The content of interpretation, organisational positions, and conservation education in zoos and aquaria

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A thesis submitted to
Auckland University of Technology
in partial fulfilment of the requirements
for the degree of
Master of International Tourism Management
(MITM)

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Faculty of Culture and Society
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2021

ABSTRACT

Biodiversity loss induced by human activities has become an urgent environmental problem worldwide. Conservation is the main pathway to reducing biodiversity loss. According to the Cambridge Conservation Forum, successful conservation implies improvements to the opportunities of enhancement of ecosystems, habitats, species, and populations in the wild, without harmful effects on human well-being. Since the human induced impacts on biodiversity are related to every action of each living person, the goal of conservation cannot be achieved without the public's participation. Conservation education is the most important method to transmit conservation concepts to the public. It aims to arouse the public's awareness of biodiversity issues and inspire conservation attitudes and behaviour.

Many zoos and aquaria now claim that they are important avenues for informal conservation education, and as animal themed attractions, they do have the potential to involve more citizens in becoming conservation champions. Some research has evaluated the output of conservation education in zoos and aquaria, showing that the effectiveness of conservation education does not appear to be successful enough. However, few studies have examined at the interpretation content provided by zoos and aquaria. Therefore, this research was conducted to understand the content of interpretation and conservation education in zoos and aquaria. Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium were chosen as two research cases, since they represent different types of animal based attractions.

The research questions of this research were: 1) what conservation education content has been provided to the public in zoos and aquaria? 2) how does the content reflect the organisational missions and their conservation work? and 3) how does conservation education in zoos and aquaria influence visitors' opinions after their visit? To answer these questions, this research collected data from three different sources, adopting three different kinds of qualitative research methods. First, photos of interpretation materials at the two case study sites were collected and analysed using content analysis. Second, textual material on the official websites of the two organisations was collected and analysed through thematic analysis, and third, visitor reviews of the two attractions on

TripAdvisor were collected and analysed employing netnography. The NVivo program was used to assist with the analyses.

The main findings of the interpretation content of the two attractions showed that 1) conservation issues were not the dominant category of the interpretation; 2) the interpretation may contribute to conservation education; 3) the content of interpretations reflected the organisational missions and the organisations' conservation work; 4) visitor reviews showed that the content of interpretation can influence visitors' opinions after their visit; and 5) conservation education of the two attractions was partially successful. This research also discusses the role of interpretation content in conservation education in zoos and aquaria, and argues that interpretation content can influence visitors' conservation learning both directly and indirectly. It is suggested that to improve conservation education in zoos and aquaria, the attractions should adjust their understanding of conservation to that of conservation science. This research also proposes a model for better conservation education design adjusted from Orams' (1997) model, emphasising the content of interpretations.

Keywords

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LIST OF ABBREVIATIONS

AU	Auckland Unlimited
AZ	Auckland Zoo
AZA	Association of Zoos and Aquariums
CCF	Cambridge Conservation Forum
CE	Conservation education
CEH	Conservation education hypotheses
CIS	Conservation impact score
COP 26	United Kingdom Conference of the Parties 2021 United Nations climate change conference
CSPO	Certified sustainable palm oil
COVID-19	The coronavirus disease 2019
DOC	The Department of Conservation of New Zealand
EAZA	European Association of Zoos and Aquaria
EE	Environmental education
EFS	Education for sustainability
ESD	Education for sustainable development
IUCN	International Union for Conservation of Nature
KT	Sea Life Kelly Tarlton's Aquarium
ME	Merlin Entertainments
NAAEE	North American Association for Environmental Education
NE	Not evaluated
NGO	Non-governmental organisation
NZ	New Zealand
SDG	Sustainable Development Goals
STEM	Science, technology, engineering, mathematics
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNEP	United Nations Environment Programme
UGC	User-generated content
WAZA	World Association of Zoos and Aquariums

ATTESTATION OF AUTHORSHIP

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Signed:

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Date: 10/12/2021

ACKNOWLEDGEMENTS

This research was a self-motivated study, during which I faced a variety of challenges and gained unforgettable experiences. Dates back to 2019, when I received the offer from Auckland University of Technology (AUT); I would never have imagined that my study would take place during such an unprecedented pandemic period. This pandemic has brought great difficulties to people around the world. However, I was fortunate to complete my research in a foreign country with guidance and support from many people. I would like to express my gratitude to the following persons.

First and foremost, I want to appreciate my supervisor, Professor Dr Michael Lück. Micha was my lecture in my class marine tourism. I was impressed by his patience and knowledge, and especially, his enthusiasm for wildlife tourism and environmental education. I was fortunate enough to receive his encouragement to choose the thesis pathway for my master's research, which allowed me to research the topic in depth. Micha gave me important guidance and support during the whole journey of this research, from the choosing of the topic to the structure of thesis writing. Although the pandemic reduced our opportunities to meet each other in person, Micha's guidance and help were never reduced. He always guided my way at the most important points, when I was confused. He comforted and inspired me, when I was stuck or upset. Thank you so much, Micha! I am lucky and proud to have you as my supervisor!

Second, I would like to thank some teachers at AUT who helped me during my master's study. Thanks to my course teachers Dr Katherine Ravenswood and Dr Hamish Bremner! Katherine taught me research methods so logically, creating a foundation for my master's research and future work. Hamish was always very kind and gave me a lot of confidence in his class. Thanks also to Associate Professor Heike Schänzel, the programme leader for the Master of International Tourism Management – she was always available to help. Thanks also to Lily Li, my student administrator; Dr Brett Heagren, Postgraduate and Scholarships Coordinator; for the work they had done for me, and thanks to the many other teachers and students of AUT who helped me during my study.

Third, I want to express my gratitude to conservationists Dr Yan Xie, her husband Mr Qian, and Mr Qi Wang, who inspired my interest in conservation education in zoos and aquaria. It was when I was working with them as a volunteer, that changed my mind about loving animals and conservation. I want to thank them for telling me the difference between being close to animals and protecting their ecosystems. Although as an animal lover, I travelled to many cities to visit zoos and aquaria before meeting them, at that time I was very human-centric and misunderstood what conservation is. Their understanding of conservation led me to think about why I went to so many zoos and aquaria, but never on thought about conservation. It was this question that led to this research.

Fourth, I want to thank my classmates and teachers in the language school I studied at before starting my master's programme. With their help, I settled into Auckland and began my study here. Thank you, Rachel and Robin, you will always be my English teachers. Thanks, Rebecca, you are my first friend in Auckland and told me where I could eat my lunch. Thanks, Jack, we always encouraged each other.

Last, I would like to express my appreciation and my love to my family members. Thanks to my parents for their understanding and encouraging me to study overseas during such an unprecedented period. Thanks also to my husband! In order to support my studies, he resigned from very comfortable work in China and worked hard as a new employee in New Zealand. He supports me both emotionally and financially. I also say thank you to my little daughter for sometimes being quiet when I was writing. It is she who inspired me to become a more conscientious, self-confident, and patient person, so I could finish this thesis.

Additionally, I acknowledge the advices from my thesis examiners and the assistance of my proof-reader, Dr Jill Poulston.

Chapter 1.   Introduction

1.1   Introduction Research context

Towards the third decade of the 21st century, environmental problems and loss of biodiversity have become increasingly obvious and urgent around the world (Balakrishnan, 2018). Human induced habitat loss and wildlife extinction also negatively affects the subsistence of human beings. For example, deforestation caused by the expansion of cities and farms not only leads to the loss of wildlife habitats, but also to climate change and more extreme weather (Wu et al., 2021). The unprecedented pandemic of the coronavirus disease 2019 (COVID-19) resulted in more people thinking about the relationship between humans and wildlife. Most scientists believed that this new virus was transmitted from wild animals to humans (Shereen et al., 2020), and humans' invasion into wild habitats may cause more cross-species infections (Walsh et al., 1993). Therefore, conservation is not only related to the existence of wildlife. but also related to every human being (Mace, 2014). Conservationists also argue that the conservation goals of maintaining wild habitats and biodiversity can only be achieved with the participation of the public (Ardoin & Heimlich, 2013). Thus, conservation education (CE) becomes a significant domain, that transfers concepts from conservation researchers to the general public, increases public awareness of biodiversity issues, and changes humans' behaviour towards a more biodiversity-friendly lifestyle.

Since the 1930s, when the concept of CE was first proposed to solve environmental issues (McCrea, 2006), CE has been developing for nearly a century and has made some significant achievements. Models for CE programme plans, and CE interpretation are also proposed by scholars (Jacobson et al., 2015; Orams, 1997). Today, CE can take place in both formal and informal settings. Many different organisations are taking part in providing CE to the public, such as through conservation organisations, schools, and tourism attractions (Good et al., 2019; Lukas et al., 2017; Martin, 1996). Nature based attractions play an important role in informal CE, since visitors can receive conservation knowledge by reading or listening to interpretations during their visits. Although conservationists have been making efforts in public CE for nearly a hundred years, and received attention from different scholars, such as educators, psychologists, and social

scientists, the output of CE is still limited (Morris et al., 2007; Stern et al., 2008). Some conservationists are perplexed that there seems to be a barrier between conservationists and people who do not care about conservation. Conservation education receivers are usually conservation supporters, but actively involving more people in conservation is not easy (Chan, 2008).

Different from most nature based attractions, which are located away from cities, zoos and aquaria have become important settings for informal CE to citizens. However, the function and CE output are facing great debate. Historically, raising animals in captivity was for human entertainment. Now, increasing numbers of zoos and aquaria claim that they are conservation organisations and important CE providers (Maynard et al., 2020), but their conservation achievements are facing significant challenges. Some researchers question the conservation function of zoos and aquaria for their keeping animals captively (Keulartz, 2015), and some argue that the conservation and CE in zoos and aquaria are not sufficiently successful, since their evaluations show low achievement scores (Buckley et al., 2020).

Despite their function of entertainment, three reasons underpin the argument that zoos and aquaria have the potential to conduct CE: first, the main exhibitions in zoos and aquaria are wildlife, which is also the major target of protection in conservation; second, according to the World Association of Zoos and Aquariums (WAZA), zoos and aquaria engage a large number of visitors worldwide (more than 700 million per year); and third, most zoos and aquaria state that conservation is their primary mission (WAZA, 2021). Some studies have been conducted to determine whether zoos and aquaria have undertaken conservation work as well as they are claiming. Most of these studies involve education output as an important indicator for evaluating the conservation achievements of zoos and aquaria (Buckley et al., 2020). Some studies argue that zoos and aquaria are very successful in CE and have irreplaceable roles in conservation (Packer & Ballantyne, 2010; Pearson et al., 2014), whilst others argue that CE in zoos and aquaria is not sufficiently successful, and requires significant improvement (Kelly & Skibins, 2020).

Why are opinions about CE in zoos and aquaria so controversial? If zoos and aquaria could conduct CE to as many citizens as they claim they do, why is the number of people who care about conservation issues still limited around the world? Why do some

citizens think they understand conservation, but still want to feed wild birds in parks? In order to understand these questions, the researcher read numerous research articles, but could not find any satisfactory explanation. Since most studies are based on quantitative methods and focus on the results of CE in zoos and aquaria, they ignore the content of CE provided, its determining factors, visitors' feedback, and the inter-relationships between those issues. Therefore, this qualitative study was conducted to investigate issues regarding the content of interpretation and CE. The main objectives of this research were to:

- categorise the content of interpretation provided to the public;
- explore how the content of interpretation contributes to conservation education;
- identify the relationships between organisational positions of zoos and aquaria and the content of the interpretations;
- make comparisons between different kinds of organisations; and
- find how the content of interpretations can affect visitors' conservation understandings.

The study also aimed to understand the role of the content of CE interpretations at zoos and aquaria, and propose a specific model regarding the content of interpretation for improving CE in zoos and aquaria. Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium were chosen as the two case sites in this research, as representative of different types of zoos and aquaria.

1.2 Thesis structure

This thesis consists of six chapters regarding the content of interpretation and CE in zoos and aquaria. The second chapter reviews relevant research articles in three main domains: CE, the function of modern zoos and aquaria, and CE in zoos and aquaria. These domains comprise the background of this research. The first section looks at prior research on CE, firstly discussing the definition of CE and relevant concepts, and different types of CE before addressing issues regarding the design and evaluation of CE. A discussion of factors affecting the effectiveness of CE programmes is then presented, followed by a critical discussion of the philosophical logic around conservation and education in the context of CE. At the end of this section, models for effective CE interpretations are considered for further research.

The second section of Chapter two examines the functions of modern zoos and aquaria in the extant literature on the roles of entertainment, conservation, and education. It also discusses the apparent conflicts between these functions and identifies opportunities to conduct CE to visitors primarily seeking entertainment. The third section of Chapter two reviews prior studies focusing on the topic of CE in zoos and aquaria. It summarises both the positive and negative effects of conducting CE in zoos and aquaria, and looks at prior research on the effectiveness of CE and affecting factors. Finally, the research gaps in relation to the ambiguity of the definition of CE, and the lack of qualitative research on the content of CE provided by zoos and aquaria are identified.

The third chapter explains the methods of this research, in seven main sections. It initially discusses the philosophical perspectives, and explains the adoption of an interpretivist paradigm, along with a relativist ontology and constructivist epistemology. The second section details the research design. It firstly proposes three major research questions and ten supplementary questions. Then, it explains why a qualitative research methodology fits the research philosophy and research questions. It also outlines potential data sources, and the rationale and methods for data analysis. The third section of this chapter explains the reasons for research sites' selection and introduces the two research sites, Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium.

The fourth section of Chapter three presents the specific data collection methods in relation to the three data sources: interpretive materials at the zoo and aquarium, official websites, and visitor reviews on TripAdvisor. This is followed by a detailed description of the data analysis methods: manifest qualitative content analysis methods and procedures were adopted for analysing the interpretive data from the zoo and the aquarium; a reflexive thematic analysis was used for data from the websites of the institutions, and visitor reviews on TripAdvisor of the two attractions, were collected and analysed following the process of netnography. In the last two sections of this chapter, the trustworthiness and limitations of this research, are discussed as well.

Chapter four presents the main findings of this research in three sections. Section one presents the categories in the content of interpretive materials in the zoo and the aquarium. The content of interpretations of Auckland Zoo is divided into six categories, which are biological knowledge, conservation information, information about the zoo

and its work, visitor information, knowledge about animal habitat and ecosystem, and Māori culture. The content of interpretations of SEA LIFE Kelly Tarlton's Aquarium was divided into eight categories: biological knowledge, conservation and environmental information, information about the aquarium and its work, visitor information, knowledge about Antarctica, ecology knowledge, Māori culture, and brain teasers. Biological knowledge was the most dominant category of interpretations in both attractions.

The second section of this chapter generates themes in the organisational positions and conservation work of the two attractions. The zoo addressed conservation as its most important work in its mission statement, while the aquarium addressed conservation issues in its vision statement. Both attractions undertook some conservation work. The third section of Chapter three looks at visitor reviews and generates pattern codes of visitors' main concerns: seeing animals, animals' welfare, and visitors' understanding of the functions of the attractions. It also presents pattern codes of visitors' understandings of interpretations and conservation.

Chapter five discusses the six important themes of this topic. First, it makes comparisons between the findings presented in Chapter four on the two organisations, and shows that they had different interpretation styles, different organisational missions, and received different feedback from visitors in particular areas. Second, the chapter makes cross-section comparisons and discusses the relationship between the content of interpretations and organisational positions. It also discusses the relationship between the content of interpretations and visitors' reflections on conservation issues, and argues that organisation positions and conservation work affect the content of interpretations, which in turn affects visitors' reflections on conservation issues.

Third, the chapter discusses the opportunity to provide CE to the public through interpretations at zoos and aquaria. Then, in the fourth section of this chapter, the relationship between the content of interpretation and CE is discussed. It initially addresses a fundamental topic, the different understandings of conservation between zoos and aquaria, and conservation science. Then, it applies categories of interpretations of the two organisations to Orams' (1997) model. It also discusses the contribution of the content of interpretation to CE in zoos and aquaria and factors affecting interpretation content on both supply and demand sides. In the last section of Chapter

six, a model is provided to understand the role of the content of interpretations and interpretation design in CE. It also proposes a model for effective CE interpretation design at zoos and aquaria emphasising the content of interpretations.

Chapter six summarises the main findings of the research and provides suggestions for CE in zoos and aquaria in practice, and recommendations for future research. It argues that to improve the effectiveness of CE in zoos and aquaria, organisations should adjust their understanding of conservation to that of conservation science, and improve CE effectiveness through appropriate interpretation design. It also suggests that broader and more in-depth research can be conducted on this topic worldwide.

Chapter 2. Conservation education in the context of zoos and aquaria

2.1 Introduction

Conservation education (CE) in zoos and aquaria is an important part of CE overall, since zoos and aquaria have the opportunity to target a large population without conservation knowledge. Conservation education in zoos and aquaria also plays an important role in fulfilling the mission of most modern zoos and aquaria, which relates to conveying conservation messages to the public. To understand existing literature in the domain of CE in zoos and aquaria, this research will first review prior studies on CE, which will set a foundation for further discussion of CE in zoos and aquaria. It will also review existing literature related to the function of zoos and aquaria, which could clarify the role of CE in animal themed attractions. After that, this research will retrospect existing studies related to CE in zoos and aquaria, to comprehend general trends of research in this domain and identify research gaps.

2.2 Conservation education

Conservation education is an established method for delivering conservation or environmental issues to the public around the world. However, relevant questions, for example, around the definition and effectiveness of CE, are debated in practice and in academic research. This section reviews the literature on CE under five topics: definition and relevant concepts, classification, design, evaluation, and influences on CE. It also discusses the philosophical relationship between conservation and education in the context of CE.

2.2.1 Conservation education and relevant concepts

In the late 1800's, the spread of national parks movement in developed countries could be seen as the beginning of conservation education (Barton,2016). While the usage of the word CE can be traced to the 1930s in the United States (US), when CE programmes were organised to solve environmental issues in prairie ecology (McCrea, 2006). Originally, CE was related to wind erosion and other natural problems, but now focuses more on biodiversity and species protection (Fleischner, 1990; Thomas et al.,

2018). Although used broadly, it is hard to find an exact definition of CE in prior research. However, the goal of CE is reasonably clear, as delivering conservation knowledge and practice to the public, increasing public awareness of the importance of restoration biodiversity, changing the attitudes and behaviours of individuals towards conservation issues, and promoting environmental conservation (Kobori, 2009; Thomas et al., 2018). It has been argued that CE is a complex field, and that it can be an outreach of conservation science (Ardoin & Heimlich, 2013; Council, 2002; Thomas et al., 2018), a more practical part of environmental education (EE) (Thomas et al., 2018), and a component of education for sustainability (EFS) (Franquesa-Soler et al., 2018; Kobori, 2009).

Conservation education is a crucial part of conservation science, and is a foundation for successful conservation. Conservation science aims to investigate ecosystems, understand human impacts, and protect biodiversity (Primack, 2006). Cambridge Conservation Forum (CCF) claims that successful conservation implies improving opportunities to enhance ecosystems, habitats, species, and populations in the wild, without harmful effects on human well-being (Kapos et al., 2008). Public support is significant for conservation success (Ardoin & Heimlich, 2013), and CE is the path to generating public support. As Jacobson et al. (2015) argued, although scientists could spend extensive time and energy investigating biological procedures, they cannot meet conservation objectives without support from the public. However, citizens will not participate in conservation activities unless they are completely informed of the importance and effects of their behaviour (Yaffee & Wondolleck, 2000). Thus, CE is essential to improve the management of the natural world and its people (Jacobson et al., 2015), which is the goal of conservation science.

With a more pragmatic and advocacy approach, CE also fulfils a niche in EE. In 1976, the Belgrade charter of the United Nations Educational, Scientific and Cultural Organisation (UNESCO) declared its commitment to develop

> a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions of current environmental problems and the prevention of new ones. (UNESCO-UNEP [United Nations environmental programme], 1976, p. 1)

This Charter defined the aim and increased global attention to EE. Environmental education delivers environmental knowledge to the public and helps society understand how to face global challenges. It aims to influence the changing of attitudes to create healthier and more civically engaged communities (North American Association for Environmental Education [NAAEE], 2021; Padua, 2010). Education about the environment, education in the environment, and education for the environment, are three major components of EE (Fien & Tilbury, 1996). Thomas et al. (2018) argued that compared with EE, which focuses on shifting people's thinking, CE intends to motivate specific protection behaviours. CE seeks to resolve the crisis of biodiversity loss and stresses the importance of education for the environment (Kobori, 2009). Therefore, CE is an essential part of EE, with a practical and conservation-oriented perspective. Education for sustainability, or education for sustainable development (ESD) is a broader topic and included as an integral element in the United Nations' (UN) Sustainable Development Goal (SDG) 4 (UNESCO, 2021). Education for sustainable development accentuates education as an essential approach to empowering people to work towards a sustainable future together under the limitations of current environmental capacity (Liimatainen, 2013; UNESCO, 2021). It emphasises that reorienting education at all levels and in all societal situations towards the concept of ESD, is the key approach to moving human beings towards a bright future (Combes, 2006). It also emphasises the connections between social development, economy, and the environment (Kobori, 2009). Education for sustainable development integrates a variety of education types, such as development education, multicultural education, poverty and welfare education, peace education, gender education, human rights education, environmental education and CE (Kobori, 2009). Conservation education, focusing on promoting theory and behaviour of biodiversity, is part of ESD (Franquesa-Soler et al., 2018).

2.2.2   Types of conservation education

With the permanent goals of promoting conservation beliefs and behaviours, CE addresses broad issues and contains a variety of activities, which can be classified according to different bases. In terms of suppliers, CE can be grouped into four supply types: conservation institutions and organisations, tourism attractions (nature reserves or parks), schools, and cooperatives. Conservation institutions and organisations are government supported institutions or non-government organisations (NGOs) that

conduct conservation research and work; CE is an outreach of their work (Ardoin & Heimlich, 2013) and they are pioneers in practising CE (Tilbury et al., 2003). These institutions and organisations hold CE seminars and training for local societies, government officials and schoolteachers (Blum, 2009) to enhance their work output.

Tourism attractions provide CE mainly to their visitors. National parks and other reserved areas (Liu et al., 2019), zoos and aquaria (Ballantyne & Packer, 2016; Buckley et al., 2020), and other nature based tourism attractions (Lück, 2003a) deliver conservation concepts through interpretations and organised programmes. Government owned and private owned, profit and non-profit attractions, have the opportunity to inspire conservation awareness through CE to their tourists (Jacobson et al., 2015). For example, Zeppel (2008) evaluated 18 marine wildlife tours to see if their interpretations were effective in meeting CE goals.

Schools are another important supplier of CE. Conservation education provided by primary and secondary schools conveys conservation concepts to the new generations and assists students to develop critical thinking around the global issue of conservation (Franquesa-Soler et al., 2018). Additionally, CE provided by schools has positive effects on students' examination performances (Bartosh et al., 2006). Sakurai and Uehara (2020) introduced a marine CE programme in a secondary school in Japan, which changed students' awareness in the long term. Tertiary institutions also run field trips to help students of conservation science gain volunteer experiences (Hart et al., 2020).

Various organisations also cooperate and contribute to CE. Conservation institutions and organisations collaborate with schools or museums to organise CE programmes (Martin, 1996) and exhibitions (Good et al., 2019). Many NGOs also devote themselves to creating teaching guidebooks to support CE in schools (Tilbury et al., 2003). Additionally, schools and attractions coordinate to provide CE programmes and field trips to students (Lukas et al., 2017).

In terms of the target population, CE can be classified into two types: training to residents who live at or near conservation areas (Bettinger & Leighty, 2020), and general education to the public. Training local communities to transfer their traditional lifestyle into an environmentally friendly style is an important part of CE (Andresen et

al., 2020) and assists in conservation work directly. From schools to tourism attractions, CE plays an important role in raising public awareness of conservation issues with the public, and aims to have long-term impacts on humans' attitudes and behaviour changes (Jensen, 2014; Sakurai & Uehara, 2020).

In considering the types of learning, free choice learning and structured programmes are common types of CE (Thomas et al., 2018). *Free choice learning* refers to learning practices in which learners can decide and monitor what, where, and when to learn, and it could be conducted through multiple types of media, such as books, TV, and online resources (Dierking & Falk, 1994; Dori & Tal, 2000; Falk, 2006; Zeppel, 2008). As Falk (2006) contended, free choice learning plays an important role in lifelong learning, and CE is a by-product of travel. Structured CE programmes are usually conducted by institutions such as schools (Sakurai & Uehara, 2020), parks (Mellish et al., 2019), and adventure clubs, with organised content that lasts for anything from hours to months. Programmes organised by schools usually emphasise learning knowledge and changing attitudes (Sakurai & Uehara, 2020). Others provide adventure based recreation experiences that provide participants with essential skills for conservation work (Stern et al., 2008).

2.2.3   *Design of conservation education*

Whether CE could achieve its goal, largely depends on the design and plan of the programmes. A systematic framework has been created to assist with the design of CE programmes (Marsh, 2016), and comprises three stages: planning (P), implementation (I), and evaluation (E) (Figure 1). Planning is the foremost stage, and begins with clarifying the mission, goals and objectives. Specific, measurable, audience focused, relevant, and time limited objectives are the foundations for CE programmes (Jacobson et al., 2015). As Jacobson et al. (2015) argued, successful CE requires the providers to understand the demands, interests, and behaviours of their target population.

Figure 1 *Framework of Conservation Education Programme Design*

PLANNING	IMPLEMENTATION		EVALUATION			
Inputs **Resources**	*Throughputs* **Activities / Audiences**		*Outputs* **Counts/Feedback**	*Outcomes*		
				Short-term **Learning**	**Medium-term** **Action**	**Long-term** **Conditions**
Staff	Curriculum	Participants	Numbers reached	Awareness	Practice	Environmental
Teachers	design	Residents	Experiences	Motivations	Decisions	Socio-economic
Volunteers	Activity	Stakeholders	Surveys	Knowledge	Actions	Political
Partners	dev.	Volunteers	Feedback	Values	Behaviors	Civic
Time	Training	Teachers	Cost per unit	Opinions	Policies	
Money	Meetings	Youth	Service quality	Skills		
Materials	Counseling	Families		Aspirations		
Equipment	Facilitation	Students				
Technology	Assessments					
	Media work					

ENVIRONMENTAL, SOCIAL, ECONOMIC, POLITICAL CONTEXT

Note. This model was produced by Jacobson in 2010, and shows the procedure of CE programme design and influencing factors. From "Effective Primate Conservation Education: Gaps and Opportunities," by S.K. Jacobson, 2010, American Journal of Primatology, 72, p. 418. Copyright by 2009 Wiley-Liss, Inc.

An understanding of the target audience is also significant in CE planning, since it can assist with selecting content and media for the programme. Additionally, involving potential audiences and partners in the planning procedure can enhance the effectiveness of CE. Before selecting appropriate messages and activities for presenting, planners should clearly recognise their resources and restraints (Jacobson, 2010; Marsh, 2016). Then, during the implementation stage, pilot tests and programme operations are essential. According to Jacobson et al. (2015), evaluation is the last stage of CE design, to assess the programme and provide feedback for further CE planning. Evaluation can emphasise the outcomes of short-term learning, medium-term action, and long-term conditions (Seng & Rushton, 2003).

2.2.4   *Evaluation of conservation education*

Many researchers put considerable efforts into creating appropriate evaluation frameworks for CE, as the evaluation of CE not only assists in the planning of future programmes but also presents the values of CE to the public and potential sponsors (Bowie et al., 2020). Existing studies have discussed broad issues related to CE evaluation, such as method selection, output and outcome indicators' choice, and the results and limitations of CE evaluation frames.

In terms of method selection, quantitative, qualitative, and mixed methods are applied in studies focusing on the evaluation of CE. Before 2010, most studies adopted quantitative methods, as numerical findings can provide concise results (Nygren & Ojalammi, 2018). Data collection methods for qualitative research are usually questionnaires and surveys (André et al., 2008; Bowie et al., 2020). However, the current tendency shows that qualitative and mixed methods studies have been increasing, as these methods can assist in seeking rich meanings in CE evaluation (Stern et al., 2013). Additionally, qualitative methods allow illiterate people, such as young children, to participate in the research (Bowie et al., 2020). Interviews (Sakurai & Uehara, 2020) and drawings (Jensen, 2014) are data collection methods used for qualitative research on CE evaluation. In terms of timelines in CE evaluation research, before and after studies (Moss et al., 2015; Stern et al., 2013) are usually designed to compare audiences' knowledge gained and attitude changes, before and after a CE experience. Furthermore, follow up investigations months or even years after a CE experience can be utilised to measure long-term outputs (Sakurai & Uehara, 2020). However, due to some restrictions, a few studies evaluate outputs only, after visitors' CE experiences. Comparison or control groups are also applied to measure CE effectiveness (Buckley et al., 2020).

The second important issue in CE assessment relates to what should be evaluated. Knowledge, attitude, and behaviour changes are the main indicators in evaluating CE programmes (Bowie et al., 2020; Orams, 1999). Testing conservation education hypotheses (CEH) is a commonly used technique for assessing the effectiveness of CE programmes (Bowie et al., 2020). Conservation education hypotheses help determine if individuals will support conservation if they have appropriate information about threatened species and biodiversity issues; the null hypothesis is that many CE programmes do not significantly influence their audiences' conservation attitudes (Struhsaker et al., 2005). Similarly, as one of the indicators in the Cambridge Conservation Forum (CCF), the measurement of the CE effect is defined as increasing awareness and influencing conservation behaviour (Kapos et al., 2008). Social (Ardoin et al., 2017) and economic outcomes (Waylen et al., 2010) have also been examined in some evaluation systems. Thomas et al. (2018) integrated these issues and reviewed 79 studies based on four categories cognitive, behaviour, social, and ecological outcomes.

The results of CE evaluation in former studies vary from positive to negative (Padua, 2009). An evaluation conducted by Michaela et al. (2002) showed that CE in Chesapeake Bay increased some of the young visitors' and most of the teachers' environmental sensitivity. Similarly, a survey conducted in the Congo showed that CE in a sanctuary effectively conveyed conservation knowledge to its young visitors, and their learning remained in their minds for more than one year (André et al., 2008). Furthermore, former research has indicated that CE could effectively inspire parents' conservation awareness through informing their children (Sakurai & Uehara, 2020). However, some long-term studies find that concepts and awareness gained from CE programmes may fade over time (Stern et al., 2008). Additionally, evaluation results from Morris et al. (2007) showed that a CE programme in Florida had a positive effect on skippers' knowledge, attitudes, and behaviour changes towards protection of manatees.

Comprehensive evaluations of CE programmes serve as a foundation for the success of future programmes. However, existing evaluation frameworks are facing queries in three major aspects. Firstly, the metrics of some evaluation frames do not reflect the goal of CE programmes (Thomas et al., 2018). For example, increasing biological or animal behaviour knowledge, which has been included in the CE evaluation curriculum (Buckley et al., 2020), may not result in audiences' conservation behaviour. Furthermore, researchers have argued that knowledge gain, which is usually measured, is not a sufficient condition for behaviour change, which is the aim of CE (Stern et al., 2013). Secondly, the methods and assessment frame designs of some evaluation studies are not robust enough to provide impartial results. For example, Mellish et al. (2019) analysed the quality of 48 CE evaluation studies using the effective public health practice project quality assessment tool, and found that most of the studies demonstrated weak or moderate quality of evaluation methods. Thirdly, too much reliance on quantitative methods reduces the interpretive function of CE evaluations. In a review article by Thomas et al. (2018), only 13 of 79 CE evaluation studies adopted qualitative methods; these can help identify reasons for assessment results, and assist in improving CE programmes.

2.2.5 *Factors affecting the effectiveness of conservation education*

Although CE evaluation can show how effective a CE programme is, it cannot provide comprehensive interpretations of the result. To improve the effectiveness of CE, some issues, such as goal setting, personal connections, and effective content in CE programmes, deserve specific discussion (Michaela et al., 2002). Firstly, definite goals are significant for CE, to avoid an excess of unnecessary elements, such as too much emphasis on the knowledge of animal behaviours. Secondly, personal connections contribute a lot to the success of CE. As Stern et al. (2013) stated, experiential engagement, social context, and issues relating to local species, are important factors affecting the effectiveness of CE. Experiential engagement, such as a visit or a volunteer programme, can link an audience with target issues. Social context, for example, peer affecting or intergenerational communication, can expand CE influence on the broader community. Furthermore, local conservation issues in CE programmes can generate more attention, because of their proximity with citizens.

Lastly, but most importantly, the content of CE directly impacts on its effectiveness. Whether specific conservation issues are included in a CE experience, directly influences the audiences' understandings of the issue. For example, an investigation conducted by Mayes et al. (2004) showed that 25% of tourists on a tour that did not mention human influences on dolphins, considered it acceptable to touch dolphins, whereas on a tour including those issues in the interpretations, only three percent of the guests accepted the behaviour of touching dolphins. Moreover, emotional connections with wildlife have become a double-edged sword in the context of CE. Many studies have proved that emotional connections with animals can lead to conservation awareness and behaviours (Ardoin et al., 2015). However, stressing these too much in CE has led to an ambiguous understanding of conservation science. Jacobson et al. (2015) argued that although most citizens in developed countries are aware of environmental and biodiversity issues, their knowledge and focus are directly affected by emotional perception. Kellert et al. (1996) found that 89% of citizens from the US considered that endangered Bald Eagles deserve conservation, while fewer than a quarter of citizens from the US believed the comparably threatened Kauai wolf spider should be protected. Therefore, CE providers should consider clear goals, personal connection contexts, and suitable content to ensure the success of CE programmes.

2.2.6 Rethinking the relationship between conservation and education in conservation education

Conservation education consists of two elements - conservation and education – and unscrambling these elements may contribute to a better understanding of the concept of CE. The first element is conservation. Although the theme topics have been shifting from species and protected areas in the 1960s to resilience and socio-ecological systems since the 2010s, the nature of conservation never changes; it is a mission driven discipline (Mace, 2014). Therefore, both the natural and social sciences are required in the field (Kareiva & Marvier, 2012), and all work within the conservation domain is targeted at achieving the mission, which is conservation itself.

The second element in CE is education, which is a process of teaching or learning (Kumar & Ahmad, 2008). Process is the core value in this definition, which means that the process of education can include aims or missions. Studies have revealed that apposite education can foster conservation behaviour, advance public awareness and support for conservation, reduce poachers, and influence policies on conservation issues (Day & Monroe, 2000).

Thus, combining the concepts of conservation and education integrates mission and process well. In the context of CE, education is a method amongst a variety of social science disciplines that can help achieve conservation goals (Bennett et al., 2017a; Heimlich, 2010). Therefore, CE is a strategic process used to influence the public, which is not familiar with conservation issues, to participate in activities to achieve conservation missions. With this philosophical understanding of CE in mind, relevant issues, such as the definition, designing, and evaluation of CE, become more intelligible; this understanding serves as the foundation of this research.

2.2.7 Effective interpretation in conservation education

As discussed in Section 2.2.1, the most significant element of CE is achieving the goals of raising awareness and changing the attitudes and behaviours of individuals towards biodiversity conservation issues. Therefore, both formal education programmes and casual interpretations of attractions can contribute to CE. This section reviews the extant research to understand the difference between interpretation and education, and how interpretation can contribute to CE.

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According to the so-called "father of heritage interpretation," Freeman Tilden, interpretation is "an educational activity which aims to reveal meanings 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). This definition shows that interpretation is an educational activity in essence, and emphasises that the process of learning through interpretations is related to real objects and is experience based. Although interpretation has a similar meaning to education in practice, it is still necessary to understand the differences between these (Lück, 2003b). Research shows that the main difference between interpretation and education is related to formality; education is always a formal activity, whilst interpretation is largely informal. Thus, formal education always takes place in formalised settings, such as in classrooms, while informal interpretation occurs in informal settings, such as at attractions. Additionally, the learners of education are students, who have a long-term learning opportunity, whereas interpretation involves visitors, who are usually voluntary first-time audiences (Hammitt, 1984). Therefore, interpretation is always in a tourism context, particularly in nature based attractions and museums (Tilden, 2007).

Interpretation has an important role in addressing environmental and conservation issues to the public, because visitors can gain knowledge and information about issues through interpretations during their visits, which can lead to their appreciation of nature, and consequent protection behaviours (Tilden, 2007). To enhance interpretation in wildlife tourism, Forestell and Kaufman (1990) created a model based on psychology theory, suggesting that there are three phases in a wildlife tour, and each phase requires a different interpretation (see Figure 2). At the pre-contact stage, visitors are anxious about upcoming events and need information about the rules to ensure a safe and satisfying experience. During the contact stage, visitors may have questions regarding the animals they are watching, whereas the post-contact stage provides opportunities for visitors to compare the knowledge gained during their experience with their expectations (Lück, 2003b). Forestell and Kaufman (1990) found that visitors accepted interpretations of environmental and conservation issues mostly at the post-contact stage, as the threats to and homes for wildlife, seemed much closer to them after viewing the wildlife.

Figure 2 *Forestell and Kaufman's Interpretation Model*
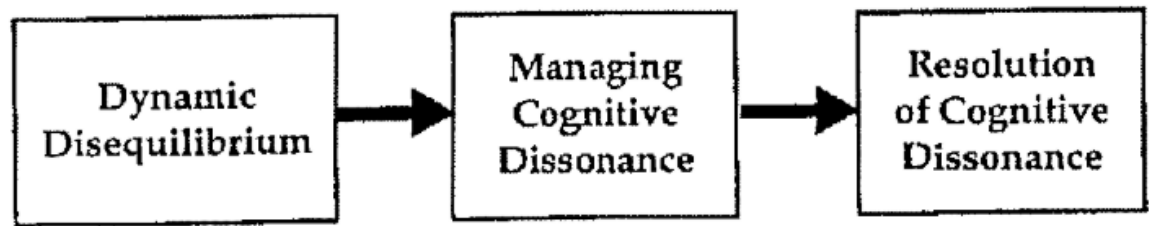
Note. This model was produced by Forestell and Kaufman in 1990, explaining the three points of effective interpretation. From "Environmentalism and on-tour experiences of tourists on wildlife watch tours in New Zealand: A study of visitors watching and/or swimming with wild dolphins", by Michael Lück, 2003, P.89. Copyright University of Otago Library.

Figure 3 *Orams' Effective Interpretation Model*
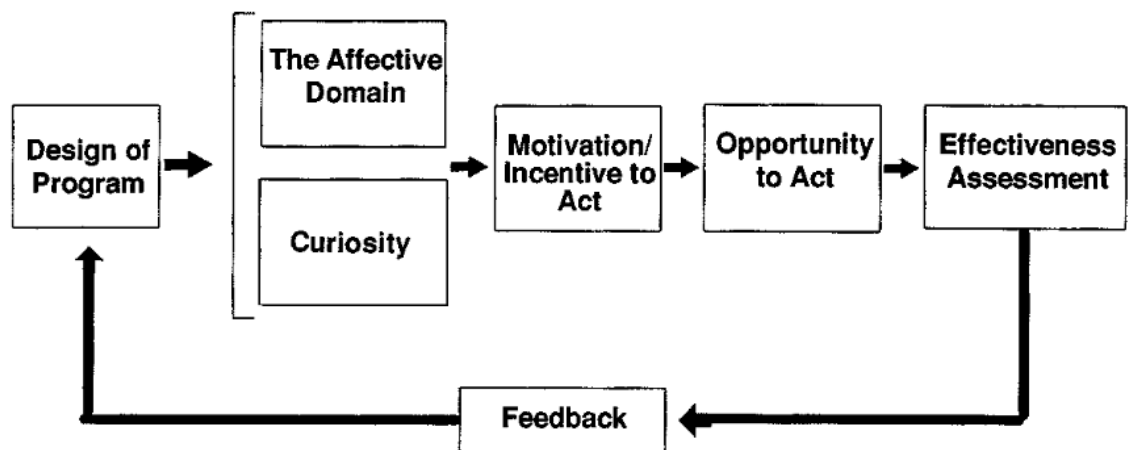
Note. This model was produced by Orams in 1997, explaining the procedures for effective interpretation. From "The Effectiveness of Environmental Education: Can We Turn Tourists into 'Greenies'?", by Mark B. Orams, 1997, Progress in tourism and hospitality, 3, p. 297. Copyright 1997 John Wiley & Sons, Ltd.

Orams (1997) proposed a more specific model (Figure 3) regarding interpretation techniques for improving environmental education through wildlife tourism. According to Orams (1997), this model aims to promote behaviour change in ecotourism attractions. There are five main techniques in the model: 1) appropriate questions can inspire curiosity towards wildlife; 2) using stories can affect visitors' emotions of

sympathy; 3) information concerning environmental problems and simple solutions can motivate visitors to act; 4) it is important to provide opportunities for the visitors to act, such as enrolling in conservation organisations and using environmentally friendly products; and 5) effectiveness assessment and feedback on the programmes is important for improving interpretations.

2.3 The function of modern zoos and aquaria

Both "conservation" and "education" appear in the mission statements of zoos and aquaria frequently (Patrick et al., 2007), which indicates they are important functions of modern zoological institutions. However, most zoos and aquaria do not demonstrate CE or the relationship between conservation and education in their mission statements (Patrick et al., 2007). Additionally, most visitors consider zoos and aquaria as recreational places (Fraser et al., 2009). Thus, the relationship between CE, conservation, education, and tourism seems to be complex. To understand the role of CE in zoological institutions, this section reviews discussions about the functions of zoos and aquaria.

2.3.1 A brief history of zoos and aquaria

Zoos and aquaria, as important sites where citizens can observe animals from a short distance, have a long history, which reflects the shifting understanding of relationships between humans and wildlife. Since ancient times when our ancestors raised the first dog antecedent, the wolf, the association between humans and animals changed (Patrick & Tunnicliffe, 2013). Humans have become the masters of animals, and possessing animals connotes power and status, and captive animals now satisfy humans' desire for curiosity, hunting, learning, and fighting (Croke, 2014; Patrick & Tunnicliffe, 2013).

Menageries, as the predecessor of zoos, existed in ancient Egypt, ancient China, Rome, and Greece (Kisling, 2000). It has been recorded that ancient emperors from these regions possessed massive collections of wild animals in menageries, however, only the upper class had the opportunity to access them (Patrick & Tunnicliffe, 2013). A modern zoo, with public oriented characteristics, can be traced back to London Zoo, founded in 1828. As a scientific zoo, London Zoo initially opened only to the members of a Friends of a Proposed Zoological Society until 1847, when London Zoo sold tickets to the public to subsidise the operations of the zoo, turning the zoo into a location for public

recreation and social engagement (Turley, 1999). Since then, zoos have been a significant component of modern cities around the world.

The design of exhibitions and interpretations in modern zoos has been transforming from emphasising taxonomies to stressing ecological systems. Before the 20th century, single species of animals were kept in cages, with their name, anatomy and physiology on the interpretation panels (Patrick & Tunnicliffe, 2013). A zoo was a place where the public could view animal specimens. Towards the end of the 20th century, ecosystem themes and behaviour biology enriched zoos' exhibitions and their visitors' experiences (Baratay & Hardouin-Fugier, 2004). Glass enclosures were eventually adopted to present the habitats of animals and plants.

Aquaria have a similar history to that of zoos. Fish were kept for food and entertainment in ancient times, and the first modern aquarium was opened by the London Zoological Society in 1853 (Lück, 2007). However, due to technological limitations, aquaria could only exhibit freshwater fish at that time. The rudiments of a marine park were opened in the American Museum in the mid 1850s, with marine animals in the exhibition (Lück, 2007). With improved techniques for tank making, filter systems, and heaters, aquaria and marine parks became prosperous.

Towards the 21st century, traditional zoos lost visitors to other tourism attractions (Tribe, 2004). To raise funds, some zoos and aquaria offer activities that allow visitors to interact with animals, such as walking with lions, feeding giraffes, riding or washing elephants, and swimming with dolphins (Patrick & Tunnicliffe, 2013). Animal-themed and marine-themed parks like Disney's Animal Kingdom, SeaWorld San Diego, and Ocean Park Hong Kong appeared in both developed and developing countries. With digital techniques and various riding facilities, these parks soon became amusement parks with captive animals (Patrick & Tunnicliffe, 2013).

Now, the number of zoos and aquaria is enormous worldwide. Nekolný and Fialová (2018) reviewed relevant literature and argued that zoos are institutions where animals are raised and presented to the public at fixed places. They also classified zoos into 16 categories, including those of wild animal parks, aquaria, farm parks, and special species parks. Amongst these types of zoological facilities, some are more entertainment oriented, while others are more conservation and educationally focused.

However, as Lück (2007) argued, most zoos and aquaria implement both entertainment and educational functions, and there is not a clear boundary to help distinguish which zoo or aquarium is entirely entertainment or educational.

In recent years, the public concern of animal welfare and awareness of ethical issues about captive animals has forced most zoos and aquaria to claim that their mission is to contribute to the conservation of wild animals. Some zoos and aquaria even claim that they are conservation centres (Rabb & Saunders, 2005). However, the conservation output is facing significant challenges in academic evaluations (Maynard et al., 2020). Balancing the conservation and entertainment function of zoos and aquaria to fulfil their conservation mission therefore deserves debate.

2.3.2   *Conservation in zoos and aquaria*

Conservation forms a significant part of the missions of zoos and aquaria; indeed, zoos have been described as centres of conservation in many works by zoo historians (Minteer et al., 2018). Conservation is also the first mission of the World Association of Zoo and Aquariums (WAZA, 2005). However, the traditional Noah's Ark paradigm is fore fronting the reality that breeding projects and reintroduction programmes cannot achieve their expected goals. Therefore, an integrated approach to conservation needs to be applied in zoos and aquaria (Keulartz, 2015). This section reviews the literature on the efforts made by zoos and aquaria to meet their conservation missions, the achievements that have been reached, and the challenges they face relating to conservation issues.

Many tasks associated with wildlife conservation have been undertaken in zoos and aquaria, and include ex situ conservation, rescue and release, research, training, education, and supporting in situ conservation projects. In *ex situ conservation*, wild animals are raised and bred out of their original territory to protect their gene from extinction. This technique is extremely beneficial when habitats are destroyed or there is not enough population of one species to maintain its group in the wild (Minteer & Collins, 2013). The next stage of ex situ conservation is reintroducing the captive bred animals into the wild. Zoos and aquaria play an important role in breeding wild animals. However, there are many arguments concerning the effectiveness of ex situ conservation in zoos and aquaria. Keulartz (2015) asserted that city zoos do not have

enough space to maintain species of vertebrates. Also, the limited number of each species in zoos and aquaria is not sufficient to maintain genetic variety, and reintroduction programmes are not effective in contributing to self-sustaining wild inhabitants. Research from Beck (1995) showed that only 12% of 145 reintroduction programmes are successful, and among these, the number of zoo born animals is limited.

Zoos and aquaria also rescue and release wild animals who are hurt because of human reasons. Advanced animal hospitals and treatment techniques assist the recovery of those animals, which are subsequently released (Che-Castaldo et al., 2018). Nevertheless, research from Innis et al. (2019) indicated that the long-term survival rate of released turtles requires more study. Research in zoos and aquaria contributes to wildlife conservation by helping to understand biological knowledge, behaviour and habitat information, and medical effectiveness of medicines and treatments on animals (Catibog-Sinha, 2008). Zoos and aquaria also provide opportunities for universities and other institutions to conduct investigations on conservation topics (Catibog-Sinha, 2008). However, the counterview is that animal behaviour in captivity is different from that in the wild, so research in zoos and aquaria cannot contribute to actual conservation (Minteer & Collins, 2013).

Training for employees of in situ conservation organisations and teachers working in public schools could also enhance the accomplishment of conservation missions (Brichieri-Colombi et al., 2019). Training can also be undertaken by institutions or organisations without animals in captivity or exhibitions. Education to increase public awareness of endangered species is another contribution zoos and aquaria could take for biodiversity. As mentioned in Section 2.2, CE in zoos and aquaria is diverse and flexible. Panels, talks, videos, activities, and organised programmes are common education modes in zoos and aquaria (Maciaszek, 2012). Moss et al. (2015) categorised biodiversity literacy in zoos and aquaria into two types: understanding biodiversity, and information about activities to help defend it. They conducted pre-visit and post-visit surveys with more than 6,000 visitors internationally, and found that CE is an effective way to increase public awareness of conservation issues.

In situ conservation projects are place based conservation activities that preserve wildlife in their original habitats. Zoos and aquaria contribute to in situ conservation

projects in multiple ways, such as researching in situ environments and comparing in situ with ex situ projects, training employees for in situ organisations, providing treatment to wildlife, raising funds for in situ protection, and organising educational tours to protected areas (Lacy, 2013; Mooney et al., 2020). It is argued that zoos and aquaria contributing to in situ conservation are more practical. Gusset and Dick (2010) evaluated 113 in situ conservation projects supported by zoos and aquaria, and found that financial support from zoos and aquaria contributed significantly to biodiversity conservation. They also argued that more investment may lead to increased conservation output.

As stated, many zoos and aquaria make efforts to meet their conservation missions. However, the effectiveness of most of their efforts is constrained by challenges, along with the reality that harvesting wild animals for captivity in zoos and aquaria can be construed as consumption of wildlife (Murray & Watson, 2014). Many studies have been conducted to evaluate the real effectiveness of conservation work in zoos and aquaria. In many of these studies, the conservation impact score (CIS) proposed by Mace et al. (2007) is commonly used to assess the impacts of conservation work in zoos and aquaria. The conservation impact score evaluates conservation impacts from five curricula: education, training, research, species, and habitats. Each curriculum is assessed on three dimensions, importance, volume, and effect, and the final score of each curriculum is the product of the three dimensions. Buckley et al. (2020) evaluated the CIS of endangered sawfish in four Australian aquaria from three aspects: education, research and conservation activities. Results showed that the overall scores were shortfalls: in most target aquaria, research and conservation activities contributed little to the conservation of sawfish. Although the education score was better, the investigation showed that only attitude change was significant, whereas behaviour change was not.

Additionally, some studies have focused on the conservation effectiveness of zoos and aquaria in different areas. Che-Castaldo et al. (2018) analysed data from federal recovery plans for endangered species and annual surveys organised by the Association of Zoos and Aquariums (AZA) to evaluate the conservation contributions of zoos and aquaria in North America. The findings of this research indicated zoos contribute to both ex situ and in situ conservation of listed endangered animals. Furthermore, the authors argued that North American zoos and aquaria had more potential to contribute

to native species. Maciaszek (2012) evaluated conservation in New Zealand zoos in six categories: education, research, captive breeding, in situ conservation, collaborations and associations, accreditation, and awards. The results of this research showed that New Zealand zoos do contribute to the conservation of native species. This study also found that zoo operators considered conservation promotion to be the most significant responsibility of zoos.

In general, zoos and aquaria argue that conservation is their primary mission, and undertaken various jobs to meet their organisational mission of conservation. However, most studies on evaluating conservation outputs show that conservation in zoos and aquaria is not effective, but has the potential to improve. As Maynard et al. (2020) argued, a strong organisational mission statement does not guarantee appropriate strategies and activities in zoos and aquaria.

2.3.3 Education in zoos and aquaria

Education is another organisational function for zoos and aquaria (Moss & Esson, 2013; Roe et al., 2015). Although it has been discussed that education is a way to achieve conservation goals, it is still necessary to view education as an independent section in zoos and aquaria. Conservation education is only one aspect of education in zoos and aquaria, and understanding the entire role of education could provide a clearer illustration of CE in zoos and aquaria. The history of education in zoos can be traced to 1929, when the Bronx Zoo of New York opened an education department (Patrick & Tunnicliffe, 2013). Now, most zoos and aquaria operate education departments, and it is generally accepted that they can educate the public (Baratay & Hardouin-Fugier, 2004; Patrick & Tunnicliffe, 2013). Relevant issues of education in zoos and aquaria are broadly discussed, including what content and form the education takes, whether visitors are teachable, and the effectiveness of education in zoos and aquaria.

Although zoological organisations around the world state their education mission to be connected with conservation and environmental issues (Moss & Esson, 2013), zoos and aquaria deliver numerous educational materials, not only regarding CE, at their parks. Indeed, zoos and aquaria were places to gain biological knowledge (Rabb, 1968) before they adopted the mission of CE. As teachers, they select the information they consider to be meaningful and attractive for teaching visitors. Thus, beliefs around the role of

zoos and aquaria decide the content of their educational material. Although most zoos and aquaria claim their first mission to be conservation, an investigation by Roe et al. (2015) showed that zoos are more likely to focus on being places for visitors to learn about animals, than about conservation. Therefore, zoos and aquaria provide knowledge associated with both organisms and wildlife conservation.

Basic knowledge about individual species, such as their biological characteristics and geographic distributions, is provided through interpretive panels or other media for visitors' education (Esson & Moss, 2013). Additionally, knowledge about animal behaviour and the life span of individual wildlife is offered by some zoos and aquaria (Fraser et al., 2009). Habitat and ecosystem information is another educational area in zoos and aquaria, and a starting point for conservation knowledge (Turkowski, 1972). In terms of CE, the endangered state, information about conservation work, the introduction of humans' impact on wildlife extinction and other environmental issues (Esson & Moss, 2013), and how to behave in an environmentally friendly manner are generally included. Teaching visitors to behave ethically towards captive animals is another part of education in zoos and aquaria, and emphasises positive behaviours, without feeding, knocking, or shouting (Collins, 2018). To achieve the teaching goals of improving ethical and conservation behaviour, information to stimulate emotional connections and sympathy are also included by zoos and aquaria (Bexell et al., 2013).

The forms of education offered by zoos and aquaria are similar to those of CE in most contexts, which were mentioned in Section 2.2: free choice learning, guided tours, and organised programmes (Collins et al., 2020). Some zoos and aquaria also provide animal shows and argue the shows are educationally oriented, but although they claim they can educate visitors through animal performance (Miller et al., 2013), animal welfare advocates believe that animal shows create a sense that animals should please people (Jiang et al., 2007). This suggests that interpretations during animal shows should not be included in educations in zoos and aquaria.

Education is a two way activity, in that both knowledge providers and receivers are subjects in the education process (Kumar & Ahmad, 2008). In zoos and aquaria, it is not just what educational information provided that matters, but also the visitors' perspectives on this (Falk et al., 2008). Thus, visitors' willingness to learn affects educational output in zoos and aquaria. There is a growing consensus that the primary

reason visitors go to zoos and aquaria is not to be educated, but for entertainment or socialisation (Ballantyne & Packer, 2016). However, despite this focus on entertainment, most visitors accept the view that zoos and aquaria are educational attractions, and believe they can gain some knowledge from visits to zoos and aquaria (Roe et al., 2015). Roe and McConney (2014) found that more than 70% of visitors to zoos and aquaria have a learning programme or objective. Dawson and Jensen (2011) found that visitors' attitudes towards learning can change according to the context. Esson and Moss (2013) argued that zoos and aquaria can provide learning experiences like those of museums but need to provide sobering data or other information to their visitors in order to encourage their environmental awareness. Therefore, although not all visitors to zoos and aquaria come for learning opportunities, there are still opportunities to transmit conservation concepts to them.

Thus, to enhance the teaching output, zoos and aquaria could pay more attention to meeting visitors' learning interests. Moss and Esson (2010) argued that the more appealing species have more potential to increase tourists' interest to learn. Moss et al. (2010) found that talks with animal feeders or interaction activities can attract more attention from visitors. Additionally, research from Collins et al. (2020) determined that compared with children who have attended zoo education programmes, children participating for the first time gain more knowledge after the trip. Furthermore, Gupta et al. (2019) contended that with careful design, zoos and aquaria can provide opportunities for STEM (science, technology, engineering, and maths) education to the public. Therefore, the educational content of zoos and aquaria should be designed to meet the needs of both first and revisiting customers, visitors with different environmental awareness levels, and visitors with different intentions for their park visits.

The evaluation of education output in zoos and aquaria is crucial, as it can reflect the effectiveness of educational inputs and assist in improving education in zoos and aquaria (Khalil et al., 2017). While evaluations can be conducted by zoo and aquaria staff and other institutions, a self-conducted assessment may be more effective. However, due to limited financial and human resources, most zoos and aquaria do not evaluate their educational outcomes (Luebke & Grajal, 2011). Consequently, most existing evaluation studies of education in zoos and aquaria are conducted by zoological associations or academic institutions (Luebke & Grajal, 2011; Moss et al., 2015).

Moreover, as Moss and Esson (2013) argued, most studies evaluate only the output of programme based educational activities, and ignore the impact of free choice learning in zoos and aquaria, which might be easier to access by the public.

Finally, there is a fundamental misunderstanding in the research on the evaluation of education in zoos and aquaria, in that most studies conflate education and CE / EE; education in zoos and aquaria is comprised of other biological knowledge, and not just conservation knowledge, as discussed. Most academic articles focus on the assessment of the environmental or conservation related knowledge gained, and attitude and behaviour changes (Weiler & Smith, 2009). Accordingly, this issue is addressed in Section 2.4.4.

2.3.4   Tourism and Recreation in zoos and aquaria

Tourism and recreation have been important functions of zoos and aquaria since the introduction of zoological gardens (Turley, 1999), although this is not mentioned in the mission statements of most zoos and aquaria. When studying CE in zoos and aquaria, it is necessary to review existing research on tourism and recreation in the parks, because the learners of CE are the tourists and visitors to zoos and aquaria. This section therefore examines the roles of tourism and recreation in zoos and aquaria from both operators' and visitors' perspectives.

Although most zoos and aquaria do not promote themselves as visitor attractions, several factors show that this is indeed their identity. Firstly, zoos and aquaria match the definition of attractions: single units, individual sites or clearly defined small scale geographical areas that are accessible and motivate large numbers of people to travel some distance from their home, usually in their leisure time, to visit them for a short, limited period (Swarbrooke, 2002, p. 3). Secondly, zoos and aquaria receive a large number of visitors. According to WAZA (2021), more than 700 million people visit zoos and aquaria around the world each year. Thirdly, tickets and other purchases from visitors are the most important financial support for the operation of zoos and aquaria. Therefore, zoos and aquaria are visitor attractions, and could not exist without visitors (Tribe, 2004).

Since visitors are important for the existence of zoos and aquaria, their motivations to visit zoos and aquaria are valuable for zoological gardens. Findings of many surveys

support the argument that the primary motivation for visitors to go to zoos and aquaria is for entertainment or recreation (Ajayi & Tichaawa, 2020; Hyson, 2004; Linke, 2011). Therefore, as visitor attractions, almost every zoo and aquarium tries to entertain visitors to some extent. Amusing or cute icons are employed to attract visitors around zoos and aquaria, creating an entertaining atmosphere, especially in the souvenir shops and canteens (Yasuda, 2013). There are also entertainment facilities, for example, children's playgrounds in most zoos and aquaria, animal shows in some zoological gardens, and rides in many animal-themed parks (Frost, 2010). Both visitors' entertainment appetite and materials provided by zoological gardens to meet this appetite, create an entertaining and recreational image of zoos and aquaria (Ajayi & Tichaawa, 2020).

There are also invisible entertainment elements, such as back region experiences offered by zoos and aquaria, that connect recreational requirements to educational or conservation values. Yasuda (2013) argued that although visitors attend the back region experiences to be entertained, the interpreters play important roles to connect the entertainment intentions to educational values. Catibog-Sinha (2008) believed zoo tourism to be a means to promote conservation values through education and interpretation (Catibog-Sinha, 2008). Another connection between zoo tourism and their conservation missions is that the profits could be used to support in situ conservation (Catibog-Sinha, 2010). Therefore, it is indisputable that zoos and aquaria are in essence, tourist attractions with entertainment element, although some emphasise entertainment, while others contribute more to conservation.

2.3.5 Rethinking the conflicting functions of zoos and aquaria

Prior research has identified three main functions of zoos and aquaria: conservation, education, and tourism and recreation. Each of the three functions is significant: conservation is the organisational mission, education is important work, and tourism and recreation provide profit for the survival of zoos and aquaria. However, the three functions are not independent of each other, and their relationships are complicated.

Existing discussions illustrate three main conflicts of this complex area. Firstly, visitors' recreational motivation and zoological gardens' educational and conservation goals seem to conflict. As Hyson (2004) argued, the majority of the public does not consider

zoos and aquaria as conservation institutions. It is also found that visitors go to zoological gardens mainly for recreation or entertainment (Linke, 2011; Ryan & Saward, 2004). Although most zoos and aquaria state their mission as conservation or education. it seems challenging for the conservation institutions to meet their visitors' needs for entertainment as well as do other tourism attractions.

Secondly, zoos and aquaria's conservation mission statements seem not to match their entertainment image and products. Maynard et al. (2020) observed that the organisational missions of conservation in zoos and aquaria do not predict their operational activities. Most zoological gardens still consume wild animals to some extent in the exhibition or animal shows to entertain their visitors (Ballantyne & Packer, 2016; Keulartz, 2015; Minteer & Collins, 2013). These entertaining images and products illustrate that conservation is just a mission statement, and not ongoing practice in zoos and aquaria.

Thirdly, various interpretation and education programmes in zoos and aquaria might not fulfil education for conservation goals. Zoos and aquaria provide excellent educational opportunities through their signs and organised programmes (Rabb, 1968); however, content related to conservation issues does not always occupy an important position in educational materials in zoos and aquaria (Patrick et al., 2007). Basic biological information is extensively provided, and the odd behaviour of animals is presented on signs and other interpretive materials to meet visitors' appetites (Fraser et al., 2009). Thus, education in zoos and aquaria is not only for conservation goals.

Based on these conflictive realities, some researchers have questioned the effectiveness of conservation, and the real output of zoos and aquaria (Malamud et al., 2010). Other researchers hold more positive attitudes towards zoos and aquaria, and have argued that zoological gardens have irreplaceable roles in connecting citizens with nature and conservation issues. Firstly, zoos and aquaria are ideal places to propagate conservation issues to the general public, who are not experts in this domain. Most visitors go to zoological gardens for recreation, but not to learn conservation issues, because they are not familiar with this area. Therefore, they are the target populations of CE, which seeks to inspire the awareness of the public (Bennett et al., 2017). Furthermore, as Esson and Moss (2013) argued, entertainment and education in zoos and aquaria are not necessarily separated; as the general public has accepted that zoos and aquaria are

conservation organisations (Dwyer et al., 2020; Falk et al., 2010), they would not reject receiving some conservation information while recreating at zoological gardens. Additionally, zoos and aquaria could increase the proportion of conservation knowledge in the content of education. With dedicated planning, zoos and aquaria could entertain their visitors while propagandising conservation values and minimising the consumption of wild animals. To summarise, zoos and aquaria are attractions that can transmit conservation knowledge through educating their visitors (Clayton et al., 2009).

2.4 Conservation education in zoos and aquaria

The review of the studies referring to CE and the functions of zoos and aquaria provides a complete background for CE in zoos and aquaria. Conservation education in zoos and aquaria is a specific part of CE, which follows the concept that through appropriate education, conservation goals can be achieved. Conservation education forms a focal point of the functions in zoos and aquaria, which are conservation, education, and tourism and recreation. Dynamic integration of these functions allows CE to successfully educate general visitors with conservation information. Overall, there are few studies on CE in zoos and aquaria., and most concentrate on the evaluation of the effectiveness of CE. This section reviews research on the impacts, effectiveness, and factors affecting the effectiveness of CE in zoos and aquaria. It will also make criteria on existing studies.

2.4.1 Positive impacts of conservation education in zoos and aquaria

According to the research, positive impacts of CE in zoos and aquaria fall mainly into three dimensions: knowledge gains, emotional connection, and donation behaviours. The most significant positive impact of CE relates to visitors' conservation knowledge gained from their visits to zoos and aquaria (Ballantyne et al., 2018; Nygren & Ojalammi, 2018). It has been found that CE in zoos and aquaria is effective in the knowledge dimension in both the short and long term (Packer & Ballantyne, 2010; Pearson et al., 2014). Some articles detect sympathy, ethical concerns, and other positive emotions (Johnson, 2020; Packer & Ballantyne, 2010; Powell & Bullock, 2015) about specific endangered animals after visitors' zoos or aquaria experiences. Although a few studies have argued that making a donation is the most acceptable conservation

behaviour resulting from CE in zoos and aquaria, visitors do not tend to spend much money (Kelly & Skibins, 2020).

2.4.2 Negative impacts of conservation education in zoos and aquaria

Other than the positive outcomes from CE in zoos and aquaria, some researchers have also observed the side effects of using captive animals for CE in zoos and aquaria. Spooner et al. (2021) argued that animals' welfare is an inevitable cost, and using animal shows as a method to convey CE might also result in visitors' confusion around animals being things that should entertain human beings. Jensen (2014) explored negative changes arising from students' understanding of the natural world after their visits to London Zoo. Furthermore, it has been argued that much interpretation about the conservation issue, such as the reality of human's impact on species extinction, may also reduce visitors' satisfaction during their visits to zoos and aquaria.

2.4.3 Effectiveness of conservation education in zoos and aquaria

Many studies query the effectiveness of CE in zoos and aquaria. For example, Nygren and Ojalammi (2018) argued that evidence of visitors' attitudes and behaviour shifts is not as obvious as that of the knowledge gained, because after visiting zoos or aquaria, many visitors still consider that conservation is experts' work, and not related to their everyday lives (Spooner, et al., 2021a). Furthermore, Bulbeck (2005) argued that an emotional connection with specific species is quite different from the concept of biodiversity, which emphasises the equal participation of any species inside the ecosystem, regardless of human value judgments.

2.4.4 Factors affecting the effectiveness of conservation education in zoos and aquaria

Almost all existing studies discuss one or more factors that affect the effectiveness of CE in zoos and aquaria. As Botha et al. (2021) argued that determinations to improve interpretations in zoological gardens include factors from both supply and demand sides (see Figure 4). Conservation education as a specific component of interpretations in zoos and aquaria also follows this rule. Thus, this section discusses research referring to the factors that affect CE in zoos and aquaria from both the supply side and receiver side.

Visitors' characters affect their acceptance of CE concepts. Many research articles contend that CE in zoos and aquaria belongs to *free choice learning* (Fraser et al., 2009; Moss & Esson, 2010), which refers to a learning process in which learners have a sizable degree of preference over what, where, and when to learn (Falk, 2006). Therefore, visitors' personal characteristics can determine how much conservation information they can learn from visits to zoos or aquaria. Visitors' previous zoos and aquaria visiting experiences have been identified as a predictor of effective CE learning (Ballantyne et al., 2011; Kruse & Card, 2004). Similarly, some researchers have argued that repeat visiting is associated with effective conservation learning in zoological gardens (Godinez & Fernandez, 2019; Pearson et al., 2013). Visitors' existing knowledge about conservation issues is also identified as a factor that can contribute to the effectiveness of CE (Mast et al., 2018; Pearson et al., 2013). Another personal character related to effective CE in zoos or aquaria experiences, is the visitors' sensitivity to conservation thinking. A literature review by Nygren and Ojalammi (2018) listed visitors with a conservation mind as the first indicator of CE learning in zoos and aquaria.

The motivation of visitors to visit zoos or aquaria is another significant influence on visitors' adoption of conservation knowledge, attitudes, and behaviour. Ballantyne et al. (2011) argued that visitors with more learning motivation present better results in CE, however, that motivation can be influenced by the marketing strategies of zoos or aquaria. Recently, some researchers have noticed that a person's values can affect their acceptance of conservation knowledge from zoos and aquaria. Ballantyne et al. (2021) found that visitors with different value priorities have a different understanding of CE interpretations, and argued that the design of the CE interpretation system in zoos and aquaria should consider visitors' motivations and personal values.

Figure 4 *Two Sides of Inputs Affecting Successful Zoo Interpretation*
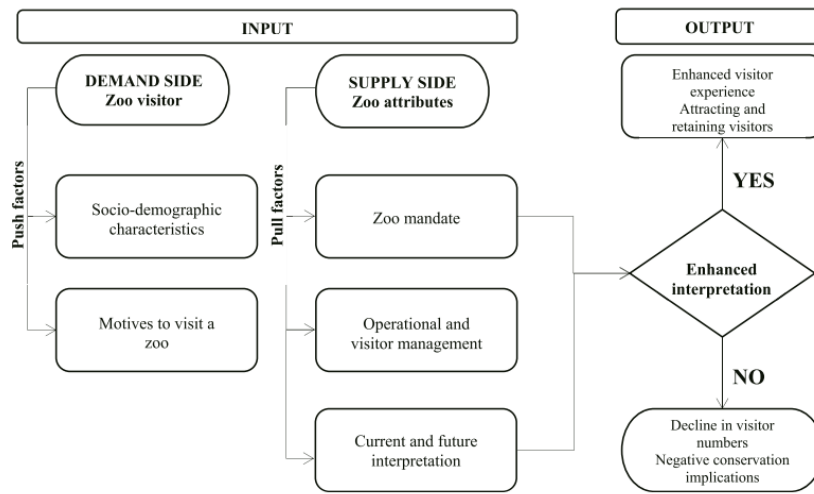
Note. This model was produced by E. Botha, M. Kruger, A. Viljoen in explaining the input and out put for successful zoo interpretation. From "Enhancing the interpretation at the National Zoological Gardens in South Africa", by E. Botha, M. Kruger, A. Viljoen, 2021, Journal of outdoor recreation and tourism, 33, p. 2. Copyright 2020 Elsevier Ltd.

Other researchers have focused on factors from the supply side that influence the effectiveness of CE in zoos and aquaria. There are mainly two perspectives in existing studies in this area: modalities of CE interpretations, and raising connections between visitors and animals. Many studies have found that the type of interpretations provided by zoos and aquaria has a significant impact on the achievement of CE. Firstly, some researchers have argued that in-person interpretation is more effective than interpretive panels. Swanagan (2000) argued that visitors participating in interactive interpretations concerning elephants will be more interested in elephant conservation, and Clayton et al. (2009) contended that the interpreter is important in terms of how visitors construct the value of conservation during their free choice learning. Other studies have emphasised the meaning of technology and innovation in CE. Perdue et al. (2012) found that video presentations can positively influence visitors' knowledge gained through their visit to zoos and aquaria, and Kelly and Skibins (2020) observed that applying new technology to interpretations related to tigers in zoos contributed to a better understanding of tiger conservation issues. Additionally, Weiler and Smith (2009) determined that more interpretation material can lead to more successful CE results.

Furthermore, it has been argued that providing post-visit CE supporting materials can enhancing visitors' learning as well as their conservation bahaviour (Ballantyne & Packer, 2016; Ballantyne et al., 2018).

Another perspective discusses the relationship between providing a connection with animals and the effectiveness of CE. Some studies have suggested that a physical connection such as a close encounter with live animals (Swanagan, 2000), or eye contact with active animals (Hacker & Miller, 2016), can lead to better CE results. Other researchers have argued that introducing an emotional connection between visitors and animals contributes to better CE results (Mast et al., 2018; Powell & Bullock, 2015). Therefore, the success of CE in zoos and aquaria depends on many factors, most of which are not independent, but interacting with each other.

2.4.5 Criteria in existing research

Prior research has explored information associated with CE in zoos and aquaria, and which contributes to both academic and empirical practices. However, there are still ambiguities and research gaps that require further study. Firstly, most existing studies do not present a clear definition of CE in zoos and aquaria. Although most researchers agree that CE aims to convey conservation knowledge to the public and promote attitude and behaviour changes towards conservation issues, the CE content that achieves these goals is not clear. This leads to a common problem in research on the evaluation of education in zoos and aquaria, relating to the ambiguous boundary between conservation education and non-conservation education in both input and output evaluations. For example, some studies suggest that visitors' knowledge gains about biological knowledge are an achievement of CE (Mallavarapu & Taglialatela, 2019; Spooner et al., 2019), some consider that people spending more time in nature is an effective output of CE (Dierking et al., 2004), and others consider visitors' affective views of animals as adorable or beautiful or intelligent are successful outcomes of CE (Bexell et al., 2013; Packer & Ballantyne, 2010; Perdue et al., 2012). Although these issues may contribute to raising public attention about biodiversity conservation to some extent, they are far from any understandings of the objective eco-system.

As Roe and McConney (2014) argued, learning about animals is a motivation for visiting zoos and aquaria. Nevertheless, learning about animals does not equate to

learning about conservation. Knowledge about wildlife and emotional connections with animals in zoos and aquaria might arouse public attention to endangered species issues, but there is a significant gap between this attention and understanding the panorama of wildlife conservation issues. How to convert the public's enthusiasm and sympathy for specific species into scientific attitudes and behaviours towards the entire biological system is still a barrier in CE in zoos and aquaria.

Secondly, few studies have paid attention to the contents presented to the public by zoos and aquaria. Research has explored many factors that could influence the effectiveness of CE in zoos and aquaria, as discussed, but seldom mentions the CE content provided to the public. Ben Zvi Assaraf et al. (2020) found that only 13% of participants' received content was related to conservation issues, and conservation was not the main theme in zoos' interpretation systems. Still, these data are from visitors' investigations. Indeed, the content provided to the public could be a significant factor in the success of CE in zoos and aquaria. Therefore, research on the CE content provided by zoos and aquaria is essential.

2.5   Chapter summary

This chapter reviewed the extant research related to CE in the context of zoos and aquaria, under the topics of CE, functions of modern zoos and aquaria, and CE in zoos and aquaria. It firstly identified CE and relevant concepts, and different types of CE. After reviewing research on the design, evaluation, and influential factors of CE programmes, it critically discussed the notion that conservation is the aim of CE, and education is the method. The chapter also reviewed research exploring the differences between education and interpretation in CE, and existing models on effective interpretations in CE.

The second part of this chapter reviewed research on the function of modern zoos and aquaria. After outlining a brief history of zoos and aquaria, it summarised three functions of zoos and aquaria found in the literature: conservation, education, and recreation. It also discussed conflicting functions and identified opportunities to improve CE in zoos and aquaria. Lastly, it reviewed research on the topic of CE in zoos and aquaria, examining the impacts and effectiveness of CE in zoos and aquaria, and

identifying research gaps. These were: there is no clear definition of CE, and no research on the content of CE provided by zoos and aquaria.

Chapter 3.   Research methods

This chapter discusses the methods used in this research, beginning with a discussion of the selected paradigm. It then presents the research design with research questions, methodology, choice of data sources, and data analysis design before introducing the research sites, which are Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium. The chapter then explains the specific data collection and analysis methods and procedures and finishes with a discussion about the trustworthiness and limitations of this research.

3.1   Research paradigm

A *paradigm*, also called "theoretical perspective" (Gray, 2018), can be defined as a series of beliefs that are correlated with the overall notions of selecting topics, organising research, and producing reports within a discipline. The choice of paradigm is important, as it provides a guide for commencing a research inquiry (Killion & Fisher, 2018). This research adopted an interpretive paradigm. This section discusses the ontology and epistemology of the interpretive paradigm and explains the reasons for adopting interpretivism.

Interpretivism pursues explanations of society in a specific historical and conventional context (Crotty, 1998; Gray, 2018). It focuses on the important roles of semantics, culture, and history, in creating social realities (Crotty, 1998; Saunders, 2019). The interpretivist paradigm emphasises the significance of social action and seeking to comprehend how human society is established, connected, and retained by individuals. It considers that people from different social statuses may hold different perspectives and present various realities (Neuman, 2014). In an interpretivist inquiry, researchers can conduct a study through their participation in that society (Kekeya, 2019). Interpretivist research is mostly qualitative, and relies on textual data (Gray, 2018).

Ontology and epistemology are the philosophical foundations of research. According to Gray (2018), *ontology* refers to being, innate existence, and the elements of reality. There are two opposing ontologies, realism and relativism. A realist ontology believes in one eternal truth that is the constant and exact reality (Jennings, 2010), whereas a relativist ontology has faith in multiple truths. Baghramian and Coliva (2019) contended that the core values of relativists' understanding of the world are: non-authoritarianism,

reliance, diversity, and incompatibility. These are the relationships interpretivist investigators aim to explain. Accordingly, this research adopted a relativist ontology.

Gray (2018) states that *epistemology* relates to what it means to know, and views the relationship between scholars and the objects of research. There are three epistemologies: objectivism, subjectivism, and constructivism. Fitting with the realist ontology, an objectivist epistemology requires the researcher to be entirely objective (Jennings, 2010), which means they should be value free and effect free, with the only mission of discovering the universal truth. While subjectivism and constructivism admire the researcher's value in the research and the society (Crotty, 1998), both of which match the relativist ontology.Since they trust that humans create meaning and the correlation between scholars and subjects of the investigation could not be entirely objective. However, there are differences between these two epistemologies: subjectivists believe that meaning is based on the object according to the subject's belief, while constructivists consider meanings are created by the subjects' interactions with the world (Gray, 2018). Thus, a constructivist epistemology fitted the interpretivist paradigm (Gray, 2018) of this research, which stressed interpreting the relationships between subjects and society.

The rationale for this research adopting an interpretivist epistemology was based on three reasons: the researcher's appreciation of the complication of CE in zoos and aquaria, the subjective characteristics of CE, and the necessity of a profound understanding of the relationships between the content of CE provided in zoological gardens and visitors' reflections. Firstly, as argued in the previous chapter, CE in zoos and aquaria is a complicated domain. There are multiple factors from both providers and receivers that could influence the effectiveness of CE, and it is difficult to understand CE using a simple linear mode of thinking. Secondly, although CE aims at disseminating knowledge on conservation science, it shares more social scientific characteristics with education, but is not as objective as a hard sciences subject. Since both providers and receivers in CE are human beings, the process could be subjective, which means subjective characteristics may construct the process of CE to a large extent. Thirdly, there are underpinning relationships between the content of CE provided by zoos and aquaria and how much conservation knowledge visitors gain from their visits. Understanding these relationships is important for explaining the current situation of the public's attitudes towards conservation issues. Therefore, this research

embraced an interpretivist paradigm and sought to explain the social process of CE in zoological gardens in depth.

3.2 Research design

3.2.1 Research questions

To understand the relationships between the CE providers' organisational missions, the contents they provided, and visitors' reflections on CE, a series of research questions needed to be answered. The three main research questions of this study were:

1) What conservation education content has been provided to the public in zoos and aquaria?
2) How does the content reflect the providers' organisational missions and conservation work?
3) How does conservation education in zoos and aquaria influence visitors' opinions after their visit?

To answer these research questions, four clusters of supplementary questions were needed:

The first cluster of supplementary questions, which may contribute to answering the first research question around the content of CE provided to the public in zoos and aquaria was:

1) What content of interpretive materials has been provided to the public in zoos and aquaria?
2) What content of these interpretive materials was related to conservation education?
3) How did the content contribute to conservation education?

The second cluster of supplementary questions comprised two questions, which set a foundation for answering the second research question.

4) What are the organisational missions of zoos and aquaria?
5) What conservation work has been conducted by those zoos and aquaria?

The third cluster of supplementary questions compared the first and the second clusters of supplementary questions to answer the second research question.

6) What is the relationship between conservation education at the zoos and aquaria and their organisational missions?

7) Did the content of conservation education at the zoos and aquaria represent the conservation work of those institutions?

The fourth cluster of supplementary questions contributed to answering the last research question:

8) What were the main concerns of visitor reviews?

9) What were visitors' reflections on conservation issues after they had visited the zoos and aquaria?

10) What was the relationship between interpretations of the zoos and aquaria and visitors' reflections on conservation education?

3.2.2   Research methodology

Research methodologies can be defined as research approaches that transform the concepts of paradigms into guidelines that lead the process of conducting research (Sarantakos, 2005). There are five major methodologies: quantitative, qualitative, mixed methods approaches, indigenous, and cross-cultural methodologies (Jennings, 2010). As Jennings (2010) argued, the selection of a methodology should consider issues such as the nature of the research or the research questions, and any possible limitations.

This study adopted a qualitative research methodology since it matched the research context, fitted the selected paradigm, and suited the available data type. Qualitative research is advanced in scientific research concerning humans and society, especially in the disciplines of psychology, education, society, and management (Bryman, 2016; Marshall, 2011). Initially, it emphasises the significance of the social context of the research topic (Tracy, 2020), and seeks to explore rich meanings of phenomena from an insight perspective (Neuman, 2014). This research aimed at exploring the content of CE in zoos and aquaria in its context, which considers both the functions of the institutions and the aims and feelings of the visitors. Moreover, the research questions, as stated earlier, consist of "what" and "how" questions, and the abundant implications of these.

The previous chapter identified the research gap of CE in zoos and aquaria, and there is adequate quantitative research on evaluating the outcomes of CE, but qualitative analyses of the reasons for and meanings of CE and its output are insufficient and therefore required.

Secondly, qualitative research usually works with a relativist ontology, and can work with both a subjective and a constructive epistemology, which fits the interpretive or critical theory paradigm (Tracy, 2020). As stated earlier, this research adopted an interpretivist paradigm, which allows for a qualitative methodology. Additionally, the most apparent characteristic of qualitative research is collecting and studying textual and visual data (Veal, 2018). Consistent with the research design, all available data in this research were textual and visual data, which are introduced in the next section.

3.2.3 Data sources and rationale

To answer the stated research questions, qualitative data were collected from three sources: first, photos of interpretive materials at selected zoos and aquaria were taken. Interpretations in zoos and aquaria are educational activities that may explain the value of what visitors observe (Wijeratne et al., 2014), and include permanent signs, electronic signs, interactive panels, videos, and various live talks on animal behaviour training and feeding. This research examined only permanent interpretive materials, that is, those that visitors could read whenever they wanted to during their visits to zoos and aquaria. It did not consider live talks as data resources for two reasons. Firstly, permanent interpretive materials represent most of the contents of educational interpretation provided by zoos and aquaria, and are the basic interpretations that most zoos and aquaria share with the public (Lück, 2015). Secondly, compared to talks, permanent materials can target more visitors; because of the fixed schedules of talks provided at zoos or aquaria, only a small percentage of visitors can attend these activities (Moss & Esson, 2013). Thus, the selection of permanent interpretive materials at zoos and aquaria as data sources was appropriate.

Second, the research analysed materials on the official websites of target research sites. There were two reasons for choosing the contents of official websites as research data. In the current information society, most zoos and aquaria present their missions and conservation works on their official websites, and these data were valuable for

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answering some of the research questions in this research. Furthermore, official websites are usually well organised, and demonstrate the structure of the vision and work of the zoological institutions. These structural data can assist in understanding the functions of a particular zoo or aquarium and identifying the role of CE in that institution.

Third, the research analysed visitor reviews of selected institutions and relevant reviews on TripAdvisor. Visitor reviews on travel websites, as a kind of user generated content (UGC), have considerable power to influence potential visitors' destination choices (Zhang et al., 2020) and provide important information for improving the services of destinations. Many studies use these kinds of review as data sources (Gour et al., 2021; Nghiêm-Phú et al., 2021) because when compared with traditional data types, they offer three significant advantages. Firstly, online reviews as research data can target a much larger population. In general, interviews for a master's study can only target tens of participants (Gray, 2018), whereas using online reviews, researchers can source the opinions of hundreds of people. Secondly, the data collected can extend over a much longer period. Using traditional data collection methods, researchers can collect data only in a particular period, whereas online reviews can provide data from several years before the start of the research, helping researchers access rich longitudinal information. Lastly, visitors create their reviews voluntarily, which reflects their true feelings. Surveys and interviews require participants to understand the research, which can cause psychological pressure on participants and introduce bias (Gray, 2018). For these reasons, online reviews have significant advantages as research data. Furthermore, TripAdvisor is one of the most successful travel websites worldwide, with trillions of authentic reviews from visitors, so was an appropriate choice as a data source. Additionally, all the data used in this research were publicly available. Consequently, the selected three types of data sources provided sufficient qualitative data for this research.

3.2.4 Data analysis design

Three major qualitative methods were used in this research. For the interpretive materials at the zoological gardens, content analysis (Jennings, 2010) assisted with categorising the content of the materials. For data from the official websites, the six steps of reflexive thematic analysis from Braun et al. (2019) were followed to explore

the connotations of the missions and work of the zoological institutions. The research also adopted a netnographic method (Kozinets, 2020) to analyse the UGC data collected from TripAdvisor.

The reasons for using three different qualitative methods in this research were based on the different characteristics of the three types of data. Interpretive materials at the zoos and aquaria are usually short scientific messages that do not contain many implicit meanings. The aim of studying them was to classify the interpretive contents and analyse the proportions of the contents provided by the zoological gardens. Manifest content analysis allows textual data to be studied and presented in a qualitative format (Neuman, 2014), which suited the requirement to analyse the data from the interpretive materials in this research.

The data collected from the official websites of the zoo and aquarium were expected to provide rich meanings associated with the organisational missions and ongoing work of the zoological institutions, and provide in-depth understandings. As reflexive thematic analysis does not pay attention to the amount of the coding but focuses on searching for themes (Braun & Clarke, 2019), it was considered an appropriate method for analysing data from the official websites. Moreover, the mass data from TripAdvisor were collected to understand the visitors' gains from the CE of their visits. These online trace data are different from traditional qualitative data, which requires specific research methods. Coincidentally, netnography provides guidelines for inspecting online traces in social media (Kozinets, 2020), which met the needs of this research. Therefore, three different qualitative research methods were utilised with different data, to fulfil the requirements of this research.

3.3   Research sites

3.3.1   Rationale for sites selection

This research selected Auckland Zoo (AZ) and SEA LIFE   Kelly Tarlton's Aquarium (KT) as the two study sites. There were four reasons for selecting these two institutions. Firstly, their organisational functions met the requirements for the target sites of the research, that is, zoos and aquaria with at least some conservation orientation. Neither of the institutions was entirely an entertainment attraction, since each incorporated conservation and conservation education elements in their mission statements and

everyday work (Auckland Zoo, 2021a; SEA LIFE Kelly Tarlton's Aquarium, 2021a), therefor meeting the requirements of this study. Secondly, they were operated by different types of stakeholders and had different wildlife collections, which allowed for comparisons between a zoo and an aquarium.

Thirdly, data required for this research were available from the two institutions: both institutions presented sufficient interpretive materials to visitors; their official websites were well developed with information on the functions of the zoo and the aquarium, and they had each generated around 3000 reviews on TripAdvisor (TripAdvisor, 2021a, 2021b), providing data from visitors' perspectives. Fourthly, the researcher was familiar with both institutions, which is important for a qualitative study. Living in Auckland, with an interest in animals and conservation issues, the researcher often visited Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium. These experiences contributed to conducting this research, because qualitative research allows for the involvement of the researchers in the research (Bryman, 2016; Gray, 2018). Therefore, Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium were appropriate research sites for this study.

3.3.2   Auckland Zoo

Auckland Zoo is the largest zoo in New Zealand, and located in the Western Springs area of Auckland, and home to more than 120 species in an area of 17 hectares. As one of Auckland's most famous attractions, it has welcomed more than 28 million visitors since its opening (Auckland Zoo, 2021a). This section briefly introduces the history, ownership, exhibitions, and current work of the Auckland Zoo.

Auckland Zoological Park was opened in 1922 by the Auckland Council, with the first exhibited animals being donated by John James Boyd. Within its nearly one hundred years of operation, the mission of Auckland Zoo has changed from its initial entertainment oriented theme, to embracing the scientific and ethical concepts of modern zoos, which stress the integrated functions of conservation, education, and recreation. Historically, the exotic and rare animals were kept in cages, and the zoo offered activities allowing visitors to interact with the animals (Wood, 1992). However, the zoo now attaches importance to habitats and creating feasible enclosures for animals. It also devotes significant efforts to the research and breeding of endangered

native animals (Kearns et al., 2016). Part of the zoo is currently under construction to develop it into a world-leading zoo (Auckland Zoo, 2021a).

Auckland Zoo is operated by Auckland Unlimited (AU), an Auckland Council controlled organisation aiming to maximise cultural, social, and economic benefits for residents and visitors to Auckland (Auckland Unlimited, 2021). Auckland Zoo has joined some significant zoological associations of the world, such as the Zoo and Aquarium Association Australasia (ZAA), the World Association of Zoos and Aquariums (WAZA), and is an associate member of the European Association of Zoos and Aquaria (EAZA). It has also won two important environmental certificates of New Zealand: the carboNZero and Qualmark accredited EnviroGold (Auckland Zoo, 2021a).

Exhibitions in Auckland Zoo are divided into six areas according to the species' origin living areas (Figure 5). The Africa Safari Track is the first and biggest area of the zoo, containing a diverse range of African species. A boardwalk leads visitors around a large enclosure of giraffes, zebras and ostriches, before going to the homes of meerkats, love birds and leopard tortoises. As they leave this area, visitors can see the lions' enclosure, opposite the white rhinoceroses. Along this track, are also the homes of flamingos, baboons, cheetahs and servals, and beside the track is a smaller track that allows visitors to view Asian elephants.

Beyond the Africa Safari Track is a New Zealand themed area, Te Wao Nui, which means "the living realm." This area presents native fauna and flora in six ecological habitats: The Wetlands, The Coast, The Islands, The Night, The Forest, and The High Country. Many endangered and unique New Zealand species live and breed here, such as kiwi, kea, takahe, whio and tuatara.

In the middle of the zoo is the Southeast Asian Jungle Track, most of which is still under construction, and will be the home to tigers and other Asian animals. However, as part of this area, the enclosures for orangutans and siamangs opened in 2020. Next to the construction area is the Australia Bush Track for animals from neighbouring Australia: the Tasmanian devil, brolga, lace monitors, goliath stick insects, wallabies and various Australian birds. The last exhibit area is the South America Rainforest Track, with Galapagos tortoises, capybaras, American alligators, spider monkeys, squirrel monkeys, cotton-top tamarins, golden lion tamarins, emperor tamarins, and

some reptile species. There are also enclosures of red pandas, otters and ring-tailed lemur in exhibitions outside the six tracks.

Besides the animal enclosures, there are other facilities at the zoo. An advanced veterinarian hospital is located near the main gate of the zoo, providing health checks for zoo animals and supporting conservation by rescuing injured wildlife. Tourism facilities are also well designed at the zoo: a Kids' Zone and party areas serve visitors with different needs, and cafetarias and canteens provide food and beverages to guests. A gift shop is located at the exit of the zoo.

Auckland Zoo is a not-for-profit wildlife conservation science organisation, so it has been involved in multiple conservation works. The staff of AZ established the Auckland Zoo Conservation Fund in 2000, which has received NZD four million for conservation projects in and out of New Zealand. The zoo is also successful in breeding and releasing native endangered insects and birds, which contributes to in situ conservation. Zoo staff spend 8000 hours a year on average working in the wild, conducting research on threatened species and controlling invasive species. Additionally, Auckland Zoo organises eco-adventure tours to the Southeast Asian rainforest and advocates consuming palm oil free or certified sustainable palm pil (CSPO) products to protect the habitats of orangutans. It is also involved in the Urban Ark programme, which seeks to provide a friendly environment for native species in the city (Auckland Zoo, 2021c).

Education is another core function of the Auckland Zoo. It provides multiple programmes for students from preschool to tertiary education institutes, with several optional topics, such as classification, behavioural enrichment, sustainability, *Mātauranga Māori* (Māori knowedge), protecting Aotearoa, adaptions, zoo care, endangered species, and human evolution. In addition, the zoo holds regular keepers' talks for the general public, some of which are provided during feeding time. Zoo staff argue that their education programmes aim to inspire young citizens with conservation science (Auckland Zoo, 2021b). Overall, the Auckland Zoo is a modern city zoo emphasising conservation and the native species of New Zealand, and provides multiple educational opportunities to the public while creating recreational experiences for its visitors.

Figure 5 *Map of Auckland Zoo*

Note. Source: Auckland Zoo (2021d). Copyright Auckland Zoo.

3.3.3   SEA LIFE Kelly Tarlton's Aquarium

SEA LIFE Kelly Tarlton's Aquarium, located close to Auckland's city centre, is a well-known attraction featuring ocean creatures and Antarctic themes. It has the largest penguin colonies in captivity in the southern hemisphere, the only turtle hospital in New Zealand (SEA LIFE Kelly Tarlton's Aquarium, 2021c), and welcomes citizens and tourists to discover the undersea world. This section introduces the study site of SEA LIFE Kelly Tarlton's Aquarium under the following topics: history, ownership and joint organisations, current exhibitions and activities, involved conservation work, and education projects.

Similar to Auckland Zoo, Kelly Tarlton's Aquarium also has a proud history. The aquarium was opened in 1985 and named after its founder, Kelly Tarlton, a marine archaeologist and diver. Tarlton utilised obsolete sewage tanks to start his aquarium with a curved acrylic tunnel and conveyor belts, both of which were new inventions at that time. He also had concrete caves and reefs constructed to create seascapes. Initially,

there were two separated basins filled with sharks and other ocean creatures, which are still operating. The aquarium was proved an enormous success, although its founder died only seven weeks after its opening. People still cherish the memory of Kelly Tarlton for his establishing of the aquarium and raising public awareness of ocean protection (SEA LIFE Kelly Tarlton's Aquarium, 2021b). Following some expansions and reorganisation, Kelly Tarlton's Aquarium has been a popular attraction in Auckland ever since.

Today, the aquarium is a member of the SEA LIFE brand, owned by Merlin Entertainments (ME), a Britain based company. As one of the largest attraction operators in the world, Merlin Entertainments runs several location based leisure brands worldwide, such as Legoland Parks, Resort Theme Parks, and Midway attractions. Around 67 million guests visit Merlin Entertainments' attractions each year. SEA LIFE is a brand of Midway attractions, and has 50 aquaria and two sanctuaries for marine creatures (ME, 2021). SEA LIFE Kelly Tarlton's Aquarium also works with the SEA LIFE Trust, a registered charity of Merlin Entertainments. The aquarium is also a member of Zoo and Aquarium Association Australasia (ZAA) and has a Qualmark accredited EnviroGold certificate.

There are 11 exhibit zones at the aquarium: Scott's Hut is the first exhibition visitors come to as they enter the aquarium, and represents life in the coldest areas 100 years ago. Opposite Scott's Hut, visitors enter the Antarctic Ice Adventure zone, where New Zealand's only colony of sub-Antarctic penguins are living and breeding. Out of this chilly zone, children can spend time creating colourful fish in the Amazing Creation zone, where one of New Zealand's unique species lives – the tuatara.

Visitors then enter an open space, where they can rest or listen to talks by the aquarium staff. This open area is surrounded by a small food bar, Rockpools, Turtle Bay, and Shipwreck Shores. The Rockpools are shallow tanks where visitors can touch some creatures under the guide of aquarium experts. The Turtle Bay is a large tank, where rescued sea turtles live before being released back to the ocean. On the wall opposite the Turtle Bay tank, are interactive activities to enable children to experience turtle protection. Shipwreck Shores is an indoor playground with soft and safe facilities, and a tank of clownfish.

Travelling through the Turtle Bay area, visitors can stand on a conveyor belt and explore the Shark Tunnel and Shipwreck Discovery zones created by Kelly Tarlton. Sharks, rays and other large fish live here, providings visitors with an undersea scape. Beyond the tunnel is the NIWA (National Institute of Water and Atmospheric Research) Southern Ocean Discovery zone, which shows the cold and magic environment of the southern ocean, with a giant squid specimen, jellyfish, and king crabs. Seahorse Kingdom is located in a separate exhibition room, where some fascinating seahorse are on display. The Fish Gallery Zone connects the tunnel, Seahorse Kingdom and the exit gift shop. Within the gallery, various tanks are used to raise different fish, crabs, octopods, and freshwater species of longfin eel.

Many activities allow visitors to have in-depth experiences. Firstly, the aquarium provides talks and feeding times for visitors: penguin talks, shark talks, turtle talks, and fish gallery feeding talks. Two distinctive experiences are also provided to the public, albeit with limited places: shark cage diving and penguin enclosure visiting. Additionally, the aquarium provides a birthday party service.

Working with the SEA LIFE Trust, SEA LIFE Kelly Tarlton's Aquarium also participates in conservation work. Besides rescuing and releasing sea turtles, the aquarium organises beach clean up activities. As with Auckland Zoo, SEA LIFE Kelly Tarlton's Aquarium provides diverse learning opportunities for students from preschool to tertiary education level, on topics such as habitats and adaptations, food chains and ecosystems, conservation, and Antarctica. In addition, it operates holiday programmes for school children and guided tours for the public. Overall, SEA LIFE Kelly Tarlton's Aquarium provides recreational, educational, and conservation experiences for Auckland's citizens and visitors.

3.4   Data collection

Data collection for this research was conducted in three phases from March to June 2021. First, the researcher went to Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium multiple times, photographing interpretive materials available to the public. Second, web pages from the official websites of the two institutions were captured and saved in Word documents. Third, visitor reviews on the two attractions on TripAdvisor

were captured and imported into Excel files. This section introduces the specific procedures of data collection for this research.

3.4.1   Interpretive materials at the zoo and aquarium

3.4.1.1 Data from Auckland Zoo

The researcher visited Auckland Zoo five times after 4th April 2021, to collect data on interpretive materials at the zoo. Due to the large land area and for family reasons, the researcher photographed target materials in different exhibition areas four times using a smartphone. Pictures of various interpretive materials were collected, such as panels, signs, banners, screens, on-wall interpretations, and interpretive interactive activities. After visiting the zoo for the fourth time, 554 pictures had been collected as raw data, covering all textual and visual interpretive materials available in the zoo. Then the researcher checked the raw data, deleted duplicate pictures, and examined the quality of the pictures that were unclear. The researcher visited the zoo again on 22nd April to rephotograph the materials in the unclear pictures and walk along all the paths in the zoo to check for any missing data. Finally, 493 pictures were confirmed as data in this research phase. The researcher divided the pictures into 13 folders according to the exhibition areas of the zoo. Examples of the pictures are presented in Figures 6 to 9.

Figure 6 *Interpretive Panel in the Africa Track, with Information About the Common Ostrich*

Figure 7 *Example of an Interactive Interpretive Panel*

Figure 8 *Example of Display Boards*

Figure 9 *Example of On-Wall Interpretations*

3.4.1.2 Data from SEA LIFE Kelly Tarlton's Aquarium

The researcher visited Sea Life Kelly Tarlton's Aquarium twice to collect data for this research. The main collection was conducted on 28th March 2021, when the researcher walked along the visiting routes of the aquarium and took photographs of the interpretive panels, banners, walls, and other materials, using a smartphone. For some electronic panels, the researcher needed to press the buttons to take photos of each sub-page. The number of pictures collected was 277. Then, the researcher examined the raw data and deleted duplicate photos. As the aquarium had replicated panels around some big enclosures to provide sufficient access for visitors, only one copy of repeated content was collected, to avoid repeat analysing, but notes were made about them for future potential discussion. The researcher also examined the quality of the data to ensure the text was clear enough for analysis. The researcher went to the aquarium again on 11th April 2021, to check for any omitted interpretive materials. After these procedures, 248 pictures were confirmed as data for this research. To assist in the analysis, the pictures were grouped into 15 folders according to the exhibition zones of the aquarium. Figures 10 to 13 present examples of the collected pictures.

Figure 10 *Example of Display Boards*

Figure 11 *Example of Electronic Panels*
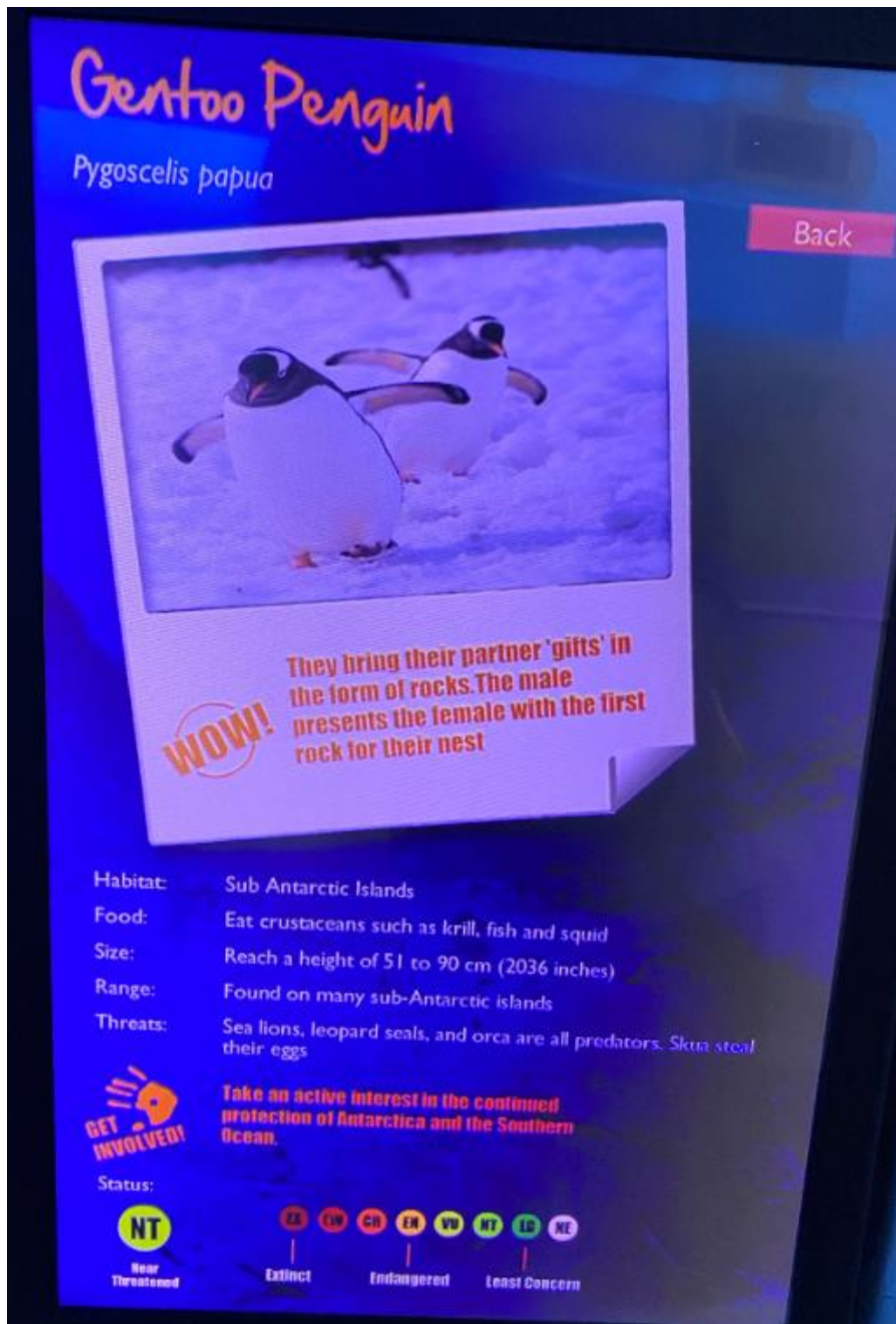
Figure 12 *Example of Banners*

Figure 13 *Example of On-Wall Interpretations*
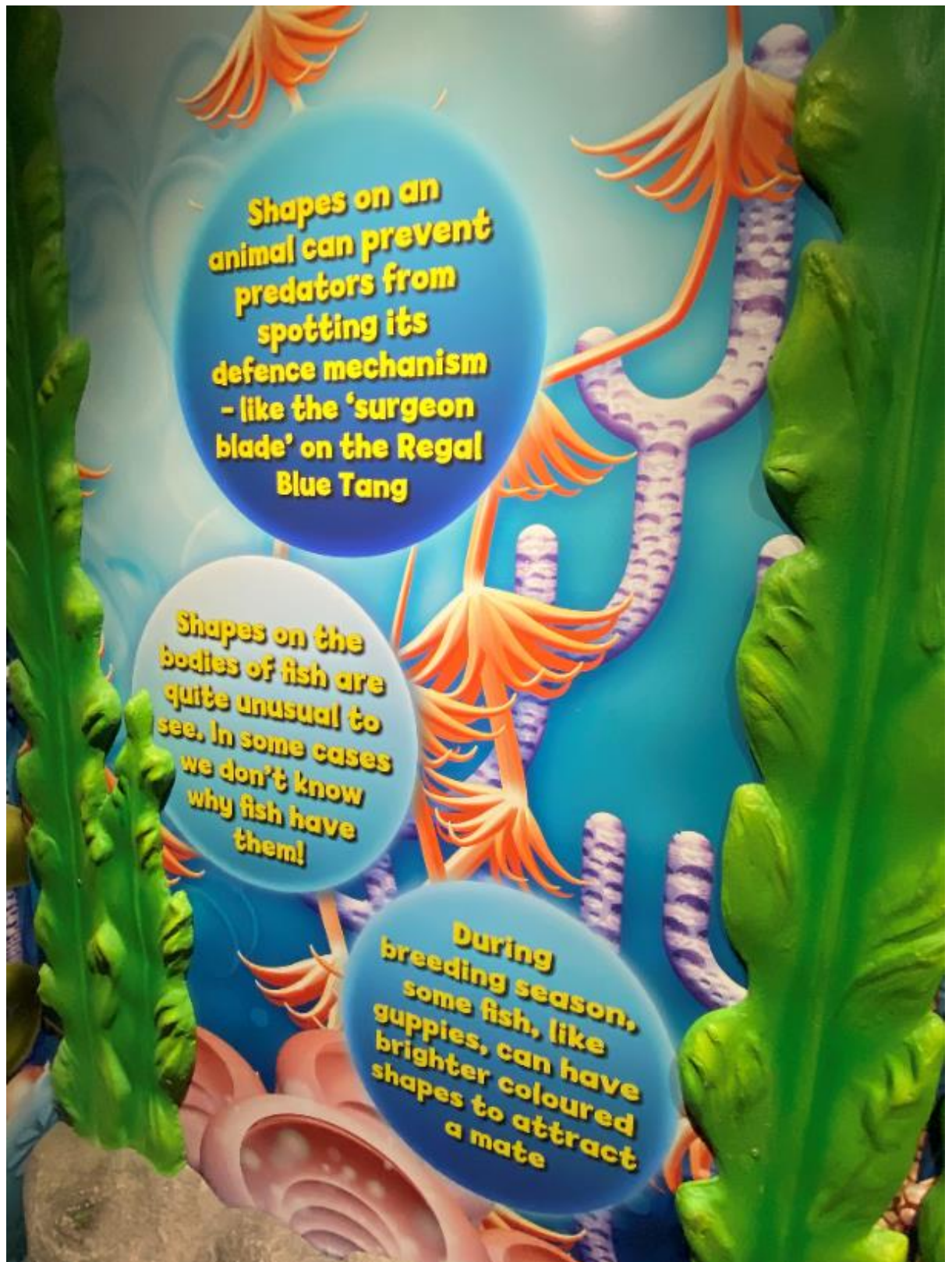
3.4.2 Data from official websites

Data from the official websites of Auckland Zoo and Sea Life Kelly Tarlton's Aquarium were collected manually from 29th May to 2nd June 2021. At first, the researcher tried two procedures to collect these data: one was through the print and save function of the browser, and the other was using Ncapture in the NVivo program, both of which could save web content as portable document format (PDF) files. However, many of the PDF files had a problem in which texts from different modules on the same page superposed each other, rendering the text unreadable. As textual information was the most important target in this research, the researcher decided to conduct a traditional method using the select, copy and paste method to transfer data into Word files. This method also allowed the researcher to add texts, which can show only after a click on the buttons, in the same file.

The researcher collected data from every available page, except news pages, from the official websites through hyperlinks. Some PDF files, such as maps and educational materials, available on the websites are also downloaded directly as data files. But if the hyperlink links to an outside website, the data will not be collected. Each page on the official websites was saved in one Word file. To organise the data more effectively, the researcher names the files with numbers and main information. In total, data from the website of Auckland Zoo are stored in 119 Word files and 41 PDF files; and data from the website of Sea Life Kelly Tarlton's Aquarium are collected in 48 Word files and 31 PDF files.

3.4.3 Data from TripAdvisor

Visitor reviews on Auckland Zoo and Sea Life Kelly Tarlton's Aquarium on TripAdvisor were the third target data set. The data were collected semi-manually with the assistance of Web Scraper, a small developer tool. Although the researcher tried some other programs for collecting these data, the results were not satisfactory, and the bugs could not be solved in a limited time. Fortunately, the amount of data required was not too great for the use of a semi-manual method.

Six steps were followed for collecting these data: firstly, Web Scraper was installed in a Google browser, then a Sitemap with two selectors was created in Web Scraper (see Figure 14). Thirdly, the target page was browsed, and the "read more" button clicked

manually (see Figure 15). Fourthly, the "data preview" button in Web Scraper was clicked to see reviews on the current page (see Figure 16), and fifthly these previewed data were copied and pasted into an Excel file manually. Finally the "next page" button was clicked to repeat the data collection processes. This semi-manual method also allowed the researcher to check data whenever necessary.

Consistent with the aims of this research phase, only the reviewers' screen names and the contents of the reviews were collected. The research collected reviews written between 1st January 2018 and 1st June 2021. Data collection was conducted on 1st June 2021. Finally, 584 visitor reviews on Auckland Zoo and 644 visitor reviews on KT were collected as data for this research.

Figure 14 *Site Map Created with Web Scraper*
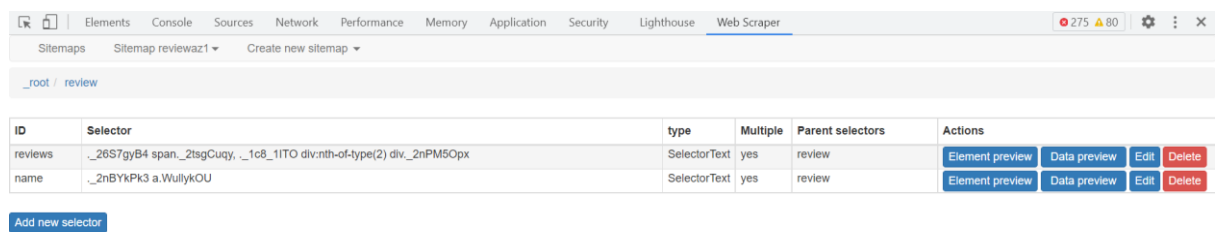
Figure 15 *The "Read More" Button on TripAdvisor*

Figure 16 *Sample of the "Data Preview" Function*
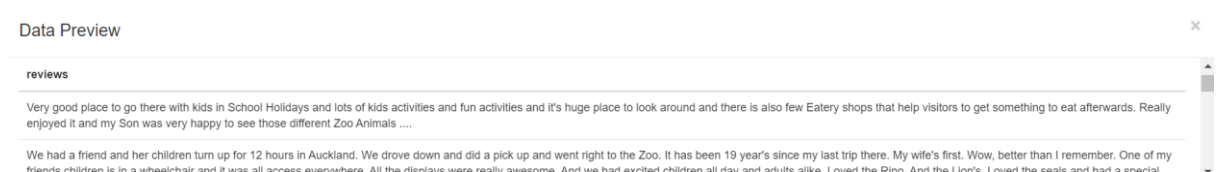
3.5   Data analysis

Three different analysis methods were conducted to analyse data from three different origins, as explained in Sections 3.2.4. This section first explains the specific analysis methods and processes, then describes the utilisation of NVivo data management software in assisting with the analysis process.

3.5.1   Analysing interpretive contents from Auckland Zoo and Sea Life Kelly Tarlton's Aquarium

To analyse the interpretive data from the Auckland Zoo and Sea Life Kelly Tarlton's Aquarium, this research adopted a manifest qualitative content analysis method. This section briefly introduces content analysis, and identifies the differences between qualitative and quantitative content analyses, manifest analysis, and latent analysis. It also explains the reasons for the selection of the method. In addition, the specific analysis procedures of qualitative content analysis are explained, followed by the application of the analysis methods in this research phase.

3.5.1.1 Manifest qualitative content analysis and rationale

Content analysis is "a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use" (Krippendorff, 2019, p. 24), and is broadly applied in both the social and natural sciences. There are two types of content analysis, qualitative and quantitative (Bengtsson, 2016). Although the types of data used in both qualitative and quantitative content analyses are the same, their emphases are different: a qualitative content analysis explores the meaning of the empirical data, while a quantitative content analysis tends to calculate the numerical aspects of data, such as frequency, direction, intensity, and space (Jennings, 2010; Neuman, 2014). The reasoning approaches of qualitative and quantitative content analyses are also different, with the former preferring an inductive approach and the latter entailing a deductive approach. In a qualitative content analysis study, categories or taxonomies are created from the data (Dey, 1993; Jennings, 2010), and there is no hypothesis. In quantitative content analysis research, categories and codes are generated based on existing theories, and a hypothesis is necessary. However, it has been argued that the separation between qualitative and quantitative content analysis is unnecessary,

as both textual presentation of the findings and the statistical results of the codes or themes can contribute to the research (Krippendorff, 2019; Lune & Berg, 2017).

This study adopted the concepts of the qualitative content analysis method for four reasons. Firstly, a qualitative content analysis fitted the interpretive research paradigm, as discussed previously. Secondly, this research phase aimed to explore the information provided by the zoo and the aquarium to the public, which emphasised the content rather than statistical issues, thirdly, the categories of contents of data were important in this phase, since they contributed to understanding the information that had been provided. Fourthly, an inductive approach without a hypothesis suited this study well, because pre-determined coding was unlikely to include all aspects of the information provided by the zoo and aquarium, whereas the openness of qualitative content analysis allowed for the analysis of materials without prejudice or omission. However, the researcher agreed with Lune and Berg (2017), who noted that research can employ some statistical findings in the codes or categories to present content proportions of the data.

Content analysis can be classified into two types: manifest analysis and latent analysis. *Manifest analysis* refers to searching for obvious meanings in the data, whereas a *latent analysis* tries to find less overt meanings behind the data. As Bengtsson (2016) argued, manifest analysis aims to describe what was said, whereas latent analysis interprets what was intended to be said. Compared with latent analysis, manifest analysis adopts a surface structure and is closer to the original expressions, which avoids the need for excessive interpretation. There is no difference between the processes used in manifest analysis and latent analysis.

There were two aspects of the rationale for choosing the manifest analysis concept: the characterstics of data in this phase were simple interpretive information from the zoo and the aquarium with little implicit meanings, and the aim was to answer the research question of "what contents of conservation education have been provided to the public in zoos and aquaria?" which did not require much in-depth interpretation. Therefore, manifest qualitative content analysis met the requirements for analysing interpretive data gathered at Auckland Zoo and Sea Life Kelly Tarlton's Aquarium.

3.5.1.2 Procedures

This research conducted the four step procedure of content analysis from Bengtsson (2016).

Decontextualisation also refers to open coding, which suggests the segmentation of materials into small meaning units containing useful information for answering the research questions. The meaning units are labelled with codes. As Gray (2018) explained, in an open coding process, data are broken down.

Recontextualisation means the rereading of the materials to make sure all aspects of the necessary information have been coded.

Categorisation refers to dividing codes into domains, which are groups of broader contents according to the research topic. The results of this step can be named as categories or themes in manifest analysis and latent analysis respectively. This research used categories and sub-categories, consistent with the labels used in the manifest analysis method.

Compilation is the last step, and serves as a bridge between the data analysis and the presentation of findings. It also reflects the researchers' role in the analysis process and their adaptation to the results, a significant characteristic of various qualitative analysis methods. In choosing the materials to be presented in the finding section, a manifest researcher refers back to the original content and stays as close as possible to the original meanings and background.

3.5.2   *Analysing data from official websites*

This research applied a reflexive thematic analysis method to study data from the official websites of Auckland Zoo and Sea Life Kelly Tarlton's Aquarium. This section introduces thematic analysis and its three branches and explains the reasons for choosing reflexive thematic analysis in this research phase. Additionally, it describes the six steps of the reflexive thematic analysis method from Braun et al. (2019), and their application in this research.

3.5.2.1 Reflexive thematic analysis and rationale

Thematic analysis is a qualitative analysis method that searches for themes or patterns in textual data, and can work with different epistemologies (Braun & Clarke, 2006). Thematic analysis has been conducted in different disciplines and has been popular over the past decade. However, Braun and Clarke (2006) argued that thematic analysis has been a broadly used and inadequately defined method. It is an umbrella term embracing three schools of different thematic analysis methods: coding reliability, reflexive, and codebook thematic analyses (Braun et al., 2019).

The coding reliability approaches conduct qualitative methods according to positivist logic, in which the themes are usually abstracted as domain summaries to drive the coding process. In these approaches, themes are both inputs and outputs of the coding process and researchers of this school pursue a reliable data coding process. Coding frames are usually used to guide the process, and themes are often extracts from the original texts. Reflexive approaches adopt a fully qualitative philosophy, and can be used with interpretivism or critical theory. The themes of reflexive thematic analysis are meaning based, and outputs of considerable coding work. Coding is an open process without a pre-determined codebook or coding frame, so codes can evolve throughout the coding procedure. This open interactive process relies on the involvement of the researches and allows for an in-depth interpretation of the data. Theme development in a reflexive thematic analysis does not emphasise the accurate presentation of the original data, but goes below the surface to seek implicit or unexpected meanings. Codebook approaches are in the middle ground between the other two approaches. They have a similar coding process to that of the coding reliability approach, in that a coding frame is created before the coding process and the themes are considered to be summaries of the content. Codebook approaches are not the same as those of the reliability of analysis process, but allow for the engagement of the researcher and the flexibility to interpret the meanings, and are therefore more pragmatic (Braun & Clarke, 2019; Braun et al., 2019).

Reflexive thematic analysis was considered a suitable method for analysing data captured from the official websites of the zoo and the aquarium for four reasons. Firstly, the reflexive thematic analysis would work with the interpretive paradigm followed in this research. Secondly, a coding frame could not be created in advance, as little

research had been conducted in this domain, as discussed in the previous chapter. Thirdly, research questions for this phase required profound interpretations of the data. Research using these data sets aimed to find out "… the organisational missions and functions of zoos and aquaria," and "what conservation work has been conducted by those zoological gardens". These questions required a flexible and searching procedure without predetermined meaning, so the researcher had an important role in the analysis process. Fourthly, data of this phase, the content from the official websites, were long enough and rich enough in meanings to allow in-depth interpretation. Therefore, reflexive thematic analysis matched the constraints of analysing articles from official websites of Auckland Zoo and Sea Life Kelly Tarlton's Aquarium and could assist in answering the research questions.

3.5.2.2 Procedures

This research phase followed the six step process of thematic analysis from Braun and Clarke (2006).

Familiarisation with data is the first step, and requires the researcher to be immersed in the data and familiar with the depth of the content. Although is a time consuming job, it serves as the foundation for the following steps. Making notes and thinking ideas for coding are suggested in this step.

Generating initial codes begins once the first step has been completed. Codes reflect a characteristic of the data relating to the analysis questions and are basic elements of the raw materials. In data driven thematic analysis, the themes depend on the codes. Therefore, ensuring all authentic data extracts are coded and collected within each code is crucial. In addition, there are three tips for this step: code as many themes as possible; code a little of the surrounding text, to keep the code in its context; and code one segment of data in as many themes as possible without concern for possible contradictions between the codes.

Searching for themes required sorting the codes identified in the previous step, into potential themes. A theme captures something important about the data in relation to the research question, and is on a broader level than are codes. Two tips are suggested for this step: use a mind map to understand the relationship between themes, and set up a

theme called "miscellaneous" to temporarily hold the codes that cannot be sorted into themes. At this step, candidate themes and sub-themes are identified.

Reviewing themes includes two levels of refining the themes. The first level requires reading all the collected codes for each theme to make sure they form a consistent pattern, and the second level involves thinking about the validity of the themes and the thematic map relating to the original data as a whole. During this step, some themes without sufficient supporting codes are removed, while other themes with similar meanings might be combined into one theme. New themes and new codes are acceptable during this step to form an organic coding logic. As a result of this step, suitable themes, their inter-relationships, and the relationships between themes and the whole data set should be clear and coherent.

Defining and naming themes means identifying the essential meanings of the themes. Each theme needs to be analysed in detail, to identify the story that each theme tells, and the relationships between the themes and the research questions. Sub-themes can be helpful as well, to represent the hierarchy in the data and provide structure for a complicated or large theme. Accurate definition of themes means that the researcher can describe the scope and content of each theme with a few sentences, and what is included in the themes or not are clearly presented.

Producing the report is the last step of a thematic analysis, and refers to the writing up of the report. Choosing the most vivid examples to demonstrate the themes is essential in this step.

3.5.3   Analysing data from TripAdvisor

This research adopted the netnographic method to analyse visitor reviews on TripAdvisor, after their visits to Auckland Zoo and Sea Life Kelly Tarlton's Aquarium. This section discusses the definition and characteristics of netnography and explains the rationale for conducting netnography in this research phase, describing the steps of a netnographic analysis process from Kozinets (2020).

3.5.3.1 Netnography

Netnography is a relatively new research methodology, which emerged because of the abundant social media development. According to Kozinets (2020), *netnography* is a

type of qualitative research devoted to comprehending the cultural practices reflected in the threads and structures of social media. Although netnography is treated as a type of ethnography, it is not simply ethnography through online methods or digital anthropology, both of which stress the usage of digital technology to investigate in culture studies. The employment of digital technology in ethnography research can include conducting interviews online, and digital anthropology can be used (for example) to investigate the effects of using smartphones during family dinners. Such studies are related to online material, but do not use social media threads as research data. Therefore, collecting data from social media threads constitutes one of the most used features of netnography. Hence, the definition of social media is significant to understanding netnography. Kozinets (2020) argued that *social media* includes applications, websites, or other online tools that provide services allowing their users to be involved in various content creation, communication, and annotation activities.

Although netnography could be seen as a unique method, it shares some important perspectives with ethnography as a qualitative research method. Firstly, it stresses the understanding of human experience and society and secondly, it appreciates the context of the individuals' daily lives. Thirdly, netnography focuses on social organisation with shared meaning, and lastly, it requires the researcher's involvement and self-awareness.

The reasons this research phase adopted a netnographic method had two aspects. Firstly, the data set for this phase met the requirements of netnographic data types; as stated, visitor reviews on TripAdvisor are threads on social media, which is the target data of netnography. Secondly, the qualitative perspectives of netnography allowed the researcher to interpret the visitor reviews on Auckland Zoo and Sea Life Kelly Tarlton's Aquarium within their cultural contexts. This helped to understand the meanings within the fragmented content created by network users and the value of the researcher's work, which fits the aim and the philosophy of this research phase.

3.5.3.2 Procedures

This research phase employed the five steps of netnography from Kozinets (2020), as follows.

Collating prepares data for the next step, coding. Since online threads can be in different formats, assembling them into a codable form is important. Three sub-steps are

suggested to accomplish the collating progress. Firstly, filtering requires the researcher to decide what data will be coded; secondly, formatting allows the researcher to choose a suitable form for storing the data for coding; and thirdly, filing means to arrange the data into different files on behalf of different sites or topics.

Coding in netnography refers to breaking data into small meaningful segments and labeling them, as in other qualitative research. It is the essential part of the analysis process and can contribute to the development of theory. This step also empowers researchers to explore patterns of the dataset.

Combining organises related codes into higher level elements, naming each as a pattern code. Merging of codes also leads to the emergence of essential patterns and structures. This process assists in answering the research questions and discovering research findings. Some codes cannot be combined, so the most significant task in this step is to generate comprehensive conceptions.

Counting, as a quantitative tool, can also contribute to qualitative research, which accepts that researchers make comparisons between the identified or pattern codes. There are two reasons to support counting as a useful tool in netnography. Firstly, counting is usually employed in content analysis research, which indicates that it is acceptable to count data in qualitative research, and secondly, data in online threads may form a larger amount than does other qualitative data, such as interview data, so requires counting to explore the patterns and compare the elements. Furthermore, some quantitative informal words can take the place of numbers or percentages in qualitative research, for example, "more," "frequently," "decrease," etc.

Charting is the last step, and describes the methods used to present the findings. Visualisation can help explain the findings of a netnographic study more clearly. The results of charting might take various forms, such as tables, maps, charts, networks, or word clouds.

3.5.4   NVivo assisting the analysing process

NVivo is a software program that can assist with the coding process of qualitative data, and useful for presenting findings (Gray, 2018). This research employed the newest version of NVivo, which was released in 2020. As Gray (2018) argued, NVivo is not a

magical tool that can produce results automatically. However, it had an irreplaceable role in the analysis process of this research, for three major reasons. Firstly, NVivo can import and analyse various types of files, such as Word, PDF, Excel, and files in the form of pictures and videos. Data for this research had three origins and were stored in different file types. For the first phase, textual data were collected at the zoo and aquarium in the form of pictures, and as NVivo supports coding of pictures, the time needed to transcribe the data into text was saved. In the second phase, PDF and Word forms of content from the official websites were coded in one project without any problems. In the third phase, NVivo assisted in coding the abundant data that was stored on Excel files.

Secondly, NVivo allowed the researcher to code one sentence into different codes, offered more advantages than did manual coding. In the manual coding process, codes are often marked by highlighting in different colours, so it becomes difficult to distinguish more than one highlighting colours on the same sentence. However, with the help of NVivo, researchers can code one sentence into several different codes without any confusion, as the codes are stored in systematic approaches. Thirdly, NVivo supports the classification and inquiry of codes, nodes, and cases, which assists in the analysis process. By classifying the codes, nodes and cases, NVivo allows inquiries into specific codes or cases, and presents the content that has been coded. These functions help researchers explore general themes in the data and make comparisons between different data sets or cases. Therefore, the NVivo software made a valuable contribution to the analysis of this complex project.

3.6   Trustworthiness of this research

Reliability and validity are the most important issues in both quantitative and qualitative research. Due to the different characteristics of the two research paradigms, reliability and validity have been replaced by trustworthiness, authenticity, and goodness of fit in the context of qualitative studies (Jennings, 2010). This section discusses the trustworthiness of the research process under three categories: data collection, data analysis, and the fitness of the whole project.

Firstly, secondary data contributed to the trustworthiness of this research and avoided the effects from researchers or the studied programmes on participants. The research

had three data resources: interpretive materials at the zoo and the aquarium, their official websites, and visitors' reviews on TripAdvisor. All provided secondary data, which were created for their own purposes, and not for this research. Therefore, the data were objective, as the creators of the data did not have the opportunity to fabricate data due to some moral or other interest, which commonly happens in interview and questionnaire methods.

Secondly, this research employed three measures to guarantee trustworthiness in the analysis process. Following scientific analysis procedures was the first measure. As explained in the data analysis section, three specific analysis processes for three different phases guided the analysis along the right path. Respecting the original data throughout the coding process further contributed to trustworthiness. Although qualitative research requires the involvement of the researcher in the analysis process, the researcher's interpretation should not deviate from the intention of the data. This researcher was cautious about this issue during the research process. Furthermore, keeping records on the process of coding and interpreting for retrospective and further checks, ensured that the analysing process was transparent, contributing to the trustworthiness of this research.

Thirdly, the fitness of this research was supported in two ways. Firstly, the data choices fitted the research questions of this research, as explained in Section 3.2.3, on data sources and rationales. Secondly the data analysis methods fitted the characteristics of data in this research, as explained in Section 3.2.2, on data analysis design. Supported by the guidance of the supervisor, these three measures helped to provide a trustworthy qualitative study.

3.7   Limitations

Two main limitations were identified in this research: the sampling of the data, and the researcher's unfamiliarity with new software. Targeting more data may increase the validity of qualitative research, however, due to the time restriction of this project, some data were excluded. Due to the time limitation, video interpretations at Auckland Zoo and Sea Life Kelly Tarlton's Aquarium were not included in the data collection process. Similarly, videos and news on the official websites were also excluded. Moreover, this research collected visitor reviews of these two attractions only from TripAdvisor,

although there are other online tourist platforms. Since time was limited, the researcher had to choose the core data which could answer the research questions. In future research, other materials could be analysed to underpin and enhance the findings of this research.

3.8 Chapter summary

This chapter presented and justified the methods used in this research. It begans with a discussion about the philosophical perspectives of the research, which were the interpretivist paradigm, a relativist ontology, and a constructivist epistemology. Then, the research design was explained briefly, including the research questions, qualitative methodology, data sources and rationale, and the data analysis design. The two selected research sites, Auckland Zoo and Sea Life Kelly Tarlton's Aquarium, were also introduced, followed by a description of the data collection and data analysis process. Data collection and analysis research was conducted in three phases: firstly, interpretive data at the zoo and the aquarium were collected and analysed following the manifest qualitative content analysis method; secondly, data from the official websites of the institutions were collected and analysed with the reflexive thematic analysis method; and thirdly, visitor reviews of the two attractions on TripAdvisor were collected and analysed following the netnographic process. At the end of this chapter, the trustworthiness and limitations of this research were also discussed.

Chapter 4.   Findings

4.1   Findings from interpretive materials

Interpretive materials are important media that convey information from attractions to their visitors. This section presents the contents of interpretive materials at Auckland Zoo and Sea Life Kelly Tarlton's Aquarium and provides basic information about what was provided to visitors through interpretive materials at the zoo and the aquarium.

4.1.1   Categories of the contents of interpretive information at Auckland Zoo

At Auckland Zoo, an abundance of interpretations is delivered to visitors. Although the types, styles, and emphases of the interpretation panels vary between different exhibition zones, they can be categorised according to the content of the textual information. In general, six categories of contents were identified: biological knowledge, knowledge about animal habitats and ecosystems, Māori culture, conservation information, information about the zoo and its work, and visitor information. The proportions of the content in the six categories were uneven, as seen in Figure 17. Biological knowledge was the most dominant category of Auckland Zoo's interpretations, and codes in this category occupied nearly half of the interpretation content. Conservation information and information about the zoo and its work were also important components of the interpretations. Visitor information was considered a vital part, providing promotions, locations, and timetable information to visitors. Knowledge about ecology and Māori culture, as supplementary knowledge, enriched the interpretation content of Auckland Zoo.

Figure 17 *Categories of Contents of Interpretive Materials at Auckland Zoo*
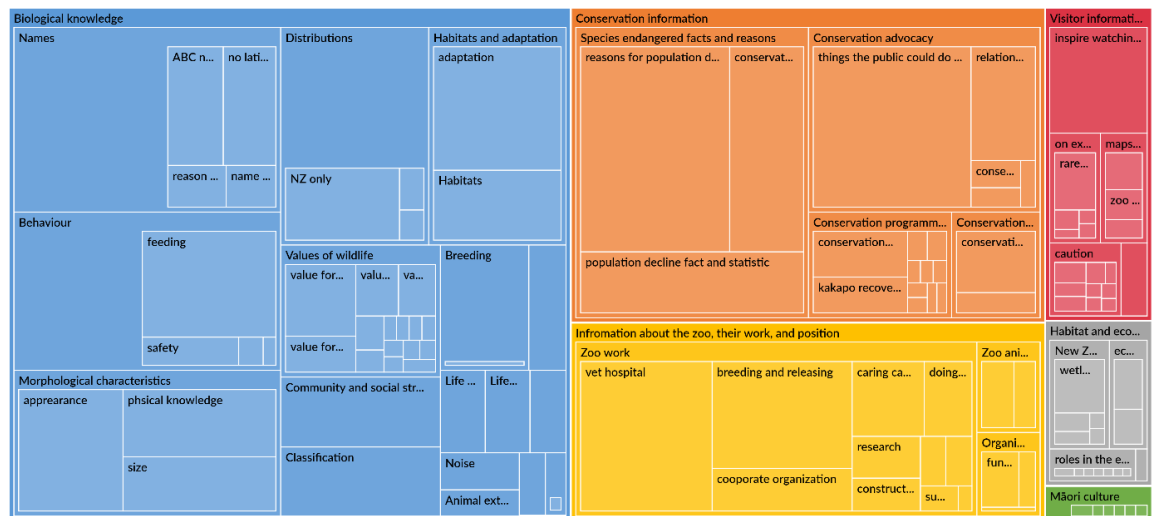
4.1.1.1 Category Z1: Biological knowledge

Biological knowledge was the dominant content in interpretations at the zoo, and included names, distributions, classifications, physical features, habitats and adaptation, behaviours, and values. There was no fixed structure for species interpretation panels at the zoo, (see Figure 18). Most of the panels provided the names of the wildlife, their distributions, and some distinctive features.

Figure 18 *Hierarchy of the Category of Biological Knowledge*
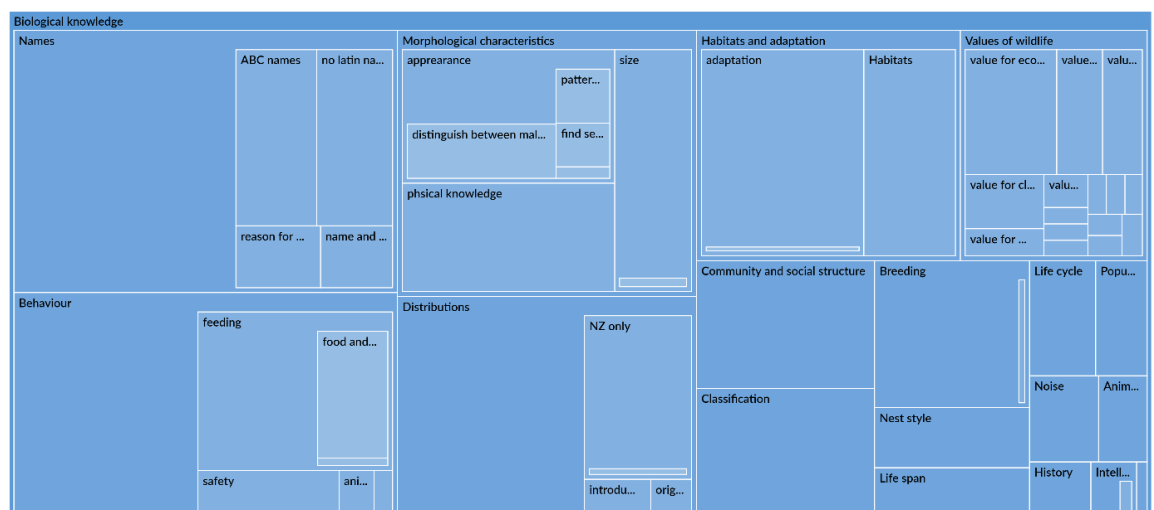
Sub-category Z1-1: Names

Names, with large font sizes, were usually the most striking on interpretive panels (see Figure 19). Most panels about overseas animals addressed both English (common)

names and Latin (scientific) names, as Figure 19 shows. However, panels about many native species did not include Latin names but provided Māori names (see Figure 20). Additionally, some interpretations explained the reasons for naming the species. There were also walls around the construction area, on which were presented animal names in the order of capital letters.

Sub-category Z1-2: Distributions

The distribution of wildlife was another major sub-category in the content of interpretive materials of Auckland Zoo. A vast majority of the panels referring to individual species included information about their distribution around the world. Some of the distribution information was provided as a map (see Figure 21), while others were textual. Species endemic to New Zealand were emphasised, for example, "*The brown teal, or Pāteke, is found only in New Zealand.*"

Figure 19 *Interpretation About Servals*
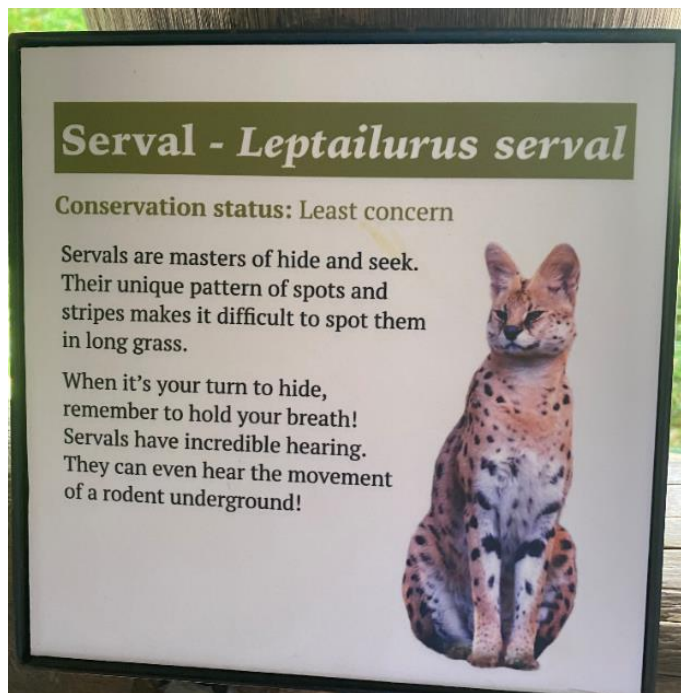
Figure 20 *Interpretive About Lizards*

Figure 21 *Interpretation About Ostriches*

Sub-category Z1-3: Morphological characteristics

Besides names and distributions, Auckland Zoo selected different aspects of the impressive features of wildlife to display on the interpretive panels. Morphological characteristics are the appearance and physical features of wildlife. Interpretations in this domain were mainly classified into three groups of appearance, physical knowledge, and size. Physical knowledge information presented the body and organs of wildlife, such as presented in Figure 22. Size showed the height, weight, or length of the

wildlife, and was a common feature addressed in interpretations, for example, "*Male American alligators can grow to be 4.5m and nearly 500 kgs.*"

Figure 22 *Interpretation About the Body of Leopard Tortoises*
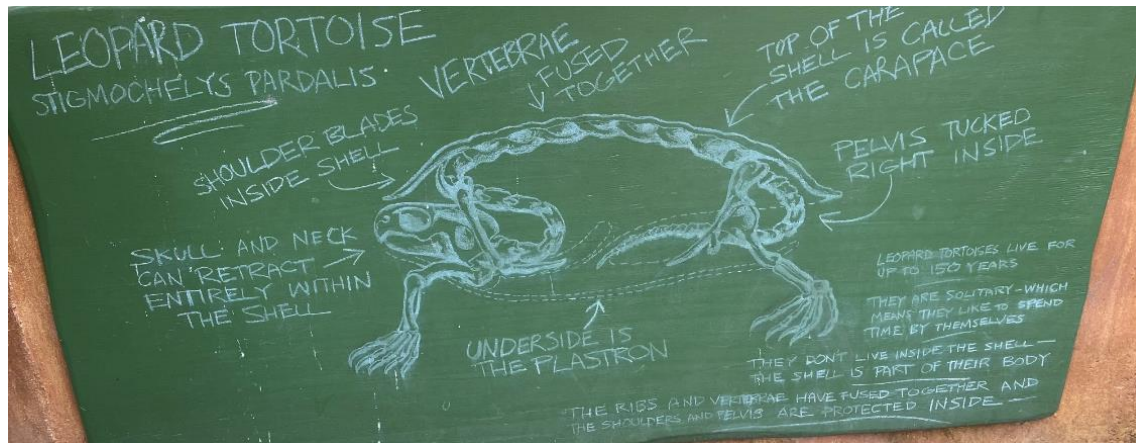
Sub-category Z1-4: Behaviour

Animal behaviours such as their sleeping, hunting, defending, and other behaviours were also described, as seen on the panel inside the kea's (*Nestor Notabilis*) enclosure: "*They have the reputation for investigating new things by pulling them apart, and are particularly fond of wiper blades on cars.*"

Sub-category Z1-5: Breeding

Breeding could also be classified as a kind of behaviour, however, this research considered it as a sub-category, so relevant information other than breeding behaviour could be included. An example referring to the tuatara (*Sphenodon punctatus*) incubation temperature was "*The sex of the young depends on the soil temperature where eggs are laid.*"

Sub-category Z1-6: Habitats and adaptation

A habitat is the environment animals live in, and adaptation is how animals adapt to their environment. Interpretations related to these two sub-categories were provided on the panels of some species. For example, "*In the summer when their water dries up, black mudfish burrow into the soil and go into a state of dormancy similar to hibernation. They stay there motionless, breathing air until autumn rains come.*"

Sub-category Z1-7: Values of wildlife

Auckland Zoo also provided some information about the values of wildlife to visitors. Values of wildlife can be considered from both the aspects of the ecosystem and of human society. Some interpretations reflected the truth that each species has its significance in the ecosystem. Some other codes were related to the values of wildlife in various domains, such as their usage for foods, fabrics, medicine, and research values for bionics and cancers.

Sub-category Z1-8: Other biological knowledge

Other biological knowledge included a variety of characteristics about wildlife, such as the classification, communication and social structure, life span, life cycle, noise, intelligence, history, population, nest style, and some extreme features of the animals. Codes of these sub-categories were significantly fewer than were the codes of other sub-categories.

4.1.1.2 Category Z2: Conservation information

"Conservation information" was the second largest category in the content of interpretation materials at Auckland Zoo, although the number of codes was only about half that of the first category. Figure 23 shows the four sub-categories of this category: species' endangered facts and reasons, conservation advocacy, conservation history and achievements, and conservation programmes and methods. The first two sub-categories were the dominant contents in this category.

Figure 23 *Hierarchy of the Category of Conservation Information*
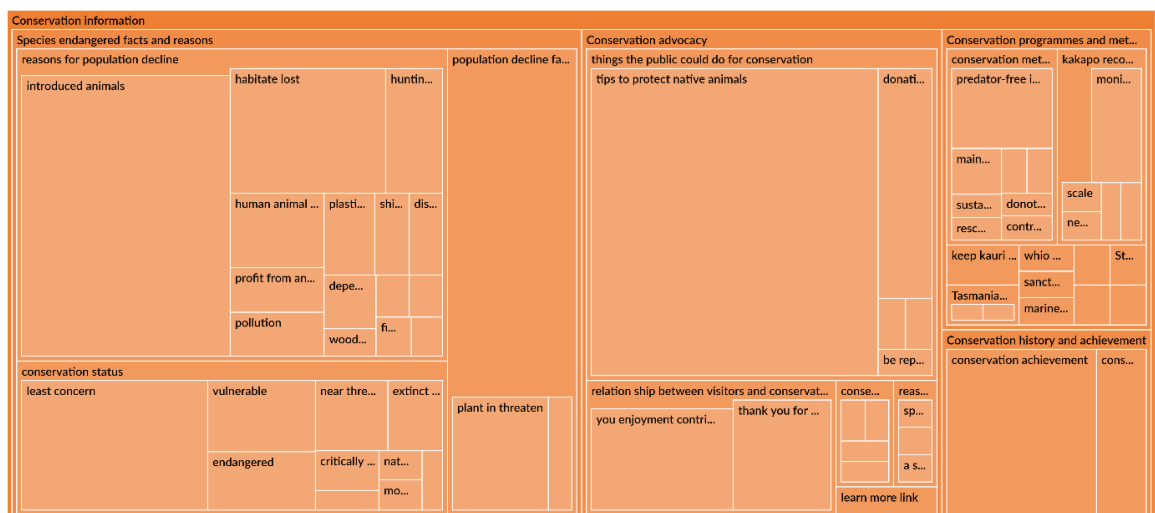
Sub-category Z2-1: Species' endangered facts and reasons

This sub-category includes three components that explain some reasons for the decline of wildlife population, present some facts and statistics about threatened wildlife, and indicate some species' endangerment levels. Multiple reasons could explain the population decline of wildlife, but the reasons for New Zealand native species being threatened were emphasised. Most contents related to reasons for wildlife population decline were provided in the Te Wao Nui area, which housed mainly native species. Introduced animals were cited as the most important reasons for the population decline of native species. Living on isolated islands such as New Zealand, with no native mammals, some birds and reptiles had evolved to lose the ability to defend themselves from mammal predators. When humans landed on the islands, they brought mammals and other pests, which soon became both predators and competitors for the food of indigenous species. Other human induced reasons affected species native to New Zealand and wildlife on other continents, such as habitat loss due to land use for city development or farming, pollution from factories, agriculture, and household waste, consumption of wildlife products, light pollution, and and traffic accidents. Panels at the Auckland Zoo also described a natural reason, infectious diseases, which led to the death of specific species.

Furthermore, the material presented facts and statistics about threatened wildlife. A typical example was found in interpretations about the kakapo (*Strigops habroptilus)*: "*Kakapos are one of the most endangered birds in the world with less than 160 birds remaining.*" Moreover, the conservation status indicated the risk of particular species becoming extinct, which is a common component on interpretation panels in zoos and aquaria. The Red List of the International Union for Conservation of Nature (IUCN, 2021) is the most accepted assessment system of conservation status worldwide. The Department of Conservation (DOC) of New Zealand has also created a national assessment system on the conservation status of plants and animals (DOC, 2021). Auckland Zoo did not include conservation status as a necessary element on interpretation panels of every species. Some panels adopted the IUCN status, as shown in Figure 24. Panels in the Te Wao Nui area interpreted the conservation status of native species according to DOC's system.

Figure 24 *Panel Referring to IUCN Conservation Status*

Panel Referring to IUCN Conservation Status

Sub-category Z2-2: Conservation advocacy

The interpretation contents of conservation issues related to the public were considered as a sub-category, "conservation advocacy." Auckland Zoo provided various tips to encourage visitors to practise conservation behaviour in their daily lives, especially in relation to native habitats and animals. However, most of the tips appeared only once during the visitors' trip around the zoo. For example, one panel suggested to "*Protect our shorebirds by keeping your dog off the dunes and leaving your vehicle in the car park*."

Donations to the zoo fund and other conservation organisations were explained as another way the public could contribute to conservation work. Inside Auckland Zoo, a few donation boxes were evident (see Figure 25), with a few sentences to encourage donations, such as "*Donate to the Auckland Zoo Conservation Fund*." Auckland Zoo also emphasised the importance of visiting the zoo for wildlife conservation work, stating that "*The more you visit the Zoo, the more we can do to conserve wildlife both here in Aotearoa and around the world, where help is needed most*."

Figure 25 *Donation Box At the Zoo*

Panels at the zoo also mentioned some reasons why the public should protect wildlife. A display board at the vet hospital explained that "*75% of new human diseases come from animals*," and animals' habitat lost through human development may cause contact between humans and wildlife, leading to the spreading of diseases from wildlife to human beings. A further reason for protecting wildlife was provided at the kea's (*Nestor notabilis*) enclosure, encouraging protection of keas because they are "*New Zealand's natural heritage*." There were also some conservation slogans, such as, "*We need to remember there are millions of us, and every little positive action we each take counts – there is enormous power in our collective efforts*."

Sub-category Z2-3: Conservation history and achievements

Signage at the zoo also provided information about the conservation history and achievements of some species, for example, "*Takahe were thought to be extinct until 1948…Since their rediscovery, intensive management …have all helped grow the takahe population*."

Sub-category Z2-4: Conservation programmes and methods

Interpretations at the zoo also provided brief information about some conservation programmes, such as the kākāpō (*Strigops habroptilus*) recovery programme, kākāriki

(*Cyanoramphus malherbi*) breeding and releasing programme, and the Tasmanian devil (*Sarcophilus harrisii*) breeding programme. Some specific conservation methods were also mentioned in the interpretations, such as the setting up of predator-free islands.

4.1.1.3 Category Z3: Information about the zoo and their work

At Auckland Zoo, there were also interpretations introducing the zoo and its work. Figure 26 illustrates the three sub-categories in this category: work of the zoo, organisational information, and zoo animals.

Figure 26 *Hierarchy of Codes of in the Category of Information About the Zoo and its Work*
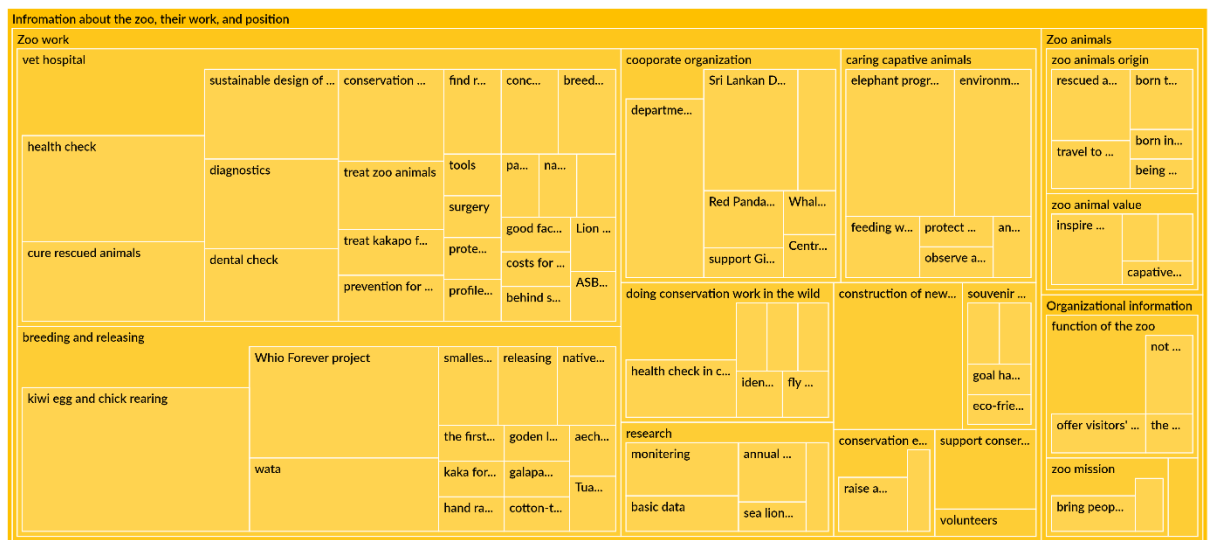
Sub-category Z3-1: Work of the zoo

Most codes in this sub-category explained the work undertaken by employees of the zoo. The work of the vet hospital occupied a large proportion of interpretations about the work of the zoo. The vet hospital undertook medical work for both zoo animals and animals in the wild, and it was claimed that the vet hospital at Auckland Zoo was *"the first national centre for conservation medicine in the world."*

Another important function of the zoo referred to the breeding of zoo and other animals for release. From the interpretations, visitors could learn that the zoo had successfully bred great flamingos (*Phoenicopterus roseus*), Galapagos tortoises (*Chelonoidis niger*), and some kinds of tamarins (*Saguinus).* Auckland Zoo also participated in the breeding and release programmes for some native species, such as kiwi (*Apteryx australis*), kea, tuatara,

and Archey's frog (*Leiopelma archeyi*). Some interpretations showed that the employees of Auckland Zoo were making significant efforts to care for the captive animals, such as providing special diets, and environmental and behavioural enrichment.

The zoo employees were also undertaking conservation work in the wild. Data on a display board (see Figure 27) showed that 60% of this time was spent on research, 28% was for species recovery, and 12% for pest control. Conservation education was also undertaken as part of some conservation programmes: *"Auckland Zoo and our devils are supporting this work (devil conservation) by telling their story as part of the Tasmanian Devil Ambassador programme."*

Additionally, information inside the souvenir shop at the zoo showed attempts to sell environmentally friendly gifts. Information about the construction of the new exhibition area for Asian species, currently in progress, was also provided.

Figure 27 *The Fieldwork of Zoo Staff*

The Fieldwork of Zoo Staff

Sub-category Z3-2: Organisational information

A few components of interpretation information were about the history, mission, and function of Auckland Zoo. The zoo's mission was expressed as, "*Auckland Zoo mission: To bring people together to build a future for wildlife.*" The zoo information also claimed that the zoo was the best place to learn about conservation around the world.

Sub-category Z3-3: Zoo animals

Some contents of the interpretation materials introduced the origins and values of zoo animals. Four kinds of origins were introduced: animals born in the Auckland or other zoos, those born in other programmes, those needing to be rescued from the wild, and those donated by private individuals. There were four values of captive animals mentioned in the panels: *"inspiring the community to value and better understand wildlife; providing the public with the opportunity to connect with wildlife; contributing to a global collaborative database for animal care and welfare; and a safeguard against possible extinction of wild populations."*

4.1.1.4 Category Z4: Visitor information

"Visitor information" refers to information the zoo provided for visitors. The main contents of this category included information inspiring viewing or imagination, information about exhibitions, warnings, timetables, and locations, and annual pass promotions. Information inspiring viewing or imagination appeared in some signage to inspire visitors to watch and think about species and their behaviours. For example, a sentence on the flamingo panel asked, "*Can you imagine always eating upside down? Flamingo can!*" Auckland Zoo also emphasised rare and new born animals in the zoo, for example, "*Meet Kabili, Auckland Zoo's newest giraffe.*" Some warnings were provided on the panels in large fonts to protect the captive animals, such as "*Please do not tap on the glass.*" Information about the timetables and locations for activities at the zoo and zoo maps was also provided. Additionally, promotion signboards about the annual passes were placed in conspicuous positions around the zoo, as Figure 28 shows.

4.1.1.5 Category Z5: Ecology Knowledge

Further to basic biological knowledge, Auckland Zoo also provided knowledge about the ecosystem. Ecology focuses on explaining the relationships between wildlife and

their environments (Hollar, 2011). Some interpretations at the zoo described the roles of wildlife in their ecosystems, to help visitors understand how the ecosystem works. They also offerred brief explanations of the six New Zealand habitats on exhibition: the night, the forests, the wetlands, the islands, the coasts, and the high lands. Additionally, there was some information concerning the ecology problems caused by deforestation and introduced wasps.

4.1.1.6 Category Z6: Māori culture

Interpretations related to Māori culture formed the smallest category of this research phase. However, these interpretations explained the important cultural traditions of Māori in relation to nature and wildlife, and the traditional wisdom around the sustainable uses of natural resources.

Figure 28 *Promotion of Annual Passes to the Zoo*

4.1.2 Categories of the content of interpretive information at Sea Life Kelly Tarlton's Aquarium

Sea Life Kelly Tarlton's Aquarium provided rich textual interpretations for visitors in the indoor environment. The major categories of the interpretive materials were

biological knowledge, conservation and environmental information, information about the aquarium and its work, visitor information, knowledge about Antarctica, ecology knowledge, Māori culture, and brain teasers. The structure of the categories is presented in Figure 29. Biological knowledge was the dominant content at the aquarium, followed by conservation and environmental information, and information about the aquarium and its work. Visitor information was also a vital part of the aquarium. The aquarium also provided knowledge about Antarctica, ecology, Māori culture, and some brain teasers to enrich the interpretations.

Figure 29 *Category of Contents of Interpretive Materials at SEA LIFE Kelly Tarlton's Aquarium*
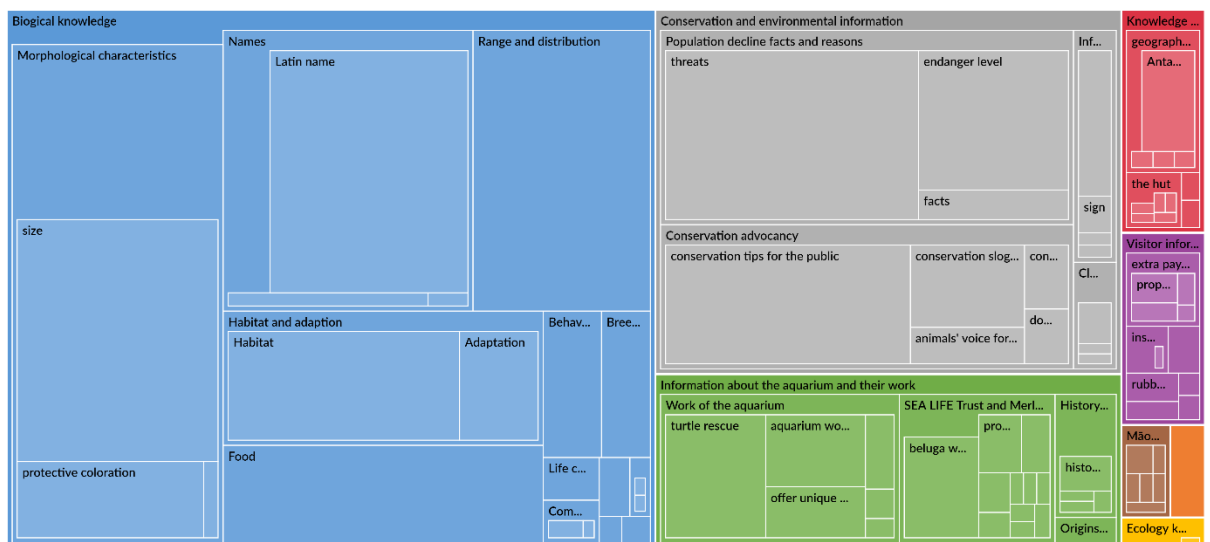
4.1.2.1 Category A1: Biological knowledge

Biological knowledge was the basic interpretation category at SEA LIFE Kelly Tarlton's Aquarium, and mainly appeared on the panels for individual species. The structure of the content was usually brief and fixed. As Figure 30 shows, a typical panel had biological information about the species' English (common) and Latin (scientific) name, their habitats, foods, sizes, and range. Other biological knowledge was also provided on interpretation walls and other interpretive materials (see Figure 31).

Figure 30 *Panel Showing the Typical Content of Interpretive Panels*
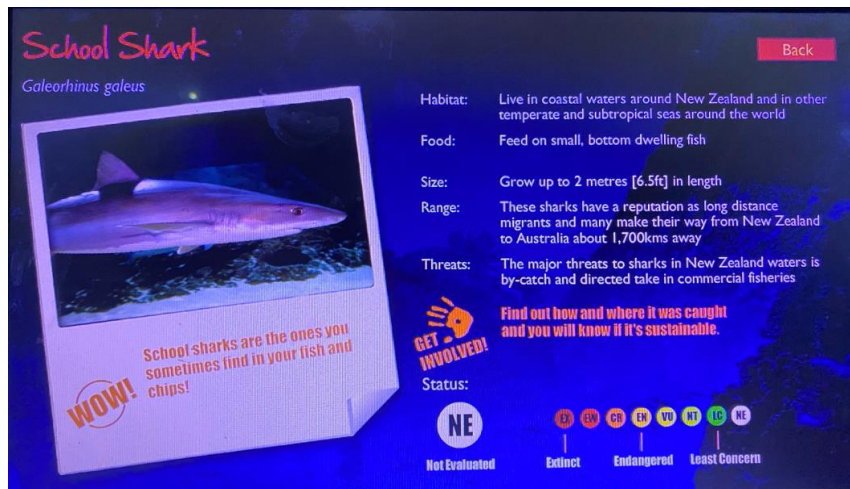
Figure 31 *Hierarchy of Codes in the Category of Biological Knowledge in the Aquarium*
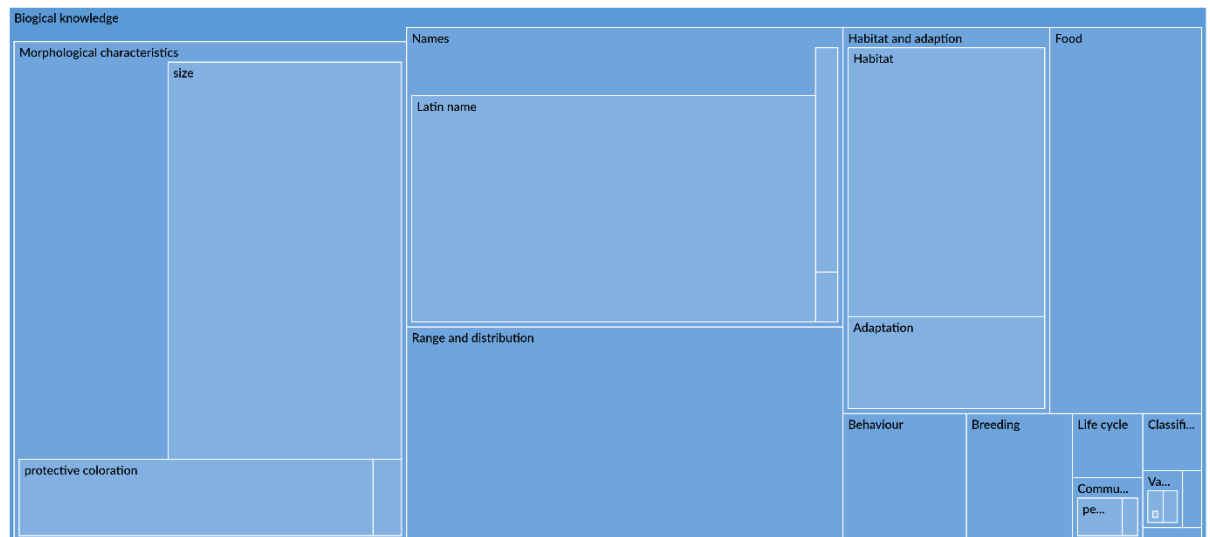
Sub-category A1-1: Morphological characteristics

Morphological characteristics were the most frequent elements of interpretive materials at SEA LIFE Kelly Tarlton's aquarium. Nearly half of the codes in this sub-category were in the sizes section of the structured panels, as Figure 31 shows. Other codes could be seen in non-structured interpretative materials, with more specific descriptions. Many referred to the colours of the animals.

Sub-category A1-2: Names

The aquarium also provided the English (common) and Latin (scientific) names of wildlife on the structured panels, as Figure 30 shows. There was also some information about the reasons for the naming of some species.

Sub-category A1-3: Range and distribution

Information about the distribution of wildlife could be seen on structured panels (as Figure 30) and panels inside the tunnel tank area (see Figure 32), which provided a map showing the distribution of fish.

Figure 32 *Example of Panels Inside the Tunnel Tank*

Sub-category A1-4: Habitats and adaptation

Habitat information appearred on each structured interpretive panel. Most of the codes were very brief, with less than one sentence. Some interpretations at the aquarium indicated how sea creatures adapted to their environment. For example, "*Sea horses, octopus, and lots of other fish can change their colours instantly to blend in with their environment.*"

Sub-category A1-5: Food

The aquarium also emphasised the food for each species on the structured interpretive panels. Some information about food was not on the structured panels, for example, "*Gaint Squid are voracious predators, which feed primarily on deep sea fish and other squid species.*"

Sub-category A1-7: Breeding

There were also some codes related to animal breeding information, such as *"Some seahorses produce up to 1500 babies in one birth."*

Sub-category A1-8: Behaviour

A few pieces of information about animal behaviour were also mentioned on some signs, such as on this example on the electronic panel of the leopard seal: "*The leopard seal is bold, powerful and curious, it may play with penguins it does not intend to eat."*

Sub-category A1-9: Other biological knowledge

Sea Life Kelly Tarlton's Aquarium also provided other biological information on the interpretation materials, such as breeding, behaviour, life cycle, classification, community and society, life span, evolution, and animals value for humans. There were several codes of these sub-categories. It was noticeable that only two values were mentioned, for example, that snapper (*Pagrus auratus*) *is "Probably New Zealand's favourite sport and table fish."*

4.1.2.2 Category A2: Conservation and environmental information

Conservation and environmental information constituted the second largest category of interpretations at Sea Life Kelly Tarlton's aquarium. The number of codes in this category was about half that of Category A1. The chief sub-categories of this category included wildlife population decline facts and reasons, conservation advocacy, information about other conservation organisations, and issues concerning climate change (see Figure 33).

Figure 33 *Hierarchy of Codes in the Category of Conservation and Environmental Information*
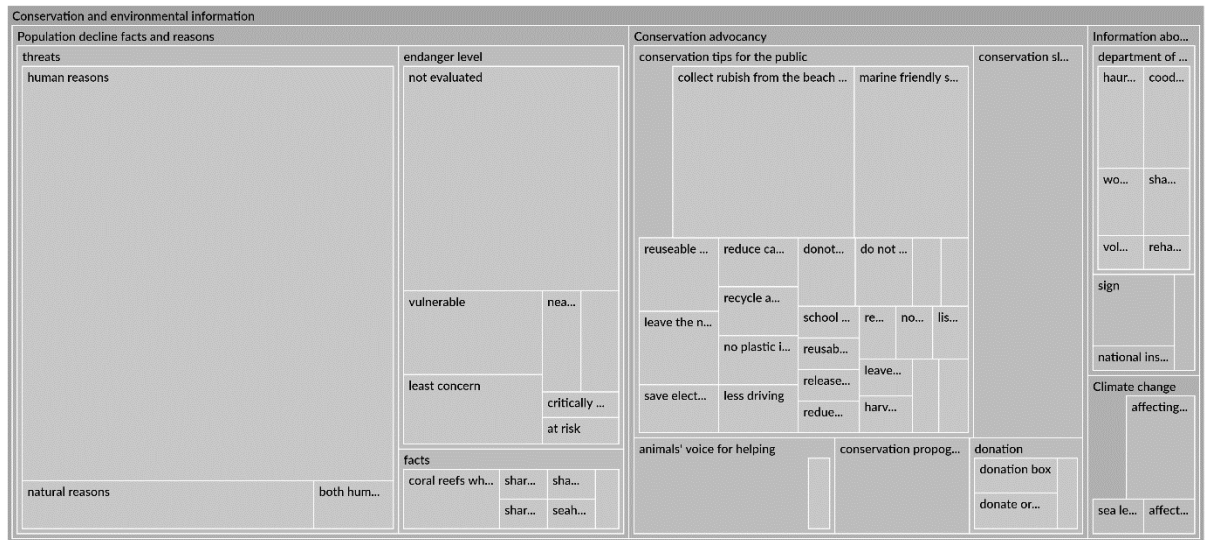
Sub-category A2-1: Wildlife population decline facts and reasons

Threats and IUCN conservation status frequently appear as two titles on some structured panels, as Figure 31 shows. They detailed the multiple threats from humans, such as development causing habitat loss, pollution, climate change, and human consumption of wildlife. The interpretations also mentioned three types of threats from nature: predators, sedimentation and erosion, and low reproduction rate. The International Union for Conservation of Nature (IUCN) conservation status was also listed on some structured panels. Most of the species with a conservation status on display were labelled as not evaluated (NE). Interpretations also showed facts related to species endangerment issues, for example, "*School sharks are the ones you sometimes find in your fish and chips!"*

Sub-category A2-2: Conservation advocacy

The aquarium also made efforts to advocate for conservation and provided various practical tips to encourage visitors to live in a conservation way. The most frequently mentioned ways to protect sea creatures were disposing of rubbish properly and choosing sustainably caught fish. Interpretations at the aquarium also encouraged visitors to reduce plastic use and carbon footprints, both of which harm the ocean, the home of all sea creatures. There were also some conservation slogans on the signs, such

as *"You can make a difference."* Some codes referred to donation information and donation boxes at the aquarium, to promote public donation for conservation.

Sub-category A2-3: Information about other conservation organisations and programmes

The aquarium provided some information about other conservation organisations, and introduced the work of DOC, which was coordinating with the aquarium in relation to conservation programmes, and supported the tuatara exhibit in the aquarium. It was claimed that "*both organisations share a vision of engaging people with conservation stories and experiences to help preserve and protect our natural world."* Some information related to Hauraki Gulf Marine Park, and a few panels from DOC showed how visitors should behave in reserves (see Figure 34).

Figure 34 *Panel Showing Information About Marine Reserves*

Sub-category A2-4: Issues concerning climate change

There were some interpretive panels at the aquarium emphasising human-induced climate change, that could be harmful to both animals and humans. For example, *"Climate change is making the oceans hotter, harming fish and other marine life and affecting ocean food sources."*

4.1.2.3 Category A3: Information about the aquarium and its work

Information about the aquarium and its work was the third largest category of interpretations at the aquarium. The aquarium mostly introduced four sub-categories of information about the organisation, as shown in Figure 35.

Figure 35 *Hierarchy of Codes in the Category of Information About the Aquarium and its Work*
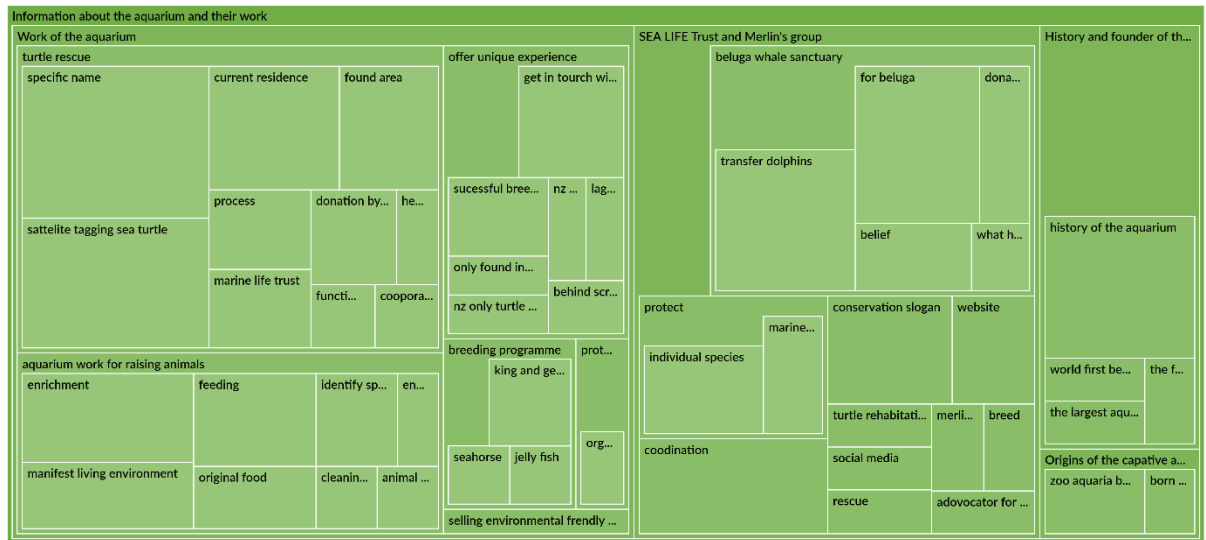
Sub-category A3-1: Work of the aquarium

Multiple kinds of work were presented in the interpretation materials, of which turtle rescues were the most stressed. There was specific information about current and former residences at Turtle Bay: their names, how they were found and cured, and when they would be released. Some interactive interpretations were provided to help young people understand the weight and food of sea turtles; interpretations also showed the turtle tracking maps of released turtles tracked by satellites

Another important part of the aquarium's work was related to animal breeding. Interpretations explained that the aquarium had successfully bred king and gentoo penguins (*Aptenodytes patagonicus and Pygoscelis papua*), moon jellyfish (*Aurelia aurita*), and spiny sea dragons (*Solegnathus spinossimus).* Providing unique experiences was an important aspect of the aquarium's work. For example, one interpretation explained that people attending the penguin discovery activity could "*Experience an on the ice encounter like no other*." There was also a banner showing a beach cleaning programme

organised by the aquarium (see Figure 36), and an interpretation on a rubbish bin reflected the sustainable management focus of the aquarium, explaining that *"Coffee cups at Kelly Tarlton's are compostable."*

Figure 36 *Banner Showing Beach Cleaning Activity*

Sub-category A3-2: Information about SEA LIFE Trust and Merlin's group

As a sub-organisation of SEA LIFE Trust and Merlin's group, the aquarium provided information aboutits parents organisations: "*SEA LIFE lends its voice as an advocate for the protection of vulnerable marine species, their habitat, and the issues that are facing the marine environment";* and *"actively campaign to protect both individual species and the marine environment from destruction or exploitation.*"

Some interpretations showed the efforts by its conservation trust, such as breeding, rescuing and protecting. The most emphasised information was about issues concerning captive whales. Interpretations told a story about two captive beluga whales being rescued and transferred from China to a beluga whale sanctuary created by the SEA LIFE Trust. Additionally, there was a panel at the exit of the aquarium illustrating the organisational mission of the Merlin group: "*Merlin's magical wand making children smile.*"

Sub-category A3-3: History and founder of the aquarium

There was also some information related to the proud history and founder of the aquarium. As *"the largest aquarium in the world and the first of its kind"* at the time of 1985, the aquarium presented specific information about its construction. Additionally, between the Turtle Bay and Shark Zone, there was a small area interpreting the story of Kelly Tarlton, the founder, and how he planned and constructed the aquarium, as Figure 37 shows.

Figure 37 *Introductory Panels About the Founder of the Aquarium*

Sub-category A3-4: Origins of aquarium animals

The aquarium also provided some information about the origins of a few aquarium animals that were human bred and reared: *"Our King Penguins were bred and reared at Sea World in the USA"; "These jellies are bred right here."*

4.1.2.4 Category A4: Visitor information

Visitor information and the following categories were small compared with the size of the previously discussed categories. In this category, the primary emphasis was on some paying activities, such as the penguin encounter and shark cage diving. There were also a few sentences inspiring visitors' investigations and some information on the panels about zone introductions, prices of tickets and annual passes, and gift promotions.

4.1.2.5 Category A5: Knowledge about Antarctica

In the Antarctic themed zone, the aquarium also provided information about Antarctica. There was geographic and climate information, and material about the history and function of Scott's Hut, which was built by one of the first explorers to Antarctica, detailing how it is threatened and protected. Interpretations also introduced the Antarctic Treaty briefly, which aims at *"devoting the Antarctic to peace and science."*

4.1.2.6 Category A6: Māori culture

The aquarium also respected the Māori culture, and used traditional Māori carving techniques to make patterns inside the tunnel. Interpretations told the Māori legends about how different creatures were formed by Ranginiui, the sky father, and Papatūānuku, the Earth mother. One panel stated that sharks were guardians in Māori creation stories.

4.1.2.7 Category A7: Ecological knowledge

Interpretations at the aquarium provided some ecological information. A typical example was found in the panel about Antarctica: *"this hostile area is home to a number of mammals and birds, as well as some plants like lichens, mosses and algae."*

4.1.2.8 Category A8: Brain teasers

There were five brain teasers on the wall at the entrance, for example, *"Question: how much did the pirate pay for his hook and peg?"* and *"Answers: An arm and a leg."*

4.2 Findings from official websites

An organisational mission is crucial for most organisations, and the foundation for the strategies and actions of the organisations. Mission statements of zoos and aquaria commonly include conservation and education elements (Maynard et al., 2020), and guide the contents of interpretation materials. Conservation work conducted by zoos and aquaria provided materials for the CE interpretations at the attractions. The official websites of both Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium provided specific information about their organisational missions and conservation work. This section present the themes of their organisational mission and conservation work from the textual materials. It answers the research questions of "what are the organisational missions of the zoo and the aquaria?" and "what conservation work has been conducted by the zoo and the aquarium?" from the viewpoints of the zoo and aquarium.

4.2.1 Organisational mission and conservation work of Auckland Zoo

4.2.1.1 Organisational mission

Auckland Zoo mentioned its mission several times on its website. Although the descriptions were slightly different, the main ideas were similar, and presented as Theme Z1.

Theme Z1: The mission of Auckland Zoo is to bring people together to build a future for wildlife

Two elements demonstrated the organisational mission of Auckland Zoo: to bring people together. and to build a future for wildlife. Thus, to explain and support Theme Z1, this research generated two sub-themes, Sub-theme Z1-1: to build a future for wildlife, and Sub-theme Z1-2: to bring people together. Sub-theme Z1-1 could be seen as the goal in the mission, and Sub-theme Z1-2 as both the aim and a method to achieve this goal.

Sub-theme Z1-1: To build a future for wildlife

"To build a future for wildlife" was the ultimate goal of the mission statement, and "a future for wildlife" was the core value of this sub-theme. There was some information

on the official website explaining the kind of future for wildlife that the zoo aimed at: *"A future where people value wildlife, and species are safe from extinction."*

It was evident that "a future" referred to all species being safe from extinction. It was also observed that the zoo used an absolute expression, "all," and emphasised a future when no species would become extinct. It further positioned the role of humans in this future: "people value wildlife." This sentence implied that people do not value wildlife enough currently, and that this may be the reason for wildlife extinction. Furthermore, the mission statement did not indicate whether it referred to the future for wildlife in the wild or in captivity. The zoo also stressed that the future for wildlife is not naturally formed but "being built" by the zoo and other people. This point emphasised the efforts of the zoo and its followers, which relates to the next sub-theme.

Sub-theme Z1-2: To bring people together

The second sub-theme indicated that Auckland Zoo sought to unite and lead the public to achieve its ultimate goal. The expression of this sub-theme appearred several times on the zoo website. As a popular attraction with a group of experts, the zoo did have the potential to impact and lead the public to make efforts to meet its goal. In terms of targeting people, the website explained that the zoo had welcomed over 28 million visitors since its opening, and "*each year welcomes over half a million New Zealanders*." In terms of professionalism, Auckland Zoo was clearly proud of the advanced work of zookeepers and staff of the vet hospitals: "*The Vet Hospital is internationally renowned for its world-leading medical care and conservation research.*"

4.2.1.2 Conservation work

As the website also explained, "*in practice, this [mission] is wildlife conservation science at work or what we here at the Zoo call Wild Work.*" The statement stressed that "*Conservation is at the heart of Auckland Zoo.*" This section generated themes related to conservation work by the zoo, explaining how the zoo aims to achieve its mission and how the concept of conservation was understood.

Theme Z2: Everything we do at Auckland Zoo directly contributes to our conservation efforts

This theme was clearly stated on the web page "About us" of Auckland Zoo. It also stated that the major work included "how we care for the wildlife at the Zoo, our Wild Work and Conservation Fund, our environmental impact, and how we connect people with wildlife conservation science, here at the Zoo."

Sub-theme Z2-1: Care for zoo animals with humanisation

Auckland Zoo considered caring for zoo animals as its most important conservation work. Multiple pieces of evidence on the website supported how much the zoo did to care for zoo animals with humanisation. Firstly, the zoo provided regular health and dental checks for its zoo animals. To ensure the animals could participate well in the health checks, zookeepers trained the animals to adapt to humans. Secondly, the zoo provided specially designed nutritious diets for its animals, which may have been different from their diet in the wild. For example: "*In the wild, red panda mostly eat bamboo. At Auckland Zoo, the keepers feed them a range of food to help keep a nutritionally balanced diet.*" Thirdly, the zoo offered environmental and behaviour enrichment for zoo animals, and fourthly, the zoo cared for old animals. Information on its website emphasised that some zoo animals live longer than the average life span of their species in the wild. For example, "*In the wild, they (golden tamarin) will live for approximately 15 years, but in zoos they can live up to 20 years.*"

Sub-theme Z3-2: Wild work

The wild work of the zoo comprised a range of work, such as fieldwork in and outside New Zealand, breeding and releasing programmes for endangered species, and rescues of injured or sick wild animals. *Fieldwork* referred to the work zoo staff conducted in the wild, such as pest control, health checks for endangered species in the New Zealand wild, and conservation work overseas. The website provided statistics and examples of this work: "*We average 8,000 hours a year on the frontline in New Zealand providing care for species*" and "*Our Wild Work in the Pacific Islands has seen our staff passing on their skills and expertise to local communities in Samoa.*"

Additionally, programmes for breeding and releasing native endangered animals have contributed to the recovery of their wild populations. The national bird, the kiwi, the

endangered Archey's frog, and native insect wētāpunga, were cited as successful examples of these programmes. The vet hospital at the zoo also treated injured or sick wildlife, and after veterinary support, most of the animals were released back to the wild. A few that did not meet the health conditions to survive in the wild were kept in the zoo as exhibit animals.

Sub-theme Z3-3: Conservation fund

The zoo's conservation fund provided economical support for various conservation efforts, and visitors could donate to the zoo feeding through the fund. The fund also supported zoo staff's fieldwork and the conservation work of overseas NGOs.

Sub-theme Z3-4: Sustainable management of the zoo

Auckland Zoo information stated that minimising the environmental impact was another important part of assisting conservation work. An example of sustainable management was evident in the two restaurants: Old Elephant House and Wētāpunga Café, as both "*proudly uses Again Again cups and re-usable crockery and cutlery.*" The sustainable management focus of the zoo was also evident in the products sold. As a sustainable palm oil supporter, Auckland Zoo sold Tip Top ice cream, because it was *"100% palm oil free*," which protects the rainforest from deforestation. The souvenir shop provided "*a range of products made from recyclable and sustainable sources.*"

Sub-theme Z3-5: Connect people with wildlife conservation science

This sub-theme is about the practice of the mission presented in Sub-theme Z1-2. The zoo staff tried "*to connect people with wildlife conservation science"* through education, sponsorship, and its conservation fund. Education from the zoo consisted of both education programmes for school students and free choice learning to the public through interpretations of the attraction. As the website material argued, "*Auckland Zoo is a world renowned learning outside the classroom provider."* Based on its understanding of conservation, the zoo provided plentiful interpretations, as presented in Section 4.1.1, for visitors to learn. The zoo also developed a series of education programmes linking to school curricula.

Additionally, Auckland Zoo conservation fund had two important roles in bringing people together. Firstly, it provided access for the public to donate to its work.

According to information provided by the zoo, it was only by purchasing tickets that visitors could contribute to the fund. Secondly, the fund supported some wildlife conservation programmes, both in New Zealand and abroad. As the website stated, *"something that our visitors may not know is that every time they visit, money goes towards funding conservation activities out in the wild - our Wild Work."* This statement implied that even though the visitors may not have realised or understood conservation, they had connected with the conservation science of the zoo by visiting the zoo.

4.2.2 Organisational mission and conservation work of SEA LIFE Kelly Tarlton's Aquarium

4.2.2.1 Organisational mission and vision

As a responsible business, SEA LIFE Kelly Tarlton's Aquarium did not address its organisational mission with conservation issues. Instead, it stated its vision about the conservation of ocean creatures and their environment. This section presents both the mission and vision in two themes.

Theme A1: Our mission is to always ensure we're protecting the magic every day through world class people and practices

The mission statement of the aquarium emphasised *"protecting the magic"* and "*through world class people and practices."* The official website of the aquarium stated that the magic meant "*driving a positive, proactive culture of safety across all our attractions*." This mission statement showed that the aquarium viewed safety as its most significant task. Further interpretation of the mission indicated that the safety was not only regarding visitors but also staff and animals: "*We focus all our energy on looking after our guests, colleagues, contractors and the animals in our care."*

Theme A2: Our vision is of a world where our oceans are healthy, properly protected and full of diverse life

The aquarium put "SEA LIFE Mission" at the front of the main webpage on conservation. Although there was no direct expression about the mission, a statement of its vision was provided, as Theme A2 shows. The aquarium first emphasised the health of the oceans and that the ocean should be properly protected. This statement implied

that without active protection, our oceans would not be able to maintain their health. It also suggested that the result of healthy oceans is that they could be full of diverse sea life.

Some detailed expressions supported and explained this vision as well. Firstly, as a responsible attraction, SEA LIFE Kelly Tarlton's Aquarium connected visitors to its vision. The aquarium emphasised its expectation of *"visitors caring for the ocean as they do."* Secondly, the aquarium explained how it could connect visitors with its mission, which was to inspire the visitors' protection activities *"by sharing the beauty of the oceans."* This sentence indicated that enjoying the beauty of the oceans could contribute to the conservation of the ocean by visitors. Thus, the operation of the aquarium itself was a conservation effort. This understanding was supported by a "*posthumous induction into the International Scuba Diving Hall of Fame"* about the founder of the aquarium, Kelly Tarlton. In relation to this award, the aquarium viewed the founder as a marine conservationist. Thirdly, the aquarium stressed the importance of inspiring the young generations' power for ocean conservation for the future. The aquarium's website explained that its vision could only be achieved with the support of the visitors: "*We can only achieve this with your support."*

4.2.2.2 Conservation work

Conservation is one of the most important tasks of SEA LIFE Kelly Tarlton's Aquarium. This section generates themes in relation to the conservation work conducted by the aquarium.

Theme A3: The aquarium cares for and creates love for the oceans and lovely ocean creatures

The aquarium did not provide an obvious theme of the aims of conservation work but expressed love for animals and the sea: "*Here at Kelly Tarlton's, we love all wildlife."* This love was a legacy of Kelly Tarlton, who created a trust to support his love for sea life. The aquarium's conservation work was an expression of love for oceans and wildlife.

Sub-theme A3-1: Wildlife rescuing and releasing

Marine wildlife rescuing and releasing was the main conservation practice of the aquarium. The official website provided information about the turtle rescue and rehabilitation programme and assisting the Wildlife Hospital in Dunedin to protect the little penguin. The turtle rescue work of the aquarium has a long history of over 20 years and the team has encountered several endangered sea turtles. The team from the aquarium has established a well-developed procedure to treat, rehabilitate and release sea turtles in need, around the seashores of New Zealand. Contents of webpages showed that tanks for exhibition in the aquarium provided a refuge for sick turtles, where they could recover and prepare for being released. This also provided an opportunity for visitors to learn about sea turtles. The website information explained about individual turtles that had lived in the aquarium and provided links for the public to watch them through a monitoring system created by the SEA LIFE group.

Information on the official website showed that the aquarium was also supporting the little penguin rescue programme at Dunedin, although, no specific information about the support from the aquarium could be found on the website.

Sub-theme A3-2: Conservation trust

According to the website, a non-profit organisation, the Kelly Tarlton's Marine Wildlife Trust, was created mainly for raising funds to cover the cost of the rescue and rehabilitation of sea life and scientific research.

Sub-theme A3-3: Sustainable management of the aquarium

Sustainable management of the aquarium was another contribution of the aquarium towards conservation. The aquarium's website emphasised efforts to reduce the use of plastic by removing plastic bags, and encouraged visitors to use their own cups for a discount on their café purshase. These efforts promoted the view that plastic waste was a crucial cause of ocean environmental problems, leading to the loss of biodiversity in the oceans.

Sub-theme A3-4: Community involvement

The aquarium website material aimed to influence visitors to contribute to conservation work. Firstly, it provided some tips for the public to ensure responsible activities for

wildlife and the environment, such as not releasing balloons, and leaving beaches clean. Secondly, staff organised conservation events to engage communities in their conservation work, such as local clean ups, workshops, and the Ocean Youth Programme. Thirdly, they advocated for donations from the public to their conservation trust and SEA LIFE Trust: "Help support research and conservation projects including the Beluga Whale Sanctuary by donating to the SEA LIFE Trust and the Turtle Rehabilitation Program by donating to the Kelly Tarlton's Marine Wildlife Trust."

4.3   Findings from visitor reviews on TripAdvisor

As a type of social media thread, visitor reviews of tourism attractions have provided valuable information for both businesses and research institutions (Nelson, 2020). This research examined visitor reviews of Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium from the last five years to explore their feedback on conservation issues. This section presents findings to answer the research questions of "what are the contents of the reviews from visitors of the zoo and the aquarium?" and "what are visitors' reflections on conservation issues after they visit the zoo and the aquarium?" The section also makes comparisons between visitor reviews of the two studied organisations.

4.3.1   Visitor reviews of Auckland Zoo and their reflections on conservation issues

4.3.1.1 General information from visitor reviews

As reviews online about any attractions, visitor reviews of Auckland Zoo reflected the authentic feelings of the visitors after their visits. The information in the reviews was not formatted, and contents were not organised. From coding of all the data in the reviews, it was found that the main concerning aspects of the reviews included feelings around seeing animals, concern for animals' welfare in captivity, complaints about unpleasant confrontations, and understandings of the functions of the zoo. There was also some information about visitors' profiles, such as whether they were visiting with children, their motivations for visiting the zoo, and their preferences for zoos and animals. This information is presented in pattern codes. As complaints were mainly about eating in the restaurants, which is not related to this research, data on this are not presented.

Pattern code Z1: Visitors' profiles

Many visitors wrote about their companions when visiting the zoo; the most frequently used words were related to "kids" and "families." This showed that the zoo was primarily an attraction for families with children. In terms of the preferences around visiting zoos, several visitors stated they had been to more than one zoo worldwide, and most of them loved zoos. Some visitors argued that Auckland Zoo was excellent compared with other zoos. The reviews were from international visitors, domestic visitors, and Auckland residents, and several were from repeat visitors and annual pass holders. Some reviews stated that the visitors came to Auckland Zoo to see particular animals, especially New Zealand's native birds; for example, *"Went to the zoo hoping to see a kiwi."*

Pattern code Z2: Seeing animals

The word cloud in Figure 38 presents the most frequently mentioned information in the reviews, and is reflective of Pattern code Z2. The words in red form the sentence, of "it is a great day to visit the zoo and seeing animals." This was the most significant code, since more than half of the reviewers expressed the pleasure of seeing animals or particular species during their visits. For example, "*Really enjoyed it and my son was very happy to see those different zoo animals.*" While some reviewers complained about not seeing many animals during their visits, visitors generally expressed their satisfaction with the zoo's viewing points for observing animals, and were happy to be close to zoo animals. Many visitors believed they were lucky to see such unique animals, especially kiwi, the national icon of New Zealand: "*We even saw the kiwis, which all the locals told me I wouldn't!.*" These codes showed visitors cared most about seeing animals during their visits to the zoo.

Figure 38 *Word Cloud of Visitor Reviews of Auckland Zoo*

Pattern code Z3: Concerning animal welfare

Reviews also showed that visitors not only cared about seeing animals, but also about the welfare of animals in captivity. About one third of the reviewers expressed concern for zoo animal welfares, such as the enclosure conditions and care provided at the zoo. A large proportion of the visitors expressed concern about the animal enclosures. As Figure 38 shows, "enclosure" was a frequently used word in the reviews. Reviews showed the visitors were generally satisfied with the enclosures in three aspects: adequate space, natural settings, and animal privacy. However, a few visitors felt disappointed because they thought the enclosures were not big enough for the animals or not similar to the animals' natural environments, espectially those for big animals.

Several visitors expressed happiness at seeing zoo animals receiving good care in good conditions, although a few expressed dissatisfaction: *"The animals don't look happy here. Have you seen happy animals in a zoo?"* These codes illustrated that captive animals' welfare was an important influence on satisfaction with visits to the zoo.

Pattern code Z4: Functions of the zoo

Several visitors expressed their understanding of the functions of the zoo, mainly seeing the zoo as a place for entertainment, learning, or conservation. Most visitors came to Auckland Zoo to enjoy an entertainment experience. Some visitors believed that the zoo was a place for learning, for example, *"Loads of animals, a great learning experience for the kids."* Most visitors understood that they could learn facts and the names of animals in the zoo, and were most impressed by the knowledge of native species at the zoo: for example, *"We love learning about the native NZ wildlife there especially."* A few visitors agreed the zoo was a place for conservation, especially conservation education. One review described the zoo as a place with several functions: *"An entertaining and educational zoo with an emphasis on conservation and animal welfare."*

Pattern code Z5: Regarding interpretations

Less than ten percent of the reviews discussed interpretations and information provided at the zoo. Most of these were positive about the information and some learned animal information from the signs, especially from information about native animals. Visitors also found that information on panels not only provided concise biological information but also specific facts about the animals. As one review statee: *"The other thing I like about this zoo is that they put the animals in context."* About one third of the reviews referring interpretations argued that the signs did not provide enough information and needed improvement. For example, *"I feel like the big bird cages could be much bigger and their enclosure signs be more interesting to draw people over to them."*

4.3.1.2 Visitors' reflections on conservation issues after their visits

Besides concern about zoo animals' welfare, about 30 visitors mentioned conservation issues in their reviews. This information was grouped into two pattern codes, as presented next.

Pattern code Z6: Conservation work is a main focus of the zoo

Ten reviewers believed that the zoo stressed conservation work a great deal. For example: *"Conservation is obviously a priority for Auckland Zoo. Kudos!"*

Pattern code Z7: Visitors' understanding of conservation work of the zoo

Other reviewers expressed their feelings about specific conservation work by the zoo, such as animal welfare, rescue and captive breeding programme, sustainable management of the zoo, conservation funds, and inspiring conservation understanding. Four reviews linked animal welfare with conservation, one of which stated that "*It's setting is picturesque and the animals are genuinely cared for and preserved with enclosures that mimic their natural environments.*" A few reviews discussed the breeding programme for native endangered animals. For example, "*The takahe making a return from the edge of extinction thanks to a captive breeding program (yes they did reach the edge of extinction due to human interference).*"

Some visitors expressed satisfaction with the sustainable management of the zoo, referring to reusable coffee cups, not selling bottled water, and the sustainable gifts in the gift shop. Three visitors noticed the tickets contributed to the zoo funds. Some visitors realised they were inspired by the zoo to appreciate animals, and two even expressed their children's interest in becoming zookeepers. For example, "*Kids were happy at the end of the day with a possible zookeeper in the making now.*"

4.3.2 Visitor reviews of SEA LIFE Kelly Tarlton's Aquarium and their reflections on conservation issues

4.3.2.1 General information from visitor reviews

Similar to reviews of Auckland Zoo, reviews of SEA LIFE Kelly Tarlton's Aquarium were related to visitors' feelings about exhibitions, their complaints, their understanding of the function of the aquarium, and animal welfare. This section presents the relevant pattern codes.

Pattern code A1: Visitors' profiles

Many visitors provided information about their profiles; most were visiting with their children. They found the visit was a *"great experience for younger children."* Many wrote that they had been to other aquaria around the world and made comparisons, arguing that *"The aquarium is small compared to others I've visited."* Reviews were from international visitors, domestic visitors, and Auckland residents. Some came to the aquarium aiming to see particular animals, such as penguins and sharks.

Pattern code A2: Seeing exhibits

Seeing exhibits in the aquarium was the most frequent topic in the reviews. A large percentage of visitors expressed their feelings about seeing animals in the aquarium, and their target animals were mainly penguins and sharks, as the word cloud in Figure 39 shows. The most frequently used words make the sentence "it is a great visit to the aquarium seeing penguins and sharks." Many expressed their love for penguins in the reviews: "*What I love the most are their penguins! They are lively and cute!*" Some were satisfied with the good viewing points and seeing sea creatures up close, and a few complained the aquarium did not provide sufficient animals. Some reviews expressed satisfaction with the Antarctic exhibition. For example, *"The exhibition regarding the Antarctic excursion caught our attention."* Therefore, exhibitions were important for visitors, and seeing or not seeing animals was still the most crucial factor in visitor reviews of the aquarium.

Figure 39 *Word Cloud of Visitor Reviews of SEA LIFE Kelly Tarlton's Aquarium*

Pattern code A3: Concerning animal welfare

Less than ten percent of the visitors showed an interest in animal welfare in their reviews. About one third of these believed the animals were well cared for and in good

condition, and nearly two thirds of thought the aquarium did not provide good enclosures for animals in captivity, especially observing that the penguins' enclosure was too small for so many penguins:

> *But soon I started feeling uneasy when I noticed the rather small place available for quite a large number of penguins who'll probably never see the sunlight again - in fact, the lack of daylight made me feel almost claustrophobic throughout the visit.*

Pattern code A4: Functions of the aquarium

Visitors also expressed their understanding of the functions of the aquarium by stating what kind of place the aquarium is. Some visitors thought the aquarium was a place to entertain, especially for children, and some thought it was a place for learning. For example, one reviewer wrote that the aquarium is *"Very educational, a great display of Antarctica and the work being done there."* Reviews disussed the learning opportunities, such as the biological knowledge of sea creatures, conservation and environmental issues, history of south pole exploration, and history of the aquarium and its founder, Kelly Tarlton.

Some visitors thought that the aquarium was a place to create memories. For example, one review stated, "*Kids are so well catered to it would be an experience they will never forget."* However, nearly ten percent of the reviews considered that the aquarium was too commercial or over-priced.

Pattern code A5: Regarding interpretations

Over ten percent of the reviews were related to information provided by the aquarium. Over 30 thought the aquarium was very informative: "*Very interesting and informative with an awesome range of sea life."* Some visitors noticed the interpretations of Scott Base at the Antarctic, and information about the founder of the aquarium, Kelly Tarlton. For example, *"Awesome exhibition areas with various animals and some very informative areas on Scott Base and Kelly Tarlton himself."* A few reviews mentioned the turtle rescue programme. For example, "*Good experience very informative along with the information that they are a rescue centre who assist sea life back into the environment they came from."* Only a few visitors recommended an improvement to the interpretation panels.

4.3.2.2 Visitors' reflections on conservation issues after their visits

There were about 30 reviews related to conservation issues. These were grouped into two pattern codes as discussed next.

Pattern code A6: The aquarium makes some effort to preserve animals and the environment

About ten visitors mentioned the conservation work of the aquarium, mainly in two aspects: protecting wildlife, and the marine environment. One review stated, *"The aquarium is small but a really good place to see how the team is helping to conserve sealife and help the environment."* Another ten reviews were related to the turtle rescue and rehabilitation programme, which was the most noticeable conservation work of the aquarium and is discussed in the next pattern code. Two reviewers had positive attitudes towards the conservation education effect of visiting the aquarium.

However, a few reviewers assessed the conservation of the aquarium critically. Some argued that some aquarium business practices were inconsistent with their conservation concepts, such as *"selling plastic gifts."* Another visitor thought that in a conservation organisation, penguins in captivity should be rescued and released, but not living in captivity lifelong.

Pattern code A7: Turtle rescue and rehabilitation

Some visitors were impressed by the rescue and rehabilitation of sea creatures, especially the work for rescuing sea turtles. For example, *"Good experience very informative along with the information that they are a rescue centre who assist sea life back into the environment they came from."* However, a few visitors were conflicted about the rehabilitation programme, since they wanted to see more turtles in the aquarium: *"We weren't disappointed that not more turtles needed rescuing from natural habitat but disappointed that there was only 1 turtle when it is strongly advertised there is more than 1!"*

4.4   Chapter summary

To answer the research questions presented in Chapter 3, this chapter presented findings from three different types of data related to Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium. Section 4.1 represents the categories of interpretive materials at

both Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium and shows that interpretations of both institutions put great efforts into providing biological information to visitors. They also provided conservation information and organisational information to the public. These findings answered the first supplementary question: "what content of interpretive materials has been provided to the public in zoos and aquaria?" This also serves as the basic information needed to answer the research question, "what content of convservation education has been provided to the public in zoos and aquaria?" However, the findings did not answer this research question, because it was not easy to determine what content could be considered as CE content. Therefore, the relationship between the contents and CE is discussed in the next chapter. How these contents contribute to raising awareness or inspiring behaviour change towards conservation issues also deserves discussion.

Section 4.2 presented themes from the official websites of Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium regarding their organisational missions and conservation work. Results showed that conservation played an important role in both organisations, and they attempted to achieve their conservation missions and visions. These findings answered research questions of "what are the organisational missions of zoos and aquaria?" and "what conservation work has been conducted by those zoos and aquaria?".

Section 4.3 presented pattern codes from visitor reviews of Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium. Results showed that visitors to the two attractions had similar profiles and their major concerns were about seeing animals, animals' welfare, and understanding the functions of the attractions. Some reviews referred to interpretations at the attractions, and showed that many people read interpretations, and interpretations affect visitors to some extent. Not many visitors reflected on conservation issues in their reviews, although the contents of existing reviews were valuable for this research.

Chapter 5.   Discussion

5.1   Introduction

The previous chapter presented the findings of this research, answering some of the research questions. In order to understand issues around interpretation and conservation education in zoos and aquaria more deeply, this chapter makes comparisons between the findings from Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium and discusses significant issues of the research topic. It firstly compares the findings from interpretative materials, official websites, and visitor reviews. It also makes cross-sectional comparisons to discuss inter-relationships between interpretations, organisational positions, and visitors' reflections on CE. The chapter also discusses the potential to conduct CE through interpretations in zoos and aquaria, and explores the relations between the content of interpretations and CE. Factors affecting the content of interpretations related to CE are also discussed, and a content-centric model for CE interpretation design for zoos and aquaria proposed.

5.2   Comparisons between Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium

5.2.1   Comparison between the interpretative materials of the two organisations

Auckland Zoo and SEA LIFE Kelly Tarlton's aquarium are both famous animal-themed attractions located in Auckland city. Interpretations at the two institutions played important roles in transmitting organisational concepts to the public. In general, the zoo had larger spaces, more interpretative panels, and most of the panels were displayed outdoors, while the aquarium occupies a much smaller space, panels there were displayed more densely indoors; the number of panels there was about half that of the zoo. Since the categories of the contents of interpretive materials have been presented before, this section will compare the similarities and differences of the contents from different perspectives.

5.2.1.1 General comparisons

Initially, the major categories and the proportions of the contents appeared similar. Both two institutions provided an abundance of biological knowledge to visitors through their

textual interpretations; furthermore, they also strongly emphasised conservation information, delivered organisational information to the public, and provided visitor information at the attractions. The only difference in the major categories existed in the second category: for the zoo, the category was named "conservation information," and for the aquarium, "conservation and environmental information." The difference occurred because interpretations at the aquarium provided information about global warming and climate change, which is a larger scale issue than the issues of species conservation. Furthermore, categories with fewer codes also showed some similarities, as information about ecological knowledge and Māori culture appeared at both attractions. The interpretation materials at the aquarium had two more categories: "knowledge about Antarctica" and "brainteaser." In terms of the structure of most panels, there were more structured panels at the aquarium than there were at the zoo.

5.2.1.2 Comparisons between Category Z2 (Conservation information) and Category A2 (Conservation and environmental information)

A comparison of particular categories might provide more meaningful information. Both Category Z2 of the zoo and Category A2 of the aquarium illustrated the conservation information provided to the public, and the sub-categories were also similar. In the sub-category about endangered species (population decline) facts and reasons, both institutions stressed the factors that induced the decline of wildlife populations. However, there were many differences in detail, as shown in Table 1. Interpretations at Auckland Zoo sought to explain how things happen. For example, the zoo explained how introduced animals destroy native species through food competition and predating on vulnerable young animals and birds, whereas panels at SEA LIFE Kelly Tarlton's aquarium merely listed threats for species. For example, threats to Green Turtle were described thus: "*Adult turtles have few enemies and fewer predators. Only humans and sharks are known to feed on them.*" Since predators are not the most important reason for the population decline of sea turtles, this threat did not reflect conservation science. Furthermore, interpretations at the aquarium mentioned some natural threats to specific species, for example, natural predators in the food chain, whereas the Zoo panels only mentioned disease as a natural threat to some endangered animals. The aquarium provided some information about global warming, which is a large scale environmental issue leading to the extinction of wildlife, especially that of sea creatures.

Table 1 *Difference Between Z2 (Conservation Information) and Category A2 (Conservation and Environmental Information)*

Sub-category	Auckland Zoo	SEA LIFE Kelly Tarlton's Aquarium
Factors for wildlife population decline	Explained the procedure for wild population decline	Threats to wildlife, including natural threats Global warming
Species conservation status	Some animals on the IUCN list, and some native species on the NZ national evaluation system list	Most species on the IUCN list, though many native species were not evaluated
Facts for wildlife population decline	Statistics	Some unexpected facts
Encouraging good public behaviours	Behaviours to protect native species	Behaviours to protect the marine environment
Conservation programmes	Many organisations and programmes were introduced	Information from DOC

Additionally, both organisations provided information about species conservation status. However, the aquarium provided the status of each species on exhibition according to the IUCN red list, and most of the statuses on the panels about native fish were those identified as not evaluated (NE). Auckland Zoo did not include conservation status as a necessary part of the panels, but mentioned some information about the species conservation status in its interpretation paragraphs. The status listed was not only according to the IUCN red list, but also according to New Zealand's national evaluation system by DOC, which may be more practical for native species than is the IUCN list. In terms of facts related to the population decline of wildlife however, their focuses were different. Auckland Zoo presented statistics on population declines or how many animals were left of particular species, as explained in Category Z2, whereas SEA LIFE Kelly Tarlton's Aquarium revealed some unexpected facts to the public, such as eating sharks in fish and chip meals.

In the sub-category of "conservation advocacy," both presented conservation slogans calling for conservation and asking for donations. They also provided practical conservation behaviour guides for the visitors to follow. However, the zoo highlighted how the public could behave to contribute to the conservation of native species, for

example, by avoiding the spreading of pests to pest-free regions, while the aquarium stressed the importance of the public's assistance with the protection of the marine environment, for example, by keeping beaches clean. Additionally, interpretations of the zoo provided information about some conservation programmes, methods, history and achievements, whereas the aquarium only offered information from DOC.

5.2.1.3 Comparisons between Category Z3 (Information about the zoo and its work) and Category A3 (Information about the aquarium and its work)

Examining the findings in the sub-categories and the structures, it was apparent that the contents of Z3 and A3 were similar in many aspects. Firstly, both the zoo and the aquarium provided information about their work and how they cared about their captive animals; secondly, both told the stories of the organisations; thirdly, both mentioned that some of their animals were bred in the captive environment or rescued from the wild; and lastly, both mentioned CE (to increase public awareness) in some interpretations, as work contributing to cooperative conservation programmes.

However, obvious variations became evident when examining these in more detail. The zoo provided comprehensive information about the work of the vet hospital. Interpretations of the zoo also told stories about breeding and releasing programmes for native species, and how the staff contributed to wild work and research. Information from the aquarium was different: it told visitors about turtle rescue programmes, focussing on individual turtles' rescue and releasing processes, and stressed the provision of unique experiences for visitors.

Furthermore, the aquarium emphasised its organisational information more, and in two aspects: one referred to the proud history of establishing the aquarium, and the story of its founder, and the other concerned the current parent organisations—the SEA LIFE Trust and Merlin Group. Interpretations at the aquarium illustrated the work of transferring two beluga whales from a captive environment to a sanctuary established by the SEA LIFE Trust. However, panels at the zoo mentioned information about their organisational function and mission as a not for profit conservation organisation, aiming to *"bring people together to build a future for wildlife."*

5.2.1.4 Comparisons between other categories

There were also some differences between other categories of the zoo and aquarium. Biological knowledge provided by the zoo was more specific in particular aspects, as interpretive panels for animals on exhibition at the zoo usually had richer contents than did those at the aquarium. Interpretive information about species provided by the aquarium was more concise and focused on particular areas, such as habitat, food, range, size, and threats. Both institutions provided knowledge related to ecology and Māori culture on their interpretation panels, which also deserve comparison. In terms of the category of Ecological knowledge, the zoo panels explained the roles of each species in specific ecosystems, and emphasised the importance of local habitats as dynamic ecosystems. The aquarium did not provide as much information related to how the ecosystem works, but only mentioned that many creatures live in particular habitats, such as in the sub-Antarctica, or in a coral reef. In terms of the categories on Māori culture, the zoo information stressed Māori respect for nature and living a sustainable life depending on nature, whereas the aquarium emphasised traditional carving arts more.

5.2.2   Comparisons between themes from the official websites

The official websites of Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium provided sufficient information about their missions and conservation work, as presented in Section 4.2. This section makes comparisons between these themes in the two organisations.

5.2.2.1 Organisational mission and vision comparison

From the themes on "organisational mission and vision," it could be seen that both the zoo and aquarium emphasised their valuing of conservation issues, and both stated their mission or vision concerning biodiversity. The differences between the two organisations were very clear. Firstly, the zoo considered conservation issues as its mission, whereas the aquarium valued safety issues in its mission, and conservation issues as its vision. According to the Cambridge Dictionary, a mission is "any work that someone believes it is their duty to do," and vision refers to "an idea or mental image of something" (Cambridge Dictionary). These definitions show the differences between

missions and visions, and suggest that Auckland Zoo was conducting work for building a future for wildlife, and SEA LIFE Kelly Tarlton's Aquarium valued healthy oceans.

Secondly, their focuses on the objectives of their work were different. The zoo focused on protecting animals, while the aquarium stressed the health of oceans, which are the foundation for biodiversity. Thirdly, they had different degrees of stress on the efforts of humans. The mission of the zoo emphasised the efforts of the zoo and the public to build a future for wildlife, suggesting that the future for wildlife requires efforts from humans, whereas the vision statement from the aquarium used more neutral tones, and did not stress much effort from humans, focusing instead on the health of the oceans.

5.2.2.2 Conservation work comparison

Conservation work was important for both Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium. This section compares the conservation work of the two organisations from two perspectives: the role of conservation work in the organisations, and the content of specific conservation work. Firstly, the roles of conservation work in the two organisations were quite different, even though both were animal-themed attractions emphasising conservation work. The zoo emphasised that *"everything they do contributes to conservation"* whilst the aquarium considered conservation as an important task, but not its entire work.

Secondly, regarding the content of the conservation work being conducted, the two organisations shared some similarities but also had some different understandings. Both the zoo and the aquarium helped rescuing and releasing injured or sick wild animals, set up funds for their conservation work, made efforts towards sustainable management at their attractions, and tried to involve their visitors in conservation work.

The most significant differences were in whether they considered their work of caring for animals in captivity as conservation work. The zoo believed caring for captive animals was its most crucial conservation work. Although the aquarium also cared for its animals, it did not emphasise its work of caring for animals in captivity as conservation work. The staff at the zoo undertook wild work in New Zealand and abroad, and conducted breeding and releasing work for increasing the wild populations of endangered native species, whereas at the aquarium, the most significant conservation work was the rescuing and releasing of sea turtles.

Lastly, both the zoo and the aquarium tried to involve visitors in conservation work. The zoo believed that connecting visitors with conservation science was a form of conservation work, whereas the aquarium used the word "involve," which focuses on the activities of the public contributing to conservation. Thus, spreading conservation information was a form of important conservation work of the zoo. The aquarium did not consider this as conservation work, although they did include conservation issues in their educational programmes and interpretations. Additionally, the zoo stressed visitors' contributions to conservation work through their visits to the zoo, and the aquarium organised practical events for citizens to contribute to marine conservation by themselves.

5.2.3 Comparison between findings from visitor reviews of the two organisations

The main patterns of visitor reviews on TripAdvisor of Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium were coded and presented in Section 4.3. This Section makes comparisons between the visitor reviews of the two attractions.

5.2.3.1 Similarities

Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium shared some similarities, leading to some similarities in the visitor reviews of the two attractions. First, the number of reviews of each attraction over the last five years was approximately 600. Second, the profiles of the visitors were similar, with many of them bringing children, many being repeat visitors, zoo or aquarium lovers, and visitors from both New Zealand and abroad. Third, the concerns of the reviews were mainly the same, and fourth, most of the visitors cared a great deal about seeing animals. Fifth, the number of reviews regarding conservation issues was quite low and similar for both attractions. In addition, a few visitors felt the attractions could inspire future career choices of visitors.

5.2.3.2 Differences

Although the main areas of concern were largely similar in the visitor reviews, the details about the two attractions differed. First, in terms of the exhibitions, reviews of the zoo mainly discussed seeing animals, whilst visitors to the aquarium wrote about animals on show and historical exhibitions of the South Pole exploration. Second, considering the animal welfare at the attractions, more zoo visitors reviewed this topic than did visitors to the aquarium. Additionally, most zoo reviewers were satisfied with

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the care and enclosures provided to zoo animals, whilst most aquarium reviewers considered the enclosures inappropriate living conditions, especially for penguins. Third, in terms of the functions of the attractions, visitors saw the zoo as a place for entertainment and education with a conservation emphasis, but visitors to the aquarium saw this more as an entertaining and educational business. Fourth, more reviewers of the aquarium considered it informative than did those of the zoo, and fifth, visitors could feel the zoo's emphasis on conservation work, but only sense some conservation work as part of the work of the aquarium. Moreover, from the reviews, it was evident that the main conservation work of the zoo was breeding and releasing native species, while the main conservation work of the aquarium was the rescue and rehabilitating of sea turtles. Visitors were satisfied with the sustainable management of the zoo, but unsatisfied with that of the aquarium.

5.3 Interpretations, organisational positions, and visitors' reflections on conservation issues

Comparing the findings from interpretative materials and those from the official websites contributes to answering the research questions, "what is the relationship between interpretations at the zoo and aquarium and their organisational missions?" and "does the content of interpretations at the zoo and aquarium represent the conservation work of those institutions?" Comparisons between the findings from interpretative materials and those from visitor reviews help answer the research question of "what is the relationship between interpretations of the zoo and aquarium and visitors' reflections on CE?"

5.3.1 Relationship between interpretations and the organisational missions

The relationship between interpretations and the organisational missions of the two organisations can be considered in two aspects: firstly, whether the mission statement appeared in interpretations at the attractions, and secondly, how the interpretations contributed to organisational missions.

5.3.1.1 Organisational missions in the interpretations

Comparing the themes regarding the organisational mission and vision statements of the zoo and the aquarium with their interpretations, it was found that the mission statement

of Auckland Zoo was clear and appeared in the interpretations at the attraction. However, the mission and vision statements on the official website of the aquarium were not included in the interpretations; its interpretations presented a different statement about a shared mission with other organisations related to conservation.

As shown in Theme Z1, the mission of Auckland Zoo was *"to bring people together to build a future for wildlife."* Similar statements appeared in interpretations at the zoo several times, as presented in Sub-category Z3-2, Organisational information. The aquarium had its mission statement related to providing a safe visiting experience for the visitors (Theme A1) on its website. There was also a vision, as presented in Theme A2, concerning ocean protection. Neither of these two themes appeared in the interpretation materials at the aquarium. However, interpretations regarding cooperation with other conservation organisations stated that they shared a vision of engaging people with conservation stories and experiences to help preserve and protect the natural world. This vision could be seen as efforts towards CE, which are presented in Sub-category A2-3.

5.3.1.2 Interpretations contributing to organisational missions

This section discusses how interpretations contributed to the organisational missions of the zoo and aquarium. Some interpretations at the zoo contributed to and reflected the organisational mission, which was evident in Sub-category Z3-1: Work of the zoo, and Category Z2: Conservation information. As explained in Theme Z1, the mission included two parts of work, which were *"building a future for wildlife"* and to *"bring people together."* Sub-category Z3-1 provided information to visitors about how the zoo worked to build a future for wildlife, such as caring for zoo animals, wild conservation work, and work at the vet hospital. Information in Category Z2 tried to engage visitors in the zoo's mission by providing conservation knowledge and advocacy; conservation knowledge can be effective to arouse environmental and conservation awareness of the visitors, and conservation tips and advocacy for donations can influence the conservation behaviours of the public.

Additionally, Category Z1 "biological knowledge," Category Z5: Ecology knowledge, and Category Z6: Māori culture, may have contributed indirectly to the zoo's organisational missions. Biological knowledge can arouse visitors' curiosities and charitable feelings about animals, which can help them learn about animal protection

issues. Knowledge about ecology illustrated the relationship of animals and their environments, as basic conservation knowledge for visitors. Information about Māori culture in the interpretations at the zoo were mostly about how traditional wisdom values nature, which can also assist in increasing the environmental awareness of the public.

The aquarium did not have a clear mission statement on either its official website or interpretations at the attraction. Its mission and vision had mixed values of providing safe and magical experiences, ocean protection, and CE. Some interpretations at the aquarium may contribute to the mission and visions. Firstly, providing unique experiences (see Sub-category A3-1) represented the efforts of the aquarium to meet its mission. Interpretations in Category A8: Brainteasers, and the emphasising of interesting facts on the biological information panels (see Figure 30 may help provide a magical atmosphere at the aquarium, consistent with the mission stated in Theme A1. Additionally, Category A5: Knowledge about Antarctica, Category A6: Māori culture, and Sub-category A3-3: History and founder of the aquarium, told stories in a legendary tone, which can also contribute to the magical experiences of the visitors.

Secondly, interpretations of Category A2: Conservation and environmental information, and turtle rescue and beach cleaning activities under Sub-category A3-1, reflected the ocean protection and wildlife conservation visions of the aquarium. Similarly to those of the zoo, Category A1: Biological knowledge, and Category A7: Ecological knowledge, may have also indirectly contributed to the conservation education vision of the aquarium, as the information could arouse visitors' enthusiasm towards animals and conservation issues.

Overall, interpretations at both Auckland Zoo and Kelly Tarlton's Aquarium reflected their organisational missions and vision statements, but different organisational missions and visions led to different styles of interpretations at the attractions.

5.3.2 *How interpretations represent the conservation work*

This section compares the conservation work presented on the official websites of Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium with the interpretations at the attractions. The aim was to find whether the interpretations provided sufficient information about the organisations' conservation work, to their visitors. Interpretations

at the two organisations reflected their understandings of conservation work. Overall, the zoo presented more conservation work information on its website, and more interpretations relating to that work than did the aquarium. Additionally, interpretations at the two attractions did not provide all the information about conservation work mentioned on their websites.

5.3.2.1 Interpretations and conservation work of Auckland Zoo

Interpretations at Auckland Zoo presented a great deal of information about the conservation work of the zoo. As Theme Z3 presented, the zoo's information claimed that *"everything we do at Auckland Zoo directly contributes to our conservation efforts."* These efforts included care for zoo animals, wild work, conservation funds, sustainable management of the zoo, and connecting people with wildlife conservation science. Firstly, interpretations at the zoo represented how the zoo cared for animals. As Figure 26 shows, interpretations about the work of the vet hospital and caring for animals in captivity occupied the largest number of codes in Sub-category Z3-1: Work of the zoo. Secondly, interpretations at the zoo also presented the wild work of the zoo. As identified in Sub-theme Z3-2, the wild work of Auckland Zoo included fieldwork, breeding and releasing programmes, and rescues of injured or sick wild animals. These efforts of the zoo were also presented in interpretations, as listed in Sub-category Z3-1.

Thirdly, regarding the Zoo's conservation fund, some panels at the zoo persuaded visitors to donate to the fund (see Sub-category Z2-2), but there was little information to explain how the fund worked. Fourthly, there was not much interpretation about the sustainable management of the zoo, with only a few panels in the souvenir shop showing that they were selling eco-friendly products. The efforts of some dining facilities in not using plastic cups and selling palm-oil-free ice cream (see Sub-theme Z3-4: Sustainable management of the zoo) were not mentioned in interpretations at the zoo. Fifthly, interpretations at the zoo connected visitors with wildlife conservation science in two ways: firstly, interpretations conveyed conservation knowledge and information to the public. Many interpretations at the zoo were related to this, such as those discussed in Sub-category Z2-1: Species endangered facts and reasons, Sub-category Z2-3: Conservation history and achievements, Sub-category Z2-4: Conservation programmes and methods, and most of the information in Sub-category Z3-1: Work of the zoo. On the other hand, interpretations told visitors how to contribute

to conservation work in practice, which was evident in Sub-category Z2-2: Conservation advocacy.

Overall, interpretations at the zoo reflected all five sub-themes of conservation work identified on its official website, although the content of some sub-themes was not presented in detail. Information about conservation organisations and activities overseas was not introduced exclusively. The official website introduced palm-oil induced deforestation and conservation issues specifically, but there were no interpretations at the zoo about the palm oil issue at all.

5.3.2.2 Interpretations and conservation work of SEA LIFE Kelly Tarlton's Aquarium

Interpretations at the aquarium reflected some of the conservation work of the aquarium. Theme A3 showed that SEA LIFE Kelly Tarlton's Aquarium conducted conservation work as an expression of love for the ocean and sea creatures. There were four sub-themes under this theme: wildlife rescue and releasing, conservation trust, sustainable management of the aquarium, and community involvement. Firstly, there were interpretations about the aquarium's wildlife rescue and releasing work, especially the sea turtle rescue and rehabilitation work (see Sub-theme A3-1). Secondly, no interpretations were found regarding the Aquarium's conservation trust, but only information about the SEA LIFE Trust. Thirdly, information on one rubbish bin stated that the aquarium was selling compostable coffee cups, which was related to the sustainable management commitment of the aquarium. Fourthly, regarding community involvement, Sub-category A2-2 provided conservation tips for visitors, some conservation slogans, and advocated for donations. There was also a banner at the entrance area of the aquariums, illustrating beach cleaning activities organised by the aquarium. Overall, interpretations at the aquarium partially reflected its conservation work, but information was not provided in detail.

5.3.3 Inter-relationships between interpretations and visitors' reflections on conservation issues

This section makes comparisons between interpretations and visitor reviews of Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium. The aim was to determine whether the main contents of visitor reviews to the two attractions agreed with the

interpretations of the two attractions and whether visitors' reflections on conservation issues agreed with interpretations of conservation issues at the attractions.

5.3.3.1 General relationships between visitor reviews and interpretations

Comparing findings from visitor reviews on TripAdvisor and those from interpretive materials at the two attractions, it was evident that some visitors noticed interpretive materials, and the main contents of visitor reviews agreed with the main contents of the interpretations. First, both visitors to the zoo and the aquarium mentioned information about interpretations (as Pattern code Z5 and Pattern code A5 presented), which showed that visitors do pay attention to interpretations at attractions. Additionally, visitor reviews of the zoo putting animals in context (see Pattern code Z5) reflected that panels about animals at the zoo had rich contents (see Section 4.1.3).

Second, visitors showed their general feelings about the attractions in reviews, which may have been influenced by interpretations, as reviews about the educational and conservation functions of the attractions may have resulted from the visitors' reading of the interpretations at the attractions. For example, findings presented in Pattern code Z4 and Pattern code A4, illustrated that visitors believed that they could learn animal names and facts when visiting the zoo and aquarium. Coincidentally, Category Z1 and Category A1 showed that most interpretations of the zoo and aquarium were about basic biological knowledge. Many visitors believed the zoo was a conservation organisation (see Pattern code Z4) but few visitors considered the aquarium as a conservation organisation (see Pattern code A4). This may be related to the original emphasis of the interpretations at the attractions. As Section 4.1.3 states, the zoo presented more conservation work on interpretive panels than did the Aquarium, which showed that they undertook a great deal of conservation work.

Many reviewers of the aquarium believed the aquarium was a very informative place (see Pattern code A5), but seldom did visitors state in their reviews that the zoo was an informative place. This difference may be linked to the density of interpretation materials at the two attractions, since the aquarium provided interpretations on the walls and panels, which generated an image of an informative place, whereas the zoo had a much larger area than did the aquarium, so interpretations were interspersed throughout the attraction, perhaps creating the impression of a less informative place.

Third, the main contents of visitor reviews agreed with the main categories of the interpretations of the two attractions. Pattern code Z2 and Pattern code Z2 showed that visitors to both attractions cared about seeing animals during their visits, and they noticed animals' morphological characteristics and behaviours. Biological information was the most dominant category of the interpretations, as shown in Figures 17 and 29.

5.3.3.2 Relationship between visitor reviews and interpretations on conservation issues

Visitor reviews regarding conservation issues numbered around 30 for each attraction, as presented in Sections 4.3.1 and 4.3.2. These numbers showed that not many visitors were concerned about conservation issues. One reason for this might be because conservation interpretations were not the major themes at the attractions, as noted Section 4.1. (reviews regarding animal welfare issues were not included in conservation issues. Auckland Zoo and conservation science have a different understanding of this issue, as discussed in Section 5.4. Only reviews that considered animal welfare ass a conservation issue were included.) However, the pattern codes regarding conservation issues agreed with interpretations at the attractions.

First, visitors' understanding of the importance of the conservation work of the two attractions agreed with the interpretations, which reflected the organisational missions and visions of the zoo and the aquarium. As Pattern code Z6 and Pattern code A6 showed, visitors could see that conservation work was emphasised by the zoo, and that the aquarium made efforts to preserve animals and the environment. As Sub-category Z3-2 showed, some interpretations at the zoo stated that the zoo was a conservation organisation, which could persuade visitors to believe the zoo undertakes much conservation work. Additionally, information about specific conservation knowledge and work can also contribute to visitors' understanding of how the zoo stresses its conservation work (see Section 4.4.1). Visitors stated that the aquarium made some effort to preserve animals and the environment, which agreed with interpretations at the aquarium. Interpretations at the aquarium did not particularly emphasise conservation work, which might relate to the multiple missions and visions of the aquarium (see Section 4.4.1).

Second, visitors' understandings of the main conservation work of the zoo and the aquarium agreed with that shown in interpretations. As Pattern code Z7 showed, visitors

could see multiple kinds of conservation work conducted by the zoo. Some reviews linked animal welfare with conservation work, as the zoo emphasised in its interpretations (see Category Z3). Visitors also mentioned rescue and captive breeding programmes, sustainable management of the zoo, and how their tickets contributed to conservation funds. The most likely information resource for these reviews was the interpretations at the zoo, as presented in Sub-category Z3-1: Work of the zoo, and Sub-category Z2-2: Conservation advocacy. Visitors to the aquarium considered that the most important conservation work of the aquarium was the sea turtle rescue and rehabilitation programme, as Pattern code A7 showed. This also agreed with the findings of Sub-category A3-1, which showed that the most important work of the aquarium was the turtle rescue and releasing programme.

Therefore, conservation issues presented at the zoo and the aquarium did not attract much attention from the visitors, according to visitor reviews. This may be because conservation issues were not the dominant themes of the interpretations. However, visitors' reflections on conservation issues after their visits to the two attractions agreed with conservation interpretations at the attractions.

5.4 The potential to conduct conservation education through interpretations in zoos and aquaria

Modern zoos and aquaria have been recognised as educational and conservation attractions and have the potential to transmit conservation education to the public. Interpretive materials at the attractions can play important roles in transferring conservation concepts to visitors. The findings of this research supported these arguments in two aspects: the target population, and visitors' attention to interpretations. Firstly, zoos and aquaria can target a large number of visitors, and these visitors are the targets of CE. As the World Association of Zoos and Aquariums (WAZA) claimed, zoos and aquaria around the world attract an immense number of visitors each year (WAZA, 2021). However, the target population of CE is the general public, as they are not experts in conservation issues (Thomas et al., 2018). The profiles of visitors of Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium suggested that most of the visitors were general citizens without much conservation background. Results from the reviews of the zoo and aquarium showed that most of the visitors were families, and the reviews reflected that they had poor conservation knowledge. Therefore, zoos and

aquaria such as Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium, have the privilege of imparting CE to the public.

Secondly, results from this research showed that visitors do notice interpretive panels, which is evidence of the potential for conducting CE through interpretations at zoos and aquaria. Some researchers have argued that visitors do not pay much attention to interpretative panels at zoos and aquaria (Ross & Gillespie, 2009). This research partially agrees with this argument. As Section 4.3 showed, approximately ten percent of reviews mentioned visitors' feelings about the interpretations at the Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium. Considering other reviewers may also have read some interpretations but did not include this issue in their reviews, there are likely to be more visitors receiving information through interpretations at the attractions than represented in the reviews. Additionally, interpretations do impact visitors' feelings towards the attractions. For example, many visitors felt SEA LIFE Kelly Tarlton's Aquarium was a very informative place, and some visitors thought that the zoo was very conservation in its approach. Some visitor reviews showed that they gained knowledge from reading the interpretive panels, and some visitors wrote reviews showing that they learned stories about animals, the life of Kelly Tarlton, and the history of Scott's Hut in the Antarctic. Thus, interpretations at zoos and aquaria are important information resources for visitors. Therefore, it is concluded that interpretive materials have the potential for conducting CE in zoos and aquaria, as they can target a large population of visitors without much conservation knowledge, and visitors do read and reflect on the contents of interpretations.

5.5 Relationship between contents of interpretations and conservation education: Implications for theory and practice

5.5.1 Different understandings of definitions of conservation

The definition of conservation is the most basic issue in understanding CE, the content of CE, and the relationships between interpretations and CE. The literature review chapter discussed the definition of conservation, which assumes public consensus of the definition. However, during the analysis of data, it was found that some zoos and aquaria have different understandings of conservation to those of conservation experts. Therefore, before discussing how the content of interpretation contributing to CE, it is

important to discuss the definition of conservation from different viewpoints and identify any inconsistencies.

According to the Cambridge Conservation Forum (CCF), conservation entails the enhancement of ecosystems, habitats, species, and populations in the wild, without harmful effects on human well-being (Kapos et al., 2008). As the wild is an accepted destination in conservation science, this definition emphasises that the success of conservation should happen in the wild. It also indicates that the goal of successful conservation is not only related to the populations of individual species, but also the large scale health of habitats and ecosystems, which are the foundation of wild populations. Referring to the goals of modern conservation science, Kareiva and Marvier (2012) argued that conservation science has a major goal of improving human well-being through environmental management, and the distinction between conservation science and environmental science lies in strategies to jointly extend subsidies to humans and biodiversity. A major underpinning of this concept, is that humans depend on a healthy ecosystem to live, as much as wildlife does, and if all wildlife is extinct, humans cannot exist on Earth. Protecting the ecosystems for wildlife is equivalent to safeguarding a healthy environment for humans. Therefore, in the narrative of conservation, human beings are not the saviour of wild species, but participants making efforts more for their own future.

In contrast, Auckland Zoo, as a member of the World Association of Zoos and Aquariums (WAZA), has a different understanding of conservation. As presented in Section 4.2.1, Auckland Zoo claimed that conservation was at the heart of its work. As a conservation organisation, the zoo stated its organisational mission to be *"to build a future for wildlife, where people value wildlife, and species are safe from extinction."* This mission statement showed that the zoo emphasised more on the species level, and successful conservation to the zoo meant no extinction of any species. The zoo did not indicate the future of wildlife is either in the wild or at the zoo, and did not provide much information on why they should conduct conservation work. Additionally, the zoo promoted the idea that caring for animals in captivity is the most important conservation work. Auckland Zoo's understanding of conservation could also include the understandings of WAZA, since WAZA also values caring for zoo animals in its conservation strategy (WAZA, 2005). Additionally, SEA LIFE Kelly Tarlton's Aquarium considered healthy oceans as the foundation for the maintenance of sea

creatures (as discussed in Section 4.2.2). The aquarium suggested that doing conservation is an expression of love for the oceans and wildlife living in the oceans.

From this information, it is evident that conservation scientists and some zoos and aquaria hold different understandings of the definition of conservation in three aspects. First, most conservation scientists believe that conservation means the maintenance of both species and their ecosystems in the wild. SEA LIFE Kelly Tarlton's Aquarium held a similar understanding to those of conservation scientists on this point. However, Auckland Zoo focused only on the non-extinction of species, and did not emphasise that the objectives of conservation work should be animals in the wild. As existing research shows that a large proportion of animals in captivity cannot live independently in the wild, conserving animals in their wild ecosystem and protecting animals in captivity are quite different. Second, conservation scientists argue that the ultimate goal for conservation is to protect the ecosystem where humans live, whereas Auckland Zoo and Kelly Tarlton's Aquarium did not stress this goal. In their statements, the reason for conservation work related more to emotional and ethical reasons.

Third, in the context of conservation science, caring for animals in captivity is not an important issue, but in Auckland Zoo, caring for zoo animals was the most significant of is conservation work. Caring for zoo animals is a scientific topic related to animal welfare. The relationship between animal welfare and wildlife conservation has been debated for some years (e.g., Hutchins & Wemmer, 1987). It is believed that these two topics belong to two different domains and are sometimes contradictory in specific circumstances, since conservation science is primarily concerned with species and ecosystems, while animal welfare primarily refers to individuals. The origin of animal welfare is related to farm animals and pets that are under the control of humans (Paquet & Darimont, 2010). Thus, animal welfare is mainly a topic related to the treatment of captive animals. The welfare of zoo animals is an extension of this topic, as zoo animals are also in captivity. Animal welfare may contribute to wild animals' conservation (Paquet & Darimont, 2010), because according to animal welfare logic, humans should not hunt wild animals. However, sometimes animal welfare may be inconsistent with wildlife conservation. For example, when pet cats and dogs are allowed to wander in wild areas, they can harm birds and other animals. Additionally, the welfare of zoo animals may help them live a high quality life, but may not contribute to their wild

population recovery. Therefore, animal welfare and wildlife conservation are two different topics.

According to this analysis, the zoo and aquarium confused the concepts of conservation and animal welfare. This research adopts the definition of conservation from CCF, which believes that conservation refers to the maintenance of ecosystems, habitats, species, and populations in the wild, and caring for zoo animals is not an important aspect of conservation.

5.5.2 How the content of the interpretation contributes to conservation education – applying Orams' (1997) model

This section discusses how the content of interpretations at Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium contributed to CE using the model from Orams (1997). As explained in Section 2.2.2, this model is a seminal model for designing effective interpretations. The model consists mainly of five parts: the affective domain, curiosity, incentive to act, opportunity to act, and effectiveness evaluation and feedback. This section examines how the interpretations fit the prior four parts of the model, and discusses the visitor reviews as a type of feedback for evaluating the effectiveness of CE at the two attractions, as presented in Table 2.

Table 2 *Applying Interpretations of the Two Organisations to Orams' (1997) Model*

Section of the Orams (1997) model	Auckland Zoo	SEA LIFE Kelly Tarlton's Aquarium
Affective domain	Stories about wild population decline	Anthropomorphic stories about beluga and sea turtles
Curiosity	Plenty of biological knowledge, some ecological knowledge	Much information regarding sea creatures, some information about the environment
Incentives to act	Stories about conservation organisations and programmes, conservation slogans, tips for public action	Interpretations concerning turtle rescue, some information from DOC, conservation slogans, tips for public action
Opportunity to act	Donation boxes, Entry money going to conservation fund	Donation boxes
Reflections from visitors	Partially successful	Partially successful

5.5.2.1 Applying interpretations at Auckland Zoo to Orams' (1997) Model

The affective domain and curiosity could be seen as the beginning of interpretations for conservation education. Both try to capture visitors' attention to wildlife conservation issues. Interpretations at Auckland Zoo provided plenty of information regarding species on exhibit and ecological knowledge, which may have stimulated visitors' curiosity to find out more about various species and their environment. Some interpretations also inspired visitors to view and imagine animals (see Section 4.1.1 Category Z4). They told stories referring to the facts of wild population decline, especially that of New Zealand's native species. This may contribute to building visitors' emotional connections with animals. To incentivise visitors to act conservationly, the zoo provided stories about conservation organisations and programmes, conservation slogans, and tips for the visitors to practise conservation in their everyday lives. The zoo also created opportunities for visitors to take part in conservation activities by displaying donation boxes at the zoo and interpreting the relationship between entry tickets and its conservation fund.

From the analysis of visitor reviews, it was evident that the CE of the zoo was partially successful, as some few visitors did notice conservation issues during their visit, and expressed their feelings about this. They could see that the zoo stressed conservation work a great deal. A few also understood that the income from their entry tickets contributed to the Conservation Fund. Although the zoo interpretations argued that all the work in the zoo contributed to conservation directly, few visitors expressed their interest in conservation issues, perhaps because the interpretations did not stimulate enough of their attention. As interpretations encouraging watching and thinking were not related to conservation issues, interpretations for stimulating curiosity and the affective domain were not effective enough. Moreover, very few visitors showed their participation in conservation work or changed of behaviour on conservation issues. The reasons for this may be because the zoo did not provide sufficient opportunities for visitors to act.

5.5.2.2 Applying interpretations at SEA LIFE Kelly Tarlton's Aquarium to Orams' (1997) Model

Interpretations at SEA LIFE Kelly Tarlton's Aquarium provided a great deal of information about sea creatures and the environment to stimulate the curiosity of

visitors. The interpretations also told stories about the life of two beluga whales and prior residents of Turtle Bay. Personification was used in these stories to stimulate empathy and sympathy. To inspire visitors to take part in conservation, the aquarium presented interpretations about its work of turtle rescues and some information from the Department of Conservation of New Zealand. It also encouraged visitors to behave in an environmentally friendly manner, and advocated for conservation in conservation slogans. Additionally, the aquarium provided donation opportunities for visitors.

Considering the analysis of visitor reviews on the aquarium, CE was considered partially successful. Some visitors did find that conservation was part of the work of the aquarium, and they also received information about the turtle rescue programme. However, some visitors were not satisfied with the conservation work of the aquarium (see Section 4.3.2 Pattern code A6). There were no reviews showing visitors' interest in participating in conservation behaviour. Two reasons could be found for this. Firstly, the aquarium did not emphasise conservation as its most important work. Therefore, many interpretations regarding sea creatures were not aimed at stimulating visitors' interest in conservation issues. Secondly, the aquarium did not provide sufficient opportunities for visitors to undertake conservation behaviours.

5.5.3 A critique on the content of interpretations towards conservation education

After discussing the definition of conservation and applying interpretations of the two attractions to Orams' model, this section discusses the advantages and disadvantages of the interpretations in relation to CE. Generally, Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium both achieved some success in CE, since both of the two attractions addressed conservation issues in their interpretations. Additionally, visitor reviews showed that the zoo seemed more successful than the aquarium in CE, as more visitors believed that the zoo was a conservation organisation and gave positive reviews about CE at the zoo. The reasons for this can be considered from three perspectives: firstly, the zoo presented its conservation mission in the interpretations, which was therefore very obvious for visitors. Secondly, the zoo provided scientific facts and statistics about biodiversity issues, which was objective and scientific. Thirdly, the zoo provided specific information regarding the reasons for population decline and procedures for the conservation of some species. This information may have helped visitors understand more about conservation.

Neither of the two studied attractions was successful enough in CE, as too few visitors expressed their behaviour changes in the reviews. Despite the reasons analysed in Section 5.5.2, this paragraph discusses some other reasons associated with the weak commitment to conservation issues evident in the reviews. First, the conservation theme in the interpretations of both attractions was not clear, and mixed with information about animal welfare, adorable characteristics, and stories of individual animals. This directed visitors' attention to topics other than that of conservation, such as caring for captive animals and being willing to contact animals up close. Second, interpretations of the two attractions did not provide clear information about why humans should protect biodiversity. Thus, visitors could not see the relationships between conservation and their lives, so did not experience much motivation to change to conservation behaviours.

Third, some interpretations were not rigorous. For example, the aquarium stated the threat of sea turtles as humans and sharks that feed on adult turtles. There were two problems in this interpretation; firstly, sharks are natural predators of sea turtles, so should not be seen as a threat for a species, according to conservation science (Washington, 2019). Secondly, this interpretation did not explain the relationship between environmental boats' collisions, pollution, and hunting for turtle eggs, which are the main human-induced threats to sea turtles (Alae Eddine et al., 2020; Mejias-Balsalobre et al., 2021; Sala et al., 2021a). The zoo also demonstrated similar shortcomings in the interpretations of their mission, as information argued that the zoo was willing to build a future for wildlife where there would be no extinction anymore. However, species extinction always happens in nature, so conservation science focuses only on human-induced extinctions (Washington, 2019). Due to this kind of interpretation, visitors may become confused about the main problems of conservation, which may lead to less behaviour change.

Fourth, some interpretations in the zoo were not objective, as they over-emphasised their contribution to conservation work and persuaded visitors to contribute just by visiting the zoo or donating to the conservation fund. This information may have misled visitors to believe that conservation is the zoo's work but not that of individuals. Most conservation experts have agreed that conservation does not depend on conservationists, and without the participation of the public, conservation goals will never be achieved

(Mace, 2014). Indeed, visitors could contribute more to conservation through their everyday behaviour than by visiting the zoo.

5.6 Factors affecting the content of interpretations related to conservation education

After discussing the relationships of contents of interpretations with CE, this section explores the underpinning logic that may affect the contents of interpretations at zoos and aquaria, as CE in zoos and aquaria involves two groups (Botha et al., 2021): the information providers (zoos and aquaria) and the knowledge receivers (visitors). However, this research primarily sought to discuss factors affecting interpretations from the two aspects of the supplier side and the receiver side.

5.6.1 Factors from the supply side

Zoos and aquaria are the suppliers of interpretations at the attractions. This section discusses two factors influencing the contents of interpretations from the supplier side, which relate to organisational positions, and the conservation work employees are involved in. Firstly, organisational positions can influence the content of interpretations of zoos and aquaria in three ways: mission, function, and their understanding of conservation. Organisational missions can influence the content of interpretations, because conservation is a mission driven discipline (Mace, 2014); therefore, an organisational mission usually serves as a guideline for the content of the interpretations. As discussed in Section 5.3.1, the different mission and vision statements of Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium led to different emphases on conservation issues in their interpretations. However, a solid organisational mission declaration does not ensure sufficient activities in zoos and aquaria (Maynard et al., 2020). Both attractions of this research addressed CE in their mission and vision statements, but the main content of interpretations did not contribute to CE very well (as discussed in Section 5.5.2). Therefore, some underpinning factors deserve further discussion.

The virtual functions of zoos and aquaria may be an important factor influencing the content of interpretations. As discussed in Section 2.3, modern zoos and aquaria are attractions with the functions of providing entertainment, education, and conservation. As tourism attractions, zoos and aquaria usually try to give their visitors relaxing and

knowledgeable interpretations. Although Auckland Zoo positions itself as a conservation organisation, its function as a tourism attraction is undeniable. The zoo offered promotions in its interpretations, and an annual pass promotion is an important element of the interpretations. This persuades visitors that visiting the zoo is a very important conservation behaviour.

The organisations' understandings of conservation can also impact the content of interpretations in zoos and aquaria. When an organisation places conservation work in an important position, it usually emphasises conservation issues in the interpretations. The interpretations may reflect the organisation's understanding of conservation, which may be different from that of conservation science. As discussed in Section 5.5.1, Auckland Zoo, as a representative of WAZA, believed caring for zoo animals was one of the most important tasks of conservation, even though conservationists seldom consider caring for animals in captivity. This example from Auckland Zoo shows that caring for zoo animals is a significant sub-category of the interpretations. According to the zoo's understanding of conservation work, interpretations about caring for zoo animals may stimulate visitors' interest in animal welfare issues, but it cannot contribute to the conservation goals of CCF (Kapos et al., 2008), which only emphasise the maintenance of species in their wild environment.

5.6.2   Factors from the demand side

Visitors are the main receivers of interpretations in zoos and aquaria, so their profiles and requirements can influence the design of interpretations. As discussed in Section 2.4.3, visitors' profiles can be important factors influencing the effectiveness of CE in zoos and aquaria, so zoos and aquaria need to consider the receivers' information when designing interpretations. This section discusses visitors' profiles in three aspects that can affect the content of interpretations regarding CE in zoos and aquaria.

First, visitors to the zoo and the aquarium were mostly returning visitors. Natural attractions, and zoos and aquaria, are important avenues for disseminating conservation concepts to the public through interpretations. Interpretation in other tourism attractions usually involves first time audiences (Hammitt, 1984), but findings of this research showed that most visitors to the zoo and the aquarium were repeat visitors. Generally, there are two types of returning visitors: adults with children, and zoo and aquarium

enthusiasts. Zoos and aquaria are avenues for children to play and learn, and their parents or other guardians usually visit the attractions with their children. These visits provide great CE opportunities through interpretations. Fans of zoos and aquaria are another important group of visitors who visit zoos and aquaria worldwide. These visitors do not usually visit just one specific zoo or aquarium, but always put zoos and aquaria on their visiting list when they travel. They are interested in animals and relevant issues and have the potential to learn conservation issues in depth. As discussed in Chapter 2, visitors' previous visiting experience is important for effective CE learning (Ballantyne et al., 2011; Kruse & Card, 2004). However, if the interpretations have not been changed for years, returning visitors cannot learn more about conservation. Therefore, it is important to provide suitable and changing content of interpretations for different returning visitors.

Second, visitors' motivation to visit zoos and aquaria is another important factor. Many researchers have found that visitors go to zoos and aquaria mainly for entertainment, but that they are also keen to learn something (Ballantyne et al., 2011). The current research agrees with these arguments and observed that what visitors want to learn may not be associated with conservation issues. Findings from this research showed that most visitors were interested in biological knowledge, such as animal names and behaviours. Therefore, zoos and aquaria, as CE providers, need to be aware of the different content of basic biological interpretations, and interpretations regarding conservation issues. Interesting designs of interpretations are also required to try to inspire more enthusiasm for conservation issues.

Third, visitors' understanding of relevant issues has changed from that of the past. Studies have argued that visitors' knowledge and their sensitivity to conservation thinking are significant for effective conservation learning in zoos and aquaria (Mast et al., 2018; Nygren & Ojalammi, 2018; Pearson et al., 2013). In the past, humans treated animals as possessions or forms of entertainment. Therefore, contemporary zoos and aquaria have tried to increase visitors' awareness by addressing animal welfare issues and making emotional connections (Patrick & Tunnicliffe, 2013). Findings from this research showed that those efforts are successful, because caring for animals and loving animals were frequently mentioned in the reviews. Now, caring for captive animals is not a new idea for visitors, but a standard by which visitors use to judge a zoo or aquarium. Too much emphasis on the emotional connection with particular species also

leads to behaviours inconsistent with the core concepts of conservation science, such as protecting some species and abhorring others, and feeding wildlife with food intended for humans. Therefore, it is important to understand the trends of society towards animal and conservation issues and provide appropriate and in-depth interpretations.

5.7   A model for CE interpretation design at zoos and aquaria

5.7.1 The role of content of interpretations and interpretation design in conservation education

As discussed in this chapter, the content of interpretations at zoos and aquaria may influence visitors' conservation learning, and various factors can affect the content of interpretations. This section discusses the role of content of interpretations in CE and the relationships of relevant factors, by proposing a relationship map, as presented in Figure 40.

Visitors' CE learning is the goal of CE interpretations at zoos and aquaria. Two important factors have been discussed as affecting visitors' CE learning; one is the content of interpretation, and the other is visitors' understanding of animal and conservation issues. This research argues that visitors' understanding of animal and conservation issues is affected by the content of interpretations in zoos and aquaria, as findings from this research showed that visitors do notice and learn from interpretations during their visits.

This research identified factors from both the supply and demand side of CE in zoos and aquaria. Organisational missions, functions, and the understanding of conservation, are significant factors influencing the content of interpretations in zoos and aquaria. Visitors' profiles and their understandings of animal and conservation issues may also affect the content of interpretation, when they are considered by interpretation designers. Therefore, interpretation design may be an important procedure that serves as a bridge linking the influencing factors with the content of interpretation.

**Figure 40** *The Role of Interpretation Content in Conservation Education*
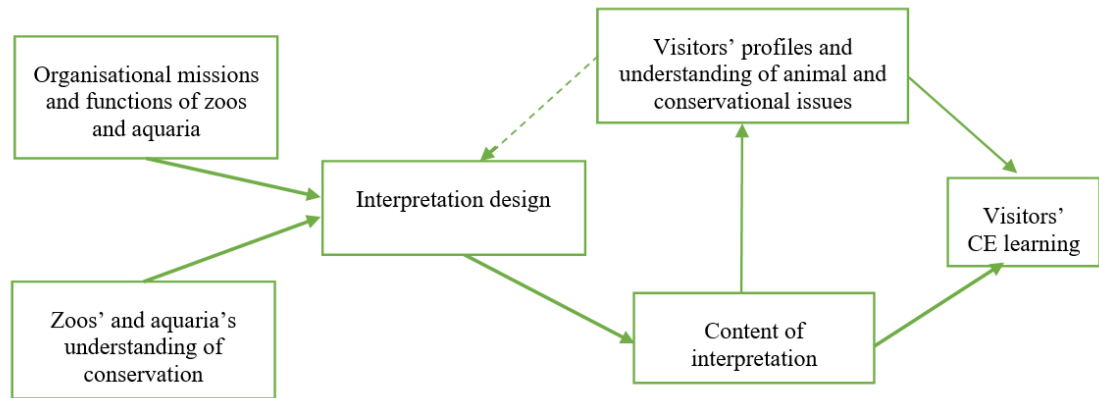
5.7.2   A model for effective conservation education interpretation design at zoos and aquaria

As discussed, the content of interpretation is an important factor influencing visitors' CE learning, as it not only affects visitors' CE learning directly, but also indirectly, by influencing their understanding of animal and conservation issues. This research argues that interpretation design usually decides the content of interpretation. Thus, this section proposes a model for effective CE interpretation design at zoos and aquaria, which is a content-centric model based on Orams' (1997) model.

This content-centric model includes four phases, as shown in Figure 41. The first phase is that of conditions and considerations, which are crucial for the interpretation design. Before designing interpretations for zoos and aquaria, it is better to consider information from both organisational and visitors' perspectives. Organisational missions and functions are guidelines for interpretation design, so it is important to adjust organisations' understandings of conservation to those of conservation science. An appropriate interpretation design also needs to consider visitors' profiles and their conservation focuses, which determine their tolerance and capacity for CE interpretations. After clarifying the conditions and considerations of interpretation design, the second phase is that of pre-interpretation design. This step sets a structure for the interpretation design at zoos and aquaria. In this phase, clear CE goals and the proportion of CE in interpretations needs to be determined. The CE goals should agree

with conservation science, and can be composed of a strategical goal and some sub-CE goals. The sub-CE goals may be associated with some conservation programmes.

Figure 41 *A Model for Effective Conservation Education Interpretation Design at Zoos and Aquaria*
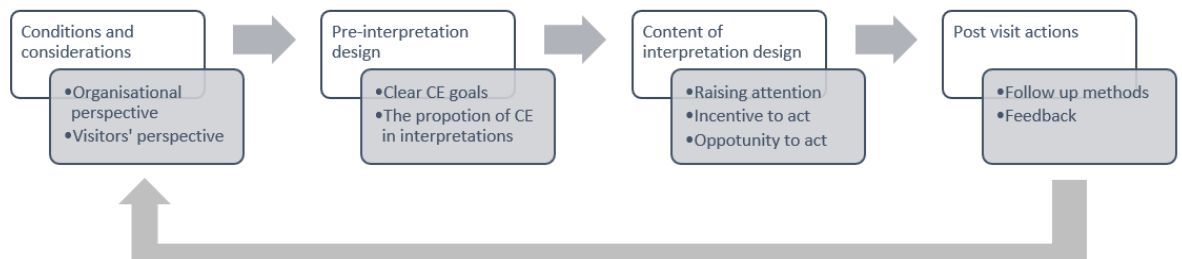
The third phase of the content of interpretation design is the core phase of this model. The content of CE interpretation is divided into three parts derived from Orams' (1997) model. As Figure 41 shows, the content of CE interpretation includes raising attention, incentive to act, and opportunity to act. Specific information is suggested for each part, as shown in Figure 42. There are some differences between the raising attention aspect of this model and Orams' (1997) model. In Orams' model, interpretations can use the affective domain and curiosity to increase public attention to conservation issues, but as discussed in this chapter, visitors' thinking about animals and conservation issues have changed, and too much emotional connection may lead to undesirable outcomes for conservation. Therefore, a more scientific basis to encourage public attention is emphasised in this research's model. This could address topics in relation to why everyone needs to participate in conservation work, the facts of endangered animals, human induced reasons, and the effects of species extinction. This research argues that conservation is not only the work of conservationists, but of every human, because if all animal disappeared, the environment would no longer be suitable for humans. This point should be emphasised in the interpretations at zoos and aquaria.

Figure 42 *The Specific Content of Interpretation Design*
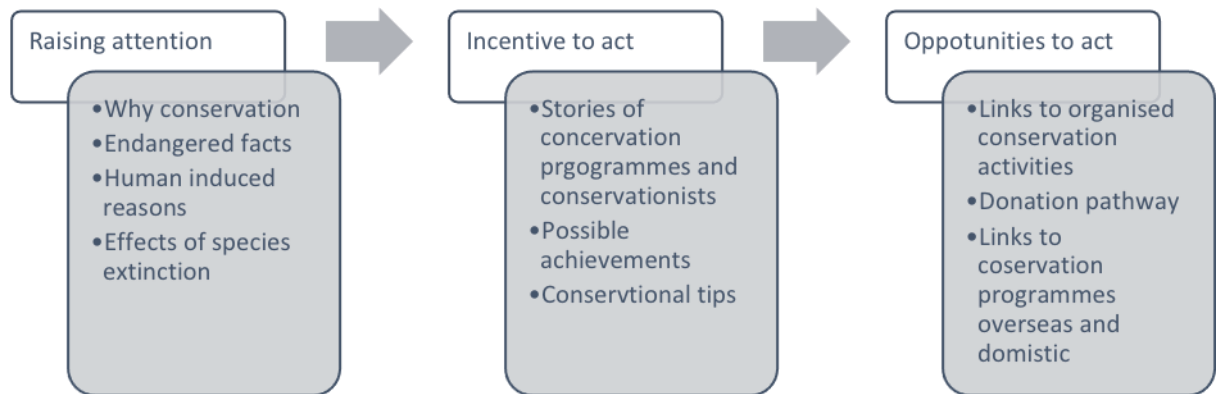
Content encouraging visitors to participate in conservation behaviour could include stories of conservation programmes and conservationists, possible achievements for the public, and conservation tips to practise in their daily lives. This research also argues that zoos and aquaria could provide more opportunities for visitors to participate in conservation activities. Besides donation boxes, they could provide QR (quick response) codes for visitors who want to donate through an online payment system, and application forms for local organised conservation activities and links to conservation programmes, both overseas and domestic.

The last phase of this model is that of the post-visit actions, which could extend the effects of interpretations. Zoos and aquaria could conduct multiple follow-up methods to make a long-term connection with visitors and provide more in-depth CE information. Social media and social media groups could contribute to this method. Additionally, understanding visitors' feedback about conservation issues is also important. Zoos and aquaria could collect feedback from visitors on numerous tourism websites and social media. Such feedback could contribute to the first phase of this model, so organisations could change their interpretations according to the profiles and understandings of their visitors; interpretations at zoos and aquaria are not fixed but require change.

5.8 Chapter summary

This section discussed topics regarding the content of interpretations for conservation education. It firstly compared findings from Auckland Zoo and SEA LIFE Kelly

Tarlton's Aquarium and summarised the differences in interpretations between the two organisations. It also compared the missions and conservation work of the two organisations. The findings showed that the two organisations have different emphases on conservation issues and that the zoo participated in more conservation work. This research also compared findings from visitor reviews on TripAdvisor.

The cross-phase comparison of findings from three sections explored the inter-relationships between interpretations and organisational positions and their conservation work. It argued that interpretations do reflect organisational missions and represent the conservation work of the organisations, and discussed the relationship between interpretations and visitors' reflections on conservation issues. The chapter also argued that zoos and aquaria have significant potential to conduct CE through appropriate interpretations.

This chapter also reviewed the relationships between contents of interpretations and CE in zoos and aquaria, and observed that there are different understandings of conservation between some zoos and aquaria and conservation scientists. The core difference lies in whether caring for animals in captivity is the most important work of conservation; caring for zoo animals is related to animal welfare, which is a different domain. To achieve better CE in zoos and aquaria, the organisations need to adjust their understanding of conservation to conservation science. After reviewing definitions of conservation, the chapter questioned how the content of interpretations contributed to CE, by applying Orams' (1997) model to interpretations of Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium. It also critiqued the content of CE interpretations at the two organisations.

The chapter also discussed factors affecting the content of interpretations at zoos and aquaria from both supplier and receiver sides. It argued that the content of interpretations can influence CE both directly and indirectly, and the affecting factors may affect the content of interpretations through interpretation design. Finally, the chapter proposed a content-centric model for effective CE interpretations using four phases: conditions and considerations, pre-interpretation design, contents of interpretation design, and post-visit actions.

Chapter 6.   Conclusion and Recommendations

Protecting the biodiversity of the Earth has become an urgent issue around the world (E. Sala et al., 2021). In the context of global climate change, the 2021 United Nations climate change conference (United Kingdom Conference of the Parties [COP] 26) set protecting and restoring ecosystems of the countries affected by climate change as an important goal (UKCOP26, 2021). According to the Cambridge Conservation Forum, effective conservation entails increasing the possibility of the survival and maintenance of ecosystems, habitats, species, and populations in the wild, without harmful impacts on human well-being (Kapos et al., 2008). Increasingly, conservation professionals have realised that conservation goals cannot be achieved without public support (Ardoin & Heimlich, 2013) and CE has been identified as the most effective method of capturing the attention of the public (Jacobson et al., 2015).

This research argues that CE is a strategic process designed to influence members of the public, who are not familiar with conservation issues, to participate in activities to achieve conservation goals. The goals of CE are delivering conservation knowledge and practices to the public, increasing public awareness of biodiversity, changing attitudes and behaviours of individuals towards conservation issues, and encouraging conservation (Kobori, 2009; Thomas et al., 2018). As an important part of conservation science, CE is offered by various organisations, such as conservation organisations, schools, and tourism attractions (Ardoin & Heimlich, 2013). CE takes place in both formal and informal settings, and particular kinds of tourism attractions provide important opportunities to conduct informal CE through interpretations.

Zoos and aquaria are important attractions to transmit conservation concepts to the public (Clayton et al., 2009), as wild animals in captivity are the main fascinations of these attractions, and they welcome a significant number of visitors each year (WAZA, 2021). In the past, zoos and aquaria were set up for entertainment and scientific research (Turley, 1999), but in contemporary tourism, education and conservation have become their main functions. As tourism attractions, zoo and aquaria operators cannot deny that the motivations of most visitors are mainly those of entertainment. Therefore, they endeavour to provide CE to the public during their visits to achieve their conservation goals, even though education in zoos and aquaria is not just to meet conservation goals.

Researchers have found that CE in zoos and aquaria can contribute to visitors' knowledge, building emotional connections with animals and inspiring donation behaviours (Ballantyne et al., 2018; Nygren & Ojalammi, 2018). However, some researchers have argued that using animals in captivity for CE may lead to a misunderstanding of wildlife conservation (Bulbeck, 2005). Therefore, some researchers have evaluated the effectiveness of CE in zoos and aquaria, and many have argued that CE in these attractions is not effective enough (Nygren & Ojalammi, 2018). The content of interpretations at attractions is a significant factor affecting CE outcomes. This research applied qualitative research methods to explore a series of questions regarding the content of interpretations and CE in Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium.

6.1 Key research conclusions

The main research conclusions are presented under four headings. First, it categorises the content of CE provided by Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium, and shows that conservation is not the dominant category of the interpretations, but can contribute to CE. Second, it contends that the content of interpretations reflects the organisations' missions of the zoo and the aquaria and their conservation work. Third, it discusses the relationship between on-site interpretations and visitor reviews, and argues that the content of interpretations can influence visitors' opinions and that therefore, the CE at the two attractions was partially successful. Fourth, it interprets the important role of the content of interpretations in CE at zoos and aquaria.

6.1.1 Content of conservation education at Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium

Conservation issues are not the dominant category of the interpretations

In order to explore the content of CE provided through interpretations at Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium, this research categorised textual interpretations at the two attractions. Interpretations of the zoo were grouped into six categories: biological knowledge, knowledge about animal habitat and ecosystem, Māori culture, conservation information, information about the zoo and its work, and visitor information. The major categories of the interpretive materials of the aquarium

were biological knowledge, conservation and environmental information, information about the aquarium and its work, visitor information, knowledge about Antarctica, ecology knowledge, Māori culture, and brain teasers. It was found that both organisations provided plenty of knowledge in their interpretations, and basic biological knowledge was the dominant category, although conservation information was also provided in the interpretations. Conservation interpretations at the zoo were more specific than were those at the aquarium. The aquarium also addressed ocean environmental issues in its interpretations. These findings show that conservation issues were important content in interpretations of the two attractions, but not the most stressed part.

The interpretations contribute to conservation education

Although conservation issues are not the dominant category of interpretations at Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium, these were still emphasised in the interpretations and may have contributed to CE. Both attractions tried to capture visitors' attention by providing interpretations related to the curiosity and affective domain Orams' (1997) model. They also tried to encourage visitors to into conservation behaviours and provided donation boxes for visitors to act.

6.1.2 The content of interpretations reflects the organisational missions and their conservation work

By comparing categories of the content of interpretations and organisational positions of the two attractions, this research found that the content of interpretations reflected the organisational mission and conservation work. Both the zoo and the aquarium included conservation themes in their organisational positions. The zoo prioritised conservation in its mission and stated that all its work contributed to conservation directly, and although the aquarium viewed conservation as an important function, its most important work was providing visitors with magical experiences. This difference in organisational positions was reflected in the interpretations of the two organisations and led to different interpretation styles. Additionally, the staff of the zoo and the aquarium were involved in conservation work, and the content of the interpretations provided specific information about conservation work from both the two attractions.

6.1.3 The content of on-site interpretations and visitors' reflections

The content of interpretations can influence visitors' opinions after their visit

Comparisons between categories of interpretations and visitor reviews of the two organisations showed that the content of interpretations can influence visitors' opinions after their visit. Visitors do pay attention to interpretations when visiting the zoo and the aquarium, and mentioned the interpretations in their reviews; their main concern points were consistent with the content of the interpretations. The content of visitor reviews reflected the content of interpretations at both attractions. Therefore, it is concluded that the content of interpretations was an important factor influencing visitors' understandings of issues addressed by the zoo and the aquaria.

Conservation education of the two attractions was partially successful

Visitor reviews of both Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium showed that the CE of the two attractions may not have been successful enough, as the numbers of reviews about conservation issues was limited. One explanation may be that the conservation issue was not the dominant category of the interpretations and therefore did not attract much attention from visitors. However, the interpretations still achieved some success in terms of CE, and have more potential, as visitors do understand the importance of conservation, which was emphasised by both the zoo and the aquarium. Additionally, some feedback on the conservation work of the two organisations was provided in the visitor reviews. Therefore, if zoos and aquaria put more effort into the content of interpretations related to conservation issues, the effectiveness of CE through free choice learning could be improved.

6.1.4 The role of the content of interpretations in conservation education at zoos and aquaria

This research identified the content of interpretations as an important factor influencing the success of CE in zoos and aquaria. Both the content of interpretations and visitors' prior understanding of relevant issues can influence visitors' CE learning. The content of interpretations can influence visitors' CE learning both directly and indirectly, and their understanding of conservation issues. Interpretation design is a significant influence on the content of interpretations in zoos and aquaria, and should consider three factors: organisational mission and functions, the organisations' understanding of

conservation issues, and visitors' understanding of relevant issues. Of these, visitors' understanding of relevant issues influences their ability to absorb CE concepts and deserves more attention from CE providers.

6.2 Recommendations for conservation education in zoos and aquaria

6.2.1 Adjusting organisational understanding of conservation to conservation science

This research identified organisational understanding of conservation as an important factor in the CE of zoos and aquaria. It is also determined that although Auckland Zoo particularly emphasised conservation, its understanding of conservation was different from that of conservation science. Auckland Zoo considered caring for captive animals as the most important conservation work, but most conservation scientists do not emphasise this aspect. This unexpected inconsistency could profoundly influence the effectiveness of CE in zoos and aquaria, because an over-emphasis on caring for captive animals may not lead to conservation behaviour. Therefore, to achieve a better conservation effect through CE, more adjustment of the approach of zoos and aquaria to that of conservation science is required.

Both zoos and aquaria, and conservation organisations can make efforts to improve CE in zoos and aquaria. Firstly, most zoos and aquaria claim that they stress conservation work, but they need to be clear about their conservation and CE goals. Certain conservation goals as presented by the Cambridge Conservation Forum, can contribute to the public's better understanding of conservation issues (Kapos et al., 2008). Secondly, more cooperation is required from zoos and aquaria with conservation organisations without captive animals. Through this cooperation, interpretations at zoos and aquaria may be closer to the perspectives of conservation science, so visitors can receive more comprehensive information about conservation issues.

6.2.2 Improving conservation education effectiveness through appropriate interpretation design

This research argues that the appropriate content of interpretations can contribute to improving the effectiveness of CE in zoos and aquaria. Therefore, interpretation designs should emphasise the content of interpretations. The research proposed a four step interpretation model for better CE in zoos and aquaria, emphasising the content of

interpretations. In the first step, designers need to consider their organisational missions and visitors' perspectives, which can establish key points for the interpretations. They also need to consider feedback from prior CE experiences. The second step requires a pre-content design to clarify the CE goals and decide on the proportion of CE content in the entire interpretations.

The third step is the core step of this model, and focuses on the content of interpretations. It follows the model from Orams (1997), focusing on the three main parts: capturing attention, incentives to act, and providing opportunities to act. Specific suggestions are provided. Firstly, interpretations should address scientific reasons for conservation to the public and focus on human-induced extinctions. Secondly, zoos and aquaria could provide more opportunities by presenting QR codes for public donations rather than just donation boxes. The last step of the interpretation design is also significant, and suggests some post-visit actions, such as making a long-term connection with visitors through social media, and providing more in-depth CE information. This work may contribute to understanding visitors' needs, as visitors' attitudes change over time.

6.3 Future research

This qualitative research investigated the content of textual interpretations at Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium and discussed how the interpretations contributed to CE. It also explored the relationships between the content of interpretations and the two attractions' organisational positions, and discussed how interpretations can affect visitors' attitudes to conservation issues. It is evident that this meaningful topic regarding the content of CE in zoos and aquaria deserves broader and more in-depth research. First, more studies on the content of interpretations at zoos and aquaria can be conducted around the world. Research on different ownership types in different countries may contribute to a profound understanding of CE provided by zoos and aquaria. Zoos and aquaria in different social contexts may have different organisational positions as well. Comparing their organisational positions with the content of their interpretations may help to identify which zoo or aquarium really makes efforts towards conservation work, and which are just claiming a conservation focus to gain public trust.

Second, this research observed that visitors' understandings of wildlife and relevant issues keep changing, which may be an important indicator of the need for CE providers to determine ways to provide more appropriate CE content. Therefore, specific studies on visitors' understandings of conservation issues may provide theoretical support for improvements to CE at zoos and aquaria. Third, besides the textual content of the interpretations, other characteristics of interpretations can also influence the effectiveness of CE. Therefore, more research is need on the non-textual content of interpretation panels, such as pictures and the arrangement of the panels.

6.4 Research contribution

The findings of this research categorised the content of interpretations at Auckland Zoo and SEA LIFE Kelly Tarlton's Aquarium, and explored the relationships between organisational positions, the content of interpretations, and visitors' reflections on CE in zoos and aquaria. The research identified the content of interpretation as a significant factor affecting CE in zoos and aquaria. It also discussed the inter-relationships between organisational positions and the content of interpretation in zoos and aquaria. It proposed a model to interpret the role of interpretation content in the CE of zoos and aquaria, which can contribute to CE both practically and theoretically.

In practice, this research may provide operators of zoos and aquaria with opportunities for new thinking around issues regarding CE in zoos and aquaria, for example, by paying more attention to the content of interpretations and the definitions of conservation. Furthermore, to improve the effectiveness of CE in zoos and aquaria, the research proposed a model for interpretation design, emphasising the content of interpretation.

Theoretically, this research filled research gaps in the knowledge of interpretation content and definitions of conservation in CE research in zoos and aquaria. It answered these two basic questions in CE research that most prior studies have not addressed. Clarifying these two questions may contribute to further studies on CE design, evaluation, and other research topics on CE in zoos and aquaria. Moreover, this research discussed both the antecedents and consequences of interpretations in zoos and aquaria, contributing to comprehensive understandings of CE in zoos and aquaria.

References

Ajayi, O. O., & Tichaawa, T. M. (2020). Visitors' characteristics and destination image: The case of Nigerian zoos. *GeoJournal of Tourism and Geosites, 32*(4), 1410-1417. https://doi.org/10.30892/gtg.32432-588

Alae Eddine, B., Youcef, B., Mouloud, B., Amaria Latefa, B., Samira Ait, D., Yahia, B., Mohamed, B., & Mohamed, B. (2020). First study of sea turtle strandings in Algeria (western Mediterranean) and associated threats: 2016–2017. *Herpetozoa, 33*(113-120), 113-120. https://doi.org/10.3897/herpetozoa.33.e48541

André, C., Kamate, C., Mbonzo, P., Morel, D., & Hare, B. (2008). The conservation value of Lola ya Bonobo Sanctuary. In T. Furuichi & J. Thompson (Eds.), *The Bonobos: Behavior, ecology, and conservation* (pp. 303-322). Springer New York. https://doi.org/10.1007/978-0-387-74787-3_16

Andresen, E., López-del-Toro, P., Franquesa-Soler, M., Mora, F., & Barraza, L. (2020). Teenagers' awareness about local vertebrates and their functions: Strengthening community environmental education in a Mexican shade-coffee region to foster animal conservation. *Sustainability, 12*(20). https://doi.org/10.3390/su12208684

Ardoin, N. M., Bowers, A. W., Roth, N. W., & Holthuis, N. (2017). Environmental education and K-12 student outcomes: A review and analysis of research. *The Journal of Environmental Education, 49*(1), 1-17. https://doi.org/10.1080/00958964.2017.1366155

Ardoin, N. M., & Heimlich, J. E. (2013). Views from the field: Conservation educators' and practitioners' perceptions of education as a strategy for achieving conservation outcomes. *The Journal of Environmental Education, 44*(2), 97-115. https://doi.org/10.1080/00958964.2012.700963

Ardoin, N. M., Wheaton, M., Bowers, A. W., Hunt, C. A., & Durham, W. H. (2015). Nature-based tourism's impact on environmental knowledge, attitudes, and behavior: A review and analysis of the literature and potential future research.

Journal of Sustainable Tourism, 23(6), 838-858.
https://doi.org/10.1080/09669582.2015.1024258

Auckland Unlimited. (2021). *About us*. Auckland Council.
https://aucklandunlimited.com/about-us

Auckland Zoo. (2021a). *About us*. Auckland Council.
https://www.aucklandzoo.co.nz/about-the-zoo

Auckland Zoo. (2021b). *Education*. Auckland Council.
https://www.aucklandzoo.co.nz/visit/education

Auckland Zoo. (2021c). *Position statements*. Auckland Council.
https://www.aucklandzoo.co.nz/get-involved/position-statements

Auckland Zoo. (2021d). *Zoo map*. Auckland Council.
https://www.aucklandzoo.co.nz/visit/zoo-map

Baghramian, M., & Coliva, A. (2019). *Relativism*. Taylor & Francis.
http://ebookcentral.proquest.com

Balakrishnan, V. S. (2018). Global warming: Experts demand urgent action to prevent
public health crisis. *Clinical research, 363*, Article k4241.
https://doi.org/10.1136/bmj.k4241

Ballantyne, R., Hughes, K., Lee, J., Packer, J., & Sneddon, J. (2021). Facilitating
zoo/aquarium visitors' adoption of environmentally sustainable behaviour:
Developing a values-based interpretation matrix. *Tourism Management, 84*.
Advance online publication. https://doi.org/10.1016/j.tourman.2020.104243

Ballantyne, R., & Packer, J. (2016). Visitors' perceptions of the conservation education
role of zoos and aquariums: Implications for the provision of learning
experiences. *Visitor Studies, 19*(2), 193-210.
https://doi.org/10.1080/10645578.2016.1220185

Ballantyne, R., Packer, J., & Falk, J. (2011). Visitors' learning for environmental
sustainability: Testing short- and long-term impacts of wildlife tourism

experiences using structural equation modelling. *Tourism Management, 32*(6), 1243-1252. https://doi.org/10.1016/j.tourman.2010.11.003

Ballantyne, R., Packer, J., Hughes, K., & Gill, C. (2018). Post-visit reinforcement of zoo conservation messages: The design and testing of an action resource website. *Visitor Studies, 21*(1), 98-120. https://doi.org/10.1080/10645578.2018.1503871

Baratay, E., & Hardouin-Fugier, E. (2004). *Zoo: A history of zoological gardens in the West*. Reaktion Books.

Barton, A. W. (2016). From parks to partnerships: National heritage areas and the path to collaborative participation in the national park service's first 100 years. *Natural Resources Journal*, 56(1), 23–54.

Bartosh, O., Tudor, M., Ferguson, L., & Taylor, C. (2006). Improving test scores through environmental education: Is it possible? *Applied Environmental Education & Communication, 5*(3), 161-169. https://doi.org/10.1080/15330150600912937

Beck, B. (1995). Reintroduction, zoos, conservation, and animal welfare. In Bryan G. Norton, Michael Hutchins, et al (Eds.), *Ethics on the ark: Zoos, animal welfare, and wildlife conservation (*pp. 155-163). Penguin Random House Publisher Services.

Ben Zvi Assaraf, O., Tishler, C., & Fried, M. N. (2020). How do visitors from different cultural backgrounds perceive the messages conveyed to them by their local zoo? *Interdisciplinary Journal of Environmental and Science Education, 16*(3). https://doi.org/10.29333/ijese/8335

Bengtsson, M. (2016). How to plan and perform a qualitative study using content analysis. *NursingPlus Open, 2*, 8-14. https://doi.org/10.1016/j.npls.2016.01.001

Bennett, N. J., Roth, R., Klain, S. C., Chan, K., Christie, P., Clark, D. A., Cullman, G., Curran, D., Durbin, T. J., Epstein, G., Greenberg, A., Nelson, M. P., Sandlos, J., Stedman, R., Teel, T. L., Thomas, R., Veríssimo, D., & Wyborn, C. (2017a).

Conservation social science: Understanding and integrating human dimensions to improve conservation. *Biological Conservation, 205*, 93-108. https://doi.org/10.1016/j.biocon.2016.10.006

Bennett, N. J., Roth, R., Klain, S. C., Chan, K. M., Clark, D. A., Cullman, G., Epstein, G., Nelson, M. P., Stedman, R., Teel, T. L., Thomas, R. E., Wyborn, C., Curran, D., Greenberg, A., Sandlos, J., & Verissimo, D. (2017b). Mainstreaming the social sciences in conservation. *Conservation Biology, 31*(1), 56-66. https://doi.org/10.1111/cobi.12788

Bettinger, T., & Leighty, K. (2020). The evolution of conservation education and its role in saving apes in Africa. *American Journal of Primatology*, Article e23203. https://doi.org/10.1002/ajp.23203

Bexell, S. M., Jarrett, O. S., & Ping, X. (2013). The effects of a summer camp program in China on children's knowledge, attitudes, and behaviors toward animals: A model for conservation education. *Visitor Studies, 16*(1), 59-81. https://doi.org/10.1080/10645578.2013.768072

Blum, N. (2009). Teaching science or cultivating values? Conservation NGOs and environmental education in Costa Rica. *Environmental Education Research, 15*(6), 715-729. https://doi.org/10.1080/13504620903420064

Botha, E., Kruger, M., & Viljoen, A. (2021). Enhancing the interpretation at the National Zoological Gardens in South Africa. *Journal of Outdoor Recreation and Tourism, 33*. Advance online publication. https://doi.org/10.1016/j.jort.2020.100362

Bowie, A., Krupenye, C., Mbonzo, P., Minesi, F., & Hare, B. (2020). Implicit measures help demonstrate the value of conservation education in the Democratic Republic of the Congo. *Frontiers in Psychology, 11*, 386. https://doi.org/10.3389/fpsyg.2020.00386

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77-101. https://doi.org/10.1191/1478088706qp063oa

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health, 11*(4), 589-597. https://doi.org/10.1080/2159676x.2019.1628806

Braun, V., Clarke, V., Hayfield, N., & Terry, G. (2019). Thematic analysis. In P. Liamputtong (Ed.), *Handbook of research methods in health social sciences* (pp. 843-860). Springer Singapore. https://doi.org/10.1007/978-981-10-5251-4_103

Brichieri-Colombi, T. A., Lloyd, N. A., McPherson, J. M., & Moehrenschlager, A. (2019). Limited contributions of released animals from zoos to North American conservation translocations. *Conservation Biology, 33*(1), 33-39. https://doi.org/10.1111/cobi.13160

Bryman, A. (2016). *Social research methods* (5th ed.). Oxford University Press.

Buckley, K. A., Smith, L. D. G., Crook, D. A., Pillans, R. D., & Kyne, P. M. (2020). Conservation impact scores identify shortfalls in demonstrating the benefits of threatened wildlife displays in zoos and aquaria. *Journal of Sustainable Tourism, 28*(7), 978-1002. https://doi.org/10.1080/09669582.2020.1715992

Bulbeck, C. (2005). *Facing the wild: Eecotourism, conservation, and animal encounters*. Earthscan.

Cambridge Dictionary. *Mission*. https://dictionary.cambridge.org/zhs/%E8%AF%8D%E5%85%B8/%E8%8B%B1%E8%AF%AD/mission

Catibog-Sinha, C. (2008). Zoo tourism: Biodiversity conservation through tourism. *Journal of Ecotourism, 7*(2-3), 160-178. https://doi.org/10.1080/14724040802140527

Catibog-Sinha, C. (2010). Zoo tourism and the conservation of threatened species: A collaborative programme in the Philippines. In W. Frost (Ed.), *Zoos and Tourism* (pp. 13-32). Channel View Publications.

Chan, K. M. A. (2008). Value and advocacy in conservation biology: Crisis discipline or discipline in crisis? *Conservation Biology, 22*(1), 1-3. http://www.jstor.org

Che-Castaldo, J. P., Grow, S. A., & Faust, L. J. (2018). Evaluating the contribution of North American zoos and aquariums to endangered species recovery. *Scientific Reports, 8*(1), 9789. https://doi.org/10.1038/s41598-018-27806-2

Clayton, S., Fraser, J., & Saunders, C. D. (2009). Zoo experiences: Conversations, connections, and concern for animals. *Zoo Biology, 28*(5), 377-397. https://doi.org/10.1002/zoo.20186

Collins, C., Corkery, I., McKeown, S., McSweeney, L., Flannery, K., Kennedy, D., & O'Riordan, R. (2020). Quantifying the long-term impact of zoological education: A study of learning in a zoo and an aquarium. *Environmental Education Research, 26*(7), 1008-1026. https://doi.org/10.1080/13504622.2020.1771287

Collins, C. K. (2018). *Education in the zoo: A study of the relationship between education, zoo visitors and animal behaviour.* [Doctoral thesis, Department of Tourism, University College Cork]. CORA Cork Open Access Archive. https://cora.ucc.ie/handle/10468/7580

Combes, B. P. Y. (2006). The United Nations decade of education for sustainable development (2005–2014): Learning to live together sustainably. *Applied Environmental Education & Communication, 4*(3), 215-219. https://doi.org/10.1080/15330150591004571

Council, N. R. (2002). *New tools for environmental protection: Education, information, and voluntary measures*. National Academies Press.

Croke, V. (2014). *The modern ark: The story of zoos: Past, present, and future*. Simon and Schuster.

Crotty, M. (1998). *Foundations of social research: Meaning and perspective in the research process*. Taylor & Francis Group. http://ebookcentral.proquest.com

Dawson, E., & Jensen, E. (2011). Towards a contextual turn in visitor studies: Evaluating visitor segmentation and identity-related motivations. *Visitor Studies, 14*(2), 127-140. https://doi.org/10.1080/10645578.2011.608001

Day, B. A., & Monroe, M. C. (2000). *Environmental education & communication for a sustainable world: Handbook for international practitioners*. ERIC.

Dey, I. (1993). *Qualitative data analysis: A user-friendly guide for social scientists*. Routledge. http://ebookcentral.proquest.com

Dierking, L. D., Adelman, L. M., Ogden, J., Lehnhardt, K., Miller, L., & Mellen, J. D. (2004). Using a behavior change model to document the impact of visits to Disney's Animal Kingdom: A study investigating intended conservation action. *Curator: The Museum Journal, 47*(3), 322-343.

Dierking, L. D., & Falk, J. H. (1994). Family behavior and learning in informal science settings: A review of the research. *Science Education*, *78*(1), 57-72.

DOC. (2021). *Conservation status of plants and animals*. https://www.doc.govt.nz/nature/conservation-status/

Dori, Y. J., & Tal, R. T. (2000). Formal and informal collaborative projects: Engaging in industry with environmental awareness. *Science Education, 84*(1), 95-113. https://doi.org/10.1002/(SICI)1098-237X(200001)84:1

Dwyer, J. T., Fraser, J., Voiklis, J., & Thomas, U. G. (2020). Individual-level variability among trust criteria relevant to zoos and aquariums. *Zoo Biology, 39*(5), 297-303. https://doi.org/10.1002/zoo.21562

Esson, M., & Moss, A. (2013). The risk of delivering disturbing messages to zoo family audiences. *The Journal of Environmental Education, 44*(2), 79-96. https://doi.org/10.1080/00958964.2012.695408

Falk, J. H. (2006). Free-choice environmental learning: framing the discussion. *Environmental Education Research, 11*(3), 265-280. https://doi.org/10.1080/13504620500081129

Falk, J. H., Heimlich, J., & Bronnenkant, K. (2008). Using identity-related visit motivations as a tool for understanding adult zoo and aquarium visitors' meaning-making. *Curator: The Museum Journal, 51*(1), 55-79. https://doi.org/10.1111/j.2151-6952.2008.tb00294.x

Falk, J. H., Heimlich, J. E., Vernon, C. L., & Bronnenkant, K. (2010). Critique of a critique: Do zoos and aquariums promote attitude change in visitors? *Society & Animals, 18*(4), 415-419. https://doi.org/10.1163/156853010X524361

Fien, J., & Tilbury, D. (1996). *Learning for a sustainable environment: An agenda for teacher education in Asia and the Pacific*. Asia-Pacific Programme of Educational Innovation for Development, UNESCO.

Fleischner, T. L. (1990). Integrating science and passion in conservation education. *Conservation Biology, 4*(4), 452-453. http://www.jstor.org

Forestell, P. H., & Kaufman, G. D. (1990). The history of whale watching in Hawaii and its role in enhancing visitor appreciation for endangered species. Paper presented at the *1990 Congress on coastal and marine tourism: A symposium and workshop on balancing conservation and economic development*, Newport, Oregon.

Franquesa-Soler, M., Barraza, L., & Serio-Silva, J. C. (2018). Children's learning preferences for the development of conservation education programs in Mexican communities. *The Journal of Educational Research, 112*(1), 28-37. https://doi.org/10.1080/00220671.2018.1427038

Fraser, J., Bicknell, J., Sickler, J., & Taylor, A. (2009). What information do zoo & aquarium visitors want on animal identification labels? *Journal of Interpretation Research, 14*(2), 7-19. https://doi.org/10.1177/109258720901400202

Frost, W. (2010). Zoos as tourist attractions: Theme parks, protected areas or museums? In W. Frost (Ed.), *Zoos and tourism* (pp. 121-130). Channel View Publications.

Godinez, A. M., & Fernandez, E. J. (2019). What is the zoo experience? How zoos impact a visitor's behaviors, perceptions, and conservation efforts. *Frontiers of Psychology, 10*, 1746. https://doi.org/10.3389/fpsyg.2019.01746

Good, C., Tyrrell, P., Zhou, Z., & Macdonald, D. W. (2019). Elephants never forget, should art museums remember too? Historic ivory collections as ambassadors

for conservation education. *Biodiversity and Conservation, 28*(6), 1331-1342. https://doi.org/10.1007/s10531-019-01735-6

Gour, A., Aggarwal, S., & Erdem, M. (2021). Reading between the lines: Analyzing online reviews by using a multi-method web-analytics approach. *International Journal of Contemporary Hospitality Management, 33*(2), 490-512. https://doi.org/10.1108/IJCHM-07-2020-0760

Gray, D. E. (2018). *Doing research in the real world* (4th ed.). SAGE.

Gupta, R., Fraser, J., Rank, S. J., Brucker, J. L., & Flinner, K. (2019). Multi-site case studies about zoo and aquarium visitors' perceptions of the STEM learning Ecology. *Visitor Studies, 22*(2), 127-146. https://doi.org/10.1080/10645578.2019.1661737

Gusset, M., & Dick, G. (2010). 'Building a future for wildlife'? Evaluating the contribution of the world zoo and aquarium community to in situ conservation. *International Zoo Yearbook, 44*(1), 183-191. https://doi.org/10.1111/j.1748-1090.2009.00101.x

Hacker, C. E., & Miller, L. J. (2016). Zoo visitor perceptions, attitudes, and conservation intent after viewing African elephants at the San Diego Zoo Safari Park. *Zoo Biology, 35*(4), 355-361. https://doi.org/10.1002/zoo.21303

Hammitt, W. E. (1984). Cognitive processes involved in environmental interpretation. *The Journal of Environmental Education, 15*(4), 11-15. https://doi.org/10.1080/00958964.1984.9942685

Hart, A. G., Leather, S. R., & Sharma, M. V. (2020). Overseas conservation education and research: The new colonialism? *Journal of Biological Education*. Advance online publication. https://doi.org/10.1080/00219266.2020.1739117

Heimlich, J. E. (2010). Environmental education evaluation: Reinterpreting education as a strategy for meeting mission. *Evaluation and Program Planning, 33*(2), 180-185. https://doi.org/10.1016/j.evalprogplan.2009.07.009

Hollar, S. (2011). *Ecology: The delicate balance of life on Earth*. Rosen Publishing Group.

Hutchins, M., & Wemmer, C. (1987). Wildlife conservation and animal rights: Are they compatible? In Fox, M. W., & Mickley, L. D. (Eds.). *Advances in animal welfare science* (pp. 111-137). Springer.

Hyson, J. (2004). Education, entertainment, and institutional identity at the zoo. *Curator the museum journal, 47*(3), 247-251. https://doi.org/10.1111/j.2151-6952.2004.tb00122.x

Innis, C. J., Finn, S., Kennedy, A., Burgess, E., Norton, T., Manire, C. A., & Harms, C. (2019). A summary of sea turtles released from rescue and rehabilitation programs in the United States, with observations on re-encounters. *Chelonian Conservation and Biology, 18*(1). https://doi.org/10.2744/ccb-1335.1

International Union for Conservation of Nature. (2021). *The IUCN Red List of Threatened Species*. https://www.iucnredlist.org/assessment/process

Jacobson, S. K. (2010). Effective primate conservation education: Gaps and opportunities. *American Journal of Primatology, 72*(5), 414-419. https://doi.org/10.1002/ajp.20792

Jacobson, S. K., McDuff, M. D., & Monroe, M. C. (2015). *Conservation education and outreach techniques*. Oxford University Press.

Jennings, G. (2010). *Tourism research* (Second ed.). John Wiley & Sons.

Jensen, E. (2014, Aug). Evaluating children's conservation biology learning at the zoo. *Conservation Biology, 28*(4), 1004-1011. https://doi.org/10.1111/cobi.12263

Jiang, Y., Lück, M., & Parsons, E. C. M. (2007). Public awareness, education, and marine mammals in captivity. *Tourism Review International, 11*(3), 237-249. https://doi.org/10.3727/154427207783948829

Johnson, L. (2020). *Exploring the relationship between empathy for animals and environmental self-efficacy in zoo and aquarium visitors* (Publication No. 28001750). [Master's thesis, University of Washington].

Kapos, V., Balmford, A., Aveling, R., Bubb, P., Carey, P., Entwistle, A., Hopkins, J., Mulliken, T., Safford, R., Stattersfield, A., Walpole, M., & Manica, A. (2008). Calibrating conservation: New tools for measuring success. *Conservation Letters, 1*(4), 155-164. https://doi.org/10.1111/j.1755-263X.2008.00025.x

Kareiva, P., & Marvier, M. (2012). What is conservation science? *BioScience, 62*(11), 962-969. https://doi.org/10.1525/bio.2012.62.11.5

Kearns, R., Collins, D., & Wiles, J. (2016). The Rotoroa Island and Auckland Zoo partnership: Connecting heterotopic spaces. *New Zealand Geographer, 72*(3), 192-204. https://doi.org/10.1111/nzg.12134

Kekeya, J. (2019). The commonalities and differences between research paradigms. *Contemporary PNG Studies, 31*, 26-36.

Kellert, S. R., Black, M., Rush, C. R., & Bath, A. J. (1996). Human culture and large carnivore conservation in North America. *Conservation Biology, 10*(4), 977-990.

Kelly, A., & Skibins, J. C. (2020). Inspiring wildlife conservation behaviors through innovations in zoo exhibit design. *Visitor Studies, 24*(1), 79-99. https://doi.org/10.1080/10645578.2020.1824881

Keulartz, J. (2015). Captivity for conservation? Zoos at a crossroads. *Journal of Agricultural and Environmental Ethics, 28*(2), 335-351. https://doi.org/10.1007/s10806-015-9537-z

Khalil, K., Ardoin, N. M., & Wojcik, D. (2017). Social learning within a community of practice: Investigating interactions about evaluation among zoo education professionals. *Evaluation and Program Planning, 61*, 45-54. https://doi.org/10.1016/j.evalprogplan.2016.12.001

Killion, L., & Fisher, R. (2018). Ontology, epistemology: Paradigms and parameters for qualitative approaches to tourism research. In D. W. Hillman & K. Radel (Eds.), *Qualitative methods in tourism research: Theory and practice* (pp. 1-28). Channel View Publications.

Kisling, V. N. (2000). *Zoo and aquarium history: Ancient animal collections to zoological gardens*. CRC Press.

Kobori, H. (2009). Current trends in conservation education in Japan. *Biological Conservation, 142*(9), 1950-1957. https://doi.org/10.1016/j.biocon.2009.04.017

Kozinets, R. V. (2020). *Netnography: The essential guide to qualitative social media research* (3rd ed.). SAGE.

Krippendorff, K. (2019). *Content analysis: An introduction to its methodology* (4th ed.). SAGE.

Kruse, C. K., & Card, J. A. (2004). Effects of a conservation education camp program on campers' self-reported knowledge, attitude, and behavior. *The Journal of Environmental Education, 35*(4), 33-45. https://doi.org/10.3200/joee.35.4.33-45

Kumar, S., & Ahmad, S. (2008). Meaning, aims and process of education. *School of Open Learning*, 3-6.

Lacy, R. C. (2013). Achieving true sustainability of zoo populations. *Zoo Biology, 32*(1), 19-26. https://doi.org/10.1002/zoo.21029

Liimatainen, A. (2013). United Nations decade of education for sustainable development. In S. O. Idowu, N. Capaldi, L. Zu, & A. D. Gupta (Eds.), *Encyclopedia of corporate social responsibility* (Vol. 21, pp. 2606-2610). Springer New York.

Linke, S. W., Caroline. (2011). Conservation, education or entertainment: What really matters to zoo visitors? In W. Frost (Ed.), *Zoos and tourism: Conservation, education, entertainment?* (pp. 69-81). Channel View Publications.

Liu, Q., Wang, J., & Zhang, J. (2019). Research on national park education and interpretation based on China national knowledge infrastructure visualization analysis. *2019 6th International Conference on Information Science and Control Engineering (ICISCE),* 2019, pp. 485-489. https://doi:10.1109/ICISCE48695.2019.00103.

Lück, M. (2003a). Education on marine mammal tours as agent for conservation—but do tourists want to be educated? *Ocean & Coastal Management, 46*(9-10), 943-956. https://doi.org/10.1016/s0964-5691(03)00071-1

Lück, M. (2003b). *Environmentalism and on-tour experiences of tourists on wildlife watch tours in New Zealand: A study of visitors watching and/or swimming with wild dolphins* [Doctoral thesis, University of Otago]. University of Otago OUR Archive]. https://ourarchive.otago.ac.nz/handle/10523/3408

Lück, M. (2007). Captive marine wildlife: Benefits and costs of aquaria and marine parks In J. Higham & M. Lück (Eds.), *Marine wildlife and tourism management: Insights from the natural and social sciences* (pp. 130-141). CABI.

Lück, M. (2015). Education on marine mammal tours – But what do tourists want to learn? *Ocean & Coastal Management, 103*, 25-33. https://doi.org/10.1016/j.ocecoaman.2014.11.002

Luebke, J. F., & Grajal, A. (2011). Assessing mission-related learning outcomes at zoos and aquaria: Prevalence, barriers, and needs. *Visitor Studies, 14*(2), 195-208. https://doi.org/10.1080/10645578.2011.608013

Lukas, K. E., Leeds, A., Slavin, M. A., Tinka, J., & Kendall, C. J. (2017). Impact of teacher training in conservation education on student learning in primary schools adjacent to Kibale National Park, Uganda. *Oryx, 53*(3), 497-504. https://doi.org/10.1017/s0030605317000965

Lune, H., & Berg, B. L. (2017). *Qualitative research methods for the social sciences*. Pearson.

Mace, G. M. (2014). Whose conservation? *Science, 345*(6204), 1558-1560. https://doi.org/10.1126/science.1254704

Mace, G. M., Balmford, A., Leader-Williams, N., Manica, A., Walter, O., West, C., & Zimmermann, A.. Measuring conservation success: Assessing zoos' contribution. In Zimmermann, A.; Hatchwell, M.; Dickie, L.; West, C.(2007).*Catalysts for conservation: A direction for zoos in the 21st Century*, London, UK.

Maciaszek, L. (2012). *Evaluating conservation in zoos: A New Zealand perspective* [Doctoral thesis, Lincoln University]. Research@Lincoln. https://researcharchive.lincoln.ac.nz/handle/10182/5250

Malamud, R., Broglio, R., Marino, L., Lilienfeld, S. O., & Nobis, N. (2010). Do zoos and aquariums promote attitude change in visitors? A critical evaluation of the American zoo and aquarium study. *Society & Animals, 18*(2), 126-138.

Mallavarapu, S., & Taglialatela, L. A. (2019). A post-occupancy evaluation of the impact of exhibit changes on conservation knowledge, attitudes, and behavior of zoo visitors. *Environmental Education Research, 25*(10), 1552-1569. https://doi.org/10.1080/13504622.2019.1632267

Marsh, K. (2016). Conservation education and outreach techniques. *Environmental Education Research, 23*(4), 591-594. https://doi.org/10.1080/13504622.2016.1199662

Marshall, C. (2011). *Designing qualitative research* (5th ed.). SAGE.

Martin, P. (1996). A WWF view of education and the role of NGOs. In Huckle, J. & Sterling, S. (Eds.) *Education for Sustainability*, (pp 40-51). Earthscan Publications.

Mast, F., Zhao, L., & Maldonado, L. (2018). Instrument development and validation for conservation learning: A tool for more rigorous research and evaluation. *Curator, 61*(2), 367-383. https://doi.org/10.1111/cura.12260

Mayes, G., Dyer, P., & Richins, H. (2004). Dolphin-human interaction: Pro-environmental attitudes, beliefs and intended behaviours and actions of participants in interpretation programs: A pilot study. *Annals of Leisure Research, 7*(1), 34-53. https://doi.org/10.1080/11745398.2004.10600938

Maynard, L., Jacobson, S. K., Monroe, M. C., & Savage, A. (2020, Sep). Mission impossible or mission accomplished: Do zoo organizational missions influence conservation practices? *Zoo Biology, 39*(5), 304-314. https://doi.org/10.1002/zoo.21557

McCrea, E. J. (2006). The roots of environmental education: How the past supports the future. *Environmental Education and Training Partnership (EETAP)*.

Mejias-Balsalobre, C., Restrepo, J., Borges, G., Garcia, R., Rojas-Canizales, D., Barrios-Garrido, H., & Valverde, R. A. (2021). Local community perceptions of sea turtle egg use in Tortuguero, Costa Rica. *Ocean & Coastal Management, 201*. Article 105423. https://doi.org/10.1016/j.ocecoaman.2020.105423

Mellish, S., Ryan, J., Pearson, E. L., & Tuckey, M. R. (2019). Research methods and reporting practices in zoo and aquarium conservation-education evaluation. *Conservation Biology, 33*(1), 40-52. https://doi.org/10.1111/cobi.13177

Merlin Entertainments. (2021). *About us*. Retrieved from https://www.merlinentertainments.biz/about-us/

Michaela, Z., Anita, K., Heather, N., & Miyoun, L. (2002). Evaluation of the Chesapeake Bay Foundation's conservation education programs. *Conservation Biology, 16*(3), 641-649.

Miller, L. J., Zeigler-Hill, V., Mellen, J., Koeppel, J., Greer, T., & Kuczaj, S. (2013). Dolphin shows and interaction programs: Benefits for conservation education? *Zoo Biology, 32*(1), 45-53. https://doi.org/10.1002/zoo.21016

Minteer, B. A., & Collins, J. P. (2013). Ecological ethics in captivity: Balancing values and responsibilities in zoo and aquarium research under rapid global change. *ILAR J, 54*(1), 41-51. https://doi.org/10.1093/ilar/ilt009

Minteer, B. A., Maienschein, J., Collins, J. P., & Rabb, G. (2018). *The Ark and beyond: The evolution of zoo and aquarium conservation*. University of Chicago Press.

Mooney, A., Conde, D. A., Healy, K., & Buckley, Y. M. (2020). A system wide approach to managing zoo collections for visitor attendance and in situ conservation. *Nature Community, 11*(1), 584. https://doi.org/10.1038/s41467-020-14303-2

Morris, J. K., Jacobson, S. K., & Flamm, R. O. (2007). Lessons from an evaluation of a boater outreach program for manatee protection. *Environmental Management, 40*(4), 596-602.

Moss, A., & Esson, M. (2010). Visitor interest in zoo animals and the implications for collection planning and zoo education programmes. *Zoo Biology, 29*(6), 715-731. https://doi.org/10.1002/zoo.20316

Moss, A., & Esson, M. (2013). The educational claims of zoos: Where do we go from here? *Zoo Biology, 32*(1), 13-18. https://doi.org/10.1002/zoo.21025

Moss, A., Esson, M., & Bazley, S. (2010). Applied research and zoo education: The evolution and evaluation of a public talks program using Unobtrusive video recording of visitor behavior. *Visitor Studies, 13*(1), 23-40. https://doi.org/10.1080/10645571003618733

Moss, A., Jensen, E., & Gusset, M. (2015). Evaluating the contribution of zoos and aquariums to Aichi Biodiversity Target 1. *Conservation Biology, 29*(2), 537-544. https://doi.org/10.1111/cobi.12383

Murray, J. M., & Watson, G. J. (2014). A critical assessment of marine aquarist biodiversity data and commercial aquaculture: Identifying gaps in culture initiatives to inform local fisheries managers. *PLoS One, 9*(9), Article e105982. https://doi.org/10.1371/journal.pone.0105982

Nekolný, L., & Fialová, D. (2018). Zoo tourism: What actually is a zoo? *Czech Journal of Tourism, 7*(2), 153-166. https://doi.org/10.1515/cjot-2018-0008

Nelson, V. (2020). Consuming local: Product, place, and experience in visitor reviews of urban Texas craft breweries. *Leisure Studies, 40*(4), 480-494. https://doi.org/10.1080/02614367.2020.1831044

Neuman, W. L. (2014). *Social research methods: qualitative and quantitative approaches* (7th ed.). Pearson.

Nghiêm-Phú, B., DeJong Watanabe, E., & Shibuya, K. (2021). Visitor perception of Tokyo's parks' attributes: An analysis of the textual reviews. *Leisure/Loisir, 45*(1), 121-137. https://doi.org/10.1080/14927713.2021.1872409

North American Association for Environmental Education. (2021). *What is Environmental Education?* www.naaee.net/what-is-ee

Nygren, N. V., & Ojalammi, S. (2018). Conservation education in zoos: A literature review. *Journal for Human-Animal Studies, 4*, 62-76. https://doi.org/10.23984/fjhas.66540

Orams, M. (1999). *Marine tourism: Development, impacts and management*. Routledge.

Orams, M. B. (1997). The effectiveness of environmental education: Can we turn tourists into "greenies"? *Progress in Tourism and Hospitality Research, 3*(4), 295-306.

Packer, J., & Ballantyne, R. (2010). The role of zoos and aquariums in education for a sustainable future. *New Directions for Adult and Continuing Education, 2010*(127), 25-34. https://doi.org/https://doi.org/10.1002/ace.378

Padua, S. M. (2009). Conservation awareness through an environmental education programme in the Atlantic forest of Brazil. *Environmental Conservation, 21*(2), 15-151. https://doi.org/10.1017/s0376892900024577

Padua, S. M. (2010). Primate conservation: Integrating communities through environmental education programs. *American Journal of Primatology, 72*(5), 450-453. https://doi.org/10.1002/ajp.20766

Paquet, P. C., & Darimont, C. T. (2010). Wildlife conservation and animal welfare: Two sides of the same coin. *Animal Welfare, 19*(2), 177-190.

Patrick, P. G., Matthews, C. E., Ayers, D. F., & Tunnicliffe, S. D. (2007). Conservation and education: Prominent themes in zoo mission statements. *The Journal of Environmental Education, 38*(3), 53-60. https://doi.org/10.3200/joee.38.3.53-60

Patrick, P. G., & Tunnicliffe, S. D. (2013). *Zoo talk*. Springer Netherlands. https://doi.org/10.1007/978-94-007-4863-7_1

Pearson, E. L., Dorrian, J., & Litchfield, C. A. (2013). Measuring zoo visitor learning and understanding about orangutans: Evaluation to enhance learning outcomes and to foster conservation action. *Environmental Education Research, 19*(6), 823-843. https://doi.org/10.1080/13504622.2012.763112

Pearson, E. L., Lowry, R., Dorrian, J., & Litchfield, C. A. (2014). Evaluating the conservation impact of an innovative zoo-based educational campaign: 'Don't palm us off' for orangutan conservation. *Zoo Biology, 33*(3), 184-196. https://doi.org/10.1002/zoo.21120

Perdue, B. M., Stoinski, T. S., & Maple, T. L. (2012). Using technology to educate zoo visitors about conservation. *Visitor Studies, 15*(1), 16-27. https://doi.org/10.1080/10645578.2012.660839

Powell, D. M., & Bullock, E. V. W. (2015). Evaluation of factors affecting emotional responses in zoo visitors and the impact of emotion on conservation mindedness. *Anthrozoös, 27*(3), 389-405. https://doi.org/10.2752/175303714x13903827488042

Primack, R. B. (2006). *Essentials of conservation biology* (Vol. 23). Sinauer Associates Sunderland.

Rabb, G. B. (1968). Education and zoos. *The American Biology Teacher, 30*(4), 291-296. https://doi.org/10.2307/4442049

Rabb, G. B., & Saunders, C. D. (2005). The future of zoos and aquariums: Conservation and caring. *International Zoo Yearbook, 39*(1), 1-26. https://doi.org/10.1111/j.1748-1090.2005.tb00001.x

Roe, K., & McConney, A. (2014). Do zoo visitors come to learn? An internationally comparative, mixed-methods study. *Environmental Education Research, 21*(6), 865-884. https://doi.org/10.1080/13504622.2014.940282

Roe, K., McConney, A., & Mansfield, C. F. (2015). The role of zoos in modern society—A comparison of zoos' reported priorities and what visitors believe they should be. *Anthrozoös, 27*(4), 529-541. https://doi.org/10.2752/089279314x14072268687808

Ross, S. R., & Gillespie, K. L. (2009). Influences on visitor behavior at a modern immersive zoo exhibit. *Zoo Biology, 28*(5), 462-472. https://doi.org/10.1002/zoo.20220

Ryan, C. & Saward, J. (2004). 'The Zoo as Ecotourism Attraction – Visitor Reactions, Perceptions and Management Implications: The Case of Hamilton Zoo, New Zealand. *Journal of Sustainable Tourism*, 12(3), 245-266.

Sakurai, R., & Uehara, T. (2020). Effectiveness of a marine conservation education program in Okayama, Japan. *Conservation Science and Practice, 2*(3). https://doi.org/10.1111/csp2.167

Sala, B., Balasch, A., Eljarrat, E., & Cardona, L. (2021a). First study on the presence of plastic additives in loggerhead sea turtles (*Caretta caretta*) from the Mediterranean Sea. *Environmental Pollution , 283*, Article 117108. https://doi.org/10.1016/j.envpol.2021.117108

Sala, E., Mayorga, J., Bradley, D., Cabral, R. B., Atwood, T. B., Auber, A., Cheung, W., Costello, C., Ferretti, F., & Friedlander, A. M. (2021b). Protecting the global ocean for biodiversity, food and climate. *Nature, 592*(7854), 397-402. https://doi.org/10.1038/s41586-021-03371-z

Sarantakos, S. (2005). *Social research* (3rd ed.). Palgrave Macmillan.

Saunders, M. N. K. (2019). *Research methods for business students* (8th ed.). Pearson.

SEA LIFE Kelly Tarlton's Aquarium. (2021a). *Conservation*.
    https://www.visitsealife.com/auckland/conservation/

SEA LIFE Kelly Tarlton's Aquarium. (2021b). *Learn about Kelly Tarlton*.
    https://www.visitsealife.com/auckland/plan-your-day/information/about-kelly-
    tarlton/

SEA LIFE Kelly Tarlton's Aquarium. (2021c). *So much to explore*.
    https://www.visitsealife.com/auckland/schools/

Seng, P., & Rushton, S. (2003). *Best practices workbook for boating, fishing, and
    aquatic resources stewardship education.* Recreational Boating and Fishing
    Foundation.

Shereen, M. A., Khan, S., Kazmi, A., Bashir, N., & Siddique, R. (2020). COVID-19
    infection: Origin, transmission, and characteristics of human coronaviruses.
    Journal of Advanced Research, 24, 91-98.

Spooner, S. L., Farnworth, M. J., Ward, S. J., & Whitehouse-Tedd, K. M. (2021a).
    Conservation education: Are zoo animals effective ambassadors and is there any
    cost to their welfare? *Journal of Zoological and Botanical Gardens, 2*(1), 41-65.
    https://doi.org/10.3390/jzbg2010004

Spooner, S. L., Jensen, E. A., Tracey, L., & Marshall, A. (2021b). Evaluating the
    effectiveness of live animal shows at delivering information to zoo audiences.
    International Journal of Science Education, Part B, 11(1), 1-16.
    https://doi.org/10.1080/21548455.2020.1851424

Spooner, S. L., Jensen, E. A., Tracey, L., & Marshall, A. R. (2019). Evaluating the
    impacts of theatre-based wildlife and conservation education at the zoo.
    Environmental Education Research, 25(8), 1231-1249.
    https://doi.org/10.1080/13504622.2019.1569201

Stern, M. J., Powell, R. B., & Ardoin, N. M. (2008). What difference does it make?
    Assessing outcomes from participation in a residential environmental education

program. *The Journal of Environmental Education, 39*(4), 31-43. https://doi.org/10.3200/joee.39.4.31-43

Stern, M. J., Powell, R. B., & Hill, D. (2013). Environmental education program evaluation in the new millennium: What do we measure and what have we learned? *Environmental Education Research, 20*(5), 581-611. https://doi.org/10.1080/13504622.2013.838749

Struhsaker, T. T., Struhsaker, P. J., & Siex, K. S. (2005). Conserving Africa's rain forests: Problems in protected areas and possible solutions. *Biological Conservation, 123*(1), 45-54. https://doi.org/10.1016/j.biocon.2004.10.007

Swanagan, J. S. (2000). Factors influencing zoo visitors' conservation attitudes and behavior. *The Journal of Environmental Education, 31*(4), 26-31. https://doi.org/10.1080/00958960009598648

Swarbrooke, J. (2002). *The development and management of visitor attractions* (2nd ed.). Butterworth-Heinemann.

Thomas, R. E. W., Teel, T., Bruyere, B., & Laurence, S. (2018). Metrics and outcomes of conservation education: A quarter century of lessons learned. *Environmental Education Research, 25*(2), 172-192. https://doi.org/10.1080/13504622.2018.1450849

Tilbury, D., Goldstein, W., & Ryan, L. (2003). Towards environmental education for sustainable development: The contributions of NGOs in the Asia-Pacific Region. *International Review for Environmental Strategies, 4*(1), 59-73.

Tilden, F. (2007). *Interpreting our heritage* (4th ed.). The University of North Carolina Press.

Tracy, S. J. (2020). *Qualitative research methods: collecting evidence, crafting analysis, communicating impact* (2nd ed.). Wiley-Blackwell.

Tribe, A. (2004). Zoo tourism. In Higginbottom, K. (Eds). *Wildlife tourism: Impacts, management and planning*, 35-56. Common Ground Publishing.

TripAdvisor. (2021a). *Reviews of Auckland Zoo*. Retrieved 1 June 2021, from
https://www.tripadvisor.com/Attraction_Review-g255106-d256913-Reviews-
or5-Auckland_Zoo-Auckland_Central_North_Island.html#REVIEWS

TripAdvisor. (2021b). *Reviews of SEALIFE Kelly Tarlton's Aquarium*. Retrieved 1 June
2021, from https://www.tripadvisor.com/Attraction_Review-g255106-d256914-
Reviews-SEA_LIFE_Kelly_Tarlton_s_Aquarium-
Auckland_Central_North_Island.html

Turkowski, F. J. (1972). Education at zoos and aquariums in the United States.
BioScience, 22(8), 468-475. https://doi.org/10.2307/1296244

Turley, S. K. (1999). Conservation and tourism in the traditional UK zoo. *Journal of
Tourism Studies, 10*(2), 2-13.

United Kingdom Conference of the Parties 26. (2021). *COP26 goals*.
https://ukcop26.org/cop26-goals/

United Nations Educational, Scientific, and Cultural Organization – United Nations
Environment Programme. (1976). The Belgrade Charter. *Connect: UNESCO-
UNEP Environmental Education Newsletter, 1*, 1-2.

United Nations Educational, Scientific, and Cultural Organization. (2021). *Education
for sustainable development*. Retrieved from
https://en.unesco.org/themes/education-sustainable-development

Veal, A. J. (2018). *Research methods for leisure and tourism* (Fifth edition). Pearson.

Walsh, J., Molyneux, D., & Birley, M. (1993). Deforestation: Effects on vector-borne
disease. *Parasitology, 106*(S1).

Washington, H. (2019). The science (and ethics) of conservation: ecological
perspectives. In H. Kopnina & H. Washington (Eds.), *Conservation: Integrating
social and ecological justice* (pp. 45-55). Springer International Publishing AG.

Waylen, K. A., Fischer, A., McGowan, P. J., Thirgood, S. J., & Milner-Gulland, E. J.
(2010). Effect of local cultural context on the success of community-based

conservation interventions. *Conservation Biology, 24*(4), 1119-1129.
https://doi.org/10.1111/j.1523-1739.2010.01446.x

Weiler, B., & Smith, L. (2009). Does more interpretation lead to greater outcomes? An
assessment of the impacts of multiple layers of interpretation in a zoo context.
Journal of Sustainable Tourism, 17(1), 91-105.
https://doi.org/10.1080/09669580802359319

Wijeratne, A. J., Van Dijk, P. A., Kirk-Brown, A., & Frost, L. (2014). Rules of
engagement: The role of emotional display rules in delivering conservation
interpretation in a zoo-based tourism context. *Tourism Management, 42*, 149-
156. https://doi.org/10.1016/j.tourman.2013.11.012

Wood, D. (1992). *A tiger by the tail: A history of Auckland Zoo, 1922-1992*. Auckland
Council.

World Association and Zoos and Aquariums. (2005). *Building a future for wildlife: the
world zoo and aquarium conservation strategy*. WAZA Executive Office.

World Association and Zoos and Aquariums. (2021). *Zoos and aquariums are the third
largest funder of conservation globally*. https://www.waza.org/

Wu, X., Hao, Z., Tang, Q., Zhang, X., Feng, S., & Hao, F. (2021). Population exposure
to compound dry and hot events in China under 1.5 and 2°C global warming.
International Journal of Climatology, 41(12), 5766-5775.
https://doi.org/10.1002/joc.7152

Yaffee, S. L., & Wondolleck, J. M. (2000). Making collaboration work: Lessons from a
comprehensive assessment of over 200 wide ranging cases of collaboration in
environmental management. *Conservation in Practice, 1*(1), 17-24.

Yasuda, H. (2013). Negotiating entertainment and education: A zoo in Japan.
International Journal of Culture, Tourism and Hospitality Research, 7(1), 105-
112. https://doi.org/10.1108/17506181311301408

Zeppel, H. (2008). Education and conservation benefits of marine wildlife tours: developing free-choice learning experiences. *The Journal of Environmental Education, 39*(3), 3-18. https://doi.org/10.3200/joee.39.3.3-18

Zhang, Y., Gao, J., Cole, S., & Ricci, P. (2020). How the spread of user-generated contents (UGC) shapes international tourism distribution: Using agent-based modeling to inform strategic UGC marketing. *Journal of Travel Research*. Advance online publication. https://doi.org/10.1177/0047287520951639