questions. Background information about the theoretical framework is intentionally brief to reduce repetition as additional information is detailed in the introduction sections of each data chapter.

Chapter 2 provides an insight into the beliefs of tourists related to the activity of cage-diving with white sharks at the Neptune Islands. This chapter is already published in Anthrozoös: Apps, K., Dimmock, K., Lloyd, D., & Huveneers, C. (2016). In the Water with White Sharks (*Carcharodon carcharias*): Participants’ Beliefs toward Cage-diving in Australia. *Anthrozoös*, 29(2), 231-245.


Chapter 4 examines the social values of the white shark cage-dive tourism site in Australia and addresses the third research question. This paper is currently under review with the *Journal of Ecotourism*.


Chapter 6 integrates and synthesises the significant findings of chapters 2–5, highlighting the practical and theoretical contribution of the research. In this final chapter, the thesis concludes with implications from the research with recommendations for shark-based tourism.
Chapter 2 – In the water with white sharks (*Carcharodon carcharias*): Participants’ beliefs towards cage-diving in Australia

Photo 3. View of a white shark from inside the dive cage.

Photo: Kirin Apps
This chapter details the analysis and findings of a belief elicitation survey conducted with 86 white shark cage-diving participants at the Neptune Islands, South Australia over 13 days between March and May 2014. The survey questions (Appendix A) were fundamental to understanding the views of participants with responses providing a formative function for subsequent phases of the research presented in chapters three and four. The survey questions were based on the theory of planned behaviour (Fishbein & Ajzen, 2010) and were designed to address the first research question (Figure 5).
Chapter two is presented as a published article for which the reference is:

2.1 Abstract

White shark (Carcharodon carcharias) cage-diving tourism is a controversial activity that provokes emotional and often opposing points of view. With increasing demand for shark tourism since the 1990’s, the underlying determinants driving this growth in participation remain unclear. This paper adopts a qualitative approach to investigate beliefs underlying tourists’ choice to observe white sharks while cage-diving at the Neptune Islands, South Australia. Elicitation surveys gathered responses from a sample (n=86) of cage-diving participants. Content analyses of responses reveal the decision to cage-dive with white sharks is driven by factors including education and the perceived naturalness of the experience. The findings of this study indicate an opportunity for cage-dive operators to provide in-situ education and interpretation with potential for increased tourist satisfaction and shark conservation outcomes.

Key words: education; interpretation; marine wildlife; shark tourism; theory of planned behaviour

2.2 Introduction

Nature-based marine tourism has experienced rapid expansion in the past two decades (Hoover-Miller et al., 2013). Today numerous opportunities exist for visitors to develop appreciation and connectivity with the ocean, gaining education and awareness regarding marine conservation, while simultaneously generating revenue for the local economy (Ballantyne, Packer & Sutherland, 2011; Catlin, Hughes, Jones, Jones & Campbell, 2013; Eagles, McCool, Haynes & Phillips, 2002; Eagles & McCool, 2002; Higginbottom, 2004).

An important niche sector in the rapidly developing marine tourism market is shark tourism (Cater, 2008). Dearden et al. (2008) noted that the popularity of shark diving has grown exponentially since the early 1990’s with Cisneros-Montemayor and Sumalia (2014) estimating that 590,000 tourists participate in shark watching activities each year, spending
almost US$327 million to be as close to sharks of all temperaments and size. While examining internet websites Gallagher and Hammerschlag (2011) found 376 established shark ecotourism operations in 29 countries targeting a number of different species including reef sharks, whale sharks and white sharks. Although shark tourism can include diving, fishing and viewing from a boat, in this study shark tourism refers to a particular type of dive undertaken to observe a given species of shark (Dicken, 2014).

The economic benefits from shark tourism are recognised, with observations by Cisneros-Montemayor et al. (2013) suggesting the number of shark watchers will double within 20 years as tourist expenditures generate an estimated USD 780 million. These figures provide incentive to reduce consumptive exploitation and place an economic value on sharks beyond the one-off value achieved through commercial fishing (Dobson, 2008; Vianna et al., 2012; Ward-Paige, 2014).

The traditional negative image of sharks has often resulted in lack of public support, and has been an obstacle for shark species receiving the management priority and conservation required (Dobson, 2008; Kempster & Collin, 2014; Neff, 2014; Topelko & Dearden, 2005). However, increased community awareness of contemporary threats to sharks has impacted on public attitudes resulting in a call for action to address species decline (Hepp & Wilson, 2014; Kempster & Collin, 2014; Simpfendorfer et al., 2011; Whatmough et al., 2011). As the popularity of shark diving continues, the dive industry has considerable potential to enhance appreciation of sharks and the marine environment by seeking to foster understanding and marine stewardship opportunities amongst visitors (Carwardine & Watterson, 2002; Dobson, 2006; 2007; Friedrich et al., 2014; Topelko & Dearden, 2005).

To date, shark tourism research has focused on potential biophysical and economic impacts (Cubero-Pardo et al., 2011; Hammerschlag et al., 2012; Vianna et al., 2012; Bruce & Bradford, 2013; Huveneers et al., 2013). Researchers studying the human dimensions of wildlife tourism are calling for better understanding of tourists participating in shark-dive activities, as their underlying motivations remain unclear (Gallagher & Hammerschlag, 2011; Simpfendorfer et al., 2011; Whatmough et al., 2011; Ziegler et al., 2012).
2.2.1 White shark tourism

White shark (*Carcharodon carcharias*) tourism has become a popular recreational activity with opportunities in only a few countries where these sharks can be reliably observed (Dobson, 2008; Kempster & Collin, 2014). These locations include; Ile de Guadalupe Mexico, the Farallon Islands off the coast of California, the Western Cape of South Africa (Carwardine & Watterson, 2002) and more recently, the South Island of New Zealand. The location of the present study is in South Australia where shark cage-diving has been conducted since the 1970’s. Today operations are confined to the Neptune Island Group with three operators attracting international and domestic tourists (Commonwealth of Australia, 2013).

White shark cage-diving involves a protected and potentially dangerous species, and the activity is not without controversy (Bruce & Bradford, 2013; Cater, 2008; Dobson et al., 2005). The industry often attracts negative attention following a human/shark incident, with the media emphasizing the view that sharks are conditioned to humans through cage-diving activities (Dobson, 2008; Muter et al., 2013). Opposition to shark cage-diving includes concern for the welfare of the species and the potential negative impacts the activity may have on shark behaviour. White shark visitation to the Neptune islands is temporary and, individual sharks vary in their time spent at the site. As such, the level of interaction with the shark cage-dive operators (SCDOs) indicates the effects of the activity are unlikely to be uniform (Huveneers et al., 2013). Researchers suggest that further research is required to understand and minimize any impacts the SCDOs may have on the behaviour of white sharks (Bruce & Bradford, 2013; Huveneers et al., 2013).

The challenge facing the cage-diving industry is to find a balance between reducing impacts on shark behaviour and habitat, while maintaining a visitor experience that fulfills expectations, supports local economies and provides a platform for research and education (Bruce & Bradford, 2013). Management strategies will be guided by the quality and quantity of scientific data available, which should be carefully balanced when developing regulatory regimes to ensure sustainable shark tourism (Techera & Klein, 2013). The current management of the cage-dive industry in Australia is moving towards a 10-year licensing agreement, from an initial 5-year license (C. Thomas, personal communication, September 1, 2015). This demonstrates the need for current biological, economic and social research to guide policy and licensing provisions.
The purpose of this study was to investigate the white shark tourist, and identify their beliefs regarding cage-diving at the Neptune Islands, South Australia. Within the context of this study an elicitation survey based on the theory of planned behaviour (TpB) was used as the guiding framework to collect qualitative data on white shark cage-diving participants. These data contribute to filling a gap in knowledge regarding the wildlife tourist and shark tourism.

2.3 Methods

2.3.1 Conceptual framework – Theory of planned behaviour

Various theoretical frameworks have been proposed to explain the intricate psychological processes associated with human behaviour. One model in particular, known as the theory of planned behaviour (TpB) has emerged as a frequently cited and influential model for determining human beliefs and behaviour in many domains (Ajzen, 2012; Fishbein & Ajzen, 2010). The rationale for using the TpB in the present study was that there is empirical support from a host of studies, validating its use in a recreation and wildlife context. Studies include research by Rossi and Armstrong (1999) - the attitude and subjective norm of hunters; Daigle, Hrubes and Ajzen (2002) - attitudes and beliefs of wildlife viewers, hunters and outdoor recreationists; Ong and Musa (2011); Apps, Dimmock and Lloyd (2015) and Apps, Lloyd and Dimmock (2015) - beliefs driving underwater diver behaviour and, the application of TpB to address human and bear incidents (Campbell, 2012; Lackey & Ham, 2003; Sakurai & Jacobson, 2011). Applying the TpB in the current study extends its application in a marine context by identifying the beliefs towards white shark tourism.

The theory of planned behaviour (Ajzen, 1991) postulates that behaviour is a function of information, or beliefs, relevant to preforming a particular behaviour. These beliefs, serve as the informational base which determines attitudes, intentions and behaviours (Figure 6) (Ajzen, 1985; Ajzen, 1991; Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). Behavioural beliefs are determined from the information an individual has about the outcome of a particular behaviour. The strength of the beliefs and the evaluation of the outcome determine a favourable or unfavourable attitude toward the behaviour. Normative beliefs refer to the perceived social pressure of important individuals and groups such as family, friends and co-workers. The strength of these beliefs in combination with a person’s motivation to comply with these social referents (family, friends, co-workers), determines the subjective norm (Ajzen & Fishbein, 1980). Control beliefs refer to the perceived presence of factors that may facilitate or hinder performance of the behaviour. They give rise to the apparent ease or
difficulty of performing the behaviour, known as perceived behavioural control (Ajzen, 1991).

Figure 6. The theory of planned behaviour  
(Adapted from Ajzen, 2006).

Consideration of these beliefs toward a given behaviour is the first step in understanding why people behave the way they do (Ajzen, 1992). According to the TpB, in order to identify particular beliefs, a target behaviour needs to be identified (Ham, Brown, Curtis, Weiler, Hughes & Poll, 2009). To maintain the compatibility of the survey questions with the particular behaviour, Ajzen and Fishbein (1980) and Francis et al. (2004) recommend clear definition of the behaviour using corresponding measures of target, action, context and time. The present study defined the target behaviour as “observing (action) white sharks (target) while cage-diving at the Neptune Islands (context) on the day of sampling (time).” The rationale for choosing this particular behaviour as the research focus was to aid an understanding of the visitor experience by identifying beliefs which underlie their attitude and intentions toward the controversial activity of cage-diving.

2.3.2 Elicitation survey data and analysis

This study applied the elicitation procedures of Ajzen and Fishbein (1980); Middlestadt, Bhattacharyya, Rosenbaum, Fishbein & Shepherd (1996); Francis et al. (2004); Beeton, Weiler and Ham (2005) and Ajzen (2006). TpB constructs of attitude, subjective norm and perceived behavioural control informed the open-ended questions used in the survey to elicit behavioural, normative and control beliefs underlying participants’ intention to observe white sharks by cage-diving at the Neptune Islands, South Australia.

Data collection occurred on-board the three cage-dive operations at the Neptune Islands group (Ron and Valerie Taylor) Marine Park over 13 sampling days between March
and May 2014. A purposive sampling technique was applied whereby all participants who had observed a shark from the cage, and were over the age of 18 and were capable of completing the English-language questionnaire, and were invited to complete the survey (98 participants).

Following the cited TpB methodology a small sample size within the sample population is considered appropriate as long as it captures a comprehensive range of salient beliefs (Curtis, Ham & Weiler, 2010; Hughes, Weiler & Curtis, 2012). Ajzen and Fishbein (1980) suggest theoretical saturation can occur at the point when additional surveys provide little additional information. Theoretical saturation in the present study was expected to occur at a size similar to other elicitation studies (e.g., 62 visitors for research by Lackey and Ham (2003), $n = 54$ and $n = 60$ for the two national parks in the study by Curtis et al. (2010)). However, new beliefs were being cited beyond the expected sample size, therefore elicitation surveys continued until theoretical saturation was achieved. Saturation was reached following 86 surveys (88% response rate). The main reason for those not participating in the study was seasickness.

Following methodology applied in previous elicitation studies content analysis of responses to open-ended questions was performed to identify the salient, or most frequently mentioned responses (Beeton et al., 2005; Curtis et al., 2010; Fishbein & Ajzen, 2010; Ham et al., 2008; Hughes et al., 2012). Where participants responded with more than one belief, all responses were included in the data set to be coded (Ham et al., 2009). In this way, an inventory of cage-diving participants’ behavioural beliefs, normative beliefs (known as social referents) and control beliefs salient to the target behaviour was generated.

The raw data were reviewed and common themes of meaning inherent to the belief response categories were identified to collapse the 196 behavioural belief responses into 15 categories, the 179 normative beliefs into 21 categories and the 175 control beliefs into 19 categories. Each category was tested for reliability among three coders until a consensus was reached on how each statement should be classified (Beeton et al., 2005; Francis et al., 2004; Middlestadt et al., 1996). This procedure enhanced the reliability of beliefs entered into the subsequent analysis. The belief categories were initially reviewed in terms of how frequently they were mentioned by participants. In accordance with Ajzen and Fishbein (1980), beliefs identified by at least 10% of participants were ranked in numerical order based on frequency of responses with those only mentioned by a few being discarded (Ham et al., 2008).
Socio-demographic variables were measured largely by multiple choice style questions with categorical response options. Results are reported presenting frequency of responses in each category and comparisons are made with participants from selected shark diving and other marine wildlife studies.

2.4 Results and discussion

2.4.1 Demographics

This section provides a demographic profile to describe the white shark cage-diving participants of this study. Limited by the sample size it is not intended as a representative sample of the population, however some comparisons and trends with studies of similar tours are made.

The majority of the sample were male (63%) with the percentage consistent with studies of shark divers by Dicken and Hosking (2009); Du Preez, Dicken and Hosking (2012); Lucrezi, Saayman and Van der Merwe (2013); Dicken (2014) and Apps, Lloyd & Dimmock (2015). However, the percentage differs from other marine tourism studies such as those focused on marine mammal tourism participants, which found an almost even proportion of males and females (Amante-Helweg, 1996; Finkler, 2001); or a higher proportion of females (Filby et al., 2015; Lück, 2003; 2015; Malcolm & Duffus, 2008). A higher proportion of female participation has also been found in studies of whale shark tourism (Catlin & Jones, 2010; Davis, Banks, Birtles, Valentine & Cuthill, 1997). Therefore, it seems the proportion of males is higher for species perceived as more dangerous (white shark, tiger shark and grey nurse shark) as opposed to those perceived as more empathic (whale sharks, whales and dolphins), where female participation often dominates. In-water participation may also influence the gender profile of marine tourism participants.

The majority (65%) of participants were under 40 years of age, followed by 30% between 40 and 60 years of age. The results are consistent with studies of shark dive tours by Dicken and Hosking (2009), Catlin, Jones, Norman and Wood (2010) and Dicken (2014) and align with Lück’s (2003; 2015) studies on dolphin tours. Half of the participants were Australian (51%), with the second largest group from the United Kingdom (20%). Other nationalities included tourists from Canada (5%), USA (5%), France (4%), Denmark (4%), Germany (2%), and Trinidad and Tobago (2%). These results align with a study of whale
shark tourists in Western Australia (Catlin & Jones, 2010), which determined 50.6% of participants were Australian.

Scuba diving certification is not a requirement for cage-diving in the surface cages at the Neptune Islands, and just under half the sample were certified scuba divers (45%). Catlin and Jones (2010) found a similar proportion of people holding scuba diving qualifications (52%) on a whale shark snorkelling tour at Ningaloo Reef, Western Australia. Of the certified divers in the present study, 72% were either “open water diver” or “advanced open water diver” certified, indicating that the majority of the sample had minimal diving experience.

This was not the first experience of observing a shark in the wild for a majority of participants (55%). Previous observations of sharks had occurred whilst scuba diving (40%), snorkelling (24%), on a boat (16%), swimming or surfing (9%), fishing (7%), and on the coast (4%). All but two described their previous experience as positive. Those for whom it was a negative experience commented, “but that was my fault”, while another stated the experience had “aspects which were both positive and negative”. Apart from one participant who had observed white sharks on previous cage-diving trips to the Neptune Islands and South Africa, none of the other participants had experience observing white sharks.

The percentage of divers with scuba diving certification (45%) and previous experience observing sharks (55%) suggests that half of the sample had prior interest in seeking marine experiences. For other participants, the cage-diving tour may be viewed predominantly as an adrenaline rush, or a “bucket list” activity. These participants may not necessarily be interested in learning about sharks or marine issues while on tour.

Of the sample 55% \((n=47)\) stated that observing white sharks was their prime reason for visiting South Australia, and 95% of participants \((n=82)\) reported that observing white sharks was the motivating factor for visiting Port Lincoln. Participants stayed an average of 2.4 nights in Port Lincoln accommodation. This is similar to studies of dive tourists by Dicken (2010) who found the “Sardine Run” in South Africa, was the predominant attraction for 86% of the sample. Dicken and Hosking (2009) found tiger shark diving at Ailwal Shoal, South Africa was the predominant attraction for 66% of participants. This primary motivation to visit an area based on the wildlife experience points to the regional importance of the tourism activity at the location. In addition to profits generated by the SCDOs, revenue from related tourism activities can benefit other sectors (Gallagher & Hammerschlag, 2011;
Huveneers & Robbins, 2014) and be a financial injection to the local economy which is unlikely to occur in the absence of the shark-diving industry.

The economic benefits from tourism can inadvertently aid the conservation of white sharks. A meta-analysis of 251 ecotourism case studies noted that if the tourism activity is the most economically advantageous use of the resource, the economic advantage is sufficient to shift management priorities at various levels to trigger conservation initiatives (Kruger, 2005). Therefore, in the context of the current study, cage-diving tourists’ expenditure can support sustainable management of the industry, at local, regional and national scales.

The sample profile in the current study indicates that most (95.3%) have come to Port Lincoln specifically to cage-dive with white sharks, which acknowledges their interest in the species. Understanding demographic characteristics is important for management of the industry. This first-time experience for most participants offers challenges and opportunities for the industry. Identifying the tourist profile can recognise where tourist satisfaction can be improved and the level at which safety briefs and information programs raising awareness can be delivered (Malcolm & Duffus, 2008).

2.4.2 Participant’s beliefs towards cage-diving in Australia

The advantages and disadvantages of observing white sharks at the Neptune Islands were identified as behavioural beliefs underlying participant’s decision-making process. Table 1 presents the advantages, and Table 2 shows the disadvantages of observing white sharks at the Neptune Islands. The behavioural beliefs dominated in the number of participant responses when compared to the normative and control belief responses. According to Ham et al. (2009), experience in protected area settings has demonstrated that it is common for behavioural beliefs to dominate, followed by normative and then control beliefs. The results of this study support this idea, and the results are presented accordingly with emphasis on behavioural beliefs.

**Education and Awareness**

The most frequently (53.5%) mentioned advantage from observing white sharks was the opportunity it facilitated to extend participants’ awareness of the species (Table 1). A similar response was found with tourists participating in whale shark tours: 83.5% responded that
expanding their knowledge was an important motivation for participating in the tour (Ziegler et al., 2012). Other studies with a focus on shark diving also found education an important factor contributing to participant enjoyment (Dicken, 2010; Dicken, 2014; Dicken & Hosking, 2009).

Lück (2008) notes marine wildlife tourists are inclined to desire education and interpretation. They increasingly expect depth in interpretative communication to a greater extent than they would receive on other tours. This contrasts with a study by Dobson et al. (2005) in South Africa. They surveyed SCDOs and found that their clients are mostly backpackers who predominantly seek an adrenaline rush and are not necessarily interested in learning about the sharks.

Results from the present study reveal an educational opportunity for SCDOs to address misconceptions surrounding white sharks by fostering positive attitudes towards sharks and enhancing participants’ knowledge and appreciation of this species. Further knowledge of white shark tourists is required to understand their expectations of the experience and the type of educational information they seek. This level of detail can help operators balance client satisfaction with the underlying objective of education and conservation (Dobson et al., 2005).

**Naturalness of the experience**

The second most frequently cited belief (40.7%) was that cage-diving offered tourists the unique opportunity to observe white sharks in their natural habitat. Respondents stated that cage-diving at the Neptune Islands was “a great opportunity to experience nature in its own environment - not many places where you can reliably experience great white sharks in this way.” Some referred to the experience as being in “the wild” with comments such as, “one of the only opportunities to see them in the wild,” “the chance to see an apex predator in the wild,” and “seeing how they live, act together in the wild.”

The perceived naturalness of the activity can add to enjoyment. Studies such as Davis et al. (1997) found “being close to nature” was the number-one factor contributing to the enjoyment of a swim with a whale shark. Dicken and Hosking (2009) found the “closeness of nature” to be the second most highly ranked factor contributing to the enjoyment of a tiger shark experience in South Africa. In a study of scuba divers at Sodwana Bay, South Africa,
with a focus on sharks, Dicken (2014) found divers’ most positive experience was related to seeing a shark in its natural environment. Other studies have also identified the perceived naturalness as a key aspect of satisfaction in marine wildlife experiences (Mayes et al., 2004; Moscardo & Saltzer, 2004).

Dobson (2007) suggests exposing tourists to sharks in their natural environment has potential to enhance positive attitudes towards sharks. According to the TpB behavioural beliefs provide the foundation of attitudes towards the behaviour (Ajzen & Fishbein, 1980). Therefore, the identified advantage of seeing sharks in their natural habitat may assume positive attitudes towards observing sharks in general. However, attitude is a combination of two components: 1) how likely the diver believes this outcome will occur, and 2), their evaluation of how good, or bad, they believe the outcome to be (Ajzen & Fishbein, 1980; Ham et al., 2009). The responses cited by participants in the current study indicate the belief foundations of their positive attitude toward the cage-diving experience. However, a second belief measurement study would need to be conducted to quantitatively determine the beliefs which underpin their attitude.

**Uniqueness of the experience**

Several cage-divers ($n=11$) described a positive aspect of observing white sharks as being a unique life experience, that it was a “once in a lifetime opportunity” and a “very unique experience to be one of few people lucky to encounter these beautiful creatures.” Other studies have found encounters with wildlife have strong emotional and psychological impacts on participants (Ballantyne, Fien & Packer, 2001; Ballantyne & Packer, 2002; Ballantyne & Packer, 2006; Dobson, 2007; Muloin, 1998). The encounter can be profound with visitors describing the experience as a privilege. A feeling of privilege has also been cited in other marine wildlife tours such as during a dwarf minke whale tour (Birtles, Valentine, Curnock, Arnold & Dunstan, 2002) and with whales, sea lions, and penguins (Bulbeck, 2004).
Table 1. Frequency of behavioural beliefs cited as the advantages of observing white sharks at the Neptune Islands.

<table>
<thead>
<tr>
<th>Belief category</th>
<th>Frequency</th>
<th>Examples of participant responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opportunity for education and Awareness</td>
<td>46 (53.5%)</td>
<td>“Education- the most important thing is that people learn something from the dive about the great white shark.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Being able to view and learn about them first hand, so as to develop a real appreciation for them.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“A tremendous opportunity to educate the public about their behaviours and ecology.”</td>
</tr>
<tr>
<td>See sharks in their natural habitat</td>
<td>35 (40.7%)</td>
<td>“A great opportunity to experience nature in its own environment - not many places where you can reliably experience great white sharks in this way.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“From a personal experience it was exhilarating. More generally it’s good if people experience sharks in the wild to get a better understanding of them.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“It’s an excellent way to see sharks and their behaviour in their natural habitat.”</td>
</tr>
<tr>
<td>Unique life experience</td>
<td>11 (12.8%)</td>
<td>“Amazing life experience.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Very unique experience to be one of the very few people to encounter these beautiful creatures.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Once in a lifetime opportunity.”</td>
</tr>
</tbody>
</table>

**Disturbing shark behaviour**

Table 2 presents the disadvantages participants associated with observing white sharks. The most frequent responses were concerns about disturbing shark behaviour (27.9%) and potential problems from using burley and bait to attract sharks to boats and people (15.1%). Respondents were uncertain about these concerns as many used terms such as “potentially disturbing them with human interaction,” “possibly training them to respond to boats for a feed,” and “perhaps disrupting their natural habitat.” These belief responses may have been influenced by the frequent debate about the cage-diving industry presented in the media or on social media. This topic is an area where participants could be informed on current research.
about shark behaviour and the use of burley. It also acts as an opportunity to explain the basis for licensing and burley regulations.

Table 2. Frequency of behavioural beliefs cited as the disadvantages of observing white sharks at the Neptune Islands.

<table>
<thead>
<tr>
<th>Belief category</th>
<th>Frequency</th>
<th>Examples of participant responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disturbing shark behaviour and</td>
<td>24 (27.9%)</td>
<td>“Potentially disturbing them with human interaction.”</td>
</tr>
<tr>
<td>habitat</td>
<td></td>
<td>“I wonder whether baiting and burley antagonizes the shark’s behaviour. There is not enough research with clear answers as to how the boat affects the sharks.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Perhaps disrupting their natural habitat.”</td>
</tr>
<tr>
<td>No disadvantage</td>
<td>23 (26.7%)</td>
<td>“None I know of.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Nothing.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Nil disadvantages”</td>
</tr>
<tr>
<td>Attracting sharks to boats/people</td>
<td>13 (15.1%)</td>
<td>“Perhaps by baiting the water it is making them unnaturally dependent on people and make them associate people/boats with food.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“They could possibly become to recognise boats and people, and form a relationship to food.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Maybe the sharks get more confident around people and boats etc., so get drawn to them.”</td>
</tr>
</tbody>
</table>

Although responses indicated participants considered the disadvantages of cage-diving, they were unsure of the degree of the potential impacts, and/or they believed the advantages of observing the sharks outweighed the disadvantages. Respondents commented to the researcher they considered possible disadvantages to be unimportant, compared with other factors which threaten white shark populations and associated habitats.

With regard to a given behaviour, the TpB suggests all beliefs may not be in agreement (Ajzen, 1985; 1991). An individual may hold conflicting beliefs, as the present
study identified advantages and disadvantages of observing white sharks. According to the TpB, the resulting attitude and formation of intention to perform the behaviour results from the weights of the beliefs. As respondents were surveyed on tour, this indicates that for this sample the advantages of cage-diving outweigh the disadvantages.

**Normative beliefs**

Normative beliefs can be useful in exploring the behaviour of wildlife viewers as they help explain the power of the social group over individual actions (Manfredo, 2008). Participants were asked to identify individuals or groups who would approve and who would disapprove of them observing great white shark/s at the Neptune Islands. Responses referred to groups such as the tourism industry, most people, researchers, and conservationists. The tendency to quote ambiguous social referents is not assumed to influence social pressure consistent with normative beliefs (Curtis et al., 2010). According to Ham et al. (2009) in protected area settings normative beliefs are often found to not be as important as other TpB constructs. Reasons for this vary; however for some behaviours, visitors do not feel much social pressure (Conner & Armitage, 1998; Ham et al., 2009).

**Control beliefs**

Intention and behaviour are, in part determined by beliefs concerning factors that facilitate or hinder perceived ability to engage in a specific behaviour (Ajzen, 1991). Beliefs, which emerged as facilitators and barriers to observing white sharks at the Neptune Islands, reveal environmental (good weather, calm ocean conditions) and economic determinants (affordable travel and tour costs) underlie perceived behavioural control when observing white sharks. The perception that observing sharks is hindered by cost is consistent with the TpB control beliefs, where resource availability determines the perception of control over a behaviour (Ajzen, 1991). However, regardless of the cost, participants are still willing to pay, and demand continues. Shark tourism is driven by economic decisions with “willingness to pay” studies suggesting divers hold high non-consumptive values for sharks. A study of American scuba divers ($n=504$) demonstrated 71% were willing to pay more to observe sharks than any other species (White, 2008).
2.4.3 Management implications

The findings from this study reveal that at least half of the sample indicated demand for information on sharks, demonstrating the potential for the SCDOs to contribute to shark conservation through education and interpretation. Proponents of nature-based tourism suggest that conservation benefits resulting from education and interpretation can help mitigate negative tourism impacts (Powell & Ham, 2008). Onsite benefits such as increased understanding and/or emotional responses to wildlife encounters may lead to off-site benefits through enhanced environmental awareness and philanthropic support for conservation (Mayes et al., 2004; Moscardo, 2008; Packer & Ballantyne, 2012; Townsend, 2008; Zeppel & Muloin, 2008). This point has been demonstrated in studies by Tisdell and Wilson (2002; 2005; 2012) with regard to tourists viewing sea turtles at Mon Repos, where learning was an outcome of the experience and was found to foster positive conservation values and visitor behaviour.

Managers have the unique opportunity to raise awareness and inform participants about shark conservation issues. However, due to the diverse characteristics of participants (language, previous marine knowledge, and tourist “type”), individual tourist’s needs are potentially difficult to address in program design (Orams, 1999). Understanding participants’ characteristics and motivations can assist the provision of interpretative material (Garrod, 2008). In the case of shark diving formal educational programs may not suit participants or the site (Dobson et al., 2005). Therefore, interpretative communication may be relevant as Ham (2013, p1) recognises, interpretation “attempts to communicate in a thought provoking way to an audience that’s completely free to ignore it.” Therefore, material can be offered for those interested without reducing the experiential satisfaction of others wishing to “ignore it”.

Further studies are needed to understand and minimise impacts the SCDOs may have on the behaviour of white sharks at the Neptune Islands (Bruce & Bradford, 2013; Huveneers et al., 2013). Tours which include education may indirectly alleviate negative impacts as visitors may experience behavioural and lifestyle changes including a desire to minimise impacts, donate money, and take direct action such as supporting shark conservation (Moscardo & Saltzer, 2004). This would not directly alleviate negative impacts of tourism but could support research into understanding and mitigating of the effects of the cage-diving industry. Shark tourism at the Neptune Islands could provide a “win-win” situation for tourists and wildlife. However, nature-based tourism’s claims to achieve the objectives of conservation via education, awareness, and experience are largely untested. Links between
SCDO characteristics and positive changes in participants’ environmental knowledge, attitudes, and behaviours require further examination. The potential for white shark tourism to influence visitors’ attitudes towards shark conservation is an area that warrants further investigation (Dobson, 2008).

2.5 Conclusion

Results from this study suggest that participants view their cage-diving experience as an opportunity to learn about sharks in a natural and unique environment. Exposure to sharks, in combination with education and interpretation, reveals the potential for management and SCDOs to play a role in providing interpretive and educational initiatives which stimulate conservation, inspire appreciation, dispel myths, and influence attitudes to achieve a more balanced understanding of the plight of this apex predator. These conclusions underscore the importance for management to understand what contributes to participation in white shark cage-diving.

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Chapter 3 – Is there a place for education and interpretation in shark-based tourism?

Photo 4. Tourists observing a white shark from the deck of the vessel.

Photo: Kirin Apps
The results presented and discussed in chapter two suggest that participants viewed their cage-diving experience as an opportunity to learn about sharks. In order to further investigate the role of education and interpretation onboard white shark cage-dive tours at the Neptune Islands, a larger sample of participants (n=607) were surveyed over 25 days between June 2015 and January 2016. The survey design (Appendix B) was adapted from research by Altobelli (2011) and Lück (2003; 2015), with qualitative and quantitative data collected to investigate if tourists want to be educated while on a white shark cage-diving tour, and if so, what do they want to learn? This chapter discusses the role of on-tour interpretation at the Neptune Islands, addressing the second research question (Figure 7).
Chapter three is presented as a published article, for which the reference is:

3.1 Abstract
Interpretive encounters are a major component of many wildlife tourism experiences and can make significant contributions to tourist satisfaction and pro-conservation attitudes. The growth of shark-based tourism has provided numerous opportunities to contribute to conservation by exposing tourists to sharks in their natural habitat, provide them with education and interpretation programmes that dispel myths, and draw attention to the threats facing shark populations. However, little research has focused on the motivations and expectations of marine tourists in relation to on-tour interpretation, particularly within industries linked to adrenaline rush. The present study explored the role of on-tour education and interpretation during a white shark cage-dive tour in South Australia. Participant surveys sought to answer the questions, do cage-dive tourists want to be educated and what do they want to learn? Results support the demand for additional on-tour information focused on shark biology, habits, and conservation, suggesting participants want more than an adrenaline rush. The findings contribute to understanding the importance of education in shark-based tourism as the cage-dive participant experience and conservation potential of the tour can be enhanced with the addition of a structured interpretation programme.

Keywords: white shark; cage-diving; wildlife tourism; shark conservation; regulation

3.2 Introduction
Shark-based tourism has experienced a dramatic growth in popularity over the past two decades (Dearden et al., 2008). Formerly perceived as a detriment to marine tourism, sharks are now promoted by many operators as a key element of the experience (Dearden et al., 2008; Kempster & Collin, 2014; Topelko & Dearden, 2005). To date, shark-based tourism research has focused on tourism impact issues surrounding shark-based tourism, such as, the potential for negative impacts on shark behaviour (Barker et al., 2011; Cubero-Pardo et al., 2011; Hammerschlag et al., 2012; Huveneers et al., 2013; Maljković & Côté, 2011; Smith et al., 2009) and the economic value of shark watching (Cisneros-Montemayor et al., 2013; Huveneers & Robbins, 2014; Topelko & Dearden, 2005; Vianna et al., 2012). Research has also highlighted the role of citizen science such as the Great Fiji Shark Count in which the
tourism industry coordinates with researchers to collect shark, ray and turtle population data in Fiji (Ward-Paige, 2014). The social dimensions of shark diving activities, including the role of education and interpretation remain predominantly unclear with researchers recognising the need for further inquiry into the human dimensions of shark tourism (Altobelli, 2011; Brena et al., 2015; Gallagher & Hammerschlag, 2011; Simpfendorfer et al., 2011; Whatmough et al., 2011; Ziegler et al., 2012).

With an estimated 590,000 tourists participating in shark watching activities each year (Cisneros-Montemayor & Sumalia, 2014), these experiences provide more opportunities than to simply entertain. They provide an ideal venue to facilitate and support the development of knowledge and pro-conservation attitudes in tourists (Dobson, 2008) through interpretive programmes designed to dispel myths and draw attention to the threats facing shark populations worldwide (Dobson et al., 2005; Topelko & Dearden, 2005). The need to use all opportunities to educate and inform the public is critical considering the high level of extinction risk that many shark species face (Dulvy et al., 2014).

One of the greatest threats to shark conservation is the traditional image of sharks as ‘human eating machines’. As a result, sympathy for sharks is often difficult to engender amongst the general public (Topelko & Dearden, 2005). While a growing faction may support shark conservation, negative attitudes and fear of sharks still exists (Crossley et al., 2014; Friedrich et al., 2014; Neff & Yang, 2013; O’Bryhim & Parsons, 2015). Shark-based tourism has, however, considerable potential to contribute to pro-conservation attitudes by dispelling myths and exposing tourists to sharks in their natural habitat (Dobson et al., 2005; Topelko & Dearden, 2005). While Dobson (2008) argues that exposure to sharks may engender a positive conservation ethic within tourists, Moscardo, Woods and Saltzer (2004) suggest that exposure to wildlife by itself is unlikely to impact on the knowledge and wildlife conservation attitudes of tourists without appropriate education material. They suggest that wildlife-based experiences need to be associated with structured, quality interpretive encounters to influence what tourists think and believe. Therefore, in order to build a motivated constituency of people who support shark conservation, shark-based tours should facilitate and support the development of knowledge and pro-conservation attitudes among their customers by incorporating a well-designed interpretation programme.

For many wildlife tours, interpretation programmes have been a major component of the ‘wildlife experience’ and can make significant contributions to tourist satisfaction (Moscardo et al., 2004). Lück (2008) holds the view that marine wildlife tourists expect a
certain depth in interpretive communication, often to a greater extent than what they would experience on other tours. Andersen and Miller (2006) found on-board interpretation was an expectation of whale watching tourists, influencing participant’s evaluations of the trip, and was an important factor in helping to avoid disappointment when trip expectations were not met as the interpretive encounter became the experience. While examining whale and dolphin tourists in New Zealand, Lück (2003; 2015) concluded that although tourists display high satisfaction levels, they still desire to learn more about wildlife and the sea in general. The findings align with results from a study into the beliefs of white shark cage-dive tourists in South Australia where tourists listed the opportunity to learn about sharks as the main advantage of white shark cage-diving (Apps, Dimmock, Lloyd, & Huveneers, 2016). In contrast, the participants partaking in white shark cage-diving in South Africa were predominantly backpackers and were viewed by operators as primarily after an adrenaline rush and not necessarily interested in learning (Dobson et al., 2005). This discrepancy in the motivations for participation in the shark-based tourism experience suggests that these drivers require further investigation.

3.2.1 Education and Interpretation

The diverse motivations and characteristics of individual participants on marine wildlife tours may be difficult to cater for in education programme design (Orams, 1999). In the case of shark-based tourism, formal educational programmes may not suit participants or the site (Dobson et al., 2005). An interpretive communication approach may be more appropriate whereby interpretation ‘attempts to communicate in a thought provoking way to an audience that’s completely free to ignore it’ (Ham 2013, p1). Defined by Tilden in 1957, interpretation is ‘an educational activity which aims to reveal meaning and relationships through the use of original objects, by first-hand experience, and by illustrative media, rather than simply to communicate factual information’ (Tilden, 2007, p.33). On marine tours, interpretive products typically include talks by tour guides or rangers on-board boats or along the shoreline and may be combined with visitor centres, displays, brochures, and signs. Information usually covers, biology, ecology, threats to marine life, and best practice guidelines, such as minimal impact procedures for interaction with the species (Zeppel & Muloin, 2008).

Ham (2007) suggests that for interpretive communication to be successful it must be enjoyable to the audience, relevant to what they already know and care about, organised for easy processing, and it must make a compelling point (communicate a relevant theme). It
must provoke participants to consider the information presented in addition to their prior attitude (Ham, 2007). Tilden (2007) advises that interpretation should be aimed at provoking visitors to think on their own, rather than simply teaching them the facts (i.e. provocation versus instruction). The Orams interpretation model (1996) incorporates the concept of ‘creating questions’ in participant’s minds. This in turn engages the visitor’s emotions, outlines relevant issues or themes, and provides opportunities for participants to act. This model also points out the significance of programme evaluation to determine the programme’s effectiveness and feed into future programme development. These recommendations for incorporating successful interpretation into nature-based tourism reflect the value of cognitive and behavioural disciplines to this field, which is increasingly contributing to meeting the goal of a balance between recreation and conservation (Catlin & Jones, 2010).

While the proponents of nature-based tourism suggest that the delivery of education is a major element to the conservation of the species, there are limitations to the provision of such a programme. Operators are challenged to engage participants and deliver effective messages while managing visitor’s safety and their desire for close interactions with wildlife (Zeppel, 2008). Cage-diving is primarily an economic activity where the primary objective is to generate a profitable return. The motivation of operators to achieve concurrent conservation objectives and contribute to wildlife conservation can be compromised to ensure that they are competitive, profitable, and improve customer satisfaction (Dobson et al., 2005). Therefore, appropriate management frameworks, such as mandating educational requirements through licensing conditions, may be required to mitigate such compromises (Techera & Klein, 2013).

At present, the majority of education and interpretation research related to marine wildlife tourism has been focused on marine mammals. Environmental education on whale watching vessels has been an effective tool to improve the personal knowledge of tourists, influence attitudes and behaviour, while contributing to a satisfying experience (Andersen & Miller, 2006). Best practice guidelines for education and interpretation within the cetacean tourism industry include providing up-to-date species information to the tourists, in addition to education and training support for operators and guides (Walker & Hawkins 2013). While whale watching and shark-based tourism may have similarities, such as the transition from an industry based on consumption to one based on observation and interaction, whales do not suffer from the negative public image that has been observed for sharks. Public support for the protection of whale species has therefore been easier to generate than support for
protection of sharks. It could be argued that while education and interpretation are a valuable element to whale watch tourism as a tool for generating public support for conservation, its implementation in shark-based tourism is of greater significance.

3.2.2 White shark cage-dive tourism

Despite negative connotations, which typically surround white sharks (*Carcharodon Carcharias*) (Dobson et al., 2005), the species has a fascination to humans, which has lead to the development of a global cage-dive tourism industry (Dobson, 2008; Kempster & Collin, 2014). These tourism opportunities exist in only a few countries where the sharks can be reliably observed including: Mexico, California, South Africa (Laroche, Kock, Dill & Oosthuizen, 2007), South Australia (Bruce & Bradford, 2011; Huveneers et al., 2013), and New Zealand (Bruce, 2015; Francis, Duffy & Lyon, 2015).

In Australia, the white shark cage-dive industry consists of three operators. Two operators offer day trips, while the third tour is conducted over multiple days (2–10 days). A typical day trip involves a full day, starting from the Port Lincoln marina. The voyage to the cage-dive site takes between 2.5 to 3 hours travelling along the coastline of the Lincoln National Park before heading offshore to the Neptune Islands. Once at the site, a safety and site brief is given to participants. Over the course of the day, participants spend time in the cage observing the shark/s, while those not in the cage are encouraged to talk with staff and ask questions related to the sharks and local area. While the window of communication opportunity may be greater for staff on-board the multi-day tour, there are multiple opportunities for interpretive encounters on-board each of the tours. The focus of the present study was on a day trip tour; and as such the findings of this research are limited to this type of experience. However, the focus on the day trip is justified as it represents the majority (~80%) of people cage-diving in Australia (DEWNR, personal communication, February 10, 2015).

White shark cage-diving involves a protected and potentially dangerous species, and the activity is not without controversy (Bruce & Bradford, 2013; Cater, 2008; Dobson et al., 2005). The controversy surrounding the cage-diving industry and potential for negative impacts on white shark behaviour has seen an increase in management and governance of the industry (Commonwealth of Australia, 2013). Wildlife tourism managers have a dual mandate to ensure activities do not significantly alter the natural environment, while ensuring these
same activities provide satisfying visitor experiences (Packer & Ballantyne, 2012). The challenge facing the cage-diving industry is to find a balance between minimising effects on shark behaviour and habitat, while maintaining an experience that fulfils tourist expectations, contributes to local economies, and is a platform for future research and education (Bruce & Bradford, 2013). Although on-going studies into the impacts of the tourism activity on sharks are being conducted, the current absence of information about the tourist experience warrants further academic attention.

This study explores the role of on-tour education during a white shark cage-dive experience. To address the gap in knowledge, the study aims to examine the experience of white shark tourism at the Neptune Islands, South Australia. Specifically, the questions posed by Lück, ‘do tourists want to be educated’ (2003) and ‘what do tourist want to learn’ (2015) frame the research questions. Results from this study explore the potential for improved communication and delivery of education, and conservation messages from operators and staff.

3.3 Methods

3.3.1 Study Site

White shark cage-diving has been conducted in South Australian waters since the late 1970s and has been confined to the Neptune Island group (35°16.72’S; 136°5.48’E) since 2002. The cage-diving site is part of the Neptune Island group (Ron and Valerie Taylor) Marine Park located 60–70km south of Port Lincoln, South Australia. At present the majority of cage-diving activities are focused on the North Neptune Island Group (Bruce & Bradford, 2013) due to its closer proximity to Port Lincoln. The site has seen an increase in cage-diving effort since 2007, from changing multi-day irregular trips, to regular day trip operations in conjunction with increased customer demand, showing an increase in mean annual diving days rising from 124 days (2000–2006) to 265 days (2008–2011) (Bruce & Bradford, 2013). In response to this increase in effort and studies showing changes in the residency and fine-scale swimming behaviour of white sharks (Bruce & Bradford, 2011; Huveneers et al., 2013), the South Australian government restricted licences to three operators and limited the number of activity days to 10 days per fortnight (DENR, 2012; Techera & Klein, 2013). Further
restrictions are expected with the release of 10-year licences currently under discussion (C. Thomas, personal communication September 1, 2015).

3.3.2 Sample

Data collection was conducted on-board a white shark cage-diving tourist operation at the Neptune Islands, South Australia, over 25 days, from June 2015 to January 2016. All cage-dive participants over the age of 18 were invited to participate in the research. Those who agreed were asked to complete and return the survey during the trip back to port. A total of 607 surveys were completed, with a response rate of 77%. The reasons given for not participating in the survey included seasickness, poor English language skills, and the respondent not having their reading glasses on-board the vessel.

3.3.3 Research instrument

Pen and paper surveys were used to collect a combination of qualitative and quantitative data. The survey design was adapted from research by Altobelli (2011) and Lück (2003; 2015) and allows for comparisons to be made with related marine wildlife tourism literature. The survey design was pre-tested over 5 days in December 2014 and resulted in minor changes and additions to the final survey. These pre-test results were omitted from the final sample.

The final survey (Appendix B) included participant’s reason for their visit with 10 variables measured on a 5-point scale ranging from “strongly disagree” to “strongly agree” (adapted from Altobelli, 2011). Using the same rating scale, respondents were asked to indicate their opinion on environmental education in general (4 variables, adapted from Lück, 2003), their view on how much the activity was an educational experience (4 variables, adapted from Lück, 2003; 2015), and whether they would have liked more information with regard to certain topics (8 variables, adapted from Lück, 2015). Demographic questions were included to describe the sample profile and were compared with sample populations from other relevant research.

Open-ended questions were offered to allow respondents opportunity to comment on their experience in their own words. Participants were asked if they would recommend this experience to family and friends, and whether there was anything that detracted from the
experience. The final survey questions asked participants if there was anything in particular they would like to know about white sharks or the marine environment. Another space allowed participants to write additional comments about their experience.

3.3.4 Data analysis

Descriptive statistics were produced to summarise cage-dive participants’ reason for their visit, opinion on environmental education in general, view on the activity as an educational experience, whether they would have liked more information, and demographic characteristics. One-way ANOVAs and independent samples t-test were used to compare the means between groups such as age and gender. To determine the reliability of the items (i.e. that the scores have high internal consistency and correlate with each other) Cronbach’s alpha coefficient was determined. Ranging from 0 to 1, values above 0.7 are deemed acceptable (Pallant, 2011). Reliability testing in the present study resulted in a Cronbach’s alpha coefficient of 0.83 for the general environmental education data set (Table 3), 0.79 for the reason for the white shark cage-dive tour data set (Table 4) 0.85 for the environmental education on white shark cage-diving tours data set (Table 5), and a value of 0.86 for the I would have liked data set (Table 6). The results indicate high internal consistency and therefore reliability of the scales within the sample. All statistical analysis was performed using IBM SPSS Statistics 22. Open-ended responses were analysed qualitatively by identifying the major categories and themes emerging from participant responses.

3.4 Results and discussion

3.4.1 Environmental education

Overall, participants agreed that education is important. Almost the entire sample (95%) strongly agreed or agreed that learning new things and increasing their knowledge was important, and that they enjoyed learning about wildlife while on holidays (89.4%) (Table 3). For many tourists, interpretive encounters and learning about wildlife are major components of the actual wildlife experience. Commonly associated with visitor satisfaction interpretation programmes have potential to help participants to better identify wildlife and natural behaviour which are also factors associated with satisfaction (Moscardo et al., 2004; Orams,
It is therefore not surprising that the majority of the sample (89%) enjoy learning about wildlife while on holidays. While the majority of the participants agree that learning about wildlife and conservation is important to them, pre-visit attributes such as environmental advocacy are strong predictors of the long-term impact of a tourism experience (Ballantyne, Packer & Falk, 2011) giving credence to the “preaching to the converted” criticism.

3.4.2 Motivations for cage-dive tour participation

There are many factors which can motivate an individual to cage-dive with white sharks. However, an understanding of participants’ diverse characteristics and motivations can assist in facilitating an experience which meets their expectations. Orams (2000) suggests the basic assumption related to the characteristics, motivations, attitudes, and behaviour of whale watchers is that people are fascinated by the animals and want to get close to them. This viewpoint is consistent with the findings from the present study and associated literature. Respondents in the present study were asked to indicate how much they agreed or disagreed with 10 statements related to the reason for their visit. The highest ranked reasons for the tour included seeing a white shark up close (99% strongly agreed or agreed), to have a unique life experience (98.3% strongly agreed or agreed), and to see a shark in its natural habitat (97.4% strongly agreed or agreed). Learning about white sharks (75.2%) and learning about sharks in general (73.7%) was also strongly agreed or agreed by participants as part of the reason for the tour (Table 4).
### Table 3. General environmental education.

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree (%)</th>
<th>Disagree (%)</th>
<th>Neutral (%)</th>
<th>Agree (%)</th>
<th>Strongly agree (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning new things / increasing my knowledge is important for me ($n = 598$)</td>
<td>0</td>
<td>0.2</td>
<td>4.3</td>
<td>38.1</td>
<td>57.4</td>
<td>4.53</td>
<td>0.59</td>
</tr>
<tr>
<td>It is important that we learn as much as we can about wildlife ($n = 598$)</td>
<td>0</td>
<td>0.3</td>
<td>6.7</td>
<td>39.0</td>
<td>54.0</td>
<td>4.47</td>
<td>0.63</td>
</tr>
<tr>
<td>Courses focusing on conservation of natural resources should be taught in schools ($n = 597$)</td>
<td>0</td>
<td>0.7</td>
<td>9.0</td>
<td>42.2</td>
<td>48.1</td>
<td>4.38</td>
<td>0.68</td>
</tr>
<tr>
<td>I enjoy learning about wildlife during my holidays ($n = 597$)</td>
<td>0.2</td>
<td>1.5</td>
<td>8.9</td>
<td>42.0</td>
<td>47.4</td>
<td>4.35</td>
<td>0.72</td>
</tr>
</tbody>
</table>

Notes: 1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree. Cronbach’s $\alpha = 0.83$. 

Table 4. Participant reasons for the white shark cage-dive tour.

<table>
<thead>
<tr>
<th>Reason for tour</th>
<th>Strongly disagree (%)</th>
<th>Disagree (%)</th>
<th>Neutral (%)</th>
<th>Agree (%)</th>
<th>Strongly agree (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>To see white shark(s) up close (n = 599)</td>
<td>0.2</td>
<td>0</td>
<td>0.8</td>
<td>16.2</td>
<td>82.8</td>
<td>4.81</td>
<td>0.43</td>
</tr>
<tr>
<td>To have a unique life experience (n = 599)</td>
<td>0</td>
<td>0.3</td>
<td>1.3</td>
<td>18.7</td>
<td>79.6</td>
<td>4.78</td>
<td>0.47</td>
</tr>
<tr>
<td>To see a shark in its natural habitat (n = 599)</td>
<td>0.3</td>
<td>0.5</td>
<td>1.8</td>
<td>20.4</td>
<td>77</td>
<td>4.73</td>
<td>0.55</td>
</tr>
<tr>
<td>To experience thrill and adventure (n = 598)</td>
<td>0.2</td>
<td>0.5</td>
<td>6.9</td>
<td>23.9</td>
<td>68.6</td>
<td>4.60</td>
<td>0.65</td>
</tr>
<tr>
<td>To see several white sharks (n = 600)</td>
<td>0.2</td>
<td>1.5</td>
<td>11.2</td>
<td>33.7</td>
<td>53.5</td>
<td>4.39</td>
<td>0.76</td>
</tr>
<tr>
<td>To learn about white sharks (n = 599)</td>
<td>0.8</td>
<td>3.2</td>
<td>20.7</td>
<td>43.6</td>
<td>31.6</td>
<td>4.02</td>
<td>0.85</td>
</tr>
<tr>
<td>To experience the marine environment while being underwater (n = 600)</td>
<td>1.8</td>
<td>6.2</td>
<td>18.0</td>
<td>38.5</td>
<td>35.5</td>
<td>4.00</td>
<td>0.97</td>
</tr>
<tr>
<td>To learn about sharks in general (n = 593)</td>
<td>0.3</td>
<td>3.0</td>
<td>22.9</td>
<td>45.0</td>
<td>28.7</td>
<td>3.99</td>
<td>0.82</td>
</tr>
<tr>
<td>To learn about the marine environment (n = 599)</td>
<td>1.8</td>
<td>10.5</td>
<td>40.2</td>
<td>28.7</td>
<td>18.7</td>
<td>3.52</td>
<td>0.97</td>
</tr>
<tr>
<td>To be with family and/or friends (n = 599)</td>
<td>7.2</td>
<td>8.7</td>
<td>33.4</td>
<td>27.2</td>
<td>23.5</td>
<td>3.51</td>
<td>1.15</td>
</tr>
</tbody>
</table>

Notes: 1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree.
Cronbach’s $\alpha = 0.79$

These results align with Altobelli’s (2011) study of shark dive tourists in Fiji which found ‘close encounters with sharks’, ‘uniqueness of the experience’, ‘to learn more/education’, to be amongst the 10 most frequently occurring themes motivating participants to choose shark diving. Dicken and Hosking (2009) found the most highly ranked factors on a scale of one (poor) to five (excellent) contributing to a tiger shark dive experience were related to, observing large sharks (mean 4.4), the closeness of nature (mean 4.3), new diving experience (mean 4.0) and marine education (mean 3.6). Further, Ziegler et al. (2012) discovered the top three reasons to participate in a whale shark tour included interest in whale sharks (84.2%), to expand knowledge (83.5%), and to explore new environments (83.4%). They asked
participants to score the importance of destination motivations for participating in whale shark tourism with the most important motivation being proximity to whale sharks (93.1%).

A number of these motivations (‘to see sharks up close’, ‘to see a shark in its natural habitat’, ‘to see several white sharks’, and ‘to learn about white sharks’) demonstrate participant’s appreciation for sharks and their desire to get close, see sharks for themselves, and to learn about them. However, having ‘a unique life experience’ and ‘experiencing thrill and adventure’ may be more of an indication of participants’ personal desire or motivations as opposed to their particular interest in sharks.

Reynolds and Braithwaite (2001) suggest the uniqueness of a wildlife tourism experience gives a sense of the experience being special and unusual and therefore the participant being privileged. Cater (2008) points out that significant status is often attached to ‘ultimate’ diving experiences and seeing rare or distinctive species such as sharks. With regard to the findings from the present study enhancing participants esteem may be significant motivation for those participants wanting to gain ‘travellers tales’ or ‘bragging rights’ as opposed to their particular interest in sharks.

The interest in ‘thrill and adventure’ for cage-dive participants may be similar to motivations for undertaking other types of recreational adventure activities. These include factors such as, the social atmosphere of participating with friends or like-minded individuals, or because they are seeking a variety of sensations, or simply that they like the image they may portray as someone who performs the particular activity (Ewert, Gilbertons, Luo, & Voight, 2013). Recognition amongst cage-dive operators in South Africa that the clientele they attract are predominantly there for the adrenaline rush (Dobson et al., 2005) and the results in the present study of those interested in thrill and adventure suggest the aforementioned factors may be more of a motivating influence than learning, or interest in sharks.

In a study of motivations for participating in adventure recreational activities Ewert et al. (2013) found males had higher sensation seeking and self-image motives than females. The current study found no significant differences in the mean responses for males and females related to thrill and adventure and unique life experience motivations for the visit. However, learning about sharks in general (p = .019, two-tailed), and learning about white sharks (p = .036, two-tailed) was more of a motivation for the trip for females than males. These results correspond with the study by Altobelli (2011), which discovered females value
the importance of educational information provided by operators on a shark diving trip somewhat more than males.

The high mean scores for the *reason for the visit* statements suggest that the behaviour of cage-dive participants is most likely to be motivated by a variety of factors which are seldom easily understood. Nonetheless, the dominance of participants in the present study who are motivated for education to be part of the experience can impact on the structure of the tour, whereby operators must attempt to balance client satisfaction with the underlying aim of education and conservation (Dobson et al., 2005).

### 3.4.3 On-tour education

With regard to education on the white shark cage-dive tour, 89% of respondents agreed or strongly agreed that tour staff had good knowledge about sharks (Table 5). Multiple statements in the open comments section commended the crew, such as “staff were knowledgeable and easy to communicate with” and “everyone was extremely helpful and knowledgeable about the sharks.”

While the majority (74.6%) agreed or strongly agreed that the cage-dive tour was an educational experience many participants responded neutrally or disagreed with regard to feeling like they had learnt a lot about white sharks (40.2%), or other marine life (72.8%). The results are similar to those of Ziegler et al. (2012) which acknowledged that despite information provided by the crew being ranked as the second most important aspect of the tour service, the information staff provided left a significant number of participants (22.4%) dissatisfied.

These results reveal an opportunity for operators to expand on-tour education from what is currently delivered. Open-ended comments also reflect participants’ desire for more education with comments such as, “I didn’t feel like much effort was made to make this educational. I would have appreciated more information about sharks and marine life” and “I want to learn more about sharks.” In the open comment section for those wishing to indicate if there was anything which detracted from the experience, responses included “I wish we learnt more about the shark’s behaviours” and “maybe needed a little more information about great whites.”
Table 5. Education on the white shark cage-diving tour.

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree (%)</th>
<th>Disagree (%)</th>
<th>Neutral (%)</th>
<th>Agree (%)</th>
<th>Strongly agree (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>The tour staff had good knowledge about sharks ( (n = 591) )</td>
<td>0</td>
<td>0.7</td>
<td>10.0</td>
<td>45.0</td>
<td>44.3</td>
<td>4.33</td>
<td>0.68</td>
</tr>
<tr>
<td>The cage-dive tour was an educational experience ( (n = 596) )</td>
<td>0.7</td>
<td>6.0</td>
<td>18.8</td>
<td>50.3</td>
<td>24.2</td>
<td>3.91</td>
<td>0.85</td>
</tr>
<tr>
<td>I have the feeling that on this tour I learnt a lot about white sharks ( (n = 596) )</td>
<td>1.2</td>
<td>9.1</td>
<td>29.9</td>
<td>43.5</td>
<td>16.4</td>
<td>3.65</td>
<td>0.90</td>
</tr>
<tr>
<td>I have the feeling that on this tour I learnt a lot about other marine life ( (n = 595) )</td>
<td>3.5</td>
<td>21.7</td>
<td>47.6</td>
<td>21.3</td>
<td>5.9</td>
<td>3.04</td>
<td>0.90</td>
</tr>
</tbody>
</table>

Notes: 1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree. Cronbach’s \( \alpha \) = 0.854.

3.4.4 What do white shark cage-dive participants want to learn while on tour?

Respondents had an opportunity to indicate what they would have liked on the tour by agreeing or disagreeing with eight statements (Table 6) in addition to opportunities for open responses. The results suggest over half the participants strongly or generally agreed they would have liked more information about white sharks. In particular, information about biology (55.7%), habits (65.9%), and the threats to sharks (65.7%). These themes continued into the open comment sections where participants responded to the question *Is there anything in particular that you would like to know about white sharks or the marine environment in general?* Comments included: “why are they here? How old do they get, how long do they live? How do you know a male from a female?” “How we can help the species to survive?” and “what can we do to protect these sharks?”
### Table 6. Participants' interest in information while on-tour.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree (%)</th>
<th>Disagree (%)</th>
<th>Neutral (%)</th>
<th>Agree (%)</th>
<th>Strongly agree (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>More information about the threats to sharks ((n = 593))</td>
<td>0.7</td>
<td>5.9</td>
<td>27.7</td>
<td>47.0</td>
<td>18.7</td>
<td>3.77</td>
<td>0.84</td>
</tr>
<tr>
<td>More information about the habits of white sharks (why they are here, where do they go?) ((n = 595))</td>
<td>0.7</td>
<td>8.2</td>
<td>25.2</td>
<td>48.1</td>
<td>17.8</td>
<td>3.74</td>
<td>0.87</td>
</tr>
<tr>
<td>More information about the biology of white sharks ((n = 594))</td>
<td>0.7</td>
<td>8.4</td>
<td>35.2</td>
<td>42.6</td>
<td>13.1</td>
<td>3.59</td>
<td>0.85</td>
</tr>
<tr>
<td>More information about sharks in general ((n = 594))</td>
<td>1.2</td>
<td>7.4</td>
<td>36.9</td>
<td>41.4</td>
<td>13.1</td>
<td>3.58</td>
<td>0.85</td>
</tr>
<tr>
<td>More information about the habitat and wildlife of the Neptune Islands and the local area ((n = 595))</td>
<td>2.0</td>
<td>9.4</td>
<td>36.1</td>
<td>41.2</td>
<td>11.3</td>
<td>3.50</td>
<td>0.89</td>
</tr>
<tr>
<td>More interaction with the sharks ((n = 592))</td>
<td>3.9</td>
<td>19.1</td>
<td>36.7</td>
<td>25.0</td>
<td>15.4</td>
<td>3.29</td>
<td>1.06</td>
</tr>
<tr>
<td>More information about how I can get involved in marine wildlife conservation ((n = 593))</td>
<td>2.5</td>
<td>15.7</td>
<td>45.2</td>
<td>27.5</td>
<td>9.1</td>
<td>3.25</td>
<td>0.91</td>
</tr>
<tr>
<td>More personal interaction with the staff ((n = 593))</td>
<td>7.9</td>
<td>23.9</td>
<td>55.8</td>
<td>9.9</td>
<td>2.4</td>
<td>2.75</td>
<td>0.83</td>
</tr>
</tbody>
</table>

Notes: 1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree.
Cronbach’s α = 0.858.

More information about the threats to sharks was the most frequently agreed upon statement in the present study (47% agree, and 18.7% strongly agree). This desire for more information with emphasis on conservation issues was also recognised by Moscardo (2007) who discovered that although respondents reported high levels of learning, very little conservation awareness was reported. Ziegler et al. (2012) suggests the lack of information that whale shark watching participants received on tour may affect the conservation potential of the industry with information regarding threats to the species being critical for instilling a conservation ethic in tourists. A well-designed interpretation programme can have a significant impact on visitor’s pro-environmental attitudes in addition to longer-term intentions to support and participate in conservation efforts (Powell & Ham, 2008). The findings from the current study suggest an opportunity for operators to deliver information
that includes threats to sharks in general, plus threats that the sharks visiting the Neptune Islands face. This information can lead to an emotional connection between respondents and the sharks they have observed and may engender sympathy towards shark conservation, their habitat, and sharks in general.

Significant differences were found between men and women participants with regard to wanting more information while on-tour. Women wanted more information about the biology of white sharks \((p = .002, \text{two-tailed})\), habits of white sharks \((p = .049, \text{two-tailed})\), threats to sharks \((p = .005, \text{two-tailed})\), how to get involved in marine wildlife conservation \((p = .007, \text{two-tailed})\), and sharks in general \((p = .003, \text{two-tailed})\) than men did. Altobelli (2011) also found that women value the importance of being educated about sharks while on-tour slightly more than men do. However, despite the difference, the mean scores suggest both genders would like additional educational information while on-tour.

The results align with Lück (2003; 2015), which suggests that marine wildlife tourists are inclined to expect a certain level of interpretive communication and desire information about the species and the marine environment in general. While written material is offered to cage-dive participants and all participants are encouraged to ask staff questions throughout the day, there is no comprehensive education and interpretation model in place. This suggests an opportunity for cage-dive operators to improve knowledge of white sharks by developing an interpretation programme with particular focus on the biology, habits, and threats to white sharks. Increased education in addition to the emotional responses of the experience may develop participants knowledge, lead to greater support for shark conservation, and enhance participants overall experience.

By coming on-tour participants already have an attraction to, interest in, and/or an expected enjoyment of the activity. These factors can lead to increased attention and willingness to learn (Ballantyne & Packer, 2006). Tour operators are therefore in a unique position to facilitate support for shark conservation and education by designing relevant interpretive programmes which addresses misconceptions and includes a conservation ethic.

### 3.4.5 The role of the tour guide

The study results indicate that participants want more education, however, an understanding how they would prefer it to be delivered is important for operators to facilitate customer
demands. Participants were asked to rank six different interpretive products including displays/signs, guidebooks, audio-visual (DVD), tour guide, brochures, and an Internet app. A tour guide was the most highly selected with 63% of participants ranking it as the most preferred product (Figure 8).

![Figure 8. Cage-dive participant's preference for interpretive products.](image)

The results suggest an opportunity to increase the value of the interpretive encounter by incorporating a tour guide. Moscardo et al. (2004) suggest that guides are especially useful at sites with a large number of visitors who can be addressed in a concentrated area. Guides have the ability to attract the attention of participants, to answer questions, provide social interaction, and tailor information to match the spatial and temporal elements of the experience. This includes discussing the behaviour that the animals are displaying at the time. Interpretive guiding has potential to enhance the participant experience, improve satisfaction, increase awareness and understanding, and potentially influence beliefs, attitudes, intentions, and behaviour (Weiler & Black, 2015). However, effective guides are costly to train and employ, and visitor numbers need to be managed for optimal communication with participants (Moscardo et al., 2004).

The growing popularity of smart phones has resulted in the development of various types of apps which can be highly effective in reaching the public with a particular message
In the current study, an app was ranked as the most preferred method by 10% of the sample, however 39% of participants ranked it as a last preference, suggesting that while some may prefer this method, it should not be solely relied upon. Information unique to the region and the themes identified in the survey results, such as shark biology and threats, could be included to create a ‘smart tour’ (Im, Yoon, & Lee, 2013). Digital technology could align with the younger demographic profile of the sample and be used to augment the human-shark encounter and extend the experience temporally and spatially (Webber, Carter, Smith, & Vetere, In press).

3.4.6 Demographic profile

The demographic survey results in this study demonstrate that the majority of shark cage-diving participants are male (60%). This finding is consistent with studies of scuba divers (Edney, 2012; Ong & Musa, 2011) and in particular shark dive tourists (Apps et al., 2016; Dicken, 2014; Dicken & Hosking, 2009; Du Preez et al., 2012; Lucrezi et al., 2013), which also established that divers are predominantly male. Orams (2000) suggests a pattern by which activities perceived as being more adventurous or having a higher risk of injury tend to be dominated by males and younger age groups.

About half (52%) of the sample was aged between 21 and 30 years old. Participation decreased with age with 20% >40, 11% >50, and 4% >60 years of age. While Ong and Musa (2011) found the majority of divers to be aged between 18 and 30 years old, other studies have found divers tend to be older (35–45 years old) (Edney, 2012). In a study of shark scuba divers in South Africa observing primarily tiger and grey nurse sharks, Dicken and Hosking (2009) and Dicken (2014) found a mean age of 39 and 34 years respectively. The younger age group in the present study may be the result of tourists attracted to the adventure aspect of cage-diving. Dobson et al. (2005) found cage-dive operators in South Africa saw backpackers as their core clientele due to their attraction to adventure-based activities. Cage-diving does not require participants to be scuba certified and may be a factor resulting in the younger demographic, whereby the significant cost to scuba dive can often be beyond the reach of younger participants (Cater, 2008).

Over half of this study’s respondents were Australian (56%) with a majority being domestic tourists from South Australia (41%), Victoria (25%), and New South Wales (21%). Local residents from Port Lincoln comprised 1% of the sample. International tourists had
travelled from over 21 countries, with England (19%), the USA (8%), and Canada (3%) being the predominant generating countries. The majority of tourists stayed in Port Lincoln for 2 (62%) or 3 (20%) nights, with 97% indicating the cage-dive tour was the primary reason for visiting Port Lincoln. Of those participants not from South Australia, 68% responded that the cage-dive tour was the primary reason for visiting the state.

3.5 Management implications

3.5.1 Education or adrenaline

This paper aimed to explore the experience of white shark cage-diving with a focus on the importance of on-tour education. The results indicate that participants generally desire more information about sharks and their habitat. This can be seen in the I would have liked statements and the general recurring theme found in the open-ended sections throughout the survey for educational improvement. The educational element anticipated on the tour, the value placed on education, and the desire for additional on-board information demonstrates that many participants seek more than an adrenaline experience.

Finding white shark tourists to be an educationally interested constituent of tourists contradicts that of Dobson et al. (2005) who found recognition amongst certain shark operators in South Africa that backpackers are the core clientele who are attracted to the ‘adrenaline rush’ aspect of the tour and not necessarily interested in learning. These conflicting results demonstrate the need for up-to-date consideration of the customer experience. In the past, the stereotypical image of the shark (open-mouthed) was perhaps the ‘hook’ that grabbed the attention of potential clients (Dobson et al., 2005). However, as the marine wildlife tourism industry continues to develop, so too will demand for well-designed interpretive encounters (Lück, 2015). What is important for operators to consider is that a number of factors motivate tourists to get in the water with sharks. Operators must remain abreast of changes in passengers’ characteristics over time and be alert to update advertising material and tour structure to satisfy the next generation of shark tourists.
3.5.2 Interaction or interpretation

The cage-dive tour was the principle reason for the majority of participants to visit Port Lincoln and South Australia, and the most common response given for the visit was ‘to see white shark(s) up close’. Hence, the importance of being exposed to white sharks was central to the experience for these participants. However, when asked what more they would have liked, the statement ‘more interaction with the sharks’ was selected as neutral or disagreed by 60% of the sample and ranked the sixth response following the ‘I would have liked more information’ statements. This finding corresponds with Orams (2000) who found the proximity of whales, on a whale watch tour, did not appear to influence participant satisfaction.

The findings suggest that while participants may have come for the initial exposure to sharks, once this primary desire had been met, the profundity of the experience may have generated motivation for participants to learn. The researchers conclude that cage-dive operators do not need to increase interaction or exposure with the sharks to satisfy their customers, they need to increase interpretation.

3.5.3 Experience or education

While the majority of respondents felt the ‘tour was an educational experience’ and they ‘learnt a lot about white sharks’, this may have been a consequence of being exposed to sharks in their natural habitat as opposed to being attributed to any educational aspect of the tour. The marine environment is inherently rich with opportunities to make the experience memorable with direct experience acting as the teacher (Dearden, Bennett & Rollins, 2007). However, exposure alone is unlikely to have much impact on the knowledge and wildlife conservation attitudes of participants. Moscardo et al. (2004) suggest that wildlife-based experiences need to be associated with structured interpretation programmes to facilitate and support the development of knowledge amongst participants. Conservation benefits are more likely to be gained when the learning benefits from information reinforce the emotional benefits of directly experiencing marine species in their natural habitat (Zeppel & Muloin, 2008). The linkages between tour characteristics and positive changes in tourists’ environmental knowledge, attitudes, and behaviours remain largely untested. The potential for white shark tourism to influence visitor’s attitudes towards shark conservation via education,
awareness, and experience is an area that warrants further academic investigation (Dobson, 2008).

3.5.4 The characteristics of on-tour interpretation

Findings from this study suggest that cage-divers are motivated by a number of factors from interest in the species to a desire for unique and adventurous activities. These diverse motivations and characteristics of individual participants may be difficult to cater for during interpretive programme design (Orams, 1999). Understanding the diverse motivations and characteristics of participants in addition to the structure of the activity can assist in effective informal interpretive programmes by tailoring both the message and the media to the participants and the tour (Ballantyne & Packer, 2006; Garrod, 2008; Lück, 2015).

The remote location and long travel times to the cage-diving site offers an opportunity for the participant to be voluntarily engaged in a white shark interpretative experience before and after the tour. Dissemination of information to customers could begin with promotional and marketing material that creates realistic expectations (Walker & Hawkins, 2013). Online resources could be sent to participants at the time of booking. Reading material could be left at local accommodation sites, and be available on the voyage to and from the site. Post-visit resources could be made available to reinforce conservation messages and support participants in adopting specific conservation behaviours once home (Ardoin et al., 2015; Hughes, 2013; Hughes, Packer & Ballantyne, 2011).

At different stages while on tour (pre-observation, observation, and post-observation) participants express different cognitive focuses, demonstrate different frames of mind, and require different kinds of interpretive programme content (Forestell, 1993; Hrycik & Forestell, 2012). Typically, the observation or contact phase of the tour is where information provided is relevant to what the participant is seeing. However, during ‘swim with’ tours, such as in the present study when divers are in the cage, there is little opportunity for interpretive encounters. Interpretative material can instead be saved for the return trip when it can be delivered at a time where other tours struggle to keep passengers occupied (Lück, 2016). In the present study, the return trip to the marina is a 2.5- to 3-hour journey with no interpretive encounters currently organised. The return trip could benefit from an interpretive programme with format customised to include information usually delivered in the contact phase and combine this with post-contact phase content typically delivered between sightings.
or following the last sighting (Forestell, 1993; Orams, 1996). Following the excitement and adrenaline rush during the activity, the return trip to the marina offers an opportunity for participants to compare, contrast, and question what they believed or knew about white sharks prior to the trip, with what they have seen or learnt during the tour. For white shark cage-diving tours, this return trip may prove to be the most suitable ‘teachable moment’ (Lück, 2016).

3.5.5 Approaches to regulating education and interpretation.

The sustainability of shark tourism is contingent on stakeholders recognising the connections between the ecological, experiential, and economic elements of the activity (Davis et al., 1997; Techera & Klein, 2013). Education and interpretation is a major element contributing to customer experience (Anderson & Miller, 2006; Lück, 2003; 2015; Moscardo et al., 2004; Orams, 1997; Weiler & Black, 2015) and has considerable potential for promoting awareness and conservation (Dobson, 2008; Dobson et al., 2005; Topelko & Dearden, 2005), which is crucial considering current declines in shark populations (Dulvy et al., 2014). However, this may be an opportunity missed unless a minimal educational element is incorporated into shark-based tours. Education-based management strategies may be required to encourage some operators to embrace an educational addition to their tour.

While the use of voluntary codes lack enforceability, their use in shark-based tourism has been effective thus far (Techera & Klein, 2013). Voluntary codes of management incorporating an interpretive programme could be adopted by the industry. As one or more operators promote a tour featuring an interpretive programme, social pressure and participant expectations may encourage others to follow. The voluntary nature and self-policing may also engender a more responsible attitude among operators (Guerra & Dawson, 2016). However, an absence or change of compliance may require a code of management with binding and enforceable regulations. While current licensing regimes control tourism operators, they do not usually control the composition of the activity that the participant will experience. Mandating specific educational requirements via operator regulations or licensing conditions would entrench the practice and provide benefits for species conservation and customer satisfaction (Techera & Klein, 2013).

Voluntary or regulatory education management strategies could include a variety of components. Techera and Klein (2013) recommend a standardised national framework
including details of the length of time for discussion or video, and guidelines for the development of educational materials. Principles such as those recommended for cetacean tourism by Walker and Hawkins (2013) could be modified for application in shark tourism. Such principles would include support for education and training to be provided to operators and guides to develop awareness of up-to-date species information. Training could also incorporate an introduction to the principles of interpretation and their application to shark tourism (Ziegler et al., 2012). Current regulations and management practices mitigating impacts of the tourism activity could also be included (Richards, O’Leary, Roberts, Ormond, Gore & Hawkins, 2015). There is potential to apply user and tour fees to fund development of such educational material and training (Techera & Klein, 2013).

3.6 Limitations

This study was conducted at a single site and therefore further replication with various samples at other sites would be required to apply the findings in a broader context. The research instrument in this study used self-administered surveys to increase confidentiality, compare the results with other survey-based studies, and allow for a greater number of participants to be included in the sample. The researchers acknowledge limitations to this format, as surveys may not have elicited the same detailed responses that qualitative interviews may have, as further probing of responses was not possible. The study relied on respondents' self-reports and while the researchers assured participants that the survey was anonymous, the possibility remains that responses may be distorted or bias by participants wanting to provide socially desirable responses and therefore may not be an entirely valid assessment of their views (Ajzen, 2005).

3.7 Conclusion

This paper has provided an insight into the largely unexplored human dimensions of shark-based tourism. The results highlight the critical aspect that is detracting from participant experience and the conservation potential of the tour, which is the absence of an interpretive encounter. The desire for on-tour education indicates shark tourists demand more than just an adrenaline rush. The findings in the context of the literature cited suggests that the cage-dive participant experience and conservation potential of the tour would be improved with the
addition of an interpretation programme delivered by a tour guide with a focus on shark biology, habits, and conservation.

The results of this paper demonstrate the importance of human dimension research for the successful management of shark-based tourism. By giving participants what they want (more education), operators have greater potential to meet conservation objectives of wildlife tourism and increase customers’ satisfaction. The growing popularity of shark-based tourism suggests demand to observe these species is unlikely to diminish in the foreseeable future. Mandating educational requirements in licensing conditions for operators may be a way to ensure that shark tourism is closer to achieving a balance between recreation and conservation. It is essential for operators to view contributing to the conservation of sharks and the experience of their clientele a responsibility upon which their business depends. Education and interpretation for shark-based tourism is one tool that can facilitate support for shark conservation, increase customer satisfaction, and does not necessarily require a huge investment from industry operators.

------------------------------- End of manuscript -------------------------------
Chapter 4 – What values do tourists’ place on a marine protected area? White shark cage-dive tourists and the Neptune Islands.

Photo 5. White shark cage-dive vessel at the North Neptune Islands.

Photo: Kirin Apps
As part of the formative belief elicitation surveys discussed in Chapter two, results suggested that participants viewed their cage-dive experience as an opportunity to observe sharks in a unique and natural environment. Therefore, to further understand the human dimension of shark-based tourism it was important to determine the importance of the shark-tourism site. Based on the methodology of Brown and Reed (2000), Clement and Cheng (2011) and Sherrouse et al., (2014) a survey was designed asking cage-dive participants to allocate a hypothetical $100 amongst 13 social values for the Neptune Islands group (Ron and Valerie Taylor) Marine Park (Appendix C). The survey was completed by 675 participants over 50 days between December 2014 and April 2016. This chapter presents the survey results and analysis, discussing how white shark cage-dive participants value the tourism site, addressing the third research question (Figure 9).
4.1 Abstract

Management of protected areas is as much about understanding how society values these resources, as it is about understanding ecological processes. Yet, in comparison to standard ecosystem monitoring and economic evaluation, social values are frequently overlooked because of the challenge to measure and define them. As marine protected areas are currently the fastest growing protected area type, this article argues the need to incorporate social value assessment in planning and policy decisions to improve ecological and social outcomes. This study surveyed 675 white shark cage-dive participants to investigate how tourists’ value the Neptune Islands group (Ron and Valerie Taylor) Marine Park. Using a novel research method and value typology previously used in forests, respondents were able to identify with 13 distinct social values. Results demonstrate that tourists hold biocentric, indirect use and non-consumptive values of the marine park as most important. The relevance of these results as an indicator of tourists’ preference for management decisions is discussed.

Key words: marine tourism; shark-based tourism; protected area management; value typology

4.2 Introduction

Breath-taking mountains, rejuvenating walks in the forest, awe-inspiring oceans; people value natural areas for a myriad of reasons and receive various benefits from them (Harmon & Putney, 2003). People often visit natural areas because they offer a variety of values they may not experience elsewhere (Harmon, 2004). This includes the intrinsic value of nature as well as values that enrich the intellectual, psychological, emotional, spiritual, cultural, and creative aspects of human existence and well-being (Putney, 2003). Harmon (2004) suggests that it is the connection between the values human cultures generate and the natural values of the environment that drives humans “protective impulse” to safeguard significant places (Harmon, 2004, p.19). These values reflect the complex, individual responses people experience and often determine why one area or species is valued over another (Pike, Johnson, Fletcher, Wright & Lee, 2010). The search for these values underpins travel,
tourism, and a social rationale for establishing protected areas for human use (Eagles & McCool, 2002).

Protected areas were created because they are sites of outstanding ecological, cultural, aesthetic, spiritual and educational value (Sala & Giakoumi, 2017). Management of these areas require not only scientific monitoring of the biophysical and cultural elements contained within them, but also a solid understanding of their inherent functions and roles within society (Ballantyne, Packer & Sutherland, 2011; Luksenburg & Parsons, 2014; Orams, 2000). Unlike ecological and economic information, the inclusion of quantitative social value information is often absent from ecosystem assessments (Sherrouse, Semmens & Clement, 2014). Social values have been largely overlooked when managing natural areas because they are often difficult to articulate, measure, and define, with the benefits they provide being felt and experienced in diverse ways by different stakeholders (English & Lee, 2003; Gee et al., 2017; Pike et al., 2010). Understanding how varied stakeholders’ benefit from natural areas, and clarifying the nature of these values, is crucial to the design of effective management policies (Koehn, Reineman & Kittinger, 2013; Palomo et al., 2014). Identifying social values can provide information about social acceptance (Engel, Marchini, Pont, Machado & de Oliveira, 2014), such as why individuals may hold certain attitudes and behaviour patterns towards management strategies (Ajzen & Fishbein, 1980; Vaske & Donnely, 1999; Vaske, Jacobs & Sijtsma, 2011). By understanding these values managers are better equipped to weigh competing demands, address potential conflicts, and develop management strategies in harmony with society’s values (Gee et al., 2017; Palomo et al., 2014; Tarrant, Cordell & Green, 2003).

4.2.1 Conceptual framework

Values are an enduring concept of worth formed from social processes of communication and debate, and influenced by the social, cultural, historical, and geographical relationships between society and the individual (O’Brien, 2003). People value natural areas for various reasons and receive numerous benefits from them (Clark, 2011; Harmon & Putney, 2003; Sala & Giakoumi, 2017). The benefits from consumptive use of the natural area (i.e. fishing or timber extraction) or from non-consumptive activities (i.e. leisure) are considered direct use values. For example, marine recreation is considered mainly to be a direct use (non-consumptive) value where the benefit is received from an interaction with the resource (Rees, Rodwell, Attrill, Austen & Mangi, 2010). Indirect use values include ecological services,
spiritual, cultural, and aesthetic benefits. These direct and indirect use values, in providing human benefits, represent an anthropocentric point of view (Vucetich, Bruskotter & Nelson, 2015) and often tend to dominate discussions of natural areas (Winter, 2007). In contrast, a biocentric viewpoint may include the intrinsic value of nature, acknowledging the area for what it is without regard to any form of human usefulness or purpose (Harmon, 2004; Vucetich et al., 2015).

Numerous value typologies have been proposed to identify public perceptions and values of natural areas. The World Commission on Protected Areas (WCPA) classified eleven major value types derived from qualities of protected areas. These types include recreational, spiritual, existence, educational, and research and monitoring values (Putney, 2003). The 13 value definitions used in the present study are based on the writings of Rolston (1989) and Rolston and Coufal (1991), modified by Brown and Reed (2000), and adopted by Clement and Cheng (2011) and Sherrouse et al. (2014). This typology compromises an inclusive range of values for natural, undeveloped settings in which protected areas can be categorised. Table 7 presents a composite of values and definitions to communicate meaning, adding to the typology’s reliability and validity in survey research (Brown & Reed, 2000; Clement & Cheng, 2011).

<table>
<thead>
<tr>
<th>Value type</th>
<th>Value description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetic</td>
<td>I value this site for the scenery, sights, smells, sounds, etc.</td>
</tr>
<tr>
<td>Biological diversity</td>
<td>I value this site because it provides a variety of fish, wildlife, etc.</td>
</tr>
<tr>
<td>Cultural</td>
<td>I value this site because it is a place for me to continue and pass down the wisdom and knowledge, traditions and way of life of my ancestors</td>
</tr>
<tr>
<td>Economic</td>
<td>I value this site for the economic benefits such as tourism</td>
</tr>
<tr>
<td>Future</td>
<td>I value this site because it allows for future generations to know and experience the area as it is now</td>
</tr>
<tr>
<td>Historic</td>
<td>I value this site because it has places and things of natural and human history that matter to me, others and/or the nation</td>
</tr>
<tr>
<td>Intrinsic</td>
<td>I value this site for its existence, whether people are present or not</td>
</tr>
<tr>
<td>Learning</td>
<td>I value this site because we can learn about the environment</td>
</tr>
<tr>
<td>Life sustaining</td>
<td>I value this site because it helps to produce, preserve and renew air and water</td>
</tr>
<tr>
<td>Recreation</td>
<td>I value this site because it provides an outdoor recreation opportunity</td>
</tr>
<tr>
<td>Spiritual</td>
<td>I value this site because it is sacred, religious or spiritually special to me, or because I feel reverence and respect for nature there</td>
</tr>
<tr>
<td>Subsistence</td>
<td>I value this site because it provides necessary food and supplies to sustain my life</td>
</tr>
<tr>
<td>Therapeutic</td>
<td>I value this site because it makes me feel better, physically and/or mentally</td>
</tr>
</tbody>
</table>

Previous assessments of social values have mostly focused on terrestrial areas. For example, the social values of forests have been described as spiritual, environmental, recreational, economic services, and economic products (Kumar & Kant, 2007), economic/utilitarian, life support, aesthetic, and moral/spiritual (Xu & Bengson, 1997), or aesthetic, recreation, biodiversity and future (Clement & Cheng, 2011; Sherrouse et al., 2014). Raymond and Brown (2006) used 12 value definitions to determine if residents from the Otway region, Victoria, Australia, differentiate values between public and private lands. Comparatively little research attention has focussed on the social values of marine protected areas.

Marine protected areas (MPAs) are considered the fastest growing type of protected area in the world (Dudley & Hockings, 2017). In 2010, signatories of the Convention on Biological Diversity agreed on a global conservation target for 10% of marine and coastal areas to be protected by 2020 (Dudley & Hockings, 2017). While a press release from an IUCN conference, stated a target goal of 30% to be protected by 2030 (Hilborn, 2017). To meet a target of 10%, a further 2 million square kilometres of marine areas will need to be designated as MPAs in the next few years (Dudley & Hockings, 2017). The present study argues why there is need for a clear understanding of social values inherent to protected areas along with the standard biological, economic, and political dimensions.

A large body of literature focuses on environmental and economic impacts of MPAs, yet there is more to be learnt about the social dimensions, especially as an element to consider in policy making (Gee et al., 2017; Pike et al., 2010; Pendleton et al., 2017; Rees et al., 2010). Determining the social values of an area is critical to creating inter-disciplinary links between the ecological system and social perceptions and significance of an MPA. The success of a protected area as a conservation tool relies on the assumption that it is managed to protect the values they contain (Hockings, Stolton, Leverington, Dudley & Courrau, 2006). From this, understanding and monitoring social values of a site is critical to assess the likely acceptance and implementation of policies and regulations, and to encourage support for resource management and conservation measures (Gee et al., 2017). Without societal support, the likelihood of a MPAs long-term effectiveness can be compromised (Basurto, 2017). Therefore, the values held by various user groups need to be considered as those held by different groups may conflict with one another, as each group considers “their” key values as most important (Abecasis, Schmidt, Longnecker & Clifton, 2013; Engel et al., 2014; Gee et al., 2017).
The tourism industry is a common stakeholder group which directly use the marine environment. Understanding what marine tourists’ value, and why they care about a particular environment can provide an important indicator of this user groups attitudes towards particular actions, and whether certain management policies will be considered acceptable (Rees et al., 2010). Using the value typology and methodology of Brown and Reed (2000) to collect data from tourists, the present study contributes to increasing our knowledge of the social values of MPAs. The questions examined in the present study include: 1) can the value typology (Brown & Reed, 2000) be used in a marine context, and do the values identified differ from those found in previous terrestrial studies? and (2) How do tourists value the Neptune Islands, do these values indicate an anthropocentric or a biocentric viewpoint and what are the implications for marine park management?

4.2.2 Research context

The Neptune Island group is located 60–70km south of Port Lincoln, South Australia (35° 16.72’S; 136° 5.48’E) (Figure 10). These island groups support the largest aggregations of pinnipeds in Australia leading them to be designated a Conservation Park in 1967 (Baker, 2004; Shaughnessy, Goldsworthy & Mackay, 2015), which was later extended to two nautical miles from the low water mark under the National Parks and Wildlife Act 1972 (SA). The wide range of flora and fauna including many species of conservation importance, such as the white shark, led the Neptune Island Conservation Park to be proclaimed the Neptune Island Group (Ron and Valerie Taylor) Marine Park on the 29th of November 2012 (DEWNR, 2012). The management plan (DEWNR, 2012) for this area includes a sanctuary zone (SZ) around North Neptune Island where commercial and recreational fishing was phased out by October 2014. Defined by the Marine Parks Act 2007 a sanctuary zone is a zone “primarily established so that an area may be managed to provide protection and conservation for habitats and biodiversity within a marine park, especially by prohibiting the removal or harm of plants, animals or marine products” (Marine Parks Act 2007, p.6)

White shark cage-diving tourism at the Neptune Islands is one of the few places in the world and the only place in Australia where tourists can predictably view white sharks in their natural habitat. Commercial white shark cage-diving activities in Australia began in the late 1970s and have been restricted to the Neptune Island Group since 2002, with activities mainly focused on the North Neptune Islands within the SZ. Currently, there are three white shark tourism operators licensed by the Department of Environment, Water and Natural Resources
(DEWNR), South Australia. Operator fees are inclusive of a $35 marine park fee for each tourist payable to DEWNR. In 2014, 10,236 tourists participated in cage-diving among the three operators contributing an estimated $7.8M in direct expenditures to the regional economy (Huveneers et al., 2017). White shark tourism is economically important to this region through the financial contribution of tourists to DEWNR, tourist operators and local businesses. As such, it is important to understand the tourists’ relationship with the site and the values they hold most important.

Data collection for the present study began two months after the designation of the North Neptune Islands SZ. Results from this research can serve as a baseline for measuring changes in values overtime by tourists. The present study provides insight to the views of this marine park user group, and offers potential to guide education efforts to express and enhance the values of the MP to the general public. The study findings will advise the extent of cage-dive tourists’ support for conservation and management objectives and policies within the region.

Figure 10. Study site location, the Neptune Island Group (Ron and Valerie Taylor) Marine Park, South Australia.
4.3 Methods

4.3.1 Data collection

Surveys are a widely applied method for collecting diverse information from multiple stakeholders in protected areas (Palomo et al., 2014) and were used in the present study to investigate tourists’ value of the North Neptune Islands Group Marine Park. Surveys were completed on-board the three licensed cage-dive vessels between December 2014 and April 2016. A pilot study was conducted during December 2014 (n=95) whereby all of the value descriptions (see Table 7) were chosen by at least one participant and as a result all were retained in the final survey. As the pilot study did not result in any changes or additions, results from the pilot study were combined to those of the main study.

A convenience sampling method was used, whereby all shark cage-diving participants, over 18 years of age, were invited to participate in the study during the return trip to Port Lincoln. The data were collected over 50 days between December 2014 and April 2016. During this time 675 participants were surveyed with an 88% response rate. Reasons for not completing surveys included seasickness and language limitations.

The survey (see Appendix C) consisted of two sections including: (1) demographic information, and (2) the allocation of a hypothetical $100 amongst 13 social values. This methodology draws on the idea of ‘assigned value’ to indicate the tourists view reflecting the importance of the value for the site. Assigning a hypothetical $100 is a data gathering method which was used in other social value research using this typology such as Brown and Reed (2000), Clement and Cheng (2011), and Sherrouse et al. (2014). The specific instructions for participants were adapted from Brown and Reed (2000) as follows:

“The site where you went cage-diving today is known as the Neptune Islands Group (Ron and Valerie Taylor) Marine Park Sanctuary Zone. This site holds different values to different people. Some of these values are connected to direct use of the area (such as for recreation). Some people value the area without setting foot on it (such as knowing it is there for future generations). Listed below are some of the best-known values of natural areas. We would like to know how important each of the following values are to you.

Imagine you could spend $100 to ensure that the North Neptune Islands keep the existing values. You may allocate or spend the $100 in any way you like, but your total spending must not exceed $100. You might spend $100 on one value, or $50 on one and $25 on another value, and another $25 on yet another. Remember the total value should equal $100.”
4.3.2 Data analysis

Survey analysis consisted of descriptive statistics, which included frequencies and mean values for demographic and marine park values. The frequency with which a particular marine park value was allocated a hypothetical dollar amount represents the prevalence of that value in the minds of the respondents. The mean value score represents the relative importance of the value to the survey participants (Brown & Reed, 2000). To determine relationships between demographic characteristics and values an analysis of variance (ANOVA) was used to test for the effects of age, while a series of t-tests were used to analyse gender and nationality variables. All statistical analysis was performed using IBM SPSS Statistics 22.

4.4 Results and discussion

4.4.1 Participants

Participants were predominantly male (58%), aged 30 years or under (53%) with ages ranging from 18 to over 66 years of age. Just over half of the participants were Australian (58%), while the second largest group was from England (15%) followed by other nationalities including Ireland, Canada, USA, France, Sweden, Denmark, Germany, and New Zealand. Tourists with limited English skills were unable to complete the survey and are therefore not included in the sample. The response rate (88%), however, suggests that the majority of those on-board at the time of sampling were able to complete the survey in English. The majority of the sample (67%; n=375) stated that observing white sharks was the motivating factor for visiting South Australia, with 96% of participants (n=652) reporting that observing white sharks was the motivating factor for visiting Port Lincoln.

4.4.2 Social values of the North Neptune Islands Sanctuary Zone

Social values most frequently mentioned were biological diversity, future, learning, recreation, and aesthetic values, while the least mentioned values were subsistence, spiritual, and cultural values (Table 8). The rank frequency and mean scores reveal no differences in responses apart from recreation and learning. Recreation and learning values which ranked fourth and third in frequency of response, ranked third and fourth in mean scores respectively. These rank discrepancies suggest that while learning was a value held by more respondents (frequency), the recreation value held more importance (mean dollar allocation). Nonetheless,
(biological diversity, future, learning and recreation) were selected as the top four most frequently selected values. For the remaining value typologies, there was agreement among participants between the frequency of selected values (rank frequency) and the value importance (rank mean score).

The following statistically significant relationships were found between value and demographic data: (1) Gender - recreation values were valued higher by males than females ($p = 0.003$, two-tailed), while learning values were valued higher by females than males ($p = 0.016$, two-tailed); (2) Age - the life sustaining value was valued higher for the 18–30 age group than by the over 45 years age group (ANOVA, $P<0.5$); (3) Nationality - life sustaining values were valued higher by international participants ($p = 0.013$, two-tailed), whilst future values were valued higher by domestic participants ($p = 0.017$, two-tailed). Relationships found by Brown and Reed (2000) and Clement and Cheng (2011) concerning gender and forest values correspond with the present study, as they too found recreation values to be rated higher by men and learning values to be valued higher by women.

Table 8. Frequency and mean scores for the 13 North Neptune Island values.

<table>
<thead>
<tr>
<th>Value</th>
<th>Frequency</th>
<th>Rank Frequency</th>
<th>Mean ($)</th>
<th>Rank mean score</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological diversity</td>
<td>479</td>
<td>1</td>
<td>25.81</td>
<td>1</td>
<td>24.25</td>
</tr>
<tr>
<td>Future</td>
<td>358</td>
<td>2</td>
<td>14.66</td>
<td>2</td>
<td>19.27</td>
</tr>
<tr>
<td>Learning</td>
<td>306</td>
<td>3</td>
<td>9.73</td>
<td>4</td>
<td>13.51</td>
</tr>
<tr>
<td>Recreation</td>
<td>293</td>
<td>4</td>
<td>10.99</td>
<td>3</td>
<td>17.98</td>
</tr>
<tr>
<td>Aesthetic</td>
<td>275</td>
<td>5</td>
<td>9.02</td>
<td>5</td>
<td>14.57</td>
</tr>
<tr>
<td>Economic</td>
<td>247</td>
<td>6</td>
<td>7.87</td>
<td>6</td>
<td>14.04</td>
</tr>
<tr>
<td>Intrinsic</td>
<td>195</td>
<td>7</td>
<td>6.49</td>
<td>7</td>
<td>14.08</td>
</tr>
<tr>
<td>Life sustaining</td>
<td>188</td>
<td>8</td>
<td>5.60</td>
<td>8</td>
<td>11.06</td>
</tr>
<tr>
<td>Historic</td>
<td>112</td>
<td>9</td>
<td>2.98</td>
<td>9</td>
<td>8.84</td>
</tr>
<tr>
<td>Therapeutic</td>
<td>96</td>
<td>10</td>
<td>2.47</td>
<td>10</td>
<td>8.67</td>
</tr>
<tr>
<td>Cultural</td>
<td>76</td>
<td>11</td>
<td>1.72</td>
<td>11</td>
<td>6.18</td>
</tr>
<tr>
<td>Spiritual</td>
<td>71</td>
<td>12</td>
<td>1.58</td>
<td>12</td>
<td>6.09</td>
</tr>
<tr>
<td>Subsistence</td>
<td>52</td>
<td>13</td>
<td>.79</td>
<td>13</td>
<td>3.65</td>
</tr>
</tbody>
</table>

Biological diversity was the most commonly held value (Table 8) with over 70% of participant’s choosing this value (Figure 11). The second most frequently chosen was future with 53% of respondents. These choices lean towards a biocentric orientation, that while there
is a component that benefits humans, such as valuing the site for future generations to experience, these values also benefit nature for its own sake, such as appreciating fish and wildlife with no regard for human use. The results assume the North Neptune Islands have inherent worth and that economic use and human benefits are not necessarily the most important according to tourists undertaking cage-diving activities. Vaske and Donnelly (1999) note that individuals who lean towards a biocentric value orientation may be more likely to have a positive attitude towards preservation of natural areas. As a result, disagreement could arise if MPA management policies conflicted with biocentric views held by this stakeholder group.

High value scores for learning, recreation and aesthetic lean towards an anthropocentric view that emphasises the North Neptune Islands for human use benefits. Learning and recreation are considered to be direct use (non-consumptive) values (Rees et al., 2010). While they do not directly provide benefits for nature for its own right (Clement & Cheng, 2011), as part of the non-consumptive category, these value orientations may lead to environmental benefits such as greater environmental awareness, philanthropic support for nature conservation, political lobbying for wider protection, and contributions towards scientific research (Moscardo, 2008; Packer & Ballantyne, 2012; Powell & Ham, 2008; Zeppel & Muloin, 2008). This was demonstrated in a study by Brown and Reed (2000) which found that learning values were associated with a favourable attitude towards wilderness designation. The aesthetic values are not considered direct use but do represent an anthropocentric view which provides benefits for humans, such as a relaxing or pleasing view, as opposed to nature for its inherent worth. While the study didn’t directly assess tourists’ likelihood to support management strategies, these results may be an indication of tourists’ preference for policies which include aesthetic and non-consumptive use of the site over those that aim to derive consumptive use and/or economic benefits.
The values identified as the most important to respondents are generally consistent with previous studies. Brown and Reed (2000) found aesthetic, recreation, life sustaining and biological diversity to be the most frequently acknowledged values held by local residents about the Chugach National Forest in Alaska. Clement and Cheng (2011) conducted social surveys on three National Forests in Colorado and Wyoming and found aesthetic, biodiversity, future, and recreation values as most important. Similarly, Sherrouse et al. (2014) found general agreement across three forests regarding the most highly rated value types (aesthetic, recreation, biodiversity and future). Likewise, a study of Hinchinbrook Island National Parks combined land and seascapes, found outdoor recreationists attributed greater scores to recreation, biological diversity and aesthetic than other values (Van Riper, Kyle, Sutton, Barnes & Sherrouse, 2011).

The high importance of the learning value at the Neptune Islands was inconsistent with previous studies (Brown & Reed, 2000; Clement & Cheng, 2011; Sherrouse et al., 2014; Van Riper et al., 2011). This discrepancy maybe because tourists broadly expect a certain level of education and learning from a wildlife tourism experience (Apps, Dimmock, Lloyd & Huveneers, 2017; Lück, 2003; 2008; 2015), than they may from visiting a forest. Respondents...
may also consider the importance of the MPA as an educational platform for research and knowledge about white sharks and their habitat, as this is the only white shark tourism site in Australia. Therefore, some of the discrepancy between this survey and those conducted in forests might not be due to the difference in protected area types but due to the cage-dive experience, and wildlife tourism in general.

Recreation was chosen by 43% of respondents and was the third most important value orientation considered by the sample. This is consistent with studies of Brown and Reed (2000), Clement and Cheng (2011) and Sherrouse et al. (2014), but inconsistent with that of Winter (2007) who found that respondents choose the intrinsic value of Fraser Island (National Park in Queensland, Australia) over its recreation value. While respondents in the present study also valued the North Neptune Islands for its intrinsic features, direct use values such as recreation and economic orientations were chosen with more frequency and were allocated a greater mean ($) value. Such discrepancy might be attributed to sample differences, with Winter’s (2007) sample being of an older demographic (mean 49.2 yrs.) compared to the young demographic of the present sample (53% were under 30 yrs.). The difference may also be characteristic of the site and the tourist’s motivation for visiting these sites. In the present study, the primary motivation for 96% of the tourists to visit Port Lincoln was to participate in white shark cage-dive tourism, demonstrating the importance that tourists place on recreation at this site.

Generally, the values that emerged as most important to respondents are consistent with those found in other studies (Brown & Reed, 2000; Clement & Cheng, 2011; Sherrouse et al., 2014; Van Riper et al., 2011). However, for this MPA, these are the views of just one stakeholder group, and may not be consistent with other marine users. Agardy, Sciara and Christie (2011) suggests that one of the shortfalls, which hinder MPAs, is the failure to incorporate stakeholders and local community’s views into planning and management. Understanding the significance of the Neptune Islands to other marine users would provide useful information in determining why people may oppose management policies, such as the SZ, and who these policies impact upon. Additional stakeholder engagement is recommended to ensure that the values of other marine user groups are identified and incorporated into decision-making processes.
4.5 Conclusion

The findings from the present study demonstrate that the value typology originally suggested by Rolston and Coufal (1991) and modified by Brown and Reed (2000) can be applied in a MPA context. All of the 13 values from the typology were chosen, with even the least frequently selected value (subsistence), being chosen by 52 respondents. Biological diversity, future, learning, recreational and aesthetic were the most frequently acknowledged social values held by cage-dive tourists with regard to the North Neptune Islands. With exception to learning, these values were consistent to those found in previous studies investigating terrestrial protected areas such as forests. While the learning value found in the marine park differentiated from the forest studies, this result does not necessarily indicate a disparity in social values between terrestrial and marine protected areas but is more likely due to differences in the particular sites, such as this site including a wildlife tourism experience where tourists have a tendency to want to learn.

Cage-dive tourists revealed a positive connection to the Neptune Islands marine environment in terms of non-commodity benefits holding biocentric, indirect and non-consumptive values as most important. Though not explicitly examined in this study, following the theory of reasoned action (Ajzen & Fishbein, 1980), it is assumed that beliefs and values underpin attitudes towards behaviours and activities. Brown and Reed (2000) suggest that publicly held forest values manifest in preferences and attitudes towards management outcomes and activities. Therefore, as biological diversity was the most common response overall, this may be an indication of tourist’s positive attitude toward management decisions which support maintaining this value, such as the establishment of the SZ. Overall, the survey responses indicate that the health and conservation of the Neptune Islands is important. While the economic benefits of protected areas may be an important consideration for managers, tourism operators and other stakeholders, this is not a value held highly by the tourists in the present sample.

The identification that tourists in the present study generally value the North Neptune Islands for its biodiversity and aesthetic characteristics, recreation and learning opportunity, and for the value it holds for future generations rather than its economic worth, provides an important foundation on which to base management objectives. This information may provide an important indicator of tourists’ attitudes and preferences towards particular actions and whether certain management policies will be considered acceptable. Identifying values may also be beneficial for targeted promotion of the marine park and the protection of the Neptune
Islands. However, further research would be required to ensure a wider cross-section of the community’s view are taken into consideration.

The conservation of marine ecosystems is as much about understanding people as it is about understanding ecological processes. As the global coverage of MPAs increase, the inclusion of social values in planning and management is critical to achieve the best possible outcomes for biodiversity and society. Management which ignores or fails to recognise these values may lead to conflict and misunderstandings with local communities on whom the success of the MPA is most dependent.

---------------------------------------- End of manuscript ----------------------------------------
Chapter 5 – Turning wildlife experiences into conservation action: Can white shark cage-dive tourism influence conservation behaviour?

Photo 6. Tourists observing a white shark from the cage in South Africa.

Photo: Kirin Apps
Throughout the preceding chapters (2, 3 & 4), research was conducted with participants on-board white shark cage-diving tours at the Neptune Islands. In order to investigate if the cage-dive experience promoted change in participants conservation behaviour (Figure 12), it was necessary to investigate participants behaviour post-tour. Based on the methodology of Ballantyne, Packer and Falk (2011), Hughes, (2013) and Powell and Ham (2008), this chapter presents the results of an online follow-up survey (Appendix D) completed in July 2016 by 136 participants, 3-24 months after their cage-dive experience. This chapter provides an insight into the conservation potential of shark tourism by discussing changes in participants attitude and behaviour towards shark conservation following a white shark cage-dive tour.

![Figure 12. Locating Chapter 5 within the thesis structure.](image-url)
5.1 Abstract

Wildlife tourism is often promoted as an activity which supports conservation by enhancing environmental knowledge, attitudes, and behaviour through interpretative messaging and personal experiences with wildlife. Despite these potential linkages, evidence to support such claims is limited. In order for wildlife tourism operators to build a motivated constituency supporting conservation, elements of the tour which contribute to positive attitudes and environmental behaviour must be identified. This study investigated the attitudes and environmental behaviour of 136 wildlife tourists following a white shark cage-dive experience in South Australia. Responses to an online survey revealed a significant increase in participation for seven of the eight conservation-related behaviours explored, and a positive shift in participants’ understanding, awareness, attitudes, and concern for sharks following the tour. Results suggest that emotional engagement during the tour is associated with enhancing participants’ knowledge and attitude toward sharks. Recommendations for complementing the emotional response to viewing wildlife, with interpretative communication, are discussed.

Keywords: conservation; wildlife tourism; marine tourism; white shark; cage-diving

5.2 Introduction

Wildlife tourism is often promoted as an activity that contributes to conservation by enhancing environmental knowledge, attitudes, and behaviour through interpretive messaging and meaningful first-hand experiences with wildlife (Ardoin et al., 2015; Ballantyne, Packer & Sutherland, 2011; Powell & Ham, 2008; Zeppel, 2008). Proponents of wildlife tourism suggest on-site benefits, such as increased understanding or emotional responses to wildlife encounters can lead to off-site benefits including greater environmental awareness and philanthropic support for nature conservation (Mayes et al., 2004; Moscardo, 2008; Packer & Ballantyne, 2012; Powell & Ham, 2008; Tisdell & Wilson, 2002; Zeppel & Muloin, 2008).

While researchers acknowledge the potential for tourism operators to engender a conservation ethic amongst participants, others suggest tourists’ main motivations are consumption and
entertainment, and that assumed increased support for conservation is unwarranted (Ardoin et al., 2015; Powell & Ham, 2008). Despite potential linkages between wildlife tourism and change in participants’ attitudes and behaviour, empirical evidence to support such claims is limited (Ardoin et al., 2015; Hughes, 2013; Powell & Ham, 2008).

A review of the learning, attitudinal, and behavioural outcomes from nature-based tourism shows that few studies investigated behaviour directly, with most studies focusing on behavioural intention (Ardoin et al., 2015). Further investigation measuring attitude and behaviour change is required to strengthen understanding of the conditions which facilitate conservation support. Tour operators and managers can then gain understanding of the operational elements which will most likely achieve support for conservation initiatives. Tour programmes may then be modified to emphasise these elements to encourage and reinforce conservation objectives.

Support for conservation can be referred to as environmental stewardship or citizenship. These terms describe the link between individuals’ every day lives and the responsible use and protection of the natural environment through sustainable practices (Fletcher & Potts, 2007; Wolf, Blahna, Brinkley & Romolini, 2013). Examples include: talking to others or writing letters to governmental officials about conservation issues, joining or donating money to environmental organisations, and avoiding the use of harmful or unsustainable products (Ballantyne, Packer & Falk, 2011; Ballantyne et al., 2008; Hughes, 2013; Powell & Ham, 2008). Three key themes are noted in the development of marine citizenship: marine education, personal attachment to the marine environment, and a sense of responsibility for the condition and management of the marine environment (McKinley & Fletcher, 2010). An increase in marine information availability and education is considered to stimulate high levels of concern for the marine environment to ultimately inspire a sense of marine citizenship (McKinley & Fletcher, 2010). For example, learning was a major outcome of the sea turtle viewing experience at Mon Repos, Australia, and was found to foster positive conservation values and visitor behaviour (Tisdell & Wilson, 2002; 2005; 2012). A survey of the general public found people with more knowledge about sharks were more supportive towards the species and their conservation (O’Bryhim & Parsons, 2015).

Environmental education seeks to foster attitudes and behaviour towards environmental protection by transmitting and accumulating knowledge (Wen & Lu, 2013). Many tourism experiences attempt to do this by combining participation in the experience with conservation-themed interpretation (Ballantyne, Packer & Hughes, 2009). The intention
is to increase tourists understanding of environmental issues thereby influencing participants to adopt conservation practices beyond the specific tourist experience (Beaumont, 2001; Hughes, 2013; Powell & Ham, 2008; Walker & Moscardo, 2014).

Behaviour is based on intentions, attitudes, and underlying beliefs, and will vary from individual to individual (Ajzen, 1991; 2005; Ajzen & Fishbein, 1980). Unless information targets these underlying beliefs, it is doubtful an individual’s attitude or behaviour will be impacted (Ham & Krumpe, 1996). The failure of information-based programmes aiming to foster behaviour change is due partly to the difficulty of changing behaviour (McKenzie-Mohr, 2000). Barriers and drivers influencing behaviour change include environmental factors, skills and abilities, personality, mood and emotions, past behaviour, demography, and culture (Fishbein, 2000; Fishbein & Capella, 2006). Therefore, stimulating long-term behaviour change may be more complicated than merely increasing knowledge.

The duration of wildlife tours usually allows a brief window for interpretive communication. It may be unrealistic to expect strong and enduring attitude changes during this short time (Ham, 2007). However, changes in tourists’ values and attitudes towards conservation after one day at an elephant park determined that even a brief communication opportunity could result in value and attitude change (Rattan, Eagles & Mair, 2012). Certain species, such as elephants may, however, be more emotionally appealing than other species, such as white sharks. Therefore, the ability of the wildlife experience to engender a conservation ethic amongst tourists may differ between species.

Stimulating a conservation ethic among participants is likely to require an integration of the emotional benefits of seeing unique wildlife with the educational benefits of learning new facts (Zeppel & Muloin, 2008). Human encounters with wildlife can have strong emotional and psychological impacts on participants (Curtin, 2006; Dobson, 2007; Hughes, 2013; Hughes et al., 2011). Direct exposure and emotional connection to wildlife can stimulate concern for a species and motivate pro-conservation behaviours (Ballantyne, Packer & Sutherland, 2011; Hughes, 2013; Skibins et al., 2013). To increase the likelihood of fostering conservation attitudes and behaviour amongst participants, researchers suggest operators capitalise on the emotional affinity between participants and the animals they observe and allow time for a reflective response (Ballantyne, Packer & Sutherland, 2011). The role of emotional engagement in wildlife tourism has been investigated in various studies. Surveys of marine wildlife tourists by Ballantyne, Packer and Falk (2011) indicated that changes in visitor’s environmental knowledge, attitudes, can be improved by encouraging
to emotionally connect with the animals they are observing. In a study of families at a marine turtle tourism site, Hughes (2013) found visitors were more likely to express an intention to adopt pro-conservation practices if they were emotionally engaged in the encounter. Jacobs and Harms (2014) research into the conservation intentions of tourists following a whale watching tour found interpretation which evoked emotion, was more likely to foster conservation intentions than interpretation which focussed on knowledge or responsibility. In an attempt to optimise the conservation potential of wildlife tourism these studies, and others (Ballantyne, Packer & Sutherland, 2011; Zeppel & Muloin, 2008), confirm that an emotional response to wildlife is an important element of the tourist experience.

5.2.1 Shark-based tourism and conservation

Charismatic megafauna such as dolphins and whales are often the focus of marine wildlife tourism. These animals are often referred to as ‘flagship species’ and promoted as a rallying point for conservationists (Skibins et al., 2013). While sharks are not generally seen as flagship species, the decline in global shark populations is a significant conservation issue that warrants immediate attention (Dulvy et al., 2014). The traditional negative image of sharks has often resulted in insufficient public support, and acted as an obstacle for shark species to receive proper management priority and conservation they require (Altobelli, 2011; Topelko & Dearden, 2005). However, public attitudes towards sharks have begun to change, with an increased level of interest and awareness of the scale of threats to global shark populations (Muter et al., 2013; Simpfendorfer et al., 2011; Whatmough et al., 2011). In particular, change in public perception has been realised amongst the marine tourism industry (Topelko & Dearden, 2005; Whatmough et al., 2011). Once considered a disadvantage to coastal tourism (Hoyt, 2014), sharks are now considered an important attraction at dive sites around the world (Huveneers & Robbins, 2014; Kempster & Collin, 2014; Topelko & Dearden, 2005).

Exposing tourists to sharks in their natural environment has considerable potential to enhance participant’s knowledge, attitudes, and behaviour towards sharks and their conservation (Dobson, 2007; Topelko & Dearden, 2005).

Shark-based tourism has seen an increase in academic attention and is an important niche sector in the rapidly developing marine tourism market (Cater, 2008). Research on the effects of tourism on sharks is on the rise with studies investigating the physiological impacts of provisioning (Maljković & Côté, 2011), changes in seasonality, residency or abundance
changes in spatial use (Corcoran et al., 2013; Huveneers et al., 2013), changes in vertical activity (Fitzpatrick et al., 2011; Huveneers et al., 2013), physical effects from divers (Smith et al., 2010) and the economic value of shark tourism (Huveneers et al., 2017). However, the social dimensions of shark-diving, such as the potential for conservation outcomes remain unclear. The unprecedented pressure from global shark fisheries (Dulvy et al., 2014; Worm et al., 2013) and the rapid growth of the shark tourism industry (Cisneros-Montemayor et al., 2013; Cisneros-Montemayor & Sumalia, 2014; Dearden et al., 2008) highlights the necessity for shark-based tourism to emphasise conservation and ensure the longevity and sustainability of both the industry and the species (Carwardine & Watterson, 2002; Dobson, 2006; 2007; Topelko & Dearden, 2005). The findings reported in this paper make a significant contribution to understanding elements of the wildlife tourism experience associated with engendering pro-conservation behaviour.

5.2.2. Research context: White shark cage-diving at the Neptune Islands

White shark cage-dive tourism has become a popular recreational activity, which exists in only a few countries where these sharks can be reliably observed (Dobson, 2008; Kempster & Collin, 2014). The present study focuses on the Neptune Islands, South Australia, where cage-dive tours have been conducted since the late 1970’s. This site has seen an increase in cage-diving effort since 2007, with the mean annual number of days rising from 124 days (2000–2006) to 265 days (2008–2011) (Bruce & Bradford, 2013). This sustained and rapid increase in activities coincided with a change from multi-day irregular timed trips to regular day trips operations (Bruce & Bradford, 2013). Currently, there are three licenced operators, with two offering day trip operations (approximately 12 hours in duration) and one offering multi-day tours (2-10 days). Tours operate 260 days a year (weather permitting) with participants boarding vessels from the Port Lincoln marina. Once at the Neptune Islands, participants can view sharks from inside a custom-built cage, from the deck of the vessel or on one vessel from a submersible viewing platform. During the tour, tourists are encouraged to ask questions with information predominantly focussed on shark-related facts and stories, and identification of individual sharks. Interpretation does not specifically include a call for action, conservation messages, or suggestions for pro-conservation actions.
If wildlife tourism is to foster understanding of conservation, engender pro-conservation attitudes, or encourage visitors to become personally involved in conservation initiatives, visitor research is needed to inform the design and delivery of a tourism experience that continues to attract and inspire visitors. The present study aimed to investigate the potential for a white shark cage-dive experience to prompt tourists to increase shark conservation behaviour. The study was guided by three research questions:

1. Does cage-diving positively enhance participants’ awareness, understanding attitudes and concern for sharks and their conservation?
2. Does conservation behaviour towards sharks increase post-experience?
3. Are perception of tour quality, knowledge gain, and emotional engagement associated with an increase in shark awareness, understanding, attitudes and concern, and conservation behaviour?

5.3 Methods

The investigation was part of a larger study examining the white shark cage-diving participant experience at the Neptune Islands, South Australia (Apps, Dimmock, Lloyd & Huveneers, 2016; 2017). As part of these studies, 783 cage-dive participants completed surveys between March 2014 and April 2016 (note: some tourists completed both the education survey in chapter two and the value survey from chapter three). Of these respondents 54% agreed to be contacted post-experience via email for follow-up questions. In July 2016, an email invitation to participate in an online survey was sent to 423 respondents’. The follow-up survey was available online for a four-week period. During this time, 136 participants (32%) completed the survey.

The majority of the sample were male (60%), with most aged between 25–34 (31%), or 35–44 (30%). Respondents’ were from 13 countries with the majority from Australia (53%) followed by England, America, Ireland, Canada, and Germany. A chi-square analysis showed no significant differences between the profiles of the follow-up sample when compared with the on-board survey sample (n=607; Apps et al., 2017) (gender $\chi^2=(1, n=752)=1.882, p=.170$; nationality (domestic/international) $\chi^2=(1, n=752)=.020, p=.887$). No further comparisons with the previous on-board data were conducted.
5.3.1 Research instrument

The online follow-up survey (Appendix D) included items designed to measure: (1) self-reported change in awareness, understanding, attitude, and concern as a result of the tour (learning outcomes) (2) self-reported participation in shark conservation behaviour (pre- and post-experience), (3) perception of tour quality, (4) self-assessed knowledge gain, and (5) emotional engagement during the cage-dive experience. All variables were measured using a 5-point Likert-type response.

Self-reported learning outcomes

To investigate self-reported changes in participants’ awareness, understanding, attitude, and concern for sharks as a result of the tour, six learning outcome measures were used. As described by Ballantyne, Packer & Falk (2011, p.1245) learning outcomes are defined as the “deepening and expanding of personal knowledge and understanding of environmental sustainability issues; and changes in awareness, appreciation and concern for wildlife.” Respondents’ were asked their level of agreement (1=strongly disagree to 5=strongly agree) with six statements exploring an increased interest in sharks, concern for shark welfare, and support for conservation. These statements included questions related to sharks in general and white sharks which were the species targeted by the tour. The statements were based on research by Ballantyne, Packer & Falk (2011).

Shark conservation behaviour (pre- and post-experience)

This section of the follow-up survey was divided into two questions. The first asked respondents to indicate, on a scale of 1 (never) to 5 (always), their participation in eight conservation actions prior to the tour. The second asked the same questions but in relation to conservation actions since the tour. The eight conservation actions were chosen from a combination of a web-based review of recommendations for shark conservation from five conservation organisation websites (Save Our Sharks, Australian Marine Conservation Society, Shark savers (WildAid), Sea Sheikh, and Project Aware), and a literature review of studies investigating participation in conservation behaviour (Ballantyne et al., 2008; Ballantyne, Packer & Falk, 2011; Hughes, 2013; Powell & Ham, 2008).
Perception of tour quality

Participants’ feelings of satisfaction and perception of tour quality are often used to evaluate success of the tour and willingness of participants to recommend or return to the destination (Powell et al., 2012; Powell & Ham, 2008). Perceptions of quality were measured using an index comprised of six questions regarding respondents’ perception of quality, enjoyment, and satisfaction with several aspects of the tour including staff, interpretation, site, and opportunities to experience white sharks. Questions investigating visitor quality and satisfaction were based on Powell and Ham (2008) and Powell et al. (2012).

Self-assessed knowledge gain

This index determined respondents’ self-reported knowledge increase in five themes: biology, habits and threats to white sharks, the Neptune Islands, and general shark knowledge. While an objectively measured pre- and post-knowledge test may have achieved different results, it could have introduced testing bias from repeat measurement (Ham & Weiler, 2002; Powell & Ham, 2008). Powell and Ham (2008) used similar questions to those in the present study with results concurring with those of an objectively measured pre- and post-voyage knowledge test.

Emotional engagement

An assessment of emotional engagement was included in the follow-up survey to investigate participants’ level of engagement in the experience with eight questions targeting emotional responses to viewing white sharks. They included aspects of the experience, such as a sense of wonder or awe, and having an enjoyable experience. Similar applications of these items have been used by Ballantyne, Packer and Falk (2011), and Hughes (2013).
5.3.2 Data analysis

Descriptive statistics were used to calculate the frequency for each index’s statement items and the demographic characteristics of the sample. The indices for self-reported learning outcomes, perception of tour quality, self-assessed knowledge gain, and emotional engagement were based on a summated score with reliability (alpha) ranging from 0.77 to 0.92. The mean and standard deviation was then calculated for each summated score based on the number of items in each index (Table 9). Changes in self-reported shark conservation behaviour between pre- and post-experience was tested using a paired sample t-test. The behaviour difference variable was calculated based on the difference between the total pre- and post-behaviour scores. The results were coded into “increased participation” based on a positive score, and “the same or decreased participation” based on an equal or negative score. To explore the relationship between increased conservation behaviour participation, and the learning outcomes, perceptions of quality, knowledge gain, and emotional engagement indices, Spearman correlation coefficients were calculated. ANOVA and Chi Square tested the differences in conservation participation according to time since the experience, nationality and gender. All statistical analyses were performed using IBM SPSS Statistics 22.

5.4 Results

5.4.1 Self-reported learning outcomes

Overall, respondents’ scores suggest an increased understanding, awareness, and concern for sharks and their conservation (mean score = 4.39; SD = 0.68) (Table 9). Interest in ‘sharks in general’ had the highest rating with 90% agreeing (strongly agree + somewhat agree) the experience made them more interested. Many strongly agreed or somewhat agreed the experience made them ‘more interested in white sharks’ (88%), ‘feel more strongly about shark conservation issues’ (84%), ‘made shark conservation more meaningful’ (82.3%), and made them ‘more concerned about the welfare of sharks in general’ (82%). Supporting shark conservation legislation’ received the lowest score with 75% agreeing (strongly agree + somewhat agree) the experience made them more likely to do so.
5.4.2 Increased shark conservation behaviour

The results demonstrate that 69% of participants increased their conservation behaviour after the cage-dive tour. Seven of the eight conservation actions significantly increased after visitors experienced the tour (Figure 13). ‘Donating money to conservation’ was the only behaviour which did not significantly increase. Specific actions which experienced the greatest increase in participation include ‘talking positively about white sharks’ (mean difference = 0.67, 95% CI: -.847 to -.502) and ‘sharks in general (mean difference = 0.58, 95% CI: -.738 to -.417), to others and on social media’, and ‘following shark conservation organisations via social media and/or email lists’ (mean difference = 0.54, 95% CI: -.698 to -.399).

There were no significant differences in conservation participation according to time since the experience (3–6 months, 6–12 months, 12–18 months, 18–24 months, over 24 months) ($F_{1,133} = .005, p = .941$) or nationality (domestic/international) ($\chi^2 (1, n=135) = .048, p = .826$). Females were more likely to report an increase in conservation participation than males (80% vs. 61%; $\chi^2 (1, n=135) = 4.5, p = .034, phi = .199$).
Table 9. Chronbach's alpha, mean, standard deviation and items for the self-reported learning outcomes, perceptions of tour quality, self-assessed knowledge gain and emotional engagement indices.

<table>
<thead>
<tr>
<th>Indices and Items</th>
<th>Mean (SD)</th>
<th>Cronbach’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self-reported learning outcomes Index</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More interested in white sharks (^b)</td>
<td>4.39 (0.68)</td>
<td>0.923</td>
</tr>
<tr>
<td>More interested in sharks in general (^b)</td>
<td>4.49 (.762)</td>
<td></td>
</tr>
<tr>
<td>More likely to support shark conservation legislation (^b)</td>
<td>4.42 (.807)</td>
<td></td>
</tr>
<tr>
<td>Shark conservation more meaningful to me (^b)</td>
<td>4.40 (.833)</td>
<td></td>
</tr>
<tr>
<td>More concerned about the welfare of sharks in general (^b)</td>
<td>4.37 (.854)</td>
<td></td>
</tr>
<tr>
<td>More strongly about shark conservation issues (^b)</td>
<td>4.25 (.888)</td>
<td></td>
</tr>
<tr>
<td><strong>Perceptions of tour quality index</strong></td>
<td>4.57 (0.42)</td>
<td>0.815</td>
</tr>
<tr>
<td>Satisfaction with opportunities to experience white sharks (^a)</td>
<td>4.76 (.427)</td>
<td></td>
</tr>
<tr>
<td>Enjoyment of visiting the Neptune Islands (^a)</td>
<td>4.7 (.574)</td>
<td></td>
</tr>
<tr>
<td>Overall satisfaction (^a)</td>
<td>4.66 (.548)</td>
<td></td>
</tr>
<tr>
<td>Overall quality of the tour (^a)</td>
<td>4.57 (.593)</td>
<td></td>
</tr>
<tr>
<td>Quality of staff on-tour (^a)</td>
<td>4.48 (.633)</td>
<td></td>
</tr>
<tr>
<td>Quality of education and interpretation (^a)</td>
<td>4.12 (.766)</td>
<td></td>
</tr>
<tr>
<td><strong>Self-assessed knowledge gain index</strong></td>
<td>4.07 (0.63)</td>
<td>0.817</td>
</tr>
<tr>
<td>Knowledge of habitat and wildlife of Neptune Islands increased (^b)</td>
<td>4.35 (.741)</td>
<td></td>
</tr>
<tr>
<td>Overall general knowledge of sharks increased (^b)</td>
<td>4.23 (.686)</td>
<td></td>
</tr>
<tr>
<td>Knowledge of movements, migrations etc. increased (^b)</td>
<td>3.91 (1.00)</td>
<td></td>
</tr>
<tr>
<td>Knowledge of white shark biology etc. increased (^b)</td>
<td>3.85 (1.003)</td>
<td></td>
</tr>
<tr>
<td>Understanding of the threats to white sharks increased (^b)</td>
<td>3.76 (1.051)</td>
<td></td>
</tr>
<tr>
<td><strong>Emotional engagement index</strong></td>
<td>4.38 (0.47)</td>
<td>0.772</td>
</tr>
<tr>
<td>It was exciting to see live sharks (^b)</td>
<td>4.90 (.306)</td>
<td></td>
</tr>
<tr>
<td>I felt a sense of wonder or awe (^b)</td>
<td>4.83 (.374)</td>
<td></td>
</tr>
<tr>
<td>I had an enjoyable experience (^b)</td>
<td>4.83 (.380)</td>
<td></td>
</tr>
<tr>
<td>The experience was engaging (^b)</td>
<td>4.66 (.587)</td>
<td></td>
</tr>
<tr>
<td>I experienced something surprising or unexpected (^b)</td>
<td>4.32 (.769)</td>
<td></td>
</tr>
<tr>
<td>I found myself reflecting on new ideas about white sharks and their habitat (^b)</td>
<td>4.12 (1.026)</td>
<td></td>
</tr>
<tr>
<td>Felt an emotional connection with one or more of the animals I saw (^b)</td>
<td>3.74 (1.124)</td>
<td></td>
</tr>
<tr>
<td>Something made me feel sad or angry about the threats to sharks (^b)</td>
<td>3.48 (1.102)</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) Based on a Likert scale 1=very low, 5=very high

\(^b\) Based on a Likert scale 1=strongly disagree, 5=strongly agree
Figure 13. Respondents’ participation in conservation actions pre- and post-tour based on a Likert scale (1= never to 5= always). * $p < 0.01$ level
5.4.3 Perceptions of tour quality

Respondents’ ratings of the six aspects of tour quality suggest high level of satisfaction and enjoyment (mean = 4.57; SD = 0.420; Table 9). ‘Opportunities to experience white sharks’ and ‘visiting the Neptune Islands’ had the highest ratings with over 96% of respondents’ ranking satisfaction and enjoyment as high or very high. ‘Overall satisfaction’, ‘overall quality of the tour’, and ‘quality of on-tour staff’ also rated highly with over 90% of respondents’ ranking them high or very high. The education and interpretation aspect of the tour received the lowest ratings with 78% ranking the ‘quality of education and interpretation’ as high or very high. Since the tour, 98.5% of participants have recommended cage-diving at the Neptune Islands to others.

5.4.4 Self-assessed knowledge gain

Respondents’ self-assessed knowledge in the five thematic areas indicates an increase in knowledge and understanding in these areas (mean = 4.07; SD = 0.63) (Table 9). Over 85% of respondents reported (strongly agree + somewhat agree) that their knowledge of the Neptune Islands habitat and wildlife and their general overall knowledge of sharks increased. A self-assessed increase in knowledge of white shark movement and migrations (72.1%) and biology (70.6%) also occurred with respondents’ strongly agreeing or somewhat agreeing with the statements. The lowest rating statement was ‘my understanding of the threats to white sharks increased’ with 64% strongly agreeing or somewhat agreeing.

5.4.5 Emotional engagement

Respondents’ ratings of the eight items suggest an emotional engagement with the experience (mean = 4.38; SD = 0.47) (Table 9). Ninety-nine per cent of respondents agreed (strongly agreed + somewhat agreed) ‘it was exciting to see live sharks’, while over 97% agreed they ‘felt a sense of wonder and awe’ and ‘had an enjoyable experience.’ Many either strongly or somewhat agreed ‘the experience was engaging’ (93%), they ‘experienced something surprising or unexpected’ (84%), found themselves ‘reflecting on new ideas about sharks and their habitat’ (74%), and ‘felt an emotional connection with one or more of the animals’ they saw (60%). The lowest rated statement was ‘something made me feel sad or angry about the
threats to sharks’ with 48% of respondents’ strongly or somewhat agreeing with this statement.

All correlations between survey variables (*self-reported learning outcomes, perceptions of quality, self-assessed knowledge gain, and emotional engagement*) were significant, except for the correlations between *increased conservation behaviour* and *perceptions of quality* and, *increased conservation behaviour* and *self-assessed knowledge gain* (Table 10). The strongest correlation was between *self-reported learning outcomes* and *emotional engagement*. Emotional engagement was also strongly correlated with *perception of quality* and *self-assessed knowledge gain*. Overall, *emotional engagement* was the most strongly correlated element with each aspect of the tour, indicating that it may be the most significant component to the tour. *Increased conservation behaviour* weakly correlated with *self-reported learning outcomes, self-assessed knowledge gain, and emotional engagement* with the strongest correlation being with *emotional engagement* (Table 10). Respondents’ were significantly more likely to report a positive increase in their awareness, understanding, attitudes, and concern for sharks (learning outcomes) if they gained knowledge and felt an emotional engagement while on-tour.
Table 10. Correlations between increased conservation behaviour, learning outcomes, perceptions of quality, knowledge gain, and emotional engagement.

<table>
<thead>
<tr>
<th>Measure</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Increased conservation behaviour</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Self-reported learning outcomes index</td>
<td>0.186*</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(awareness, understanding, attitude and concern for sharks)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Perception of tour quality index</td>
<td>0.063</td>
<td>0.367**</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Self-assessed knowledge gain index</td>
<td>0.156</td>
<td>0.453**</td>
<td>0.513**</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>5. Emotional engagement index</td>
<td>0.243**</td>
<td>0.682**</td>
<td>0.493**</td>
<td>0.579**</td>
<td>1.000</td>
</tr>
</tbody>
</table>

* p < 0.05 level (2-tailed)
** p < 0.01 level (2-tailed)

5.5 Discussion

The overall aim of this study was to explore the wildlife tourism experience and investigate changes in tourists’ conservation behaviour following the tour. Findings revealed tourists’ (1) awareness, understanding, attitudes, and concern for sharks was positively enhanced; (2) increased participation in conservation-related behaviours was declared; and (3) increased conservation participation and enhanced understanding, awareness, attitudes, and concern for sharks were most strongly correlated with emotional engagement during the experience.

A positive shift in participants’ understanding, awareness, attitudes, and concern for sharks supports the ability of wildlife tourism to stimulate awareness and appreciation amongst participants for the wildlife it targets (Ballantyne, Packer & Falk, 2011, Powell et al., 2012; Zeppel & Muloin, 2008). Beaumont (2001) refers to a ‘ceiling effect’, whereby participants may already have reasonably strong environmental attitudes prior to the tourism experience. This ‘preaching to the converted’ has been observed in tourism experiences with visitors to a rainforest (Hill, Woodland & Gough, 2007), an eco-lodge (Sander, 2012), and an expedition cruise (Walker & Moscardo, 2014). For cage-dive participants who already have a high awareness and concern for shark conservation, the experience may act to reinforce and enhance the already favourable attitudes. Regardless of whether the tour was ‘preaching to the converted’ or stimulated participants to change previously held attitudes, the results demonstrate most participants were more interested in sharks and concerned for their conservation following the tour than before. The increase in interest and concern may result in a future call for action to address conservation issues.
The result demonstrating a majority of participants (69%) increased participation in conservation-related behaviour supports tourism’s claim of fostering pro-environmental behaviour amongst participants. Research by Ballantyne, Packer and Sutherland (2011) and Filby et al. (2015) also found increased environmental behaviour following a tourism experience. Respondents’ in the present study were most likely to engage in minimal effort activities such as talking positively about sharks to others including on social media. The finding corresponds with Filby et al. (2015) who determined that commitment to action was often dependent on the level of investment required with low commitment/minimal effort actions being the most likely to occur. The ease of completing actions like following shark conservation organisations and talking positively about sharks could also be due to the popularity of social media and the prevalence of shark stories in the media in Australia in recent years (McCagh, Sneddon & Blache, 2015; Muter et al., 2013).

Non-performance of conservation actions like writing letters to government and signing petitions could be due to lack of resources, skills, or limited opportunities to perform the behaviour since the tour (Hughes, 2013). Willingness to financially support conservation by donating money achieved the lowest increase in participation. Powell and Ham (2008) determined that tourists’ intention towards philanthropy was positively correlated with their level of enjoyment and degree of knowledge gain. While the present study indicates participants gained knowledge and enjoyed the tour (98.5% recommended the tour), it did not result in increased philanthropy which may be due to limited resources or opportunities to donate money since the tour, and not a lack of intention to do so.

For wildlife tourism to build a motivated constituency that support sharks and their conservation, elements of the tour that contribute to enhancing participants’ awareness, understanding, attitudes, concern, and increasing conservation behaviour must be identified. Attitudes and knowledge towards the environment and particular species are often considered a precursor to generating environmental actions (Hughes et al., 2011; McKenzie-Mohr, 2000), yet, our analysis showed weak correlation between self-reported learning outcomes (awareness understanding, attitudes, and concern for sharks) and behaviour, with an almost non-existent relationship between knowledge and behaviour (Table 10).

These results correspond with Filby et al. (2015) who found biocentric values held by swim with dolphin tourists did not necessarily develop into pro-conservation action. Similarly, increased knowledge with grey nurse shark divers did not convert into an overall improvement in biocentrism (Smith et al., 2009). Attitudes and knowledge are, however, only
two barriers to public participation in conservation behaviour. Other social, environmental, structural, and institutional factors may influence participants’ behavioural change (Eagle et al., 2016; Fishbein, 2000; Fishbein & Capella, 2006; McKenzie-Mohr, 2000). Weak correlations could be due to the use of self-reported measurements. Any measure of actual change, especially in behaviour, would have been ideal and may have produced different results, however it was beyond the scope of this research.

The most significant relationship with increased conservation behaviour was emotional engagement. Cage-diving offers an up-close experience with white sharks in their natural habitat, in addition to the element of thrill. These elements enhance participants’ sense of wonder, awe and excitement, contributing to their emotional arousal and producing lasting memories (Ballantyne, Packer & Sutherland, 2011). This result suggests the potential for emotional engagement in the tour to stimulate conservation support beyond tour duration. The correlation was, however, weak. While the present study did not identify a strong relationship between the variables tested and increased conservation behaviour, 69% of participants increased conservation behaviour following the tour. This finding supports the view that tourism operators can foster conservation amongst participants. Further investigation into the relationship between factors which influence conservation behaviour is an important area of enquiry for future studies.

Similar to conservation effort, the positive shift in participants’ awareness, understanding, attitudes, and concern for sharks was associated with an emotional engagement in the experience. Emotional engagement in the experience was also associated with a high perception of tour quality and self-assessed knowledge gain. Following a wildlife tourism experience, visitors commonly express a sense of wonder, awe, excitement and privilege. These feelings contribute to an emotional connection with the animals observed establishing empathy and concern for their welfare (Ballantyne, Packer, Hughes, & Dierking, 2007; Ballantyne, Packer & Sutherland, 2011; Curtin, 2006; Zeppel & Muloin, 2008). The present study identified participants’ feelings of wonder and awe and emotional connection with one or more of the animals they observed. Ballantyne et al. (2007) and Hughes (2013) found an emotional affinity combined with a reflective response had the most powerful impact on visitors, provoking deeper thought and leading to concern and respect not only for the animals observed but for the species’ broadly. The present research suggests that engaging participants on an emotional level can increase interest in the animals observed including concern for species welfare, making conservation more meaningful to participants.
The relationship between knowledge gain and the positive shift in participants’ understanding, awareness, attitudes, and concern for sharks reinforces the importance of quality education and interpretation programmes that include conservation messages. Finding over 85% of participants agreed their knowledge of the Neptune Islands habitat and wildlife and general overall knowledge of sharks increased, concurs with other marine tourism experiences. Swim-with-dolphins research found a majority of participants’ knowledge increased from a slight level of perceived knowledge pre-tour, to a moderate level post-tour and six months after the tour (Filby et al., 2015). These results, along with the present study suggest a perceived increase in knowledge occurs at the time of the tour and lasts across time (Filby et al., 2015).

While the findings report respondents’, knowledge increased while on tour, understanding of the threats to white sharks and quality of education and interpretation provided received the lowest rank compared with other knowledge and quality statements. The results correspond with Filby et al. (2015) who found tourists were moderately satisfied with information on conserving dolphins and their environment. While not all research supports the assumption knowledge gain alone will influence conservation attitudes (Beaumont, 2001; Ham, 2007; Hill et al., 2007), there is much empirical support for interpretative programmes which are viewed as an important strategy for wildlife tourism to transfer knowledge, stimulate emotions, promote conservation, and increase tourist satisfaction (Hughes, 2013; Filby et al., 2015; Jacobs & Harms, 2014; Lück, 2015; Walker & Moscardo, 2014; Stamation, Croft, Shaughnessy, Waples & Briggs, 2007; Tisdell & Wilson, 2012; Zeppel & Muloin, 2008). The present results suggest an opportunity to improve interpretative communication on wildlife tours, highlighting threats facing the animals observed to enhance conservation potential of the tour.

In South Australia, although white shark cage-diving participants are eager to learn with some interpretative material available, there is limited structure to interpretative programmes, leading participants to seek more information about sharks from the operators (Apps et al., 2016; 2017). Seeing white sharks in their natural habitat can be a powerful emotional experience as demonstrated by the present study. However, without a well-structured interpretive programme to support this experience the potential to advance shark conservation may be an opportunity lost. In addition to on-board interpretation, participants’ may benefit from post-visit resources including strategies and examples to help convert support for conservation into action before enthusiasm wanes (Ballantyne, Packer & Sutherland, 2011; Hughes et al., 2011; Hughes, 2013).
Ballantyne, Packer and Sutherland (2011) found it was the information operators delivered about the dangers faced by “their” animals that stayed in participants’ memories. The aroused feeling of protectiveness amongst tourists takes the emotional connection a step beyond empathy. Jacobs and Harms (2014) determined that interpretation, focused on emotion, had a larger impact on tourists’ whale conservation intentions than interpretation which focussed on knowledge or responsibility. If tour operators in the present study reinforce a conservation message in combination with the emotional impact of the experience and time for reflection, a greater influence on participants’ post-tour conservation behaviour may be detected. Operators and managers can benefit from implementing interpretation programmes by contributing to conservation of the resource on which their business depends and increasing customer satisfaction (Lück, 2015). The interpretation programme can become an attraction in itself, being especially valuable in the absence of wildlife.

5.6 Limitations

Analysis of post-experience responses provided insight to factors which facilitate participants’ progress from experience to conservation action. The results, however, are subject to several limitations. The study was limited to one type of wildlife interaction at one site. The emotional response to viewing white sharks from a cage is unlikely to be typical for all marine wildlife tourism experiences and might be different in other countries where white shark cage-diving occurs. Sampling bias could not be avoided due to the diminishing sample size from the on-board sample \(n=738;\) Apps et al., 2016; 2017), to those who provided an email address \(n=423\), to the online sample discussed in the present study \(n=136\). All three samples, to varying degrees, may have been positively biased towards those who are more interested and supportive of sharks and their conservation. While the sample size in the present study \(n=136\) may be considered small, it is comparable to previous similar studies with a sample size ranging from 57 to 150 surveys completed (Ballantyne et al., 2008; Ballantyne et al., 2009; Hughes, 2013; Jacobs & Harms, 2015; Powell & Ham, 2008).

The response rate for those who were invited to participate in the online study was 32%, but was 19% of the original on-board sample (Apps et al., 2016; 2017). This rate is comparable to other studies of marine tourists with response rates for follow up web surveys ranging from 10 to 25% (Ballantyne Packer & Falk, 2011; Filby et al., 2015) These results demonstrate the often-avoidable degree of attrition across multiple stages of survey
research and is likely due to surveys being distributed online as participants have no personal contact with the researcher they may feel less obligated to participate than they did on-tour.

The measures of increased conservation behaviour, knowledge, and participants’ learning outcomes were based on self-reports. There is debate about how closely self-reporting reflects actual behaviour (Hughes, 2013). Due to the socially desirable nature of environmental behaviours, respondents’ may have overstated their involvement in conservation actions. If such a bias occurred, respondents would likely overstate participation in both pre- and post-tour conservation behaviour leading to little influence on our findings as the results used the difference in conservation involvement between the two surveys, rather than results from independent surveys. The unequal time between respondents’ participation in the tour and completion of the survey (3–24 months) may have also influenced respondents’ self-reports. For example, evaluation of emotional responses could change over time as participants reflect on the experience potentially giving greater significance to certain memories such as those related to a sense of wonder, awe, and excitement (Ballantyne, Packer & Sutherland, 2011). Time also allows distance from the experience and a period for reflection which may facilitate a sense of ‘what might have been’ a better experience (Curtin, 2006, p.313). However, the potential influence of unequal time between the tour and the post-survey with increased conservation participation was tested with no significant difference detected.

5.7 Conclusion

Tourists often consume wildlife experiences in the form of a short superficial visit with a collection of photographs, souvenirs, and memories (Curtin, 2009). The present study, however, demonstrates that even a brief encounter can have a profound effect on participants’ awareness, understanding, attitudes, concern, and behaviour towards wildlife conservation. For wildlife tourism operators and managers aiming to encourage visitors to increase their participation in pro-conservation behaviours, the findings from this research suggest emotionally engaging participants in an experience. Visitors can be encouraged to reflect on their experience, to think deeply about what they have seen and heard to establish a personal response and relate the animals encountered through broader environmental issues (Ballantyne, Packer & Sutherland, 2011). Suggested strategies include implementing interpretation programmes which reinforce participants’ sense of wonder, awe and
excitement. Participants are likely to benefit from examples of practical actions they can take to contribute to the conservation of sharks and other wildlife. Post-visit resources are recommended to allow participants to follow-up on particular interests and conservation strategies, extending the conservation potential of the experience beyond the time of the tour.

Many complex factors contribute to conservation behaviour, including skills and abilities, personality, past behaviour, demographics, and culture, however, neglecting the potential influence of emotional engagement in wildlife tourism experiences is not recommended (Jacobs & Harms, 2014). Combining the emotional response of viewing wildlife with the educational benefits of a specifically designed interpretation programme allows tourism operators an opportunity to cultivate the conservation potential of the tourism experience. In a time of changing environments and species decline, encouraging tourists to adopt pro-conservation behaviours is an area of wildlife tourism that warrants implementation, and further investigation.

----------------------------------  End of manuscript  ----------------------------------
Chapter 6 – Discussion & Conclusion

Photo 7. Silhouette of a white shark beneath a tour vessel and dive-cage.

Photo: Kirin Apps
6.1 Synopsis

This final chapter of this thesis discusses the significant findings from the research, and the practical and theoretical contributions to shark-based tourism. This thesis aimed to explore the human dimension of shark-based tourism and describe the potential for such activity to contribute to shark conservation. It endeavoured to identify the features of shark-based tourism which maximise conservation outcomes and addressed the following research questions:

1. What are the salient beliefs of tourists with regard to shark-based tourism? (Chapter 2)
2. What is the role of on-tour education and interpretation about sharks? (Chapter 3)
3. How do participants value the shark tourism site? (Chapter 4)
4. Can the shark tourism experience promote change in participants’ conservation behaviour? If so, which elements of the tour are associated with a positive shift in conservation behaviour? (Chapter 5)

The key findings from each research question were discussed in the corresponding chapter with the main conclusions summarised below.

Chapter 2: Identifying the salient beliefs of tourists with regard to shark-based tourism.

The purpose of this study was to investigate the white shark tourist and identify their beliefs regarding white shark cage-diving at the Neptune Islands, South Australia. An elicitation survey based on the theory of planned behaviour (TpB) was applied to collect qualitative data from cage-dive participants (n=86). The key findings of this chapter were:

i. Behavioural beliefs dominated participant responses, with the most frequently mentioned advantage of observing white sharks being the opportunity it facilitated for education and awareness.

ii. The second most frequent response was the belief that cage-diving offered tourists a unique opportunity to observe white sharks in their natural habitat.
**Chapter 3: The role of on-tour education and interpretation**

Following on from the key findings of chapter two which identified demand for on-tour education and interpretation, the study in chapter three surveyed a larger sample of participants (n=607) to assess how much, and in what way tourists wanted to be educated while on tour. Results showed that:

i. The main motivation to participate in white shark cage-diving is to see a white shark up-close in its natural habitat, have a unique life experience, and learn about white sharks, and sharks in general.

ii. While participants generally agreed the tour was an educational experience, many revealed further demand for information about white shark biology and ecology, and the threats to sharks in general.

**Chapter 4: The social value of the Neptune Islands**

To further understand the human dimension of shark-based tourism it was important to determine how tourists valued the Neptune Islands and whether the site could contribute to a conservation ethic amongst participants’. The study in chapter four surveyed a larger sample of participants (n=675) to assess social values of the Neptune Islands based on assigning a dollar value up to $100 for the 13 value types. The results established that:

i. The social values most frequently cited were biological diversity, future, learning, recreation, and aesthetic values.

ii. Respondents held biocentric, indirect and non-consumptive values as most important indicating a positive connection to the site in terms of the conservation and protection of these values.

**Chapter 5: Tour elements associated with influencing conservation behaviour**

The final stage of the study was an online survey (n=136), completed 3-24 months after the cage-dive tour. This study investigated which elements of the tour were associated with
positive changes in participants’ knowledge, attitude, awareness, concern, and conservation behaviour. The findings demonstrated that:

i. Understanding, awareness, and concern for sharks and their conservation increased amongst participants’ post-tour.

ii. Conservation behaviour of tourists was higher after having experienced a cage-diving tour. A significant increase in participation for seven of the eight conservation actions was detected and included: ‘talking positively about sharks to others and on social media’, and ‘following shark conservation organisations via social media and/or email lists.’

iii. Respondents reported knowledge gain about white sharks, sharks in general, and the Neptune Islands after the tour. The lowest increase in knowledge was associated with threats to white sharks.

iv. Emotional engagement was experienced on-tour with participants’ responding that they felt excited, engaged, a sense of wonder and awe, and an emotional connection with one or more of the sharks they saw, with many reflecting on new ideas about sharks. Emotional engagement was the most significant element of the tour correlating with increased understanding, awareness, and concern for sharks and their conservation, increased conservation behaviour participation, self-assessed knowledge gain, and a high perception of tour quality.

6.2 Main themes from the thesis

The synthesis of the study findings identifies two key emergent themes contributing to the conservation potential of white shark cage-dive tourism:

- Education/interpretation
- Emotional engagement

The subsequent fundamental suggestion incorporating these key themes argues that there is a greater potential for conservation outcomes when the tourism experience contains a combination of education/interpretation and emotional engagement (Figure 14).
The following exploration of these themes integrates and examines the significant findings from the study (from chapters 2–5) within the theoretical framework of wildlife tourism and conservation.

6.2.1 Education and Interpretation

The positive impacts of education and interpretation have been supported by several results of this study, in addition to other sources assessing interpretation in marine wildlife tourism (Eagle et al., 2016; Lück, 2008; 2015; Lopez & Pearson, 2016; Mayes & Richins, 2008; Powell & Ham, 2008; Tisdell & Wilson, 2005; Zeppel, 2008; Zeppel & Muloin, 2008). Qualitative responses in chapter two revealed that many viewed their cage-dive experience as an opportunity to learn about sharks in a unique and natural environment. These responses were similar to other studies of shark diving tourists who found education and interpretation were important factors contributing to participant enjoyment (Dicken, 2010; Dicken, 2014; Dicken & Hosking, 2009; Ziegler et al., 2012). However, they contrasted results from Dobson, et al. (2005) who found that tourists undertaking white shark cage-diving in South Africa are there predominantly to experience an adrenaline rush and are not necessarily interested in learning about sharks.
Further exploration of the cage-dive experience with a larger sample size in chapter three of this thesis reiterates participant interest and support for on-tour education and interpretation. Participants not only viewed education as important, they enjoyed learning about wildlife while on holiday (chapter 3) and associated knowledge gain with a high perception of tour quality (chapter 5). Learning about sharks and the marine environment was a motivation for coming on-tour (chapter 3) with many associating the Neptune Islands with high learning values (chapter 4). These results give empirical support for the assertion found in the literature that wildlife tourists’ desire, expect, value, and enjoy on-tour education and interpretation (Lück, 2008; 2015).

The proponents of wildlife tourism often cite the increase of participant’s knowledge and awareness of the target species and its habitat, as conservation benefits of wildlife tourism (Ardoin et al., 2015; Ballantyne, Packer & Sutherland, 2011; Jacobs & Harms, 2014; Lück, 2003; Powell & Ham, 2008; Zeppel, 2008; Zeppel & Muloin, 2008). While investigations of marine tourism experiences with species such as whales (Lopez & Pearson, 2016), dolphins (Mayes & Richins, 2008) and sea turtles (Eagle et al., 2016; Tisdell & Wilson, 2005) have added empirical support to this claim, investigations of the shark tourist have, until now, been absent from the literature. In the present study, participants agreed that the tour was an educational experience (chapter 3), and that their general knowledge of the Neptune Islands and sharks had increased (chapter 5). These findings support claims that wildlife tourism contribute to participant knowledge and awareness.

While education and interpretation may increase participant knowledge and awareness, evidence to support the link between increased awareness, and pro-conservation attitudes and behaviour is limited (Ardoin et al., 2015; Hughes, 2013; Powell & Ham, 2008). Responses to the post-tour survey (chapter 5) detected a positive correlation between knowledge gain and an increase in awareness, understanding, attitude and concern for sharks and their conservation. However, no relationship was detected between knowledge gain and increased conservation behaviour participation. Understanding human behaviour is challenging (Ajzen, 2005), with knowledge just one of the potential barriers to conservation behaviour participation (Eagle et al., 2016; Fishbein, 2000; Fishbein & Capella 2006; McKenzie-Mohr, 2000). While not all research supports the claim that knowledge gain alone will influence conservation (Beaumont, 2001; Ham, 2007; Hill et al., 2007; Holbrook, Berent, Krosnick, Visser & Boninger, 2005), there is much empirical support for interpretative programmes and their ability to promote conservation (Filby et al., 2015; Hughes, 2013; Jacobs & Harms, 2014; Lück, 2015; Mayes & Richins, 2008; Novey & Hall, 2007; Stamation
et al., 2007; Tisdell & Wilson, 2012; Walker & Moscardo, 2014; Zeppel & Muloin, 2008). Many participants throughout the study expressed a need for more information about white sharks, and the threats to their conservation (chapter 3), with education and interpretation receiving the lowest rating of the tour quality variables (chapter 5). These findings, combined with the absence of structured interpretive programmes on-board tour vessels at the Neptune Islands, suggest that on-tour education and interpretation can be improved and could stimulate a conservation ethic amongst participants.

However, some may argue that on-tour education and interpretation programmes incorporating a message of conservation is ‘preaching to the converted’ as tourists undertaking wildlife tourism can already have reasonably strong environmental attitudes and high levels of conservation behaviours prior to undertaking tours (Beaumont, 2001; Hill et al., 2007; Lee & Moscardo, 2005). Different types of tourist undertake cage-diving at the Neptune Islands, with each likely to be affected differently by the experience. Some were on tour due to an interest and appreciation for sharks, with many planning or ‘dreaming’ about the experience for many years, some since childhood. Others displayed their passion for sharks with clothing, jewellery and tattoos on their skin (Figure 15). It is within these groups of people where the experience can reinforce their passion and validate their attitudes towards sharks and their conservation (Beaumont, 2001; Ham, 2007; Lee & Moscardo, 2005; Sander, 2012; Walker & Moscardo, 2014). Other groups were on-board the tour to support a partner or friend, to celebrate a friend’s birthday, as part of a bachelor party, for an adrenaline rush, or as a final adventure after backpacking in Australia (Author, direct observation). It is this group, those with potentially the least shark conservation experience and the weakest attitudes, which will be most influenced by the experience (Beaumont, 2001). These people were often observed expressing their surprise at the ‘peaceful’ and ‘majestic’ nature of the sharks, demonstrating the influence of the experience on their prior knowledge of sharks.

Apart from increasing participants’ factual awareness of sharks, knowledge can also influence emotional experiences in wildlife tourism, which may in turn stimulate positive attitudes and behaviour towards conservation. For example, being aware of the excessive demand for shark fin and the threat of extinction for many global shark populations may stimulate feelings such as empathy and concern, thereby influencing the emotional experience of observing white sharks in their natural habitat. This was corroborated in a study by Skibins, Dunstan and Pahlow (2017) which concluded that the conservation status of an animal was directly capable of generating concern amongst zoo visitors. Thus, knowledge can trigger feelings and therefore contribute to participants liking or disliking particular animals (Jacobs,
The significant relationship between knowledge and emotional engagement detected in chapter 5 provides further insight into the link between education and interpretation with emotion and the potential contribution to conservation. The role of emotion is further discussed in the following section.

Figure 15. Cage-dive participants exhibiting their passion for sharks on their skin.

(Photos: Kirin Apps).

6.2.2 Emotional engagement

Emotion constitutes a powerful internal force that can drive our attraction to wildlife (Manfredo, 2008), and our motivation to observe wildlife (Jacobs, 2009). Emotions play a central role in the individual and as such the study of emotional engagement may greatly enhance our understanding of the human dimensions of wildlife tourism (Jacobs, 2009). Although the role of emotional engagement was directly investigated in chapter five, cage-
diving with white sharks is a stimulating, multisensory experience, and as such, all stages of the study (chapters 2–5) provided insight into the emotion of the experience.

The opportunity to see a shark in its natural habitat was one of the main drivers motivating participants to undertake a cage-diving tour (chapters 2 & 3). Respondents often referred to this as being in “the wild” with comments about this opportunity referred to as “the chance to see an apex predator in the wild” and “one of the only opportunities to see them in the wild” (chapter 2). Often denoting wilderness, ‘the wild’ can also be a state of mind, describing a certain mood or feeling with varying importance and context to different cultures and individuals (Nash, 2014; Rolston, 2001). It may have a twofold emotional tone, one is inhospitable, mysterious, and threatening, while it may also be beautiful and capable of elevating and delighting (Nash, 2014). Wilderness may also be viewed as something remote and pristine, offering biological diversity (Bulbeck, 2005) which corresponds to participants’ importance of the site for its biological diversity values (chapter 4).

The opportunity to observe white sharks at such a remote site may have also contributed to participants’ reference of having a unique life experience (chapter 2 & 3). While discussing the experience of observing animals in the wild, Bulbeck (2005) found people described the unique qualities of the experience, such as “seeing something nobody else had seen” (p.49). Wildlife experiences often engender a feeling of the experience being unique with the tourist feeling a sense of privilege. These experiences range from viewing wildlife in zoos (Myers, Saunders & Bexell, 2004; Myers, Saunders & Birjulin, 2009) to natural experiences such as swim-with-dwarf minke whale tours in the Great Barrier Reef (Birtles et al., 2002). These feelings of special privilege are often correlated with a desire to protect the observed animal (Myers et al., 2009).

Encounters with wildlife can stimulate strong emotional responses within humans (Ballantyne et al., 2001; Ballantyne & Packer, 2002, 2006; Bulbeck, 2005; Curtin, 2006; Dobson, 2007; Jacobs, 2009; Muloine, 1998; Smith, Ham & Weiler, 2011; Skibins & Sharp, 2017) such as arousing empathy and concern for the welfare of the individuals observed, and the species as a whole (Ballantyne & Packer 2002; Marseille, Elands & van den Bink 2012; Skibins et al., 2013: 2017). This point was evident in chapter five when respondents indicated that they felt more concerned about the welfare of sharks in general following their cage-dive tour. Observing white sharks simulated a range of emotions amongst participants such as excitement, enjoyment, wonder, and awe, with some respondents expressing a feeling of emotional connection with one or more of the sharks observed (chapter 5). These feelings are
often described following a wildlife encounter whether it is with captive animals in zoos (Myers et al., 2009; Marseille et al., 2012; Skibins et al., 2017) and aquariums, or with animals in the wild (Curtin, 2006; Skibins & Sharp, 2017).

While engaging people on this emotional level, wildlife tourism has great potential to encourage participants to support conservation and adopt environmentally responsible behaviours in response to their visit (DeMares, 2000; Hughes et al., 2011; Myers et al., 2009; Skibins et al., 2013; Skibins & Sharp, 2017; Smith et al., 2011). The positive correlation between emotional engagement in the cage-dive experience and participants increased conservation behaviour and understanding, awareness, attitudes, and concern for sharks (chapter 5) contributes empirical support for the conservation potential of wildlife tourism and provides insight for designing tourism experiences which encourage visitors to emotionally connect with the animals observed.

6.3 Addressing the thesis aim and contributing to identified gaps in knowledge

6.3.1 What does this study tell us about shark-based tourism and the potential for conservation?

White shark cage-dive participants provided insight into the conservation potential of shark-based tourism. Respondents associated the dive site with high biological diversity, future, and aesthetic values that may serve as an indication for their support for conservation initiatives which uphold these values (chapter 4). Following the tour, participants expressed increased awareness, understanding, attitude, and concern for sharks and their conservation, with 69% increasing their conservation behaviour participation (chapter 5). Whilst this increase in behaviour was evident in minimal commitment activities, such as talking positively about sharks and following shark conservation organisations, this increase in positive conversation may have indirect and far-reaching outcomes for shark conservation through countering negative public perceptions about sharks.

6.3.2 Practical and theoretical contribution of the thesis

This study contributes to the body of literature on marine wildlife tourists, and in particular addresses a number of gaps in the shark-based tourism literature (as identified in chapter 1).
The following is a clear indication of how the research has addressed these previously identified gaps in knowledge.

**Human dimension information was missing from current shark-based tourism research.**

This thesis has contributed to the body of literature on wildlife tourists, especially those participating in shark-diving activities. Understanding the human dimensions of shark-based tourism, such as demographic profiles, tour motivations, expectations and experience, can assist managers and operators when structuring ‘best practice’ tours which will continue to attract, inspire and satisfy participants. Of particular relevance is the finding that participants desire and often expect an educational component to the tour (chapters 2 & 3). While shark-based tourism may appeal to a portion of tourists who are seeking an adrenaline experience (Dobson et al., 2005), for the majority of participants, learning about and observing sharks in their natural habitat, is the focus of the tour.

**The potential for shark-based tourism to have a positive impact on tourist’s knowledge, awareness and conservation behaviour had not yet been explored.**

Wildlife tourism is often promoted for its potential to influence pro-conservation knowledge, attitudes and behaviour (Ballantyne, Packer & Sutherland, 2011; Skibins et al., 2013; Zeppel, 2008). However, empirical evidence to support such claims is limited (Ardoin et al., 2015; Hughes, 2013; Powell & Ham, 2008). The research findings obtained for this thesis suggest an increase in shark knowledge and concern for their welfare, in addition to respondents increasing participation in conservation behaviour following a white shark cage-dive tour. The findings offer an evidence-based addition to the literature supporting the conservation potential of wildlife tourism.

**The elements of the shark-based tourism experience that contribute to knowledge, awareness, and conservation behaviour were unknown.**

For wildlife tourism to maximise the conservation potential, elements of the tour which act as drivers for conservation participation need to be identified. Previous research has highlighted the potential influence of education and interpretation (Lück, 2003; Jacobs & Harms, 2014; Zeppel & Muloin, 2008) and the role of emotional engagement (Ballantyne, Packer &
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Sutherland, 2011; Hughes, 2013; Skibins et al., 2013), however, until now the drivers of conservation participation in response to shark-based tourism specifically, have been absent from the literature. This research reveals the significance of an emotional engagement in the experience in conjunction with an education/interpretation programme to encourage positive conservation outcomes in response to the tour.

While the above-mentioned contributions from this research have theoretical relevance to the body of literature on wildlife and marine-based tourism, the results also have practical relevance to tourism managers and operators. The following section includes recommendations and implications from the research for operators and managers who wish to engender a conservation ethic amongst their tour participants.

6.3.3 What techniques can white shark cage-dive tourism operators adopt to encourage shark conservation amongst participants?

The overarching research question for this thesis considered the role of shark-based tourism in encouraging participation in shark conservation. This study revealed there is greater potential for conservation outcomes when the tourism experience contains a combination of an interpretation programme with an emotional engagement in the experience. Seeing sharks in their natural habitat can be a powerful emotional experience, but the potential for conservation outcomes may be lost without a framework within which to support and expand on the experience. It is therefore recommended that shark tourism operators implement an interpretation programme, which incorporates an intellectual and an emotional connection between tourists and the sharks they are observing. By integrating both the affective domain (emotions and feelings) and the cognitive domain (objective knowledge acquisition), the benefits of marine wildlife interpretation can be improved with greater outcomes for conservation (Ballantyne, Packer & Sutherland, 2011; Hill et al., 2007; Zeppel & Muloin, 2007).

Chapters three and five included recommendations for the characteristics of on-tour interpretation and approaches to regulating interpretation within the shark tourism industry. The following recommendations add to those suggestions and include strategic ideas to integrate the importance of emotional engagement in shark-based tourism interpretation.
The findings suggest that the tourist experience will be enhanced and participants will be further encouraged to adopt conservation behaviours as a result of their visit, if tourism operators and staff:

- Optimise the emotional engagement in the experience by using commentaries that reinforce participants’ sense of wonder, awe, and excitement. Encourage participants to use their imagination to identify with the individual sharks and to experience empathy. Allow time for reflection where participants can think deeply about what they have seen and heard in order to contemplate the meaning of the experience. This may involve personal quiet reflection, or interactions with staff, companions, and family members (Ballantyne, Packer & Sutherland, 2011);
- Give information about the potential dangers facing the individual sharks being observed. This type of information often tends to stay in participants’ memories for longer compared to factual information (Ballantyne, Packer & Sutherland, 2011);
- Give examples of how visitors’ everyday behaviours can positively and negatively impact the animals being observed and wildlife in general;
- Provide participants with direct opportunities to participate in pro-conservation behaviours throughout the tour;
- Provide post-visit resources. These prompt participants to reflect upon their experience and provide them with simple and achievable actions to adopt to contribute to shark conservation. Tourists often appreciate post-visit resources as they enjoy the chance to re-live and prolong their wildlife tourism experience. Specific information on individual animals may strengthen tourists’ connection to the site, experience and the animal’s observed, and is likely to act as a catalyst for future action (Hughes, 2011);
- Ensure that staff and/or guides are able to answer participants’ questions and initiate conversations (Ballantyne, Packer & Sutherland, 2011). Ensure staff are supported to attend regular training workshops (Walker & Hawkins, 2013); and
- Ensure educational materials are made available to participants at each stage of the experience. From booking, arrival, on-tour, and post-tour. (Walker & Hawkins, 2013).

Commercial shark tourism operators may be reluctant to implement an interpretive programme as part of their tour due to a perceived cost, or to considering it superfluous. However, there are many benefits of interpretation programmes to operators, such as adding
value to the experience in the eyes of potential visitors (Ballantyne, Packer & Hughes, 2009) and giving customers a more satisfying experience (Stamation et al., 2007). Interpretation that explains the significance and the need for conserving shark species and their habitat may also help to ensure the sustainability of the resource upon which the tourism industry depends. A well-structured quality programme can also support minimising the negative impacts of tourism, such as managing tourist expectations and reducing pressure on the operators for lengthy ‘up-close’ experiences (Stamation et al., 2007). Some tourists may expect interactions that include sharks with their mouth open, teeth exposed, biting the cage, etc. However, with adequate interpretative material, participants would understand that this is not normal behaviour and should not be expected.

If operators are still reluctant to adopt interpretation programmes, mandating specific educational requirements via operator regulations or licensing conditions could entrench the practice within the industry. A standardised industry framework for interpretive programmes could be developed by DEWNR and funded by the $35 marine park fee included in operator fees. This ideally would include support for education and training provided to operators and their staff, and up-to-date interpretative material for operators to access such as brochures, visual/audio, and/or an industry App.

6.4 Future research directions

Throughout each of the paper chapters in this thesis a number of limitations and areas of future examination were identified. Further investigations of the tourist experience following implementation of the recommended interpretative programme would enable researchers to assess whether expected changes in conservation behaviour and improved tour satisfaction has occurred.

Additional research is also needed to identify any detrimental impacts of shark tourism on shark behaviour, local habitats and regional communities. While shark tourism may inspire a conservation ethic within tourists, encouraging increasing numbers of people to these sites may put species, habitats and local communities at risk. Both government and the tourism industry will need to weigh up the costs and benefits of encouraging shark-based tourism. Regular consultation with all relevant stakeholders will be necessary to establish appropriate guidelines to ensure the sustainability of both the tourism industry and the resource upon which it depends. While there are many people who support wildlife tourism, there are also those who oppose this type of tourism, especially with controversial species such as white
sharks. Investigating the perceptions of the public not going on these types of tours would provide further insight into the human dimensions of wildlife tourism.

6.5 Final reflection

The current threat of extinction for many shark populations requires immediate attention. However, the traditional negative public image of sharks often results in a lack of public concern. While there is growing support for shark conservation, further changes in public perception are required for shark species to receive the conservation and management priority they require. Exposing humans to sharks via shark-based tourism has the potential to reverse the negative public image by dispelling myths, inspiring an emotional connection and drawing attention to the threats facing global shark populations. Creating a more realistic image of sharks is probably the most significant contribution that tourism can offer shark conservation.

Processes which threaten wildlife and their habitat are to a great extent the result of human behaviours. Therefore, understanding human behaviour must form part of the conservation solution. The need to understand people is by no means a new idea, yet it often remains a neglected one. In 1943, Aldo Leopold, wildlife biologist and conservationist, said, “The real problem is one of human management. Wildlife management is comparatively easy; human management is difficult” (Meine, 2010, p. 444). Effective conservation solutions, and wildlife tourism management strategies, require that both human and ecological dimensions to be understood. The growing demand for wildlife tourism suggests that human aspirations to observe and interact with species, such as sharks, are unlikely to subside in the foreseeable future. Therefore, the application of human dimension research, such as that carried out for this thesis, will be of increased significance for the conservation and management of many key wildlife species as wildlife tourism opportunities continue to develop.
References


Appendices

Appendix A:
Elicitation survey used in Chapter 2

Appendix B:
Education survey used in Chapter 3

Appendix C:
Value survey used in Chapter 4

Appendix D:
Post-tour online survey used in Chapter 5

Appendix E:
Evidence of peer review publications

Appendix F:
Statement of co-author contributions
Appendix A: Elicitation survey used in Chapter 2

The Experience Of Great White Shark Tourism

You are invited to be part of a study of shark-based tourism and shark conservation in Australia. This research, hopes to learn more about the beliefs and attitudes of participants toward shark tourism and conservation in Australia. We encourage you to be involved, as an understanding of the participants in shark based tourism activities can provide valuable information for researchers and policy makers trying to conserve shark species in Australia.

Involvement in this study will require you to fill out the following questionnaire. It should take approximately 5-10 minutes. All information will remain private, confidential and be stored securely. The responses will not be identified. The findings will be summarised into a report (this will be available to all participants), journal articles, conference presentations, and as part of a PhD thesis.

If you agree, and would like to participate,
Please complete the following questionnaire and return to the researcher.

Instructions for participants

There are no right or wrong answers. I am interested in your honest opinion.

Please list the thoughts that come immediately to mind.
You have the option of a non-response if you cannot think of any beliefs relevant to the question.

Please tick the appropriate box where applicable

Participation is completely voluntary.
If you decide you do not want to complete the questionnaire you are free to withdraw at anytime

Thank you. Your time and opinion is appreciated
This study has been approved by SCU Ethics Committee (Approval Number ECN-14-042).

(To be completed by researcher) Date:___________________
Operator____________________
ID #____________________

Great White Shark Experience Survey

Your thoughts about sharks and previous experience with sharks
1. Please complete the following sentence:
I consider sharks to be ________________________________________________________________

2. Is this how you thought about sharks before your experience today? YES ☐ NO ☐

3. If no, what did you previously think about sharks? ____________________________________

4. Before today, have you had a previous experience with a shark in the wild? YES ☐ NO ☐ (go to Q8).

5. If yes, was it a positive or negative experience? Positive ☐ Negative ☐

6. How did the encounter occur? Swimming ☐ Surfing ☐ Fishing ☐
   Snorkeling ☐ Scuba Diving ☐ Viewed from a boat ☐ From the coast ☐ Other ________________

7. Where did the encounter occur? E.g. Fiji, Sydney, Mexico. __________________________

**Shark Based Tourism**

8. What do you see as the **advantages** of observing great white shark/s at the Neptune Islands?
________________________________________________________________________________

9. What do you see as the **disadvantages** of observing great white shark/s at the Neptune Islands?
________________________________________________________________________________

10. Who (individuals or groups) do you think would **approve** of you observing great white shark/s at the Neptune Islands?
________________________________________________________________________________

11. Who (individuals or groups) do you think would **disapprove** of you observing great white shark/s at the Neptune Islands?
________________________________________________________________________________

12. What factors or circumstances would make it **easy** for you, to observe great white shark/s at the Neptune Islands?
________________________________________________________________________________

13. What factors or circumstances would make it **difficult** for you, to observe great white shark/s at the Neptune Islands today?
________________________________________________________________________________
14. What in your view are the three **BEST** aspects of your great white shark experience today?

1. 
________________________________________________________________________________

2. 
________________________________________________________________________________

3. 
________________________________________________________________________________

15. Was there anything that detracted from the experience?
________________________________________________________________________________

16. What will you tell your friends and family about your great white shark experience today?
________________________________________________________________________________

**Demographic**

17. What is your gender?  
Male ☐  Female ☐

18. What age group are you in? (*Circle one*)

18-20  21-25  26-30  31-35  36-40  41-45  46-50  51-55  56-60  61-65  66 +

19. What is your nationality:  
Australian ☐  (Post code ___________)  
Other ________________

20. Are you a certified SCUBA diver?  
YES ☐  NO ☐

21. If yes, please indicate your scuba diving certification level.

Open Water Diver ☐  Rescue Diver ☐  Instructor ☐  
Advanced Open Water ☐  Dive Master ☐  Other ☐ ________________

**Visiting Port Lincoln**

22. How many nights are you staying in Port Lincoln? _________________ OR  
I live in Port Lincoln ☐

23. Was observing great white sharks the motivating factor for you to come to:  

Port Lincoln?  YES ☐  NO ☐  
South Australia?  YES ☐  NO ☐

**Further Contact**
24. Are you available for any follow up questions via email?  YES☐ NO☐  
If yes, please print your Email address  
________________________________________________________________________________

25. Would you like to make any other comments about sharks in general or your shark diving experience today?  
________________________________________________________________________________
________________________________________________________________________________

26. Are you interested in receiving information about the results of this research?  YES☐ NO☐  
If yes, please print your Email address; or email same as above ☐  
________________________________________________________________________________  

Thank you.  
Your time and honesty have been much appreciated
Appendix B: Education survey used in Chapter 3

The Experience Of White Shark Tourism

You are invited to be part of a study of shark-based tourism and shark conservation in Australia. This research hopes to learn more about the beliefs and attitudes of participants toward shark tourism and conservation in Australia. We encourage you to be involved to help build knowledge of shark-based tourism. The information assists researchers and policy makers trying to conserve shark species in Australia.

Your involvement requires completing a questionnaire (5-10 minutes). All information will remain private, confidential and be stored securely. Responses will not be identified. Findings will be summarised into a report (available to all participants), used in journal articles, conference presentations, and be an important part of a PhD thesis.

If you would like to participate, please complete the following questionnaire and return to the researcher. Participation is completely voluntary and you are free to withdraw at anytime.

Thank you. Your time and opinion is appreciated

Kind regards,

Kirin Apps (principal researcher)
School of Environment, Science and Engineering
Southern Cross University, Lismore, NSW.
kirintapps@gmail.com.au
https://www.facebook.com/sharkpax

This study has been approved by SCU Ethics Committee (Approval Number ECN-15-018).

Complaints about the ethical conduct of this research should be addressed in writing to the following:
Ethics Complaints Officer
Division of Research
Southern Cross University
PO Box 157
Lismore, NSW, 2480
Email: ethics.lismore@scu.edu.au
All complaints are investigated fully and according to due process under the National Statement on Ethical Conduct in Human Research and this University. Any complaint you make will be treated in confidence and you will be informed of the outcome.
Great White Shark Experience Survey

Section 1: You, the cage diving participant

1. Please complete the following sentence:
   I consider sharks to ________________

2. Is this how you thought about sharks before your experience today? YES ☐ NO ☐

3. If no, what did you previously think about sharks? ____________________________

4. Before today, have you participated in white shark cage-diving? YES ☐ NO ☐
   If yes where? ____________________________ How many times? _______________

5. Did you see a white shark today? No ☐ Yes, from the cage ☐ and/or from the surface ☐

6. In your view what are the BEST aspects of your white shark experience today?
   ____________________________

7. Was there anything that detracted from the experience?
   ____________________________

8. Will you recommend the white shark cage diving experience to your friends and family?
   YES ☐ NO ☐
   Why? ____________________________

9. People cage dive with white sharks for many reasons. Considering your reason for this visit, how much do you agree with each of the following reasons? *(Please tick one response for each reason)*

<table>
<thead>
<tr>
<th>Reason for visit</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
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<td>To see a shark in its natural habitat</td>
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<td>To see several white sharks</td>
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<td>To see white shark(s) up close</td>
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<tr>
<td>To learn about white sharks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To learn about the marine environment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To have a unique life experience</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To experience thrill and adventure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To experience the marine environment while being underwater</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Section 2: Environmental education

Please indicate with a tick how much you agree with each of the following statements.

<table>
<thead>
<tr>
<th>10. Environmental education in general</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Courses focusing on conservation of natural resources should be taught in schools</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning new things / increasing my knowledge is important for me</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is important that we learn as much as we can about wildlife</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I enjoy learning about wildlife during my holidays</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>11. Environmental education on White shark cage-diving tours</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The cage-dive tour was an educational experience</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have the feeling that on this tour I learnt a lot about white sharks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have the feeling that on this tour I learnt a lot about other marine life</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The tour staff had good knowledge about sharks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>12. I would have liked</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>More information about the biology of white sharks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More information about the habits of white sharks, (Why are they here, where do they go?)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More personal interaction with the shark(s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More information about the threats to sharks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More information about the habitat and wildlife of the Neptune Islands and the local area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More information of how I can get involved in marine wildlife conservation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More information about sharks in general</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More personal interaction with the staff</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
13. Please RANK (1 most preferable - 6 least preferable) your preference for the delivery of education and interpretative material during a white shark tour.

<table>
<thead>
<tr>
<th>Displays / Signs</th>
<th>Guide book</th>
<th>DVD</th>
<th>Tour guide</th>
<th>Brochure</th>
<th>Internet App</th>
</tr>
</thead>
</table>

Section 3: Demographic

14. What is your gender? Male ☐ Female ☐

15. What age group are you in? (Circle one)
- 18-20
- 21-25
- 26-30
- 31-35
- 36-40
- 41-45
- 46-50
- 51-55
- 56-60
- 61-65
- 66 +

16. What is your nationality: Australian ☐ (Post code ______) Other_________________

17. Are you a certified SCUBA diver? YES ☐ NO ☐

If yes, what is your certification level (Open water, Rescue, Instructor)? ______________

18. How many nights are you staying in Port Lincoln? _________OR I live in Port Lincoln ☐

19. Was observing white sharks the motivating factor for you to come to:

Port Lincoln? YES ☐ NO ☐

South Australia? YES ☐ NO ☐

20. Are you available for any follow up questions via email? YES ☐ NO ☐

If yes, please print your Email address ________________________________

21. Are you interested in receiving information about the results of this research? YES ☐ NO ☐

If yes, please print your Email address ________________________________ OR

☐ Email as above (please tick if you would like the researcher to use the same email you printed for Q26.)

22. Is there anything in particular that you would like to know about white sharks or the marine environment in general?

23. Would you like to make any other comments about your experience today

__________________________________________________________

Thank you. Your time and opinion have been much appreciated.
Appendix C: Value survey used in Chapter 4

The Experience Of White Shark Tourism

You are invited to be part of a study of shark-based tourism and shark conservation in Australia. This research hopes to learn more about the beliefs and attitudes of participants toward shark tourism and conservation in Australia. We encourage you to be involved to help build knowledge of shark-based tourism. The information assists researchers and policy makers trying to conserve shark species in Australia.

Your involvement requires completing a questionnaire (5-10 minutes). All information will remain private, confidential and be stored securely. Responses will not be identified. Findings will be summarised into a report (available to all participants), used in journal articles, conference presentations, and be an important part of a PhD thesis.

If you would like to participate, please complete the following questionnaire and return to the researcher.
Participation is completely voluntary and you are free to withdraw at anytime.

Thank you. Your time and opinion is appreciated

Kind regards,

Kirin Apps (principal researcher)
School of Environment, Science and Engineering
Southern Cross University, Lismore, NSW.
kirintapps@gmail.com.au
https://www.facebook.com/sharkpax

This study has been approved by SCU Ethics Committee (Approval Number ECN-16-067).

Complaints about the ethical conduct of this research should be addressed in writing to the following:
Ethics Complaints Officer
Division of Research
Southern Cross University
PO Box 157
Lismore, NSW, 2480
Email: ethics.lismore@scu.edu.au
All complaints are investigated fully and according to due process under the National Statement on Ethical Conduct in Human Research and this University. Any complaint you make will be treated in confidence and you will be informed of the outcome.
Section 1: The Neptune Islands Group (Ron and Valerie Taylor) Marine Park Sanctuary Zone

The site where you went cage diving today is known as the Neptune Islands Group (Ron and Valerie Taylor) Marine Park Sanctuary Zone. This site holds different values to different people. Some of these values are connected to direct use of the area (such as for recreation). Some people value the area without setting foot on it (such as knowing it is there for future generations). Listed below are some of the best known values of natural areas. We would like to know how important each of the following values are to you.

1. Imagine you could spend $100 to ensure that the North Neptune Islands keep the existing values. You may allocate or spend the $100 in any way you like, but your total spending must not exceed $100. You might spend $100 on one value, or $50 on one and $25 on another value, and another $25 on yet another. Remember the total value should equal $100.

<table>
<thead>
<tr>
<th>The Neptune Islands Group (Ron and Valerie Taylor) Marine Park Sanctuary Zone Values</th>
<th>$ Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetic value - I value this site for the scenery, sights, smells, sounds, etc</td>
<td></td>
</tr>
<tr>
<td>Economic value – I value this site for the economic benefits such as tourism</td>
<td></td>
</tr>
<tr>
<td>Recreation value – I value this site because it provides an outdoor recreation opportunity</td>
<td></td>
</tr>
<tr>
<td>Life sustaining value – I value this site because it helps produce, preserve and renew air and water</td>
<td></td>
</tr>
<tr>
<td>Learning value - I value this site because we can learn about the environment</td>
<td></td>
</tr>
<tr>
<td>Biological diversity value – I value this site because it provides a variety of fish, wildlife, etc</td>
<td></td>
</tr>
<tr>
<td>Spiritual value – I value this site because it is sacred, religious or spiritually special to me or because I feel reverence and respect for nature there</td>
<td></td>
</tr>
<tr>
<td>Intrinsic value – I value this site for its existence, whether people are present or not</td>
<td></td>
</tr>
<tr>
<td>Historic value – I value this site because it has places and things of natural and human history that matter to me, others, and/or the nation</td>
<td></td>
</tr>
<tr>
<td>Future value – I value this site because it allows future generations to know and experience the area as it is now</td>
<td></td>
</tr>
<tr>
<td>Subsistence value – I value this site because it provides necessary food and supplies to sustain my life</td>
<td></td>
</tr>
<tr>
<td>Therapeutic value – I value this site because it makes me feel better, physically and/or mentally</td>
<td></td>
</tr>
<tr>
<td>Cultural value – I value this site because it is a place for me to continue and pass down the wisdom and knowledge, traditions and way of life of my ancestors</td>
<td></td>
</tr>
<tr>
<td>Total (Value should not exceed $100)</td>
<td></td>
</tr>
</tbody>
</table>

2. Before you came on the trip, did you know the white shark cage diving site “the North Neptune Islands” is part of the

Neptune Islands Group (Ron and Valerie Taylor) Marine Park? YES ☐ NO ☐

If yes, did that that influence your decision to cage dive here? YES ☐ NO ☐

3. Before you came on the trip, did you know the white shark cage diving site “the North Neptune Islands” is part of a

Sanctuary Zone? YES ☐ NO ☐

4. Do you know what a sanctuary zone is? YES ☐ I know a little ☐ NO ☐

5. During the trip, did you learn or hear about the Neptune Islands Marine Park? YES ☐ NO ☐

6. During the trip, did you learn or hear anything about the Sanctuary Zone? YES ☐ NO ☐
If yes, how did you hear or learn anything about the Marine Park/ Sanctuary Zone? (Staff member, leaflet, other passenger)

Section 2: Demographic

7. What is your gender?  Male ☐  Female ☐

8. What age group are you in? (Circle one)
   18-20  21-25  26-30  31-35  36-40  41-45  46-50  51-55  56-60  61-65  66 +

9. What is your nationality:  Australian ☐ (Post code _____)  Other_____________________

10. Are you a certified SCUBA diver?  YES ☐  NO ☐

If yes, what is your certification level (Open water, Rescue, Instructor)? __________________

11. How many nights are you staying in Port Lincoln? ______ OR  I live in Port Lincoln ☐

12. Was observing white sharks the motivating factor for you to come to:
   Port Lincoln?  YES ☐  NO ☐
   South Australia?  YES ☐  NO ☐

13. Are you available for any follow up questions via email?  YES ☐  NO ☐

If yes, please print your Email address ________________________________

14. Are you interested in receiving information about the results of this research? YES ☐ NO ☐

If yes, please print your Email address ________________________________OR

☐ Email as above (please tick if you would like the researcher to use the same email you printed for Q13.)

15. Is there anything in particular that you would like to know about white sharks, the Neptune Islands or the marine environment in general?

____________________________________________________________________________

16. Would you like to make any other comments about your experience today?

____________________________________________________________________________
Thank you. Your time and opinion have been much appreciated.
Appendix D: Post-tour online survey used in Chapter 5

(Information included in email to participant)

My name is Kirin Apps and I am conducting research as part of a PhD at Southern Cross University. You may remember me from the survey you completed during your white shark cage-dive tour at Port Lincoln.

This research hopes to learn more about the beliefs, attitudes and behaviour of participants toward sharks and their conservation in Australia. We encourage you to be involved to help build knowledge of shark-based tourism and assist researchers, policy makers and the white shark cage-dive industry of Port Lincoln.

Your involvement requires completing an online survey (Approximately 5 minutes). All information will remain private, confidential and be stored securely. Responses will not be identified. Findings will be summarised and used in journal articles, conference presentations, and a PhD thesis. A summary of the results will be available to interested participants via email (instructions are included on the survey).

If you would like to participate, please click on the link included in the email.

Kind regards,

Kirin Apps (principal researcher)
School of Environment, Science and Engineering
Southern Cross University, Lismore, NSW.
kirintapps@gmail.com.au
https://www.facebook.com/sharkpax

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Southern Cross University
PO Box 157
Lismore, NSW, 2480
Email: ethics.lismore@scu.edu.au

All complaints are investigated fully and according to due process under the National Statement on Ethical Conduct in Human Research and this University. Any complaint you make will be treated in confidence and you will be informed of the outcome.
Thank you for participating in this survey. We appreciate your feedback. This survey has 15 questions and will take approximately 5-7 minutes to complete. Please click the >> button to get started.

Q1 With regard to your cage-dive tour, to what extent do you agree or disagree with the following statements?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree (1)</th>
<th>Somewhat disagree (2)</th>
<th>Neither agree nor disagree (3)</th>
<th>Somewhat agree (4)</th>
<th>Strongly agree (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The experience has made me more interested in white sharks. (1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The experience has made me more interested in sharks in general. (2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The experience has made shark conservation more meaningful to me. (3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some of my beliefs about sharks have changed as a result of the experience. (4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel more strongly about shark conservation issues. (5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am more concerned about the welfare of sharks in general. (6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The experience has made me more likely to support shark conservation legislation. (7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Q2 Please rank the following statements regarding your white shark cage-dive tour.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Very low (1)</th>
<th>Low (2)</th>
<th>Moderate (3)</th>
<th>High (4)</th>
<th>Very high (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The quality of the staff on this tour. (1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The quality of education and interpretation provided by this tour operator. (2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Your enjoyment of visiting the Neptune Islands. (3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The overall quality of the tour (equipment, service, food etc). (4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Your overall satisfaction of this tour. (5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Your satisfaction with the opportunities to experience white sharks. (6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Q3 With regard to your cage-dive tour, to what extent do you agree or disagree with the following statements?

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree (1)</th>
<th>Somewhat disagree (2)</th>
<th>Neither agree nor disagree (3)</th>
<th>Somewhat agree (4)</th>
<th>Strongly agree (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>My understanding of the threats to white sharks increased. (1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My knowledge of the biology of white sharks (e.g., diet, size, reproductive cycle, growth) increased. (2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My knowledge of the movements, migrations and habits of white sharks increased. (3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My knowledge of the habitat and wildlife of the Neptune Islands increased. (4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My overall general knowledge of sharks increased. (5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Q4 To what extent do you agree or disagree with the following statements?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree (1)</th>
<th>Somewhat disagree (2)</th>
<th>Neither agree nor disagree (3)</th>
<th>Somewhat agree (4)</th>
<th>Strongly agree (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I felt an emotional connection with one or more of the animals I saw.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I experienced something surprising or unexpected.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Something I saw or heard made me feel sad or angry about the threats to shark.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The experience was engaging.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It was exciting to see live sharks.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt a sense of wonder or awe.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I had an enjoyable experience.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I found myself reflecting on new ideas about white sharks and their habitat.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Q5 Before the cage-dive tour, how often did you do the following?

<table>
<thead>
<tr>
<th>Activity</th>
<th>Never (1)</th>
<th>Rarely (2)</th>
<th>Sometimes (3)</th>
<th>Often (4)</th>
<th>Always (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talk positively about white sharks to others, or on social media. (1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Talk positively about sharks in general, to others, or on social media. (2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Donate money to shark conservation. (3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Write or email government with regard to sharks. (4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sign a shark conservation petition. (5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Follow shark conservation organisations via social media and/or email lists. (6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choose sustainably caught seafood. (7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access shark information (documentaries, articles, websites). (8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Q6 Following the cage-dive tour, how often have you done the following?

<table>
<thead>
<tr>
<th></th>
<th>Never (1)</th>
<th>Rarely (2)</th>
<th>Sometimes (3)</th>
<th>Often (4)</th>
<th>Always (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talk positively about white sharks to others, or on social media. (1)</td>
<td>☐</td>
<td>☐</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Talk positively about sharks in general, to others, or on social media. (2)</td>
<td>☐</td>
<td>☐</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Donate money to shark conservation. (3)</td>
<td>☐</td>
<td>☐</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Write or email government with regard to sharks. (4)</td>
<td>☐</td>
<td>☐</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Sign a shark conservation petition. (5)</td>
<td>☐</td>
<td>☐</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Follow shark conservation organisations via social media and/or email lists. (6)</td>
<td>☐</td>
<td>☐</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Choose sustainably caught seafood. (7)</td>
<td>☐</td>
<td>☐</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Access shark information (documentaries, articles, websites). (8)</td>
<td>☐</td>
<td>☐</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
</tbody>
</table>
Q7 Since the tour have you engaged in any of the following?

<table>
<thead>
<tr>
<th>Recommended cage diving at the Neptune Islands to others? (1)</th>
<th>Yes (1)</th>
<th>No (2)</th>
<th>No Comment (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talked with others about the Neptune Islands Marine Park? (2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Talked with others about the Neptune Islands Sanctuary Zone? (3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sourced information about the Neptune Islands? (4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Talked with others about marine parks, or sanctuary zones in general? (5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sourced information about marine parks or sanctuary zones in general? (6)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Q8 Do you have any comments about what may have prompted any changes in your attitude or conservation behaviour with regard to sharks?

Q9 Gender
- Male (1)
- Female (2)

Q10 Nationality
- Australian (1)
- Other (2) ____________________

Q11 Age
- Under 18 (1)
- 18 - 24 (2)
- 25 - 34 (3)
- 35 - 44 (4)
- 45 - 54 (5)
- 55 - 64 (6)
- 65 - 74 (7)
- 75 - 84 (8)
- 85 or older (9)

Q12 How long has it been since your cage-dive tour?
- 3 - 6 months (1)
- 6 months - 1 year (2)
- 1 year - 18 months (3)
- 18 months - 2 years (4)
- Over 2 years (5)

Q13 Who was your tour operator?
- Calypso Star Charters (1)
- Adventure Bay Charters (Shark Warrior) (2)
- Rodney Fox Shark Expeditions (3)
- No comment (4)

Q14 Are there any other comments you would like to make about cage-diving at the Neptune Islands?

Q15 Are you interested in receiving information about the results of this research? If so please type your email address or visit the research page https://www.facebook.com/sharkpax/
Appendix E: Evidence of peer review publications

The publications from Chapters 2, 3 & 5 can be found at the links provided.

Chapter 2
http://www.tandfonline.com/doi/abs/10.1080/08927936.2016.1152714

Chapter 3

Chapter 5
https://www.sciencedirect.com/science/article/pii/S0308597X17304839

Chapter 4
The following manuscript is under review in an international journal. Please see email correspondence on the following page for evidence of review process.
Dear Kirin,

Your manuscript entitled "What values do tourists place on a marine protected area? White shark cage-dive tourists and the Neptune Islands." has been successfully submitted online and is currently being considered for publication in the Journal of Ecotourism. The following people are currently listed as authors of this paper: Apps, Kirin; Dimmock, Kay; Lloyd, David; Huveneers, Charlie.

Your manuscript ID is JOE-0813.

Please mention the above manuscript ID in all future correspondence. If there are any changes to your postal or email address, please log in to ScholarOne Manuscripts at https://mc.manuscriptcentral.com/cvp-joe and edit your user information as appropriate.

If you need to make changes to your submission, please email me. Please do not just submit your paper a second time.

We suggest that you bookmark the journal's ScholarOne Manuscripts website to make returning to it easier (depending on the web browser you are using this may also be called adding the website to your 'favourites').

As soon as a decision on your submission is reached, we will let you know by email. The peer review process can take three or four months. In the meantime, you are most welcome to browse our 'Author Services' website, where you will be able to find information about permissions, copyright, language services and what will happen with your article if it is published:

http://journalauthors.tandf.co.uk/

Thank you for submitting your manuscript to the Journal of Ecotourism.

CO-AUTHORS: This email is automatically copied to all co-authors; if you are named as a co-author, but did not give your consent to that, or did not consent to this paper's submission to the Journal of Ecotourism, please contact the Editorial Office (RECO-peerreview@tandf.co.uk) immediately.

Best wishes,

Adrian Mangaliman
Journal of Ecotourism Editorial Office
Appendix F: Statement of co-author contributions

The publications detailed below are to be included as the following chapters of the PhD thesis of Kirin Apps, titled: More than an adrenaline rush!: A study of white shark cage-dive participants’ in Australia and the potential to encourage a conservation ethic

Chapter 2


The nature and extent of the candidate’s intellectual input was the following:

<table>
<thead>
<tr>
<th>Nature of contribution by K. Apps</th>
<th>Extent of contribution (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conception, literature search, ethics approval, survey design, data collection, analysis and manuscript preparation.</td>
<td>85%</td>
</tr>
</tbody>
</table>

The following co-authors contributed to the work:

<table>
<thead>
<tr>
<th>Name</th>
<th>Nature of contribution</th>
<th>Extent of contribution (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>David Lloyd</td>
<td>Supervision and manuscript editing</td>
<td>5%</td>
</tr>
<tr>
<td>Kay Dimmock</td>
<td>Supervision and manuscript editing</td>
<td>5%</td>
</tr>
<tr>
<td>Charlie Huveneers</td>
<td>Supervision and manuscript editing</td>
<td>5%</td>
</tr>
</tbody>
</table>

Chapter 3


The nature and extent of the candidate’s intellectual input was the following:

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<td>Supervision and manuscript editing</td>
<td>5%</td>
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</table>
Chapter 4

The nature and extent of the candidate’s intellectual input was the following:

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</tr>
</thead>
<tbody>
<tr>
<td>Conception, literature search, ethics approval, survey design, data collection, analysis and manuscript preparation.</td>
<td>80%</td>
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The following co-authors contributed to the work:

<table>
<thead>
<tr>
<th>Name</th>
<th>Nature of contribution</th>
<th>Extent of contribution (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>David Lloyd</td>
<td>Supervision and manuscript editing</td>
<td>5%</td>
</tr>
<tr>
<td>Kay Dimmock</td>
<td>Supervision and manuscript editing</td>
<td>5%</td>
</tr>
<tr>
<td>Charlie Huveneers</td>
<td>Conception, supervision and manuscript editing</td>
<td>10%</td>
</tr>
</tbody>
</table>

Chapter 5

The nature and extent of the candidate’s intellectual input was the following:

<table>
<thead>
<tr>
<th>Nature of contribution by K. Apps</th>
<th>Extent of contribution (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conception, literature search, ethics approval, survey design, data collection, analysis and manuscript preparation.</td>
<td>90%</td>
</tr>
</tbody>
</table>

The following co-authors contributed to the work:

<table>
<thead>
<tr>
<th>Name</th>
<th>Nature of contribution</th>
<th>Extent of contribution (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kay Dimmock</td>
<td>Supervision and manuscript editing</td>
<td>5%</td>
</tr>
<tr>
<td>Charlie Huveneers</td>
<td>Supervision and manuscript editing</td>
<td>5%</td>
</tr>
</tbody>
</table>
Statement of David Lloyd
I, Associate Professor David Lloyd, principal supervisor of PhD candidate Kirin Apps, agree that the above descriptions of the contributions of the authors to these publications are accurate and correct.
Signed:

David Lloyd
Date: 11 January, 2018

Statement of Kay Dimmock
I, Dr Kay Dimmock, co-supervisor of PhD candidate Kirin Apps, agree that the above descriptions of the contributions of the authors to these publications are accurate and correct.
Signed:

Kay Dimmock
Date: 09 January, 2018

Statement of Charlie Huveneers
I, Associate Professor Charlie Huveneers, external supervisor of PhD candidate Kirin Apps, agree that the above descriptions of the contributions of the authors to these publications are accurate and correct.
Signed:

Charlie Huveneers
Date: 10/01/2018