THE APPLICATION OF PERSUASIVE COMMUNICATION THEORY TO PROMOTE VISITOR CONSERVATION BEHAVIOUR AT WELLINGTON ZOO

BY

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A thesis

submitted to the Victoria University of Wellington

in fulfilment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

JUNE 2011

Abstract

Zoos can play a key role in conservation by facilitating behaviour change in their 600 million visitors annually. However, while numerous articles reinforce the potential zoos have in influencing conservation behaviour in visitors, only a few zoos have quantified the impact a visit has on visitor conservation behaviour. In this thesis, I applied a persuasive communication framework to develop a conservation communication campaign at Wellington Zoo, New Zealand. My results make a significant contribution to the body of literature that evaluates communicating conservation behaviour to zoo visitors and suggest future directions zoos can take to achieve their goal of facilitating conservation behaviour in their visitors.

In Study 1, I determined visitor perceptions of conservation wildlife threats and the corresponding actions that could be taken to alleviate these threats. Visitor perceptions were biased towards global awareness of conservation threats with less awareness of local threats, a condition referred to as environmental hyperopia. Furthermore, there was an expert-lay discrepancy in the perception of local and global threats and mitigating actions. Based on these results, two conservation behaviours were selected to advocate to zoo visitors.

To determine the content of the message, I applied the Theory of Planned Behaviour in Study 2 to identify the variables (attitudes, norms, and perceived behavioural control) linked to behavioural intention. The variance in visitor intentions for bringing cats in at night and for purchasing FSC wood products were explained by the TPB constructs, with visitor attitudes and norms both strongly linked to intention. Past behaviour also played a role in the habitual behaviour of

bringing cats in at night, but not the non-habit forming behaviour of purchasing FSC wood products.

In Study 3, I tested which method of communication (signs or animal talks) was the most effective for communicating conservation behaviours. I also tested if talks and signs based on the Elaboration Likelihood Model, implemented after a staff training programme, were more likely to increase visitor satisfaction, relevancy, and elaboration, all key cognitive components that ultimately influence behaviour change. Signs were an ineffective method to communicate conservation messages but animal talks were much more effective in communicating conservation messages to visitors. However, elaboration did not increase after the training programme. This could reflect that the training programme was ineffective and a more intense training programme may need to be implemented in the future. It is also possible that visitors enter the zoo with an already high level of elaboration and attending a keeper talk is not sufficient to increase visitor elaboration above the threshold.

Results of this thesis have implications for how zoo programming to enhance zoos' abilities to foster conservation action in their visitors. Additionally, my results also have broader implications to the field of conservation psychology and provide insight for environmental communication community.

Acknowledgments

Table of Contents

List of Tables

List of Figures

Chapter 1

Introduction

The state of the environment is one of the main biological and social issues today (Zelezny & Schultz, 2000). While environmental awareness has increased over the last three decades (Barr, 2004; Dunlap, Gallup, & Gallup, 1993) this has not corresponded to the increase in pro-environmental behaviour needed to mitigate the threats to conservation (Clayton & Brook, 2005). Solutions to most environmental issues rely upon people modifying their behaviour to more sustainable practices (De Young, 1993) and also recognizing the major role people play in solving conservation issues (Jacobson & McDuff, 1998).

Zoos, with an annual visitation of 600 million visitors worldwide (World Association of Zoos and Aquariums, 2009), have the capacity to promote conservation action by connecting visitors to wildlife (Falk, 2005; Fraser & Wharton, 2007; Povey & Rios, 2002; Swanagan, 2000). However, measuring the impact a zoo visit has on visitor conservation awareness and behaviour is an emerging field, and few zoos have conducted such research (Catibog-Sinha, 2008; Dierking, Burtnyk, Buchner, & Falk, 2002).

In this PhD thesis, I investigated the effectiveness of a conservation communication campaign on visitor behavioural intention at Wellington Zoo, New Zealand. Specifically, my thesis followed three main steps. First, I identified visitor perceptions of global and local conservation threats and actions, and I compared these results to those from environmental experts and other empirical data. Second, based on these results, two behaviours were selected to communicate to visitors. Based on the Theory of Planned Behavior (Ajzen, 1991), I assessed the

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psychological constructs that influenced the intention to engage in these conservation behaviours. Finally, I measured the effectiveness of communicating conservation behaviour at animal talks and via signs based on the Elaboration Likelihood Model (Petty, McMichael, & Brannon, 1992). I conducted this research in New Zealand, which has a unique flora and fauna and consequently distinct conservation challenges, but where minimal social science research in zoos has been conducted (MacDonald & Linklater, 2006). This thesis drew from several disciplines: environmental psychology, persuasive communication theory, social marketing, and museum/zoo visitor studies. The results of this thesis will strengthen the effectiveness of zoos to communicate conservation behaviour to visitors with potential ultimate impact of contributing to mitigating the conservation crisis.

Zoos and conservation communication

People acquire information about the environment from several places: the media, government, and other people. Free-choice learning venues, such as zoos, museums, and national parks, can serve as places to educate the public about the environment (Clayton, Fraser, & Saunders, 2009; Falk, 2005). The World Zoo and Aquarium Conservation Strategy (World Zoo and Aquarium Conservation Strategy, 2005) states zoos have the capacity to foster conservation action in a large number of people and must be a venue of conservation communication. However, a comprehensive literature review by The Association of Zoos and Aquariums' Multi-Institutional Research Program (Dierking et al., 2002) found little research on conservation behaviour change communication in zoos. The study concluded that the majority of zoo research focuses on public perception of animals, audience research,

visitor flow, visitor demographics or evaluates single species exhibits (e.g., Lukas & Ross, 2005). Conservation messages that are advocated are subtle and short-term, and overall there are missed opportunities to encourage visitor conservation action at home (e.g., Broad & Weiler, 1998). Furthermore, zoo visitors are generally more knowledgeable and concerned about conservation issues compared to the general public and the communicated messages need to be more targeted (Ballantyne, Packer, Hughes, & Dierking, 2007; Barr, 2004; Dierking, Adelman, & Ogden, 2004; Falk & Adelman, 2003). To maximise a zoo's impact on conservation, zoos should advocate specific and relevant conservation behaviours that visitors can undertake at home (Ballantyne et al., 2007; Dierking et al., 2004). However, few zoos have implemented a persuasive conservation communication campaign to achieve this goal and instead zoos often misinterpret how to promote behaviour change in visitors (Ballantyne et al., 2007; Smith, 2006). To facilitate behaviour change in visitors, zoos can look to the broader field of environmental and conservation psychology for an understanding of the complex factors that influence behaviour change (Cannon, Dietz, & Dietz, 1996; Hesselink, Goldstein, van Kempen, Garnett, & Dela, 2007; Jacobson & McDuff, 1998; Stokes, 2006; Szucs, n.d.).

Environmental and conservation psychology

Environmental psychology is the study of the relationship between behaviour and experience with the built and natural environments (Bell, Greene, Fisher, & Baum, 2001). Conservation psychology is a more recent focus within the field of psychology that integrates methods from social psychology, public health, and social marketing to understand why people act (or do not act) in a sustainable manner

(Clayton & Brook, 2005). The American Psychological Association Population and Environmental Psychology Division has highlighted conservation psychology (Saunders, 2003) and created a website (www.conservationpsychology.org) to link researchers in this emerging field. Furthermore, the Society for Conservation Biology, the leading conservation professional society, recognised the key role of psychology, sociology and other disciplines outside of biology must play in solving the environmental crisis and in turn created the Social Science Working Group in 2003 (Society for Conservation Biology, 2008). However, studies investigating the role of psychology in shaping conservation issues remain far from mainstream in both the psychological and biological disciplines (Clayton & Brook, 2005; Ulrich, 1993). For my thesis, I drew upon research from the larger discipline of environmental psychology, especially when it pertained to environmental sustainability (e.g., Uzzell & Rathzel, 2009), and when possible the more targeted field of conservation psychology.

Current research in environmental psychology is targeted in two main areas: general environmental attitudes (often referred to as environmental values, concern, literacy, or stewardship) (Dunlap, Van Liere, Mertig, & Jones, 2000) and environmental behaviour change (Ogden et al., 2004). The majority of environmental psychology work is focused on environmental attitudes (Castro, 2006; Milfont, 2007) and on the development of frameworks to assess accurately or explain general environmental attitudes. These frameworks of environmental attitudes include the basic wildlife values (Kellert & Clark, 1991), new environmental paradigm (Dunlap & Liere, 1978), value belief norm model (Stern, 2000), environmental citizenship behaviour framework (Hungerford & Volk, 1990), connectedness to nature (Mayer & Frantz, 2004; Schultz, Shriver, Tabanico, & Khazian, 2004), inclusion of nature in

the self (Schultz, 2001), and the wilderness environmental protection scale (Lutz, Simpson-Housley, & deMan, 1999). These scales are used to look at differences in environmental attitudes between groups, such as Japanese versus Americans (Kellert, 1991), rural/farmers versus urban (Lutz et al. 1999; Williams & McCrorie 1990; Winter 2005) older versus younger and men versus women (Payne, Mowen, & Orsega-Smith, 2002; Steel, 1996; Van Liere & Dunlap, 1980), gender (Kellert & Berry, 1987), changes over time (Bogner & Wiseman, 1997), and Pakeha and Asians (Milfont & Gouveia, 2006). Some studies have suggested tailoring intervention programmes based on differences among groups (Milfont & Gouveia, 2006; Williams & Cary, 2002), but few have actually implemented behaviour modification programmes based on these differences (Saunders, 2003).

While establishing and understanding the differences in general environmental attitudes is important, the key to solving environmental issues is focusing on how to effectively change people's behaviour (Clayton & Brook, 2005). However, the link between general environmental attitudes and behaviour change is disputed (Manfredo, Teel, & Bright, 2003; Steel, 1996). Some studies have found a correlation, but often weak, between general environmental attitude and environmental behaviour (e.g., Kaiser, Wolfing, & Fuhrer, 1999). Others have found no relationship (e.g., Gatersleben, Steg, & Vlek, 2002; Heslop, Moran, & Cousineau, 1981). In short, the relationship between general attitudes and environmental behaviour can be weak and highlights that environmental behaviour is not exclusively explained by attitudes alone (Bamberg & Möser, 2007; Crompton, 2008)

The inconsistency between attitudes and behaviours has been explored and the key factor is to define and measure the attitude and behaviour on the same scale (Ajzen, 2005). General attitudes correlate to general (or aggregate) behaviours but do

not correlate to specific behaviour, a process known as evaluative inconsistency (Ajzen, 1991). For example, overall attitudes toward the environment correlate with general environmental behaviours but do not correlate to specific behaviour, such as composting or taking public transport. Instead the specific behaviour is influenced by other factors such as the situation, time, or other people. To increase the correlation between attitude and behaviour, the behaviour must be defined clearly (Ajzen, 2001). Thus, the second broad area of environmental research, behaviour change, selects a specific behaviour in a given time and context and the barriers and facilitators to this behaviour are identified. Based on these results, a programme to modify the behaviour can be developed (Ham et al., 2007). Compared to environmental attitude research, there is a significantly smaller body of literature on environmental behaviour change.

Behaviour change campaigns incorporate psychological models that have been the foundations of other successful social change programmes, such as public health campaigns (Abraham & Michie, 2008; Kotler, Roberto, & Lee, 2002; Weinreich, 1999). Jacobson et al. (2006) outline six different psychological models of behaviour change:

- Theory of Planned Behaviour – behaviours are determined by intentions which are a product of attitude, perceived control, and social norms (n=790[1])

- Elaboration Likelihood Model – long term attitude change occurs when people are engaged in thinking about the issue (n=119)

- Motivational Theories – Motives and needs produce behaviour, understanding the two assists with predicting behaviour (n=65)

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[1] n is the number of articles using the name of the psychological model as a keyword in the bibliographic search engine PsycInfo from 2000 to 2008; search date 1 May 2008

- Stages of Change – Change is a series of five steps from deciding, committing to, and finally achieving the change (n=795)

- Diffusion of Innovation – New ideas are perpetuated by innovators and spread through the community (n=79)

- Social Learning Theory – People can learn from observing others engaging in the behaviour (n=387)

However, few zoos have applied any of these psychological models to investigate the impact a zoo visit has on visitor conservation behaviour (Smith & Broad, 2008). My PhD used the Theory of Planned Behaviour (TPB) and the Elaboration Likelihood Model (ELM) because they have been subjected to more than three decades of scrutiny and have been applied repetitively to environmental behaviour change campaigns outside of zoos. These two models of behaviour change can be used together as TPB identifies the content of the message and ELM guides the delivery of the message. When used in tandem, these models have been effective in successfully changing behaviour in wildlife settings (Curtis, 2008; Ham et al., 2007; Orams, 1997). But the two models have not been applied to communication campaigns in a zoo thus my thesis addressed this gap and tested if the models were effective in communicating conservation behaviour. These models are discussed in more detail in Chapter 3 and Chapter 4.

Applying a persuasive communication framework

Persuasive communication is multi-disciplined and is a process that uses verbal messages to influence attitudes and behaviours and, through a process of reasoning, modifies or changes the response (Ajzen & Driver, 1992). An effective

behaviour change campaign incorporates the principles of social marketing (Kotler et al., 2002; MacFadyen, Martine, & Hastings, 1999; Weinreich, 1999), community-based social marketing (McKenzie-Mohr & Smith, 1999; Pickens, 2002), and environmental and social psychology (Fishbein & Cappella, 2006; Manfredo, 1992; Steg & Vlek, 2009). In all of these paradigms, extensive formative research is critical before a communication campaign is launched (e.g., Uhrig, Bann, Wasserman, Guenther-Grey, & Eroglu, 2010), and each step has a theoretical basis with the outcomes contributing to the next step (Cappella, 2006; Fishbein & Cappella, 2006). Weinreich (1999) outlines five research steps to design a successful persuasive communication campaign:

- Planning – What is the problem or issue to be addressed? Which behaviours should be changed? Who is the target audience? What does the target audience think about and behave in relations to the problem?

- Message and Material Development – What message will be conveyed and how will it be conveyed? What does the audience believe about the message?

- Pretesting – Is the audience receptive to the message? Is the channel of communication effective? Are the selected messages, materials, and communication method effective?

- Implementation – Does the audience engage in the behaviour because of the campaign? Is the action sustainable in the long-term?

- Evaluation and Feedback – Assessment occurs throughout the entire process and feedback is used at each stage to improve the programme.

Persuasive communication has proven to be successful in natural resource management, but it is still underutilised in addressing most environmental issues (Manfredo, 1992) despite being supported by the IUCN (Hesselink et al., 2007). Researching and assessing each of these detailed steps, which require significant resources prior to launching a communication campaign, is often overlooked in conservation communication campaigns (Johnson, Kazakov, & Lynch, 2007; McKenzie-Mohr, 2000; Novacek, 2008), particularly in zoos (Morgan & Hodgkinson, 1999; Smith & Broad, 2008). My PhD was the first to apply a persuasive communication framework to test conservation behaviour messaging in a New Zealand zoo and is one of only a few worldwide.

PhD thesis structure

The main objective of my PhD was to determine the attitudes of zoo visitors towards two conservation actions and if the zoo communication campaign, based on persuasive communication theory, resulted in zoo visitors having a greater intention to engage in the behaviour. In this PhD thesis, I addressed four gaps in the literature:

- To date zoos have focused on advocating basic conservation threats to visitors. However, these threats are already recognized by most visitors and what is needed instead is a better understanding of the most effective methods for communicating locally relevant conservation actions that zoo visitors can participate in (Dierking et al., 2002).

- Few zoos apply behaviour change theory to communicate conservation actions to visitors. Instead the limited social science research in zoos has focused on general environmental attitudes (Ogden et al., 2004) and few

studies have examined the underlying beliefs of visitors that do and do not

engage in the targeted behaviour (Smith & Broad, 2008). To date, no zoo has

assessed the underlying visitor beliefs of conservation behaviour (Smith,

Broad, & Weiler, 2008).

- To date, evaluation of interpretive communication in zoos has been limited,

  and the vast majority have focused on how communication efforts influence

  knowledge gain and/or attitude change, with little attention paid to the

  effectiveness of interpretation targeted specifically towards behaviour change

  (Munro, Morrison-Saunders, & Hughes, 2008).

- Social science research in New Zealand zoos has been very limited, with only

  one published study to date (MacDonald & Linklater, 2006). My thesis is the

  first study to combine the psychological models TPB and ELM to

  communicate conservation behaviour in a zoo.

As mentioned previously, Weinreich (1999) summarises the five steps necessary to

design and implement a successful behaviour change campaign: planning, message

and material development, pre-testing, implementation, and evaluation and feedback.

My PhD is divided into three sequential studies that addressed the first three stages

and assimilated stage five throughout the thesis. Each chapter is a single study, with

their own introduction, methods, results, and discussion. Theoretical and applied

results are discussed at the end of each chapter.

In the first study, analogous to Weinreich's (1999) planning stage, I assessed

visitor perception of global and local conservation threats and actions. Visitor

responses were also compared to perceptions of environmental experts and published

data. This formative step is often skipped in behaviour change campaigns, but is

important for assessing the current knowledge, beliefs and behaviours of the targeted audience (Kotler et al., 2002).

Based on results from the first study, I identified two specific conservation behaviours to advocate to zoo visitors. My second study used the Theory of Planned Behaviour (TPB) to investigate the cognitive components that were linked to behavioural intention. This step is necessary to identify the content of the messages for an effective persuasive communication campaign (Ballantyne et al., 2007; Fishbein & Cappella, 2006; Ham et al., 2007; McKenzie-Mohr & Smith, 1999). My second study was analogous to Weinreich's (1999) message and material development step.

In the third study for the thesis, I assessed the effectiveness of communicating conservation actions at animal talks and via signs throughout the zoo on visitor intention. This study corresponded to Weinreich's (1999) pre-testing phase as signs or animal talks may not be an effective method to communicate conservation action to zoo visitors (Ballantyne et al., 2007). Conservation messages were integrated into talks and signs based on the Elaboration Likelihood Model (ELM) and I measured if talks and signs based on ELM were more effective in eliciting elaboration than non-ELM talks and signs. Integrating the results of a TPB analysis with ELM has been advocated by Ham et al. (2007) and has proven successful in natural resource management. TPB identifies the content of the message, and ELM outlines the communication strategy. When used together these two psychological models can create messages that have maximum impact.

Finally in Chapter 5, I summarise the findings and discuss the overall implications for conservation communication in zoos. I also note future research directions.

Study Site – Wellington Zoo, New Zealand

Wellington Zoo is located in the capital city of New Zealand (41°17′S 174°27′E) and was the first zoo established in New Zealand in 1906. Wellington Zoo is a Wellington City Council Controlled Organisation and is governed by a board of trustees appointed by the Council. The zoo is located on 13 hectares of public green space, and is approximately five kilometres from parliament house and the city centre.

In 2007/08 approximately 182,000 visitors came to Wellington Zoo, with 56% of the visitors coming from Wellington City and 8% internationally. Half of all Wellington residents visited the zoo during the year. The zoo had an annual operating cost of approximately $4.7 million, and the organisation generates 44% of its operating revenue, with the remaining portion coming from a Wellington City Council grant (Wellington Zoo Annual Report, 2008). Visitor demographics based on self-submitted exit questionnaires showed a female bias (57.9%). The largest age group was children under 17 (37%), followed by 17-24 year olds (26.9%), 25 to 34 year olds (17.1%), 35 to 54 year olds (14.95%) and over 55 years (3.8%). The zoo houses approximately 500 individual animals comprising over 100 species. Wellington Zoo is a member of Australasian Regional Association of Zoos Parks (ARAZPA) and Aquarium and World Association of Zoos and Aquariums (WAZA).

My Position

During the duration of data collection I was employed as Manager of Visitor Experience at the Wellington Zoo. This dual role, both as employee and as a researcher, is important to clarify. My research project was supported by Wellington Zoo Trust and aligned strategically to the direction the zoo was heading. Thus the

overall aims of my research were complimentary to the organisation. Throughout the process I was always aware of my position, communicated my dual role openly and strived to ensure the integrity of my research. One study (Chapter 3) utilised zoo staff and relied on individuals implementing a programme I designed in consultation with staff and zoo senior management. There is a possibility that this could have created conflict as I was more senior in the organisation than the staff and there willingness to implement the training programme may have been affected by my role in the organisation, positively or negatively. While I recognise that having a dual role as a researcher and an employee may at times present conflicts of interests or lead to others being biased in their implementation of the desired programme, I believe that being outside the organisation and conducting similar presents a different set of challenges (e.g. xenophobia or suspicion of the researcher that results in lack of support of the project) and in fact it was easier for me to work from with in the organisation in this particular case.

Human ethics approval

Human ethics for all questionnaires was approved on 3 Oct 2007 by the School of Geography, Environment and Earth Science Human Ethics representative Dr. William Hipwell (Appendix 1.1). All questionnaires were considered anonymous and confidential. Potential respondents were provided with a participant information sheet which detailed the purpose of the study, contact information of the researcher and supervisor, anonymity and confidentiality of responses, storage of data, right of withdrawal, and community access to results. Appendix 1.2 is the participant information sheet used in Study 1.

Chapter 2

Perceptions of zoo visitors and environmental professionals related to global and local conservation threats and actions

Introduction

Understanding the public's perception of a conservation issue is an essential first step towards changing behaviour because perceptions impact the level of engagement in environmental issues (Eisenhauer & Nicholson, 2005; Lorenzoni, Nicholson-Cole, & Whitmarsh, 2007). Prominent behaviour change paradigms based on social marketing (Kotler et al., 2002; Weinreich, 1999), social psychology (Ajzen & Driver, 1992; Fishbein & Cappella, 2006), and integrated system for knowledge management (Allen, Bosch, Gibson, & Jopp, 1998) all state that the first step in a persuasive communication campaign is to assess what the target audience knows and believes about the issue. However, persuasive communication campaigns often skip this stage (Weinreich, 1999) especially in studies of public engagement with conservation issues (Johnson et al., 2007; McKenzie-Mohr, 2000; Novacek, 2008). Instead experts often develop the content of the message based on their own experiences and not on research of the target audience. As a result, the audience may not be receptive to the message and the persuasive communication campaign often fails (Hesselink et al., 2007).

Although little is known about perceived threats to wildlife, significant research has occurred in the broader area of environmental risk perception [e.g., chemical pollutants and pesticides (Blok, Jensen, & Kaltoft, 2008), radioactivity and nuclear power (Slovic 1987), global warming (Kahlor & Rosenthal, 2009),

genetically modified foods (Savadori et al., 2004)]. A common finding is that experts and the general public perceive environmental threats differently (Bonnes, Uzzell, Carrus, & Kelay, 2007; Goedeke & Rikoon, 2008; Winter, 2005). Experts conduct technical studies to assess threats and base their perceptions of risk on the outcomes of this research (Blok et al., 2008). On the other hand the public has minimal access to these results, and instead predominately base their perceptions on mass media (Kahlor & Rosenthal, 2009; Nisbet & Lewenstein, 2002) or on their own inferences and observations, which can lead to biased conclusions (Kellstedt, Zahran, & Vedlitz, 2008).

The discrepancy between the experts' and the general public's perception of environmental threats can produce significant challenges for planning behaviour change interventions. The challenge is particularly acute in situations where a participatory approach and public engagement is required to solve environmental problems (Fischer & Young, 2007; Lorenzoni et al., 2007). If the public does not have the awareness or understanding of an issue, they are unlikely to take personal action or demand government action to solve the problem (Novacek, 2008). Solutions to environmental problems typically rely on effective engagement with the public to increase awareness and ultimately to solve the crisis (Miller, 2005; Nisbet & Scheufele, 2009; Petts, 2006; Steinberg, 2005; Van Vugt, 2009; Weber & Word, 2001).

Zoos can play a critical role in educating the public about conservation issues (Novacek, 2008), and understanding the visitor's perception of conservation issues is an essential first step as it will direct the development and delivery of zoo messages (Ballantyne, 1998; Falk, 2005). To date no zoo in New Zealand has assessed visitor perception of conservation issues and overall social science research in zoos has been

minimal (MacDonald & Linklater, 2006). Furthermore research on conservation threat perception, attitudes and behaviours in New Zealand overall has been very limited over the last two decades (Allen et al., 1998; Allen & Kilvington, 1999; Bryce, Day, & Olney, 1997; Craig et al., 2000; Fraser, 2002; James, 1993, 2001; Johnson et al., 2007; Kilvington, Rosier, Wilkinson, & Freeman, 1998; McCallum, Hughey, & Rixecker, 2007; Norton & Miller, 2000; Ryan & Saward, 2004; Schultz et al., 2005; Taiepa et al., 1997).

In this study I examined what the target audience, Wellington Zoo visitors, perceived to be the main global and local conservation threats and the conservation actions needed to address these threats. I compared zoo visitor's perceptions of local and global wildlife threats and actions with those of local environmental experts and to previous empirical studies. This is the first study to specifically assess the perception in New Zealand zoo visitors of conservation threats and corresponding actions to wildlife. Furthermore, my study is the first to date that compares the perception of conservation threats and mitigating actions of a lay audience (i.e., visitors) with experts and empirical data. This research corresponds to Weinreich (1999)'s first step in developing an effective persuasive communication programme, planning, as outlined in Chapter 1. In turn, the results influenced the studies outlined in subsequent chapters.

Methods

Participants

Participants were recruited from two groups using a purposeful sampling technique. First, 103 local environmental and conservation professionals were

identified. The initial list of professionals was generated from environmental and conservation contacts at local universities, government agencies (city, regional, and central), garden and nature centres, museums, and non-profit conservation/environmental organisations. Additional organisations were identified using the environmental website www.eco.org.nz. At least two people, normally the president or chief executive officer and another senior executive or senior scientist, from each organisation were identified and sent questionnaires (see Appendix 2.1 for a list of organisations I contacted). The self-administered questionnaire was distributed via the mail in October 2007 and included a postage-paid return envelope. A pre-questionnaire letter was sent to increase response rate (Appendix 2.2). Three questionnaires were returned due to incorrect addresses or person no longer at the address and could not be rerouted. Fifty completed questionnaires were returned, for a response rate of 49%.

A second group was drawn from people visiting Wellington Zoo on weekends from 6 October to 23 December 2007. Visitors over the age of 18 were approached as they left scheduled animal talks[2]. These locations were chosen for respondents' comfort: most places had seating and also offered an alternative activity (i.e., viewing of the animals) for children and other members of the group while the selected individual completed the questionnaire. The specific animal talk and time was randomized throughout data collection. No more than two talks a day were targeted to ensure visitors were not asked twice to participate in the questionnaire during their zoo visit. Participants were selected based on the next to pass method (i.e., an imaginary line was drawn outside of the enclosure and the first visitor to pass the line was approached) (Bucy, 2005). In the case of a group, a random adult was

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[2] Through out the day at Wellington Zoo, staff members give scheduled talks on animal natural history and conservation in front of specified animal enclosures. Visitors are informed of the times upon entering the zoo.

selected from each group. Because questionnaires were self-complete, as soon as one person agreed to fill out the questionnaire, the next person to pass the imaginary line was approached. If participants declined, they were thanked and the next person to pass the line was approached. Refusal rate was <4%. Three questionnaires turned in by respondents had to be discarded due to incompleteness. A total of 109 questionnaires were used in the analysis.

Questionnaire

The questionnaire (Appendix 2.3) for both groups contained both open and closed questions. The first two questions asked about the knowledge and impact that the average Wellingtonian can have on wildlife conservation problems. Questions 3-6 were a series of open-ended questions to promote free-listing (Bernard, 2006; Weller & Romney, 1988) of local and global wildlife conservation threats and possible actions to mitigate the threats. With free-listing, the frequency of an item listed is in proportion to its overall awareness and perception in a population (Sinha, 2003).

Questions of age, sex, occupation and education (questions 7-12 for the experts and 7-13 for visitor) were also included to test for an effect as they have influenced some environmental behaviours (e.g., Kellert & Berry, 1987; Zelezny, Chua, & Aldrich, 2000) and not others (e.g., Korfiatis, Hovardas, & Pantis, 2004) . Wording and categories for education and age brackets were extracted from New Zealand census data (New Zealand Statistics, 2001. The questionnaire took no more than 10 minutes to complete and was anonymous and confidential. Because the data was categorical and I would conduct non-parametric analysis, I followed Graves (2002) recommendation of 60 to 120 for sample size.

Analysis

The free listed answers to questions 3-6 (local and global conservation threats and actions) were assigned to categories based on the World Conservation Union – Conservation Measurement Partnership for threats (IUCN, 2006b) (Appendix 2.4) and actions (IUCN, 2006a) (Appendix 2.5). The IUCN-CMP has developed a standardized classification system which divides conservation threats and conservation actions into two levels. The second level threats are comprehensive and group the broader first level classification. Salafsky (2008) found this classification system to be robust and valid across many different conservation programmes and target species. By adopting this classification system, results from this research can be compared to other projects worldwide, monitored over time for change, and the results can be shared with other organisations.

Some answers to conservation threats could not be placed into IUCN-CMP categorises. These responses cited underlying social, economic and political causes of conservation threats (e.g., humans or population growth), and not the direct threat itself. An additional threat category "human factors" was created for these responses. A final category called 'other' was created for responses that could not be classified into any of the defined categories (this was less than 1% of responses).

The categories and definitions were given to two independent staff members who served as reviewers and sorted a subset of the data into categories. Both individuals sorted the data with 100% accordance, and in turn, I made no further changes to the definitions.

Categorisation of each threat was mutually exclusive, i.e., one response could not be attributed to more than one category. However, respondents could provide

three separate answers that were assigned to the same category. For example, Expert #13 listed two of the global threats as "over fishing" and "deforestation/clear cutting." Both were scored as Biological Resource Use based on IUCN-CMP level 1 categories but were assigned to different level 2 categories (Fishing & Harvesting Aquatic Resources and Logging & Wood Harvesting). Additionally, respondents could have provided more than one action for a given threat. For example, Expert #2 listed the solutions to habitat destruction as "support appropriate government (local, regional & national) policies, support organisation on the field, do your own part to live sustainability (e.g., reduce, reuse, recycle) shop well (do not buy unsustainable products) educate children" This one answer was categorised as Education & Awareness, External Capacity Building, Law & Policy, and Livelihood, Economics & Other Incentives.

Expert and visitors answers to the four-open ended questions were entered verbatim into Excel 2003 and then categorised based on the IUCN-CMP classification. The verbatim responses, corresponding categories, and definitions of the categories were also given to two independent reviewers who examined the category assigned to each response. The reviewers and I convened (initial discrepancies existed in <2% of the total dataset) and reviewed the categorisation of the data until a consensus was agreed upon.

Data were analysed in two ways. First, I tallied the responses to Questions 3-6, i.e., for each question a respondent could have given either 0, 1, 2, or 3 responses. This allowed for a comparison of the quantity of responses between experts and visitors. Second, I categorised the responses using the IUCN-CMP to determine if there was a difference between the types of threats or actions listed.

A series of correlations were calculated to measure the association, if any, between the demographic variables of age, sex, and education and the number of items listed. A rank biserial correlation was calculated for sex and the number of items listed. Spearman's rho correlation was calculated between education and number of items listed. The polyserial correlation was calculated between age and number of items listed.

The generalized estimating equation (GEE) (Liang & Zeger, 1986) was used to evaluate if the number of threats and actions listed was influenced by subject group (visitor or expert), geographic proximity of the threat or action (global or local), and demographic variables (sex, age, education). GEE is an extension of the quasi-likelihood approach and is suitable to use when the data are correlated and binary or counts (Hanley, Negassa, Edwards, & Forrester, 2003), as is the case in my study. The correlation structure for repeated measures was assumed to be unstructured and data were poisson distributed. The quantity of threats or actions listed was the dependant variable for all models. Model A contained subject group (visitor or expert). Model B contained subject group and geographic proximity (global or local) as the independent variables. Model C contained subject group, geographic proximity, and demographic variables. The number of children and adults was also entered as covariates for Model C. Models were compared using the Quasilikelihood Under Independence Model Criterion (QIC); models with the lowest QIC are the most robust (Pan, 2001). Due to small numbers in some cells, the Fisher's Exact Test (in place of a chi-square test) was used to assess if visitor and expert groups were independent of each other (Garson, 2008).

Responses by both visitors and experts were compared to published data that quantified threats to global and New Zealand threats. Salafsky et al. (2008) was used

as the empirical research that quantified global conservation threats and Environment New Zealand (Environment New Zealand, 2007) defined the key threats to New Zealand conservation.

Actions were sorted into two categories based on the actor or entity responsible for the action (IUCN, 2006a). Land/Water Protection, Land/Water Management, Species Management, and Law & Policy are actions that focus on biodiversity targets and rely primarily on organisations (governments or large scale non-government organisations) to implement. In contrast, Education & Awareness, Livelihood, Economic & Other Incentives, and External Capacity Building target the underlying causes and ultimately require individuals to implement.

Results

Descriptive statistics

Experts were more educated ($X^2 = 29.5$, $p < .001$, $df = 4$) and were older ($X^2 = 20.8$, $p < .001$, $df = 4$) than zoo visitors but both groups were similar in terms of the ratio of male and female respondents (Table 2.1).

Overall, the quantity of items listed was greater for experts than zoo visitors (Figure 2.1) which may be a result of the circumstance of data collection. Experts may have had more time to complete the questionnaire at work. Similarly, the experts were selected due to their high knowledge in conservation threats and therefore I expected a greater number of items.

Threats to wildlife

Table 2.1

Demographic summary of environmental experts (n = 50) and zoo visitors (n = 108)

Zoo Visitors	Environmental Experts
Sex	**Sex**
Male - 41	Male - 26
Female - 67	Female – 22
Blank - 0	Blank – 2
Education level	**Education level**
Fifth Form[a]- 28	Fifth Form[a] - 1
High School[b] - 15	High School[b] - 0
Bachelor/vocational degree - 39	Bachelor/vocational degree [c] - 21
Higher degree[d] - 23	Higher degree[d] – 27
Blank – 3	Blank - 1
Age	**Age**
18-24 - 22	18-24 - 0
25- 49 - 70	25- 49 - 30
50 – 64 - 13	50 – 64 - 15
Over 65 - 3	Over 65 - 4
Blank – 0	Blank - 1
Times to Zoo in last Five years	**Organisation**
None - 33	Academic - 6
One to three - 44	Government - 27
Four to ten - 19	Non-government organisation - 14
More than ten - 12	Private sector - 2
	Retired – 1
Number of adults in group (including self)	**Expertise**
One - 15	Administrator – 1
Two - 50	Animal health – 2
Three - 16	Animal welfare – 2
Four - 16	Biosecurity – 2
Five - 5	Biologist – 1
Six - 1	Botanist/horticulture – 4
Seven - 1	Committed individual – 1
Eight - 1	Communication – 1
Nine – 1	Community relations – 1
Ten – 2	Conservation – 2
	Conservation genetics – 1
	Conservation management– 2
	Conservation medicine – 1
	Ecology – 3
	Educator – 3
	Environmental care – 1
	Environmental studies – 1

Fauna Conservation – 1
Housing and environment – 1
Marine conservation – 2
Marine mammals - 1
Microbiology – 1
Ornithology – 2
Science/policy – 1
Social marketer – 1
Statistics – 1
Translocation – 2
Veterinarian – 2
Volunteer – 1
Waste – 2
Nothing - 1
Blank – 2
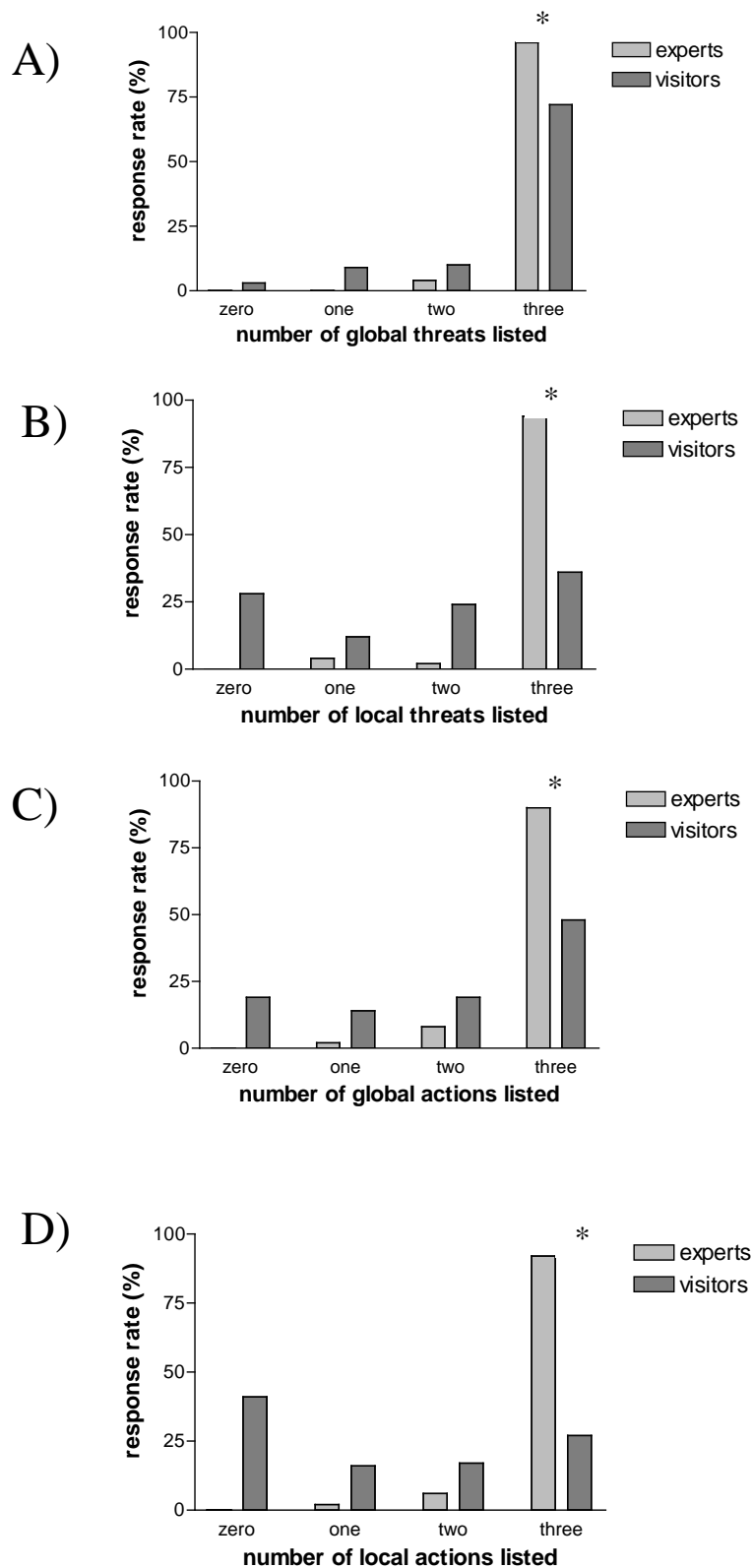
Figure 2.1 Percentage of respondents listing zero, one, two or three a) threats to global conservation; b) threats to local conservation; c) actions to solve global conservation; d) actions to solve local conservation. * = p < .05

Experts listed global and local threats at a similar rate ($\bar{x}$ global threats = 2.959 and $\bar{x}$ local threats = 2.898) but visitors showed a global-local dichotomy, listing significantly more global threats than local threats ($\bar{x}$ global threat = 2.574 and $\bar{x}$ local threats = 1.685). The GEE confirmed visitors listed significantly greater global threats than locals threats compared to the experts but demographic variables did not significantly contribute to the model. Model B (QIC = 188.448) performed better than Model A (QIC = 201.048) or Model C (QIC = 191.562) for listing of threats.

Although the quantity of the threats listed differed between the visitors and experts, the specific categories of global threats listed by experts and visitors were similar ($p > 0.05$, Fishers exact test) (Table 2.2). Both visitors and experts listed Biological Resources as the key threat followed by Human Factors, Climate Change & Severe Weather, Pollution, and Invasive & Other Problematic Species & Genes. Visitor and expert listing of global threats was similar to the threats outlined in published data. Biological Resources and Invasive & Other Problematic Species & Genes were listed in the top five threats by experts, visitors, and the published data (Salafsky, 2008). However, Pollution and Climate Change & Severe Weather were ranked higher by visitors and experts than the published data. Similarly, experts did not list Agriculture & Aquaculture and Residential & Commercial Development as a threat and visitors listed this category less than 2%. Nevertheless Salafsky (2008) list these as key threats to species conservation.

While visitors and experts listed similar threats globally, they listed significantly different local threats ($p < 0.001$, Fishers exact test) (Table 2.3). The largest difference between experts and visitors was the listing of Invasive & Other Problematic Species & Genes. Experts listed this category five times more frequently than visitors, and the empirical data on conservation threats confirm that the main

26

Table 2.2

Summary of global threats identified by experts (n = 50) and visitors (n = 109) and the percent listed of conservation actions to solve the specific threat. Number in parentheses is the count of respondents who listed that category. Empirical data ranking is based on the cumulative threat to 1191 species based on Salafsky (2008).

Global Threat	Corresponding Conservation Action Listed by Expert	Corresponding Conservation Action Listed by Visitor	Empirical Data
Agriculture & Aquaculture	0% (0)	0% (0)	1
Biological Resource Use	90% (45) • 22% Education & Awareness • 13% External Capacity Building • 13% Land/Water Management • 3% Land/Water Protection • 3% Law & Policy • 31% Livelihood, Economics, & Other Incentives • 6% Other	79% (86) • 12% Education & Awareness • 9% External Capacity Building • 9% Land/Water Management • 5% Land/Water Protection • 20% Law & Policy • 24% Livelihood, Economics, & Other Incentives • 4% Other • 17% Blank	2
Climate Change & Severe Weather	36% (18) • 16% Education & Awareness • 16% Law & Policy • 68% Livelihood, Economics, & Other Incentives	37% (40) • 10% Education & Awareness • 5% Land/Water Management • 5% Law & Policy • 52% Livelihood, Economics, & Other Incentives • 5% Other • 24% Blank	9
Human Factors	26% (52) • 26% Education & Awareness	38% (41) • 38% Education & Awareness	n/a

- 8% External Capacity Building
- 3% Land/Water Management
- 3% Land/Water Protection
- 15% Law & Policy
- 21% Livelihood, Economics, & Other Incentives
- 9% Other

- 13% External Capacity Building
- 3% Law & Policy
- 9% Livelihood, Economics, & Other Incentives
- 4% Species Management
- 4% Other
- 30% Blank

Invasive & Other Problematic Species & Genes	14% (7) • 22% External Capacity Building • 33% Land/Water Management • 22% Law & Policy • 11% Other • 11% Blank	3% (4) • 25% Education & Awareness • 25% External Capacity Building • 25% Land/Water Management • 25% Other	3
Pollution	16% (8) • 18% Education & Awareness • 18% External Capacity Building • 55% Livelihood, Economics, & Other Incentives • 9% Other	22% (24) • 7% Education & Awareness • 4% Law & Policy • 63% Livelihood, Economics, & Other Incentives • 26% Blank	7
Residential & Commercial Development	0% (0)	11% (12) • 15% Education & Awareness • 15% Law & Policy • 40% Land/Water Management • 15% Other • 15% Blank	4
Natural System Modifications	0% (0)	0% (0)	5
Energy Production & Mining	0% (0)	0% (0)	6
Human	0%	1% (1)	8

Intrusions & Disturbances		• 100% Law & Policy	
Transportation & Service Corridors	0% (0	0% (0	10
Other	20% (10%)	7% (18)	

Table 2.3

Summary of local threats identified by experts (n = 50) and visitors (n = 109) and the percent listed of conservation actions to solve the specific threat. Number in parentheses is the count of respondents who listed that category.

Local Threat	Corresponding Conservation Action Listed by Expert	Corresponding Conservation Action Listed by Visitor
Agriculture & Aquaculture	2% (1)	2% (2)
Biological Resource Use	74% (37) • 8% Education & Awareness • 20% External Capacity Building • 32% Land/Water Management • 8% Land/Water Protection • 22% Law & Policy • 10% Livelihood, Economics, & Other Incentives	47% (51) • 14% Education & Awareness • 6% External Capacity Building • 17% Land/Water Management • 6% Land/Water Protection • 13% Law & Policy • 16% Livelihood, Economics, & Other Incentives • 5% Other • 23% Blank
Climate Change & Severe Weather	12% (6) • 14% External Capacity Building • 14% Law & Policy • 57% Livelihood, Economics, & Other Incentives • 14% Species Management	18% (20) • 5% Education & Awareness • 60% Livelihood, Economics, & Other Incentives • 15% Other • 20% Blank
Human Factors	48% (24) • 9% Education & Awareness • 27% External Capacity Building • 11% Land/Water Management • 6% Land/Water Protection • 14% Law & Policy • 9% Livelihood, Economics, & Other Incentives • 3% Other • 3% Species Management	31% (34) • 33% Education & Awareness • 21% External Capacity Building • 2% Land/Water Management • 9% Law & Policy • 2% Livelihood, Economics, & Other Incentives • 5% Species Management • 5% Other • 23% Blank

Invasive & other Problematic Species & Genes	68% (34) • 16% Education & Awareness • 21% External Capacity Building • 61% Land/Water Management • 2% Livelihood, Economics, & Other Incentives	13% (14) • 7% External Capacity Building • 79% Land/Water Management • 7% Land/Water Protection • 7% Law & Policy
Pollution	20% (10) • 19% Education & Awareness • 6% External Capacity Building • 13% Land/Water Management • 19% Law & Policy • 31% Livelihood, Economics, & Other Incentives • 13% Other	28% (31) • 6% Education & Awareness • 6% Land/Water Management • 6% Law & Policy • 61% Livelihood, Economics, & Other Incentives • 3% Other • 18% Blank
Residential & Commercial Development	14% (7) • 85% Land/Water Management • 15% Livelihood, Economics, & Other Incentives	19% (21) • 10% Education & Awareness • 5% External Capacity Building • 15% Land/Water Management • 5% Land/Water Protection • 10% Law & Policy • 10% Livelihood, Economics, & Other Incentives • 10% Other • 38% Blank
Human Intrusions & Disturbances	0%	1% (1) • 100% Law & Policy
Other	10% (5%)	7% (18)

threat to New Zealand biodiversity is introduced pests (Environment New Zealand, 2007).

Actions to mitigate conservation threats

Similar to the results for threats to wildlife conservation, experts listed global and local actions at a similar rate ($\bar{x}_{\text{global actions}}$ = 2.878 and $\bar{x}_{\text{local actions}}$ = 2.898), but visitors showed a global-local dichotomy, listing significantly more global actions than local actions ($\bar{x}_{\text{global actions}}$ = 1.972 and $\bar{x}_{\text{local actions}}$ = 1.296).

The GEE confirmed visitors listed significantly more global actions than local but experts did not and demographic variables did not significantly contribute to the model. The number of actions listed was best fit by Model B (QIC = 296.446) over Model A (QIC = 303.964) or Model C (QIC = 302.763).

The majority of experts (64%) and visitors (56%) listed global actions based on individuals engaging in a pro-environmental behaviour as key to solving conservation threats. Global actions that required organisations to implement them were listed less frequently by both experts (28%) and visitors (21%) (Table 2.4). At the local level, visitors continued to list actions that focused on individual actions (64%) but the majority of experts listed actions implemented by government or organisations (51%)(Table 2.5). Experts listed Land/Water Management and Protection (38%) as a local solution at a greater rate than visitors (20%). Another key difference between expert and visitor local actions was the listing of Livelihood, Economics, & Other Incentives. At the local level, visitors listed this action at a similar rate to the global level (32% and 30% respectively). In contrast, 35% of experts listed this action as a global solution but only 11% listed this category for solving local threats. Visitors and experts listed Education & Awareness as a local solution at a similar rate (20% and 18% respectively). This result also reflected the

Table 2.4 Visitor and expert respondents listing of global actions categorised

according to IUCN-CMP definitions.

Global Actions	Visitors	Experts
Education & Awareness	17%	5%
External Capacity Building	8%	24%
Livelihood, Economics, & Other		
Incentives	30%	35%
Subtotal of individual-based actions	55%	64%
Land/Water Management	5%	10%
Land/Water Protection	3%	3%
Law & Policy	13%	16%
Species Management	5%	1%
Subtotal of organisation-based actions	26%	30%
Other	5%	8%

Table 2.5 P Visitor and expert respondents listing of local actions categorised

according to IUCN-CMP definitions.

Local Actions	Visitors	Experts
Education & Awareness	20%	18%
External Capacity Building	12%	18%
Livelihood, Economics, & Other Incentives	32%	11%
Subtotal of individual-based actions	64%	47%
Land/Water Management	18%	34%
Land/Water Protection	2%	4%
Law & Policy	10%	13%
Species Management	5%	2%
Subtotal of organisation-based actions	35%	53%
Other	5%	8%

similarity between visitor and expert assessment of conservation-related knowledge among Wellingtonians assessed in Question 1 ($\bar{x}_{visitors}$ = 2.330 and $\bar{x}_{experts}$ = 2.338; t = .838, p > .05, df = 150). However, experts and visitors differed in the extent they rated individual action at the local level. Question 2 asked what impact an individual can have on solving conservation problems and experts ranked the impact as significantly lower than zoo visitors ($\bar{x}_{visitors}$ = 2.010 and $\bar{x}_{experts}$ = 1.792; t = 1.998, p < .05, df = 150).

Finally, a similar (low) percentage of experts and visitors believed the global and local conservation issues were the same (12% and 18% respectively) and that the conservation actions required at global and local scales were the same (18% and 16%).

Discussion

The objective of this study was to assess zoo visitors' perceptions of wildlife threats and the corresponding actions to mitigate the threats and to compare these perceptions to those from environmental experts and published data. The results of this study yielded three important findings. First, visitors listed fewer threats to wildlife than experts. Second, visitors had a biased perception toward global threats compared to local threats. Finally, the majority of both visitors and experts listed global actions that relied on individuals to take steps to solve the problem, but at the local level experts shifted to actions implemented by government and organisations whereas visitors still listed largely individual-based actions the majority of the time. Overall demographic variables of age, sex, and education did not help explain differences in the perception of conservation threats and actions, which supports

findings of previous studies (Johnson et al., 2007; Korfiatis et al., 2004; Uzzell, 2000). The results of this study provided insight into conservation perceptions of zoo visitors and guided subsequent steps of the thesis.

This study documented an expert-lay discrepancy similar to previous work on other environmental threats (Slovic 1987). A key component to the expert-visitor discrepancy may be the frequency of the threat. The general public often overestimate the occurrence of infrequent but catastrophic events (e.g., nuclear accidents, earthquakes) and underestimate slow events that have a greater cumulative effect (e.g., motor vehicles, smoking, and surgery) (Sandman, 1994). A majority of conservation and environmental threats can be considered slow and additive over time (e.g., deforestation, agricultural impacts, pollution) (Uzzell, 2000) and this may contribute to the lack of awareness by the zoo visitors. The failure of visitors to register slow environmental degradation supports the shifting baseline syndrome (Pauly, 1995) in which people are not as conscious of slow alterations to the ecosystem, and in turn, over time people accept a lower condition of the ecosystem as the norm (e.g., Turvey et al., 2010). The largest discrepancy in perception of local threats between the experts and visitors was visitors significantly underreported Biological Resource Threat and Invasive & Other Problematic Species & Genes. Both these processes are slow and additive and thus may factor in to the lower perception by visitors.

Zoo visitors also demonstrated environmental hyperopia (Uzzell, 2000) by listing more global threats than local threats. Environmental hyperopia is based on people's perception that more distant environmental problems are more severe and my results corroborate similar work on other environmental issues (Bonaiuto, Breakwell, & Cano, 1996; Garcia-Mira & Real, 2005; Uzzell, 2000). The general

public's perception of environmental issues may be biased toward global problems, as mass media, a main source of scientific information for the public (Research New Zealand, 2007), tends to emphasise global issues over local problems (Garcıa-Mira & Real, 2005; Hatfield & Job, 2001; Uzzell, 2000).

At the global scale visitors listed the key threat as Biological Resources, similar to experts and the empirical data. In contrast, at the local level visitors not only listed significantly fewer threats compared with experts, but they underreported the main threat to New Zealand conservation- invasive species. The infrequent listing of invasive species by visitors is surprising considering experts and published reports list invasive species as the main threat to New Zealand biodiversity (Environment New Zealand, 2007; Moran, Cullen, & Hughey, 2008). However, my results (13% of visitors listed invasive species as a problem) support New Zealand's Department of Conservation (Johnson et al., 2007) findings that only 7% of the public are aware of invasive species as a conservation threat. However, there were a small percentage of visitors (13%) that listed invasive species as a local threat and all of these respondents were able to provide actions to remedy this threat (e.g., keep pets in at night, local government should continue to lay poison bait). Therefore, while the majority of visitors may be unaware of the local threat posed by invasive species, there is a minority of visitors that is highly knowledgeable about local conservation threats and mitigating actions. These people may play a key role in future advocacy and action campaigns and are referred to as block leaders in persuasive communication campaigns (McKenzie-Mohr & Smith, 1999). Block leaders pass information on to others and through social diffusion and normative behaviour can elicit significant behaviour change (Burn, 2006).

One explanation for visitor environmental hyperopia is optimism bias, which refers to the perception that negative events are more likely to occur to other people and positive events are more likely to occur to oneself (Hatfield & Job, 2001; Weinstein, 1980). Optimism bias has been found across a wide range of environmental issues [e.g., watershed management (Pahl, Harris, Todd, & Rutter, 2005), air pollution (Hatfield & Job, 2001), climate change (Milfont, 2010)] and across numerous countries [(Gifford et al., 2009), including New Zealand (Milfont, Abrahamse, & McCarthy, in press)]. New Zealanders, compared to numerous countries in a multi-cultural study (Gifford et al., 2009), are significantly more positive about the local environment (Milfont et al., in press). I do not assume that zoo visitors are a representative sample of New Zealanders but these results support my findings that visitors are more optimistic about their local environmental state. Alternatively, environmental hyperopia may be linked to the knowledge-deficit hypothesis in which inaction is the result of a lack of education or exposure to the issue. Interestingly, experts continually note a lack of environmental education as the main cause of the public's lack of action (Blok et al., 2008; Nisbet & Lewenstein, 2002) and in my study three times as many experts cited education as a solution to local conservation issues compared with global issues. However, the link between increased knowledge and environmental action has rarely been tested (Kahlor & Rosenthal, 2009) and awareness of an issue does not always transmit into action (Ajzen, 1991).

Another critical component to the local-global dichotomy is that people often feel helpless to solve global problems. This may occur because environmental action is moderated by control; people believe they do not have control over global issues and therefore do not believe they can be involved in the solution (Garcia-Mira &

Real, 2005). However, I found a greater number of actions listed for global threats compared with local threats, indicating a greater awareness at the global level. Understanding the link between awareness of conservation actions, proximity of the problem (global and local), perceived control over the issues, and ultimately implementing the behaviour should be the subject of future research. I will return to the link between knowledge and action in Chapter 3.

Overall, expert assessment of global and local threats was in line with published data. The one notable exception is climate change. Both visitors and experts rated climate change as a threat at a much higher rate than supported by empirical data. There are several possible explanations for this. For one, the discrepancy may be an artefact of time. The data used to quantify species and ecosystem threats (Salafsky et al., 2008) were collected in the 1990s and a more recent analysis may find climate change contributing to species and ecosystem decline at a higher rate. Another possibility is experts may be susceptible to the increase in perception of climate change, just like the general public. Climate change has rapidly become the number one perceived environmental problem, more than doubling in three years, while perception of other environmental problems, such as biodiversity loss, has remained the same or decreased over time (Curry, Ansolabehere, & Herzog, 2007).

Experts and visitors listed global actions that depend on individuals implementing the behaviour. However, locally experts placed less emphasis on individual behaviours and noted more actions to be implemented by government or NGOs. This is supported by experts ranking the impact Wellingtonians have on conservation issues lower than visitors. However, the literature points to the critical role local people must play in successful conservation action. Not only can

individuals make a collective difference in voting and financial support of conservation initiatives, but individuals can alter their behaviour to more sustainable practices that have a cumulative impact (e.g., keeping cats inside at night, purchasing sustainable products). Although experts may find engaging the public challenging (Weber & Word, 2001), public engagement is vital (Allen & Kilvington, 1999) and is considered by some to be the third tenant of good science (Weber & Word, 2001). Experts' reluctance to believe in individual behaviour change as a solution may be self-fulfilling; if experts do not engage with the public on solutions than the public will ultimately be less aware and take fewer actions on local issues. Furthermore, reliance on government mandates to implement environmental action may not be entirely successful unless there is public participation (Dietz, Gardner, Gilligan, Stern, & Vandenbergh, 2009). Engaging with people through urban restoration projects such as bird monitoring and tree planting have social and educational values that are important for conservation solutions (Dunn, Gavin, Sanchez, & Solomon, 2006; Miller, 2005).

My findings corroborate other research (Johnson et al., 2007) that New Zealanders have a low perception of local conservation threats and mitigating actions and have greater awareness of global environmental threats. The solutions to New Zealand's conservation issues are complex but will ultimately rely on both direct behaviour change of individuals and a change in public policy. For either to be implemented effectively, citizens must be empowered and engage in the issue (Pahl-Woslt, 2005). However, in conservation, the human perspective is often undervalued and instead emphasis is often is placed on the "nuts and bolts of conservation" (Allen & Kilvington, 1999; Gifford, 2008). For example, education and advocacy were a component in only five of the eleven DOC species recovery programmes and it was

the second least-funded objective of all recovery programmes (Moran et al., 2008). Additionally, the lack of perception of local conservation threats is not surprising as most conservation biology is not being conducted where people live and work (less than 6% in urban, suburban or exurban areas) (Miller & Hobbs, 2002).

Focusing on what the average person can do and that they can contribute to the solution may be key to solving environmental hyperopia (Garcia-Mira & Real, 2005). However, focusing on increasing awareness of local threats alone may not be enough as simple awareness of a problem rarely results in a change of behaviour (Ajzen & Fishbein, 1980). Instead, successful behaviour change is more likely achieved via a persuasive communication campaign (Weinreich, 1999). But this method is still underutilised in most environmental issues (Manfredo, 1992). Instead the erroneous belief that awareness translates into action is still assumed. For instance, research by the New Zealand Department of Conservation stated local conservation issues are given 'frequent coverage in the media' but this has not transmitted into the desired levels of awareness and in the general public (Johnson et al., 2007, p. 20). The assumption that media exposure will translate into public awareness and ultimately behaviour underscores the misconception about behaviour change campaigns with the public. Media coverage, especially network television, is not effective in motivating the public to participate in environmental issues (Kahlor & Rosenthal, 2009). Furthermore, media coverage predominately focuses on the threats and does not provide solutions to the environmental issue (Sandman, 1994). To change people's behaviour effectively, an advocacy campaign needs to be grounded in persuasive communication theory and not assume that action will come via awareness or an understanding of the facts.

In conclusion, this study applied Weinrich's (1999) first step of persuasive communication theory, planning. In order to successfully change zoo visitor's conservation behaviour, it was critical to research their perceptions of the threats and actions to wildlife conservation. The results indicate a dichotomy in visitor awareness of conservation threats, with an underreporting of local threats. More importantly visitor ability to list conservation actions was low, especially at the local level. Thus zoos can utilise these results to focus more on communicating about local conservation threats and actions to mitigate these threats. In Chapter 3, I apply these results and examine the cognitive constructs of two specific conservation behaviours, one focused on a global threat to conservation and the other on a local threat to conservation, to understand the intention of visitors to engage in these behaviours.

Chapter 3

The application of the Theory of Planned Behaviour (TPB) to two
conservation behaviours

Introduction

     To maximise the impact of a zoo visit, zoos should communicate conservation action visitors can do at home to mitigate the conservation crisis (Ballantyne et al., 2007). But few zoos to date advocate specific and relevant conservation actions that visitors can engage in (Dierking et al., 2002). Instead most conservation message are subtle or short-termed (Broad & Weiler, 1998). In short, zoos have a great opportunity to affect conservation behaviour in visitors but no zoo has conducted research in understanding the beliefs that relate to the intention to engage in conservation behaviour, and thus what the content of the communication should be (Smith, 2006).

     Identifying the beliefs that are significantly related to behavioural intention is necessary for an effective communication campaign. The identified beliefs become the content of the communication campaign and through persuasive communication channels, the beliefs are modified and the behaviour is altered as a result of these new beliefs (Ham et al., 2007; McKenzie-Mohr & Smith, 1999). However, systematic identification of the beliefs linked to intention is often skipped in persuasive communication campaigns and instead the beliefs (and the corresponding content of the advocated message) are assumed or inferred by the communication campaign manager (Kotler et al., 2002). Because the manager often comes from a different perspective, this approach may be flawed and the campaign fails. Instead

non-biased research to identify the beliefs is vital to truly understand what messages may elicit thinking about the conservation issue and ultimately behaviour change (Ballantyne et al., 2007; McKenzie-Mohr & Smith, 1999).

Expanding on the results from Study 1, two specific conservation actions were selected to advocate to zoo visitors and then I identified visitor beliefs associated with each action. First, through a systematic process I identified an action that would mitigate a key global threat to wildlife conservation. Utilising the IUCN-CMP categories Vié, Hilton-Taylor, & Stuart (2009) and Salafsky et al. (2008) found a key threat to wildlife globally was habitat loss. Similarly, both experts (90%) and visitors (79%) listed habitat loss as the key threat in study 1. Thus I chose this threat to target as it is supported by the empirical data and is already known by a large majority of the target population- zoo visitors. I selected a conservation action to combat habit loss. In selecting the action, the objective was to select an action that was relevant to Wellington Zoo visitors (Dierking et al., 2002). First, I conducted a literature review on the role New Zealanders play in habitat destruction globally. Imported furniture and decking are the main end uses of wood imported into New Zealand. An estimated $15-20 million of kwila, an Asian tropical hardwood, is imported into New Zealand every year for decking and outdoor furniture. Virtually all the wood from Indonesia and Papua New Guinea imported into New Zealand is illegal (Ministry of Forestry, 2008). Thus purchasing of sustainable timber products to mitigate habitat destruction that comes from harvesting tropical rain forest was identified as a behavior to advocate to zoo visitors.

Next I reviewed different types of sustainable certifications for wood products and identified Forest Stewardship Council (FSC) to be the most robust (Appendix 3.1). FSC is a non-governmental organization that certifies the production

of raw timber. Companies that produce products that originate in FSC-certified forests are permitted to use the FSC logo as a 'seal of approval,' which guarantees to the consumer that the product originates from a well managed forest and the entire process of the product (e.g., sawmill) is sustainable. FSC products adhere to environmental, social and economical standards and accreditation is through independent third party organizations. The accreditation is approved by a wide variety of organisations such as the World Bank and Green Peace. There are currently 78 FSC certified suppliers in New Zealand and more than 30% of New Zealand pine plantations are FSC certified; this is double the world-wide norm (Forest Stewardship Council, 2007).

Finally, I reviewed conservation messages of other New Zealand environmental and conservation agencies. Two organisations, Forest and Bird and Green Peace NZ, advocated the use of Forest Stewardship Council (FSC) wood thus Wellington Zoo's advocacy of FSC would be reinforcing to other organisations.

Similar to the process to select an action that would remedy a key global threat to wildlife conservation, a relevant action was selected that would mitigate a key local (i.e. New Zealand) threat. A key treat to New Zealand is the impact of invasive species. Results from Study 1 found that while the majority of experts (68%) recognised the impact of invasive species on New Zealand wildlife, very few zoo visitors (13%) listed invasive species as a threat.

I conducted preliminary research into the cause and effect of invasive species. The single largest threat to New Zealand's biodiversity is introduced pests (e.g., stoats, rats, possums, and cats) (Environment New Zealand, 2007) and native populations have quickly declined (McDowall 1969). More than 25,000 plant species, 54 mammal, and 2000 invertebrate species have been introduced into New

Zealand. Bringing cats inside at night to reduce their impact on native wildlife was further investigated because this action is primarily under the control of the owner but the impact of rats, possums, and stoats is best mitigated through large-scale poisoning programmes that are supported by local or central government.

New Zealand has the highest rate of cat ownership per capita in the world, with 51% of homes having at least one cat (Argante, 2008). An estimated 16-24 million animals a year are killed by cats in New Zealand (Clifton, 2001). Cats have been the driving force of several bird extinctions of New Zealand birds, including the Stephen's Island Wren (*Traversia lyalli*) (McCarthy, 2005) and cats are a predator of juvenile kiwi (McLennan et al., 1996). In studies of urban cat kill, Auckland cats' diet consisted of rodents, birds, and lizards in decreasing order (Gillies & Clout, 2003) but in Dunedin birds were the most common followed by rodents (Van-Heezik, Smyth, Adams, & Gordon, 2010). At this rate, modelling found six species of birds would not be sustainable in the urban centre. The use of bells is effective in reducing predation on mammals but not birds and reptiles, possibly because birds rely largely on visual cues in predator avoidance behaviour, or the acoustic qualities of cat bells may not lend themselves to warning birds or reptiles (Woods, Mcdonald, & Harris, 2003). Thus in New Zealand, bells on cats may not be an effective management tool for preserving bird life. Home ranges of domestic cats can be quite extensive (up to 112ha), so a single house cat can travel a long distance in a day and rivers and streams are not barriers to cats (Fitzgerald & Karl, 1986).

A review of New Zealand environmental and conservation organisations found that the Department of Conservation, Royal Forest and Bird Protection Society and the Society for the Prevention of Cruelty to Animals all advocate keeping cats inside at night time to protect wildlife.

In addition to the steps above, an internal zoo process was conducted to develop engagement with the staff for the forthcoming communication campaign. Three workshops were run with the Wellington Zoo staff to determine what behaviours should be advocated to zoo visitors. Zoo staff were divided into small groups and given a list of the species held at Wellington Zoo. Alongside the animal was the IUCN Red List's reason for decline and in the case for New Zealand fauna, information provided by the Department of Conservation. In groups, staff members were asked to list what action a visitor could take to remedy the threat species by species. These actions were collected, along with the research and findings on FSC and cats in at night, and discussed at a senior management meeting. The Manager of Conservation and Veterinary Science, myself and the CEO confirmed FSC and cats in at night as the conservation behaviours to be advocated to visitors. A presentation to all staff outlined the process and also provided detailed information on the background and impact of these conservation behaviours. Staff members were given the opportunity to provide feedback and two subsequent presentations that detailed the conservation impact of both advocating FSC and cats in at night were presented at all-staff meetings.

Next, following the steps outlined in Chapter 1 for a successful persuasive communication campaign (Weinreich, 1999), I identified the underlying beliefs of zoo visitors who intend to engage or not engage in the behaviour of bringing cats in at night or purchasing FSC products using a set of questionnaires based on the Theory of Planned Behaviour.

The Theory of Planned Behaviour (TPB) has been used to identify the beliefs that influence environmental behaviour (Kaiser et al., 1999) and there is a strong relationship between the TPB constructs, behavioural intention, and ecological

behaviour (Bamberg & Möser, 2007; Kaiser & Gutscher, 2006). Although there are other possible models to explain behaviour change [i.e., stages of change or social cognition theory (Rimer & Glanz, 2005)], TPB has been successful in identifying the beliefs that motivate behaviour change in natural resource management (e.g. Ham et al., 2008). Because of TPB's success targeting behaviours in natural resource management (Ham et al., 2007), I selected TPB as the theoretical model to explore the cognitive constructs that are linked to behavioural intention for bringing cats in at night and purchasing FSC products in zoo visitors. No zoo has applied TPB to identify the beliefs of visitors to engage in conservation behaviour (Smith et al., 2008). I will begin with a brief summary of the TPB and how it relates to my research. A comprehensive explanation of TPB can be found elsewhere (Ajzen, 1991, 1998, 2001, 2002, 2005, 2006, 2008; Ajzen & Driver, 1992; Ajzen & Fishbein, 1980, 2005).

The Theory of Planned Behaviour

TPB was designed to predict and explain human behaviour in specific contexts (Ajzen, 1991) because previous research showed general attitudes did not predict specific behaviour (Ajzen, 1998; Ajzen & Fishbein, 1980). TPB states that the principal predictor of a specific behaviour is the intention to engage in the behaviour during a given time frame (Ajzen & Driver, 1992). According to TPB, intention to engage in a behaviour is influenced by attitudes, subjective norms, and perceived behavioural control (Figure 3.1). Attitudes can be positive or negative, and are based on an individual's beliefs about the behaviour. Subjective norms are a culmination of social pressure from others to engage or not engage in the specified behaviour. Finally, perceived behavioural control (PBC) is an individual's perception of the ease of performing the behaviour. PBC is influenced by the individual's

perception of having sufficient access to resources and the opportunities to perform the desired behaviour (Armitage & Conner, 1999; Conner & Sparks, 1996). In general, TPB predicts that the more positive attitudes and subjective norms are toward the behaviour, and the higher the degree of perceived behaviour control, there will be a greater intention to engage in the behaviour and increased implementation of the behaviour (Ajzen, 1991).

The degree to which each construct (attitude, norms, and PBC) influences intention and behaviour is specific to the targeted behaviour and can not be generalised to other behaviours. For example, environmental attitudes have a strong influence on some behaviours (e.g., recycling cans and metals, purchasing environmentally sound products, reducing water usage), but not on others (e.g., biking to work, composting, or car pooling) (Steel, 1996). Thus my research will be specific to the targeted audience and the two specific behaviours and are not generalised to others. A summary of each construct (attitudes, norms, and PBC) is outlined below and its application to past environmental studies and my study is discussed.

Attitude

For almost four decades it has been recognised that general attitudes alone do not lead to specific action (Armitage & Conner, 2001; Aronson, 2008). Broad attitudes toward a subject or personality trait have only indirect influence on specific behaviours (Ajzen & Fishbein, 1980). TPB focuses on the attitude toward a specific behaviour in a certain time frame, known as the principle of compatibility (Ajzen, 1991, 2005), and the link between attitude and behaviour improves when assessing a targeted behaviour in a specific context (Ajzen, 2005).
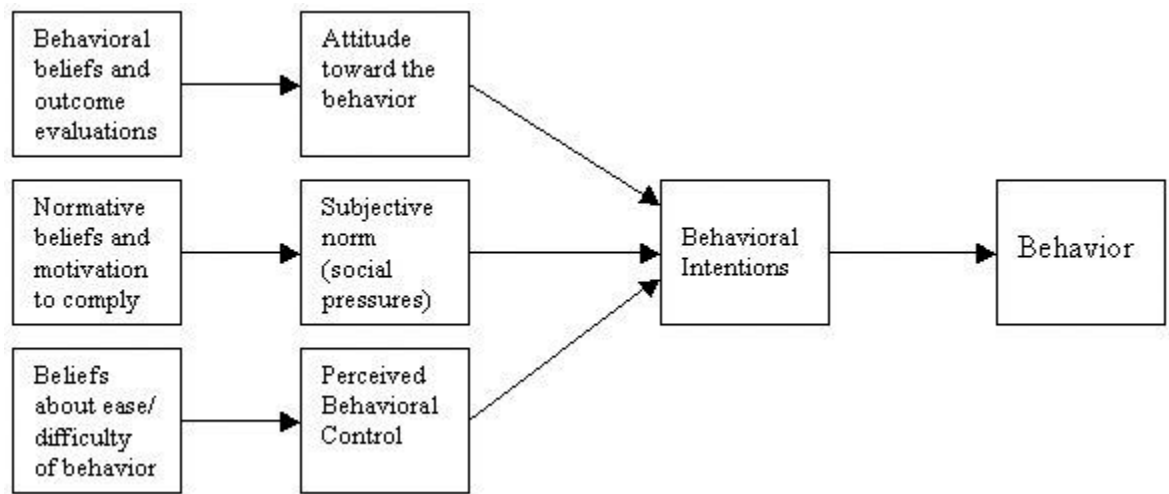
Figure 3.1. The Theory of Planned Behaviour (Ajzen, 2005).

Attitudes toward the behaviour are the culmination of a person's beliefs about the behaviour. Within the TPB, a person can have numerous beliefs about the behaviour but only attend to a few beliefs at any given moment; these are referred to as salient beliefs (e.g., composting is good for the environment). Each salient belief also has an evaluation (e.g., helping the environment is extremely desirable/undesirable) and the sum of all the salient beliefs multiplied by their respective evaluations form an indirect measure of attitude. This process of attitude formation is known as the expectancy-value model (Ajzen, 1991) and is represented by the equation:

$$A \approx \Sigma\ b_i e_i$$

where the total attitude (A) is the sum of all the salient beliefs (b) about the targeted behaviour (i) multiplied by its respective valuation (e). Thus, a numerical equation can be created to compare attitudes between and within subjects.

The expectancy-value model measures indirect attitudes based on salient beliefs, which are readily accessible in memory and automatically activated. To identify these, an elicitation pilot study is conducted (Ajzen, 2006). However, one criticism of the model is that indirect attitudes based on salient beliefs are only one possible influence on attitudes (Ajzen, 2001). Attitudes may also be influenced by direct attitudes that require cognitive effort and can be processed, reviewed, and altered before being expressed (Ajzen, 2005). To control for the possible limitations of the expectancy-value model I followed Ajzen's (1991) recommendation and included questions in the final survey that measured both indirect measures of attitude (generated from an elicitation pilot study) and direct attitudes, also known as global attitudes (generated from previous studies; (Ajzen, 2006)). (p52)

Beliefs can be categorised as either affective – how you feel (also referred to as experiential), or semantic – how you think (also referred to as cognition or evaluative). Affective beliefs are more accessible in memory than semantic beliefs, as evidenced by a significantly shorter response time and the fact that affective beliefs often arise without conscious effort (Ajzen, 2001). While affective beliefs may be more accessible, their influence on attitude is context-dependent. Attitudes towards one specific behaviour may rely more on affective beliefs, whereas attitudes toward a different behaviour may be based more on semantic beliefs. Affective and semantic beliefs can be independent of each other, with one being positive and the other being negative (Ajzen & Driver, 1992). For example, a person may recognise that spiders play an important role in the food web (semantic belief), but be filled with fear when they encounter a spider (affective belief). A person can retain the two conflicting beliefs if the perceived negative beliefs can offset the positive or vice versa. I incorporated both affective and semantic beliefs statements into my research.

Subjective norms

Subjective norms are a person's perception of social pressure related to the performance of a specific behaviour. Norms can be powerful because in general humans want to be liked by others (Aronson, 2008), and individuals are more likely to affiliate and comply with people they like (Cialdini & Goldstein, 2004). Additionally, people often conform to norms to enhance, protect, or repair their own self-esteem (Aronson, 2008).

Similar to attitudes, subjective norms are comprised of two components. The first are normative beliefs, which consist of impressions of how people in a person's life would like them to behave (e.g., people in my household would like me to compost). The second is the corresponding evaluation about complying with these

people (e.g., doing what people in my household want me to do is important/unimportant). Subjective norms are calculated using the equation:

$$SN \approx \Sigma \ n_i m_i$$

where subjective norm (SN) is the total of the normative beliefs (n) of the targeted behaviour (i) multiplied by the corresponding motivation to comply with the source of the belief (m). Norms have been instrumental in some environmental behaviours such riparian planting by farmers (Fielding, Terry, Masser, Bordia, & Hogg, 2005), water conservation (Corral-Verdgugo & Frias-Armenta, 2006), and recycling (Barr, 2007).

Norms do not influence intention unless they are salient (Cialdini & Goldstein, 2004). To make norms more salient, individuals can be primed or focused on a subject closely related to the norms (e.g., thinking about their parents if parental norms are important to that person for the specified behaviour). Salient normative beliefs, similar to attitudinal beliefs, are context and behaviour specific. Thus people that influence one behaviour may have no effect on a different behaviour. Additionally, to be effective the normative beliefs must be salient both immediately and in the long-term as the targeted behaviour may not be acted upon until much later. This can often be a challenge in public behaviour change campaigns, as there is a long gap between viewing a public service announcement on television and the opportunity to engage in the desired targeted behaviour. In these cases if the salient normative link is not sustained, then the behaviour may not occur (Cialdini & Goldstein, 2004). In addition, the limited role of norms with behavioural intention in previous research may be the result of measurement error due to single questions

being used to assess norms (Armitage & Conner, 2001). As a consequence, I incorporated multiple questions to measure norms in my study.

Subjective norms have been further divided into two types: descriptive norms (what is commonly done by others) and injunctive norms (what is commonly approved/disapproved by others) (Cialdini, Reno, & Kallgren, 1990). The impact of the two different types of norms depends on which norm is focal to the specific behaviour and if the descriptive and injunctive norms are in alignment (Cialdini & Goldstein, 2004). Descriptive norms have been found to hold greater influence on intentions in some TPB studies (Cialdini et al., 1990), but other studies concluded that injunctive norms have more influence (Kallgren, Reno, & Cialdini, 2000; Louis, Davies, Smith, & Terry, 2007). Therefore, both descriptive and injunctive norms were included in my questionnaires to evaluate their impact on the two conservation behaviours.

The influence of injunctive norms may be regulated or primed by the degree to which an individual feels they belong to a reference group (i.e., group membership, self-identity) (Cialdini & Goldstein, 2004). The more a person feels a part of a group, the more they will conform to that group's norms (Cooper, Kelly, & Weaver, 2004). For example, a person who has a strong Catholic identity is more likely to view the norms of the Catholic Church as important, and thus these norms will impact their behaviour. The degree to which someone identifies to a reference group and the norms of that group may explain some of the inconsistencies in the subjective norm literature, especially in the health field (Louis et al., 2007). However, identification of a relevant reference group can be difficult if all groups exert a positive influence (Campbell & Mackay, 2003), or are too generalised and thus do not exert normative pressure (Lackey & Ham, 2003). I have added an

assessment of group membership to one of the behaviours (cats in at night) to determine its influence on subjective norms and possibly as an independent construct altogether of the TPB model (Terry, Hogg, & White, 1999).

Perceived behavioural control

PBC measures the degree to which a person believes they are able to engage in the specific behaviour. It incorporates a person's perceived control over the behaviour (controllability) and their ability to engage in the behaviour (self-efficacy). PBC is not a significant TPB construct in cases where a person has little knowledge regarding the targeted behaviour, the behaviour is new, or the situation and resources needed to conduct the behaviour have changed (Ajzen, 2005). Some environmental studies conclude that PBC had little effect on behaviours such as recycling (Tonglet, Phillips, & Read, 2004) and waste management (Taylor & Todd, 1997). But in many cases PBC may have strong predictive power and be the most important construct for modelling behaviour, e.g., condom use (Albarracin, Johnston, Fishbein, & Mullerleile, 2001). However, while PBC is well understood for its influence on health behaviours its influence on specific environmental behaviours is still variable (Kaiser & Gutscher, 2006).

PBC is similar to the other constructs in the TPB model in that it is specific to a particular behaviour in a given context. A person can have a high PBC to one behaviour and not another (i.e., recycling newspapers vs. recycling a computer). PBC can be calculated using the following formula:

$$PBC \approx \Sigma\ b_i m_i$$

where PBC is the sum of all the salient control beliefs (b) about the targeted behaviour (i) multiplied by the respective control belief power (m).

Past behaviour: a fourth construct?

TPB is open to the inclusion of other variables that explain a significant proportion of variance in intention or behaviour and have a theoretical framework (Ajzen, 1991). Past behaviour is one variable that has been discussed at length in the literature and has proven important in environmental behaviour (e.g., Bamberg, Ajzen, & Schmidt, 2003; Cheung, Chan, & Wong, 1999; Tonglet et al., 2004). A meta-analysis of studies incorporating past behaviour found it to be a good predictor of future behaviour (Ouellette & Wood, 1998). Past behaviour may have residual effects on the TPB constructs and its impact can vary in scope based on the targeted behaviour and context (Bamberg & Schmidt, 2003). In turn, I also measured past behaviour to determine its influence on the overall model.

Robustness of TPB

The Theory of Planed Behaviour has been applied and evaluated in thousands of papers and to summarise all of them here would not be feasible. Instead I focus on six meta-analyses of TPB, all finding strong evidence to support TPB. Table 3.1 summarises the key findings of each of these papers as they apply to my research. The reliability of outcomes of TPB studies can depend on several key factors which I have used in the design of my study, indicated by the last column in Table 3.1. Foremost, TPB must target discrete behaviours and not goals [e.g., going to the gym each day is a behaviour while losing weight is a goal (Ajzen, 2005)]. Finally, a strength of my study was that I used the targeted population for all steps of study (elicitation study and experimental study) unlike previous research that tended to use a separate sample for the elicitation study (Curtis, 2008).

An elicitation study is conducted with a representative sample of the target population in which the salient beliefs of the behaviour are identified (Ajzen, 1991).

Participants are asked a series of open-ended questions and based on their answers the TPB questionnaire questions are created. However, the use of global (or standard) belief statements is often used in lieu of elicited beliefs. This can skew the results as responses to global measures may be relatively automatic and not correlate highly with the behaviour (Ajzen, 1991). Therefore I measured both elicited and global beliefs.

For some environmental behaviours, the TPB constructs can not significantly explain behaviour and instead the behaviour is related to sociodemographic variables (Gatersleben et al., 2002). Therefore I included sex, age, and education to assess their role on intention to engage in the behaviour as possible confounding variables, similar to other studies (Johnson et al., 2007; Korfiatis et al., 2004; Uzzell, 2000). As already discussed, TPB is able to accommodate the addition of other variables if they have direct impact on behaviour.

Finally, while numerous studies have looked at the evaluation of TPB, few have developed persuasive communication campaign to change the targeted behaviour. A review by Hardeman (2002) found only 24 interventions based on TPB studies. Half of these studies were effective at changing intention and one-third resulted in behaviour change. However, the effect size varied and often the reporting of the targeted construct (i.e., attitude, norms, or PBC) was not clearly identified. In this study I used TPB to identify the beliefs linked to behavioural intention to bring cats in at night and to purchase FSC products. Based on these results, in Study 3 (see Chapter 4) I developed a persuasive communication campaign to determine if Wellington Zoo visitors are receptive to conservation messages communicated at animal talks and signs. Thus TPB was used to develop the content of conservation message advocated to zoo visitors.

Table 3.1.

Summary of meta-analysis papers examining Theory of Planned Behaviour (TPB) and methodological implications for my study

Author	Topic	Number of studies in meta analysis	Key findings	Methodological considerations for my study
Armitage & Conner (2001)	general	185	▪ If high control, intention predicts behaviour ▪ If low control, PBC and intention predicts behaviour ▪ Low effect of social norm probably due to how its measured (weaker than other relationships) ▪ Behaviour can be measured 3 ways: desires, intentions, self predictions ▪ Self reported behaviour	• Relationship between control and other constructs to be analysed

Godin & Kok (1996)	health	56	▪ PBC and attitude link important in health behaviours
			▪ Social influence less important
			▪ Other variables added significantly:
			  – Personal norm
			  – Role-identity
			  – Moral norms
			  –
				• Adding reference group to one study to assess impact on TPB model

Sheppard et al. (1988)	consumer choice	87	▪ TPB explains behaviours not goals ▪ Historically TPB accurate with single action not complex series of steps ▪ Consumer choice often between several options (Brand A, B, C) but TPB does fit to this process	
Bamberg & Moser (2007)	environmental behaviours	57	▪ Moral norms (personal norms) contribute to pro-environmental behaviour (added construct to TPB) ▪ Knowledge necessary but not significant pre-condition for pro-environmental norms and attitudes ▪ Awareness and knowledge of environmental problem is an indirect determent of pro-environmental behaviour	• Research involves one environmental behaviour that is high knowledge and one that is low, will assess impact of knowledge on intention

Albarracin et al. (2001)	condom use	96	▪ Intentions correlate more strongly with past behaviour than future behaviour ▪ Attitude and intention based on past behaviour ▪ Past behaviour has little direct influence on future behaviour ▪ Attitudes direct impact on behaviour may activate behaviour automatically	• Past and future behaviour will be assessed to measure influence on TPB model
Hardeman et al. (2002)	Intervention programmes - health	24	▪ Intervention based on TPB resulted in 1/2 of participants changing intention and 2/3 changing behaviour ▪ Small effect sizes ▪ Effectiveness unrelated to which construct was used to develop intervention (i.e., attitude, norm, PBC)	

Methods

Participants

Participants were visitors to Wellington Zoo over the age of 18 during the school holidays in 2008. Participants were recruited while waiting for the 1:15pm kiwi presentation in the zoo's amphitheatre. This location was chosen for visitor comfort as it offered a sheltered location for visitors to sit while filling out the questionnaire. All visitors were approached upon entering the amphitheatre prior to the beginning of the presentation and asked to complete a questionnaire. Recruitment of participants was stopped five minutes before the presentation began to avoid distraction. In the case of a group, the person selected was the nth person in the group with n being randomly chosen on the day. All visitors had the right of refusal. Completed questionnaires were collected before the presentation began.

Elicitation questionnaire

Prior to creating the questionnaire, an elicitation pilot study was conducted to identify salient attitudinal, normative, and control beliefs about the targeted behaviour (Ajzen, 1991; Ajzen & Fishbein, 1980; Lackey & Ham, 2003; Middlestadt, Bhattacharyya, Rosenbaum, Fishbein, & Sheppard, 1996). In the pilot study, visitors were asked open ended questions about their attitude, normative influence, and control over the behaviour. From this, a list of commonly held beliefs was generated. The elicitation study was conducted daily from 14 to 29 January 2008 (Appendix 3.2 for cats in at night and Appendix 3.3 for purchasing FSC products). The questionnaire was timed and took no more than five minutes to complete. The questionnaire was confidential. Twenty-five visitors were approached per topic and there was a 0% refusal rate. Respondent answers were categorised based on a coding

frame (Bucy, 2005). Belief statements stated by at least 10% of the respondents were incorporated into the final questionnaire (Table 3.2).

TPB questionnaire

The TPB questionnaire was conducted during the school holiday periods when visitation was high from 5 to 21 July and 28 September to 2 October 2008. Based on the elicitation study, questionnaires were created for the two targeted behaviours that contained questions to assess attitude, PBC, norms, past behaviour and intention (Appendix 3.4 for cats in at night and Appendix 3.6 for purchasing FSC products). In addition to those questions generated from the elicitation study, global questions were added to ascertain direct attitudes (see keys to questionnaires Appendix 3.5 for cats in at night and Appendix 3.7 for purchasing FSC products). The global attitude construct contained both affective and semantic attitude statements. Similarly, global norms were differentiated as descriptive or injunctive norms. Participants also provided information on their age, gender, and education level to test for an effect on the model as they have influenced some environmental attitudes and behaviour (Dietz, Kalof, & Stern, 2002; Fransson & Garling, 1999; Kellert & Berry, 1987; Zelezny, Chua, & Aldrich, 2000). For the cat questionnaire, membership in environmental and conservation organisations was collected (question 43). Group membership was not included in the FSC questionnaire as no representative group could be identified as having influence on visitor FSC purchasing power from the elicitation study. While visitors did list some people as supporting their purchasing of FSC products, none of these groups rated high in visitor opinion, thus, following Lackey and Ham (2003) I inferred there was no identifiable group membership influencing purchasing of FSC products. Each

Table 3.2

Elicitation studies results (n=25) for the two targeted behaviours, cats in at night and purchase FSC products. Only those beliefs elicited >10% were incorporated into the final questionnaire

Cats in at night	Purchase FSC
What do you believe are the advantages/disadvantages or good/bad things of keeping a cat inside at night?	*What do you believe are the advantages/disadvantages or good/bad things of buying New Zealand pine (FSC)?*
For cats safety/health (58%)	Good for the environment/sustainable (48%)
Will not hunt wildlife (25%)	Quality/appearance (29%)
Urinate/defecate inside (38%)	Price (24%)
Wakes you up (13%)	Good for New Zealand economy (24%)
Cats do not like it (13%)	Air mileage/carbon footprint (15%)
Sleep in bed (8%)	Reduces native forests (5%)
Cat hair (4%)	
Comfort to sleep with (4%)	
Fleas (4%)	
Difficult to get them in (4%)	
Who (individuals or groups) do you think would support/object or approve/disapprove of you of keeping a cat inside at night?	*Who (individuals or groups) do you think would support/object or approve/disapprove of you of buying New Zealand pine (FSC)?*
Conservation organisations (e.g., Department of Conservation, Forest and Bird, Wellington Zoo, Karori Wildlife Sanctuary) (33%)	Conservation organisations (33%)
	Illegal loggers/distributors (29%)
	Forest owners (24%)
	Indigenous people (10%)
	Government (10%)
SPCA (13%)	Non FSC forest owners (15%)
Veterinarian (13%)	Family (5%)
Family (4%)	

Owners of the house (4%)

People who do not like cats (8%)

Animal lovers (8%)

Family (4%)

Owners of the house (4%)

How difficult is it to keep your cat inside at night? What factors or circumstances would enable you to keep a cat inside at night?

Cat enjoys coming inside (29%)

Litter box trained (25%)

Set up of house (i.e., doors and windows set up) (14%)

Urinate/defecate inside (13%)

Baby in the house (4%)

Other cats come inside (4%)

Visitors let the cat out (4%)

Allergies to cat (4%)

Keeps people awake at night (4%)

Difficult to get inside (4%)

How difficult is it to buy New Zealand pine (FSC)? What factors or circumstances would enable you to buy New Zealand pine (FSC)?

Availability (33%)

Clearly marked/brand awareness (19%)

Expense (15%)

Look (5%)

questionnaire was piloted with six individuals and changes were made based on feedback. The questionnaire was timed and took no more than 10 minutes to complete.

Different items assessing the same construct were randomly dispersed in the questionnaire following recommendations by Azjen (1991, 2006). Based on feedback from pilot questionnaires, I chose a unipolar scale (i.e., 1 to 7) for the evaluative questions with the end points consistent throughout the questionnaire, i.e., 1 always on the left-hand side and 7 on the right-hand side (Dillman, 2000). All questions were stated in the positive based on feedback from the pilot and based on findings by Schriesheim (1991). Seven was always the highest positive score with the inadvertent exception of question 32 for the cat questionnaire and question 36 for FSC. These two questions were rotated for coding.

The questionnaire was confidential and was self-administered. The self-administered method was selected over face-to-face interviews as self-administered questionnaires are less at risk for response bias (Bryman, 2004). Francis (2004) suggests a sample size of 80 for TPB questionnaires assuming a moderate effect size, which is common for TPB studies. My objective was to collect at least 100 questionnaires to account for incomplete questionnaires.

Scores for each construct (attitude, norm, and PBC) were created by taking the composite score of both the indirect beliefs (generated from the elicitation study) and direct beliefs. Intention to engage in the behaviour was calculated using the mean of four questions for cats in at night and three questions for purchasing FSC products.

Analysis

Data were analysed in two ways: first, descriptive statistics were reported and construct validity was calculated for each questionnaire. Second, I adopted an information theoretic approach to test hypotheses and make inferences about the intention to engage in the behaviours of bringing cats in at night and purchasing FSC products (Burnham & Anderson, 2002). For these tests respondents who either currently had a cat or have had a cat were included in the analysis. Respondents who never had a cat (n=9) were omitted from the analysis as their answers were purely hypothetical. An information theoretic approach is appropriate to use when there are many explanatory variables and *a priori* models exist based on prior research or theory. The method also ensures that data dredging is avoided (Burnham & Anderson, 2002). The information-theoretic approach identifies the best model(s) based on fit with the data and the principle of parsimony (i.e., preference to models with fewer parameters to avoid overfitting) (Burnham & Anderson, 2002). An information theoretic approach is superior to stepwise modelling (Johnson & Omland, 2004; Whittingham, Stephens, Bradbury, & Freckleton, 2006) and is the preferred statistical method in conservation-related literature (Boughton, Quintana-Ascencio, Nickerson, & Bohlen, 2011; Pennington & Blair, 2011; Richard, 2005)

Using an information theoretic approach, I tested the following models (see Tables 3.4 and 3.5). The first model included attitude, norm, and perceived behavioural control. Next, I included past behaviour along with the three original TPB variables. Purchasing of FSC products was underreported by visitors in Study 1 as a conservation behaviour and as a result I considered it a novel behaviour. The TPB model may break down when respondents have little knowledge of the behaviour (Sheppard et al., 1988), thus for the FSC analysis I also added previous

knowledge of the behaviour to a third alternative model which also included past behaviour and the original TPB variables. Finally, I considered if sex, age, and education improved the fit of the model because these socio-demographics have proven to have influence on some environmental behaviours (e.g., Zelezny et al., 2000) but not others (e.g., Korfiatis et al., 2004).

I conducted all procedures using the statistical software R 2.12.1 (R Foundation for Statistical Computing, Vienna, Austria) to calculate Akaike Information Criterion for each model in the way described by Burnham and Anderson (2002). I used a second-order Akaike's Information Criterion (AIC_c) as the information-theoretic statistic because model and sample size were small [i.e., $n_{cats} = 99$ questionnaires with from 1 to 7 explanatory variables (K_{cats}) and $n_{FSC} = 109$ questionnaires with from 1 to 8 explanatory variables (K_{FSC}) such that n/K‹ 40; (Burnham & Anderson, 2002)]. I judged the relative power of candidate models by comparing their AIC_c and ratios of Akaike weights (w_i). It is not the absolute value of the AIC_c but the relative values over the entire set of candidate models that is considered important (Burnham & Anderson, 2002). The Akaike weights (w_i) are evidence in favour of a model being the best fitting model of the candidate models. I ranked all candidate models according to their AIC_c values and examined the model with the smallest AIC_c value. Relative support between candidate models was the difference between each model's AIC_c and the minimum value from all models (ΔAIC_c). I considered models with ΔAIC_c ‹ 2 to have compelling support from the data and models with ΔAIC_c ›10 to have no support (Burnham & Anderson, 2002). I assessed the evidence ratios to determine if the uncertainty of other candidate models given another data set and when the ratio was low concluded model uncertainty was high and used inference about the possible best fitting models. Finally, I used model

averaging to assess the relative importance of variables in the best fitting model (Burnham & Anderson, 2002). To assess fit of supported models, I calculated the adjusted R^2 values.

Results

Cats in at night

One-hundred and eleven questionnaires were collected and three incomplete questionnaires were not used for a total of 108 questionnaires. Refusal rate was <2%. Education and sociodemographic variables for zoo participants are summarised in Table 3.3. Sixty percent of respondents currently had a cat, 31% had a cat in the past and 9% have never had a cat. For the last two groups, respondents were asked to respond as if they currently had a cat. Thirty-one percent of respondents kept their cat inside all night, 54% allowed the cat access to the inside and outside throughout the night and 15% kept the cat exclusively outside at night. On average, the behaviour conducted was highly consistent over time (7 = all the time and $\bar{x}$ = 6.37, +/-.13). The main reasons visitors kept their cats inside was for safety for the cat (45%), comfort of the cat (36%), and to protect wildlife (14%). Visitors who allowed their cats to come and go freely from the house at night did so for toileting needs (40%) and for the cat's freedom (37%). Those that restricted cats to the outside at night did so because they did not want the cat to come in (50%), wake the house (25%), or toilet inside (25%).

To determine if the questionnaire questions were collectively measuring attitude, norm and PBC (i.e., construct validity) two tests were performed. Internal reliability was assessed by calculating Cronbach's alpha for each construct. The four

questions used to measure behavioural intention had a low reliability ($\alpha = .334$).

However, removal of question 7 increased the reliability to an acceptable level ($\alpha = .824$). Therefore, following Bryman (2004), question 7 was removed from further analysis and the remaining questions had high internal reliability. Similarly, attitude had a lower than recommended reliability ($\alpha = .543$) and the omission of questions 3 and 5 increased alpha to an acceptable level of 0.791. Norm and PBC had high reliability ($\alpha = .812$ and $\alpha = .813$ respectively). The mean, standard deviation, and correlation to intention for each question is reported in Appendix 3.5.

Based on Kaiser (1960), construct validity was also assessed by the use of principal components analysis (PCA) and factors only with a Eigen value of over 1 were retained. For attitudes, three components (two elicited components and one global) were identified accounting for 66% of the variance ($\lambda_1 = 4.175$, $\lambda_2 = 1,279$, $\lambda_3 = 1.148$). Analysis of norms identified two components (one elicited and one global) accounting for 72% of the variance ($\lambda_1 = 3.038$, $\lambda_2 = 1.300$). For TPB, 57% of the variance was accounted for by two components (one elicited and one global) ($\lambda_1 = 3.365$, $\lambda_2 = 1.231$). Based on PCA and Cronbach's alpha values, the questionnaire was considered reliable and valid.

Membership in a group was not significantly correlated to behavioural intention of bringing cats in at night ($p > .05$). Thus I concluded group membership was not a significant influence in bringing cats in at night, and I did not include this variable in further analysis.

The TPB variables (attitude, norm, and PBC) were the most-supported model for explaining intention to bring cats in at night, with an AIC_c weight of 0.497 among the candidate models (Table 3.4). The second best model comprised of only attitude

Table 3.3.

Demographic summary of respondents to questionnaires of bringing cats in at night
(n = 108) and purchasing FSC questionnaire (n=109)

Cats in at night questionnaire	FSC questionnaire
Sex	Sex
Male - 29	Male - 34
Female - 79	Female – 73
Blank - 0	Blank – 2
Education level	Education level
Fifth Form[a]- 28	Fifth Form[a] - 26
High School[b] - 13	High School[b] - 11
Bachelor/vocational degree - 54	Bachelor/vocational degree [c] - 48
Higher degree[d] - 8	Higher degree[d] – 15
Blank – 5	Blank - 9
Age	Age
18-24 - 17	18-24 - 14
25- 49 - 79	25- 49 - 76
50 – 64 - 8	50 – 64 - 10
Over 65 - 3	Over 65 - 7
Blank – 1	Blank - 2
Times to Zoo in last Five years	Times to Zoo in last Five years
None - 31	None - 33
One to three - 39	One to three - 34
Four to ten - 24	Four to ten - 24
More than ten - 14	More than ten - 17
Number of adults in group (including self)	Number of adults in group (including self)
One - 32	One - 42
Two - 48	Two - 47
Three - 10	Three - 8
Four - 11	Four - 5
Five or more- 4	Five or more- 5
Blank - 3	Blank - 1
Number of children in group	Number of children in group
One - 16	One - 26
Two - 31	Two - 35
Three - 19	Three - 15
Four or more- 23	Four or more- 18

[a] School Certificate passes, National Certificate Level 1 or 2, Sixth From Certificate, or University Entrance prior to 1986

[b] University Bursary Entrance Exam, scholarship, Higher School Certificate, National Certificate Level 3

[c] BA, BSc, New Zealand Diploma, New Zealand certificate, national diploma, Trade certificates, apprenticeships, national certificate, bridging certificates, foundation certificates

[d] PhD, MA, post graduate diploma

and norm ($\Delta AIC_c = 0.777$) was also a plausible model ($\Delta AIC_c < 2$). The third model with past behaviour as an additional predictor received limited empirical support ($\Delta AIC_c = 2.343$). With the best model being 3.2 times greater than the model with past behaviour included, only the first two models were considered as having substantial support. Weight of evidence ($w_{\text{best model}}/w_{\text{second-best model}}$) in favour of the best model was 1.5 times greater than that of the second best model, thus the possibility remains that attitude and norm significantly influence intention (especially because it is more parsimonious) and PBC has only a minimal effect on intention.

The relative variable importance ($w_+ (j)$) was calculated using the sum of the Akaike weights across all the models that contained that variable (Burnham & Anderson, 2002). Attitude was the most important ($w_+ (j) = 1.0$), with norm of similar importance ($w_+ (j) = 0.997$) but PBC was proportionally less important ($w_+ (j) = 0.667$), further supporting the minimal effect of PBC as a variable in the candidate models.

Finally, the influence of some predictors (e.g., education, sex, and age; and individual TPB constructs on their own) can be dismissed as they essentially received no empirical support ($\Delta AIC_c > 10$). R^2_{adj} for the best fitting model was 0.694.

To explore further the relationship between past behaviour, the TPB constructs and intention, respondents were divided into three groups based on their past behaviour (i.e., keeping cats outside at night, allowing cats to come and go from the house at night, and keeping cats restricted to inside the house at night). A repeated measure analysis of variance was conducted on attitude, norm, PBC and intention between the three groups. There was a significant difference in TPB constructs among the groups $F (2, 103) = 24.377$, $p < .001$, partial $\eta^2 = 0.319$ (Figure

Table 3.4. The nine candidate models for intention to bring cats in at night. Models are in descending order based on the second-order Akaike's Information Criterion (ΔAIC).

Candidate models	k	AICc	ΔAICc	Akaike wt	R^2 adj
Attitude + Norm + PBC	3	330.221	0.000	0.497	0.695
Attitude + Norm	2	331.114	0.777	0.337	0.689
Attitude + Norm + PBC + past behaviour	4	332.407	2.343	0.154	0.691
Attitude + Norm + PBC + education + sex + age + past	7	337.382	8.050	0.009	0.691
Attitude	1	340.669	10.255	0.003	0.657
Norm + PBC	2	356.806	26.469	0.000	0.605
norm	1	366.599	36.185	0.000	0.564
PBC	1	383.823	53.409	0.000	0.210
education + sex + age	3	431.838	101.617	0.000	0.003

3.2). Visitors that kept their cats in at night had significantly greater attitudes ($p_{\text{cats in at night vs. cats come and go}} < .001$; $p_{\text{cats in at night vs. cats outisde}} < .001$), norms $_{\text{in at night vs. cats come and go}}$ $< .01$; $p_{\text{cats in at night vs. cats outisde}} < .01$), and PBC ($p_{\text{in at night vs. cats come and go}} = < .001$; $p_{\text{cats in at night vs. cats outisde}} = < .001$) values than visitors in the other two categories. However, visitors that allowed cats to come and go and those that allowed cats to stay outside exclusively were similar to each other in attitude ($p_{\text{cats outside vs. cats come and go}} > .05$), norm ($p_{\text{cats outside vs. cats come and go}} > .05$) and PBC values ($p_{\text{cats outside vs. cats come and go}} < .05$).

I evaluated the potential difference between norms and past behaviour as the difference may have implications for future advocacy campaigns (e.g., Schultz, W & Tabanico, 2007). There was a significant interaction between injunctive norms and descriptive norms among the three past behaviour groups, F (2, 103) = 5.983, $p < .05$; partial $\eta^2 = 0.104$) (Figure 3.3). Visitors that kept their cats inside at night and those who let them come and go had greater injunctive norm values ($\bar{x}_{\text{inside}}= 6.0$ +/- .25; $\bar{x}_{\text{come and go}}= 3.84$ +/- .233), but visitors who kept their cats outside exclusively had greater descriptive norm values ($\bar{x}_{\text{outside}}= 3.8$ +/- .335).

Finally, perceived control over the behaviour, measured by the average of two questions, was relatively high among respondents ($\bar{x} = 5.380$ +/- .157) but there was a significant difference (F (2, 103) = 7.497, $p < .05$) in perceived control based on past behaviour with visitors who brought their cats in at night and those who let them come or go reporting significantly higher control than visitors who left their cats outside all night ($\bar{x}_{\text{inside}}= 5.87$ +/- .19; $\bar{x}_{\text{come and go}}= 5.307$ +/- .21; $\bar{x}_{\text{outside}}= 4.09$ +/- .40),
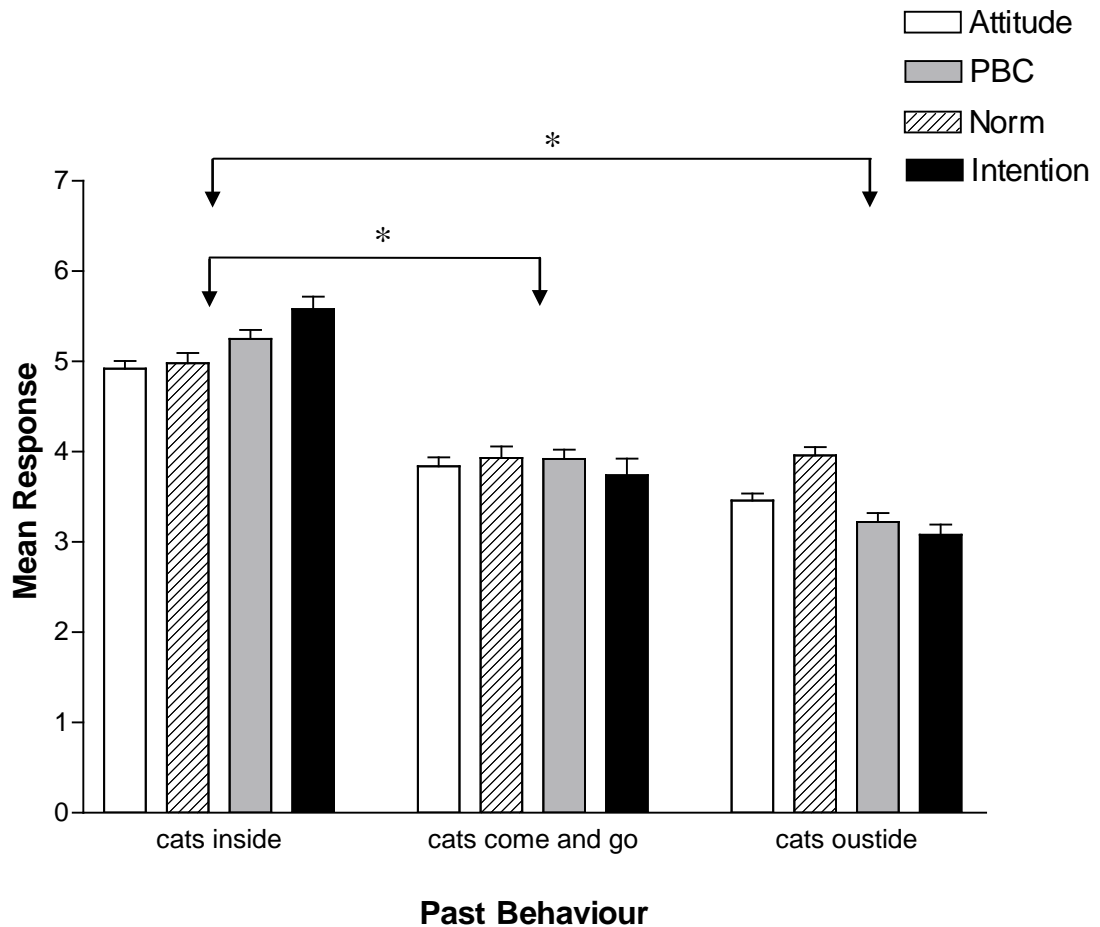
Figure 3.2. Mean response rate (1 to 7, 7 being the highest) for attitude, norm, PBC, and intention (+SE) of visitors who in the past brought their cats in at night (n = 30), let cats come and go (n = 53), or kept cats outside (n = 15). There was a significant difference on all four variables (arrows) between visitors who kept their cats inside versus those that let their cats come and go. There is also a significant difference between visitors who kept their cats inside versus those visitors that kept their cat outside exclusively. * = < .05
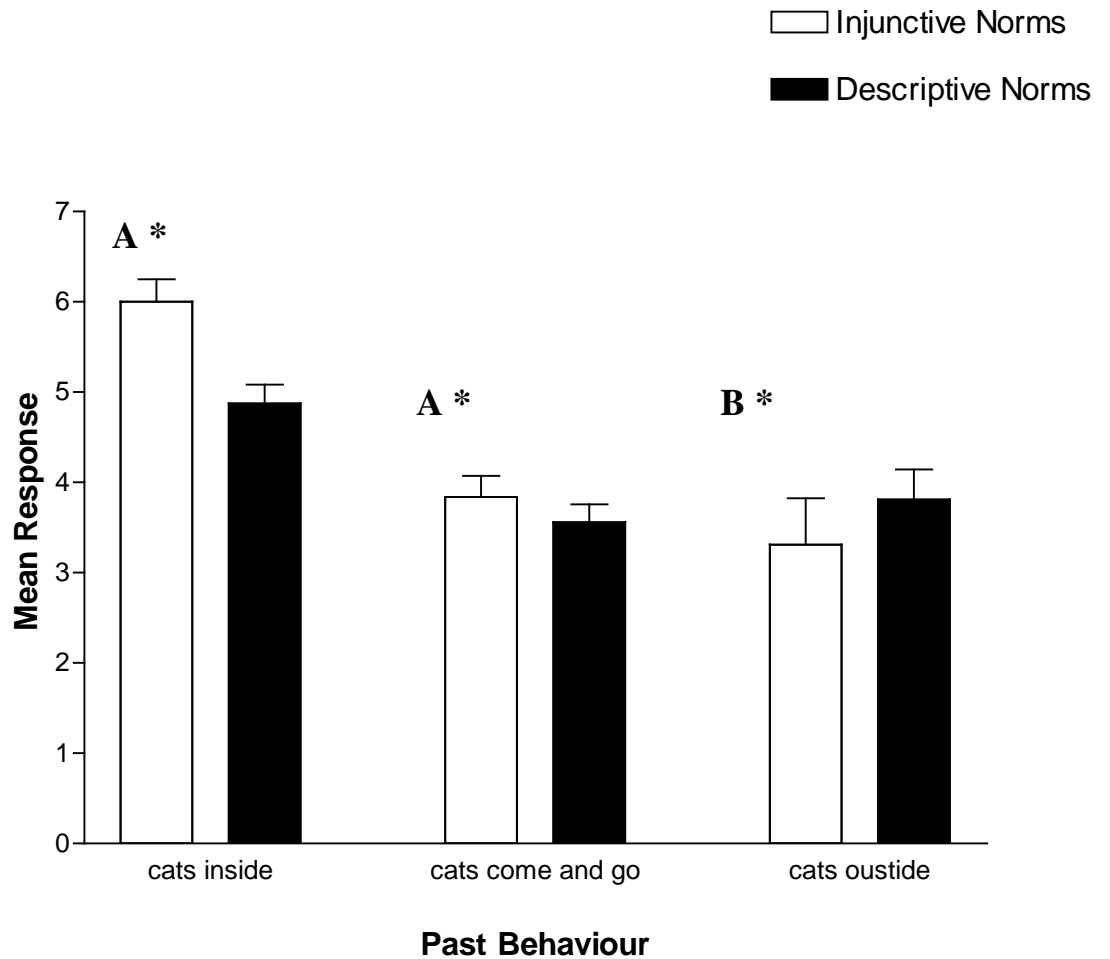
Figure 3.3. Mean injunctive and descriptive norm response rate (+SE) of visitors

who in the past brought their cats in at night (n = 30), let cats come and go (n = 53),

or kept cats outside (n = 15). Visitors that kept that cat inside or let their cats come

and go had significantly greater injunctive norm than descriptive norm values (A).

Visitors that kept their cats outside exclusively had significantly greater descriptive

norm values (B). * = p < .05.

Forest Stewardship Council (FSC) wood

One-hundred and eleven questionnaires were collected and two incomplete questionnaires were discarded for a total of 109 complete responses. Refusal rate was less than 2%. Visitor demographics are summarised in Table 3.3. Sixty-six percent of respondents had not heard of FSC timber or knew what the symbol meant. In the twelve months prior to the questionnaire, 57% of respondents had either bought raw timber or new wooden furniture. The questionnaire provided a brief description and purpose of FSC for those respondents that had no previous knowledge of FSC. Once the concept of FSC was explained, visitors were given the questionnaire. The effect of previous knowledge of FSC is considered shortly.

Again, the internal reliability and validity of the questionnaires as an instrument was assessed. All constructs had acceptable Cronbach's alpha levels ($\alpha_{attitude}$ = .724; α_{norm} = .743; α_{PBC} = .724; $\alpha_{intention}$ = .770). Global and elicited components were analyzed using principal component analysis. For attitudes, two components were identified accounting for 63% of the variance (λ_1 = 4.340, λ_2 = 1.363); two norm components were identified accounting for 56% of the variance (λ_1 = 3.314, λ_2 = 1.166); and two PBC components were identified accounting for 56% of the variance (λ_2 = 2.671, λ_2 = 1.228). The questionnaire was considered reliable and valid based on PCA and Cronbach's alpha values. The mean, standard deviation, and correlation to intention for each question is reported in Appendix 3.7.

Similar to the analysis of cats in at night, the TPB variables (attitude, norm, and PBC) were the most-supported model for explaining intention to purchase FSC products with an AIC$_c$ weight of 0.865 among the candidate models (Table 3.5). Based on both the ΔAIC$_c$ and AIC$_c$ weight criteria this model clearly outperformed others. The second best model included past behaviour along with the TPB variables,

but had a ΔAIC_c of 4.108 and an AIC weight of only 0.111. Attitude, norm, and PBC is convincingly best (Burnham & Anderson, 2002). Attitude, norm and PBC were all of equal importance in the leading model ($w_+ (j)_{Attitude} = 1.0$) ; ($w_+ (j)_{Norm} = 1.0$); ($w_+ (j)_{PBC} = 1.0$). R^2_{adj} for the best fitting model was 0.463. Finally, the influence of some predictors (education, sex, and age; individual TPB constructs on their own) can be dismissed as they essentially received no empirical support ($\Delta AIC_c > 10$).

There was no significant difference between injunctive norms and descriptive norms (t (103) = 1.735, p > .05). There was no relationship between PBC and past behaviour (r = .06, p > .05, n = 111) and past behaviour and intention (r = -.06, p > .05, n = 111). Control over the behaviour was overall high among respondents ($\bar{x}$ = 5.57, +/- .112).

Discussion

This is the first study conducted in a zoo to identify the underlying beliefs of visitors' intention to engage in two conservation behaviours. The beliefs were identified using the Theory of Planned Behaviour and the results shape the content of the subsequent communication campaign (Chapter 4). For both behaviours, attitudes and norms were key predictors of intention. PBC also had a relationship to the behavioural intentions of purchasing FSC products but only a minimal relationship to keeping cats inside at night. Overall, the socio-demographic variables of age, sex, and gender were not significant of behaviour, a result similar to previous studies (e.g. Korfiatis et al., 2004).

Attitude was the explanatory variable with the greatest predictive power for both behaviours. For the behaviour of bringing cats in at night, nine of the ten attitude belief statements were strongly correlated to intention. Similarly, the

Table 3.5. The ten candidate models for purchasing FSC products. Models are in descending order based on the second-order Akaike's Information Criterion (ΔAIC).

Candidate models	k	AICc	ΔAICc	Akaike wt	R^2 adj
Attitude + Norm + PBC	3	306.749	0.000	0.865	0.463
Attitude + Norm + PBC + past behaviour	4	310.858	4.108	0.111	0.453
Attitude + Norm + PBC + past behaviour + knowledge	5	314.241	7.492	0.020	0.446
Norm + PBC	2	319.668	12.918	0.001	0.391
Attitude + Norm	2	319.792	13.043	0.001	0.390
Attitude + Norm + PBC + education + sex + age + past behaviour + knowledge	8	320.429	13.679	0.001	0.433
Attitude	1	322.875	16.125	0.000	0.367
PBC	1	324.539	17.790	0.000	0.357
norm	1	342.601	35.851	0.000	0.244
education + sex + age	3	372.483	65.733	0.000	0.029

intention to purchase FSC was correlated to all nine of the attitude belief statements. This reinforces that attitudes are consistent with intention and behaviour if they are measured on the same scale of specificity and supports the attitude-behaviour relation (Ajzen, 2005; Kaiser & Gutscher, 2006). These beliefs are strong predictors of behaviour (Ajzen, 2005) and should be targeted in future advocacy campaigns to encourage change. In the next chapter, a conservation advocacy campaign aimed at Wellington Zoo visitors will incorporate these beliefs.

In addition to attitudes, norms were also significant predictors of intention. The effect of injunctive and descriptive norms varied for the two behaviours, which reinforces that each behaviour must be assessed separately because norms are selectively influenced by culture, context, and individuals (Cialdini et al., 1990). For the behaviour of purchasing FSC products, injunctive and descriptive norms did not significantly differ in their effect on intention. However, for cats in at night, there was a significant interaction between injunctive and descriptive norms and past behaviour. Injunctive norms were more powerful predictors of intention for visitors already engaging in the desired behaviour, but descriptive norms were more predictive of intention for visitors not already bringing their cats in at night. Therefore, creating a future behaviour change communication campaign targeted at people who keep their cats outside should focus on descriptive norms. This group rates the behaviour of others as influential on their own behaviour and therefore a normative campaign highlighting what others do (e.g., 31% of zoo visitors keep their cat inside exclusively) may prove successful. Similar campaigns using normative messaging have been effective at reducing electricity usage (Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007) and hotel towel use (Schultz, Khazian, & Zaleski, 2008). Again, my results demonstrate the importance of conducting research to

identify the beliefs linked to behavioural intention and suggest the importance of future campaigns utilising normative messaging, an approach that is novel to most zoos.

Although the role of group membership has played an important role in some environmental behaviour (e.g., Beedell & Rehman, 2000; Corral-Verdgugo & Frias-Armenta, 2006; Fielding et al., 2005), my results did not find a relationship between intention and group membership for the cats in at night behaviour. The groups used may not have been representative of the groups that influence the respondents (Campbell & Mackay, 2003; Cialdini et al., 1990), but it is also possible that for this behaviour group membership simply does not have an influence on intention (Lackey & Ham, 2003).

PBC was also a variable in the most parsimonious model for both behaviours, but for cats in at night it had only a minimal effect. The relationship between PBC and past behaviour varied for the two behaviours, with correlation between PBC and past behaviour being significant for cats in at night but not for purchasing FSC products. The concept of habit may explain the different relationships between past behaviour and PBC for the two behaviours. Habit is a repetitive behavioural tendency in a stable supporting context and habits are performed quickly with minimal attention (Ouellette & Wood, 1998). For some environmental behaviours (e.g., car use), habit has a significant influence on future behaviour (Bamberg et al., 2003). However, past behaviour has little influence on future behaviour when the context is unstable and variable (Albarracin et al., 2001) or when attitudes and norms towards the behaviour are strong (Ajzen, 1991). Under these circumstances behaviour is controlled more by deliberate reasoning. The intention to purchase FSC products can be considered unstable and variable, as most people will not routinely

purchase wood furniture or raw timber on a regular basis. Under these circumstances past behaviour should have little influence on future intention, and norms and attitude should have a greater influence. This prediction is supported by my data. In contrast the act of bringing cats in at night is a daily routine (a habit) and explains the significant role of past behaviour on intention. Finally, when the individual has significant control over the behaviour PBC should exert minimal influence on intention and behaviour (Armitage & Conner, 2001). Again this is consistent with my results as respondents reported high control of both behaviours ($\bar{x}_{cats}$= 5.38 +/- .157; $\bar{x}_{FSC}$= 5.57, +/- .112).

Because purchasing FSC products was not highly acknowledged as a conservation action in Study 1, I also included knowledge to potential models in the analysis. The role of knowledge in the TPB model is still under debate. Sheppard et al (1988) suggest the TPB model will break down when there is little knowledge or skill of the behaviour, but Bamberg (2007) states extensive knowledge is not required to develop a pro-environmental attitude and instead knowledge indirectly influences PBC, attitude, and intention. In my study there was no relationship between knowledge and attitudes, PBC, or intentions. The role knowledge has on shaping intention is critical to assess as advocacy campaigns regularly focus on providing more information to increase an individual's knowledge with the goal of ultimately encouraging actions on the relevant issue (Hesselink et al., 2007). However, it has been repeatedly shown that knowledge does not lead to environmental action (Ogden et al., 2004) and this was reinforced by my results. There was no relationship between those that had prior knowledge of FSC and there intention to purchase FSC products as knowledge was not a key variable in any of the optimal modes. These findings will have future implications when establishing an

intervention programme for the two targeted behaviours as increasing awareness and providing information will most likely not increase intention to engage in the behaviour. Instead messaging should be based on the attitudes and norms that were significantly related to behavioural intention.

There are some limitations of the current study that should be acknowledged. The best fitting model for purchasing FSC explained a little less than half the variance in intention, thus there may be other factors outside of the variables used in this study contributing to the behavioural intention. Future research should explore other variables as the TPB model does allow additional variables to be added when driven by theory (Ajzen, 1991). Regardless, these results highlight the extent to which the TPB variables explain intention to engage in bringing cats in at night and purchasing FSC wood products and can be used to form the content of persuasive messages, as in the next chapter. Thus the constructs identified by the TPB study lay the foundation for an effective persuasive communication campaign (von Haeften, Fishbein, Kasprzyk, & Montano, 2001).

A second consideration of the study is the low alpha level for intention to bring cats in at night could be a sign of acquiescence or social desirability. The first question to measure intention was not correlated to the remaining three questions. This could be a sign of social desirability, with respondents answering in a way they believe is desired by the researcher or others (Bernard, 2006). Additionally there was no relationship between answering the open-ended question to assess intention to purchase FSC products and the two scaled questions, a further possible indicator of social desirability. However, the difference between elicited and global beliefs can also be used as a measure of social desirability. Global attitudes are often more slowly activated and processed through working memory whereas evaluation of

elicited beliefs is more automatic (Bassili & Brown, 2005). In my study elicited and global beliefs were highly correlated for both behaviours, thus I ascertain that social desirability should have minimal impact on my results but future research is needed to confirm this. While the impact of social desirability in this study is uncertain, social desirability and self-report bias has not been a factor in recent environmental studies (Kaiser, Schultz, & Scheuthle, 2007).

Another consideration is related to the analysis. In my study, I used an information theoretic approach which is superior to stepwise modelling (Whittingham et al., 2006). This analysis was chosen to determine the best model, however it did not explore the relationship between the variables in the preferred model. In the future, a larger sample size should be collected to ensure that analysis via Structural Equation Modelling (SEM) can be conducted to determine indirect causal pathways among the variables (Byrne, 2001). In addition to the above methodological considerations, my study measured intention and not the behaviour itself. The full extent that attitude, norms, and PBC and other variables such as past behaviour and knowledge have on actual behaviour can not be extrapolated from these results. Future research should investigate long term studies that measure the link between visitor intention and actual implementation of the behaviour after the zoo visit. This is more fully discussed in Chapter 5.

In conclusion, my results will add greatly to conservation communication in zoos, and the wider field of conservation communication in general, as no zoo has investigated visitor beliefs towards conservation behaviour (Smith, 2006). Identifying these beliefs and incorporating them into the communication message is vital for a communication campaigns to succeed (Weinreich, 1999). My findings suggest future communication campaigns for the two specific behaviours studied

should incorporate messages based on attitude and normative beliefs as these were significantly correlated to behavioural intention. Past behaviour had a significant effect on future intention when the behaviour was a habit (i.e., bringing cats in at night), but had no effect when the behaviour was more infrequent and unpredictable (i.e., purchase FSC products). Furthermore, knowledge of the behaviour had no effect on intention. If the objective is to shift people from inaction to action, then the constructs identified by this study should be integrated into an intervention phase. However, few studies have taken the results from a TPB study and implemented a behaviour change programme (Fife-Schaw, Sheeran, & Norman, 2007). In the next chapter, I applied the results from this study and assessed if visitors were receptive to conservation action messages communicated at Wellington Zoo.

Chapter 4

Evaluating the method of communicating conservation messages to visitors: message recall and applying the Elaboration Likelihood Model (ELM)

Introduction

To date, few zoos' have environmental communication programmes that reflect our understanding of the complex factors that lead to behaviour change (see Chapter 1 for a review). Most zoos base their communication methods on the premise that if they can increase retention of facts by visitors this will result in a learning experience that leads to conservation behaviour. However, the environmental psychology literature has repeatedly demonstrated that behaviour change is best achieved by the application of persuasive communication techniques, which are based on a theoretical framework that identifies the cognitive processes most likely to influence behaviour change (Ballantyne, Packer, Hughes, & Dierking, 2007; Brown, Ham, & Hughes, 2010; Jacobson, McDuff, & Monroe, 2006; Rimer & Glanz, 2005). Although these methods have been highly successful in encouraging behaviour change in health campaigns (e.g., Dinoff & Kowalski, 1999) and non-captive wildlife encounters (e.g., Orams, 1996), they have been largely ignored by zoos (Ballantyne et al., 2007; Smith, 2006). In this chapter I examine the effectiveness of two communication methods, signs and animal talks, to communicate conservation behaviours to zoo visitors. I also examine if the application of the persuasive communication theory the Elaboration Likelihood Model (ELM) increases cognitive processing in visitors that leads to behaviour

change. Recent research confirms that visitors need to have experiences that engage and encourage them to reflect on their visit which then leads to them ultimately acting on the environmental message that was communicated (Ballantyne & Packer, in press). This chapter applies Weinriech's (1999) third step in a persuasive communication campaign, pre-testing, and is a vital step to ensure that the message is being communicated via the proper channels and visitors are hearing and processing the content of the message.

A key step in a successful persuasive communication campaign is assessing the method or mode of communication (e.g., via talks, pamphlets, TV commercials, or signs). Ensuring the message is being delivered to visitors via the optimal communication method increases the likelihood the message will be heard and that action will ultimately be taken (Rimer & Kreuter, 2006). In zoos there are two main methods to communicate with visitors: signs and face-to-face interpretation (i.e., staff and volunteers interact and speak with visitors through scheduled animal talks, animal presentations, or impromptu opportunities to engage with staff and contact animals). The ability of face-to-face interpretation and signs to communicate specific conservation behaviour messages to zoo visitors has not been examined extensively and the two key studies conducted to date have yielded mixed results. For example, Smith and Broad (2008) evaluated a bird of prey presentation that suggested conservation behaviours for the visitor to conduct at home. Eighty-one percent of the visitors recalled the message upon exiting the presentation, and follow-up interviews six-months later found 78% of visitors had started or increased their engagement with the conservation action. In contrast, Mony (2007) found visitors attributed conservation messages the most to signage and the least to face-to-face interpretation with volunteer docents; only 4% of visitors reported receiving key conservation

messages from the docents. Thus, the only two studies to date that have assessed communication channels for advocating conservation behaviour to zoo visitors had conflicting results, one favoured signs and the other supported face-to-face interpretation. While both studies examined face-to-face interpretation, in Mony (2007) volunteer docents were untrained and the interactions with visitors were ad-hoc. My study addressed a limitation of Mony's (2007) conclusions by implementing a training programme with staff so more conclusive results can be drawn about the optimal method to communicate conservation message to visitors via signs or face-to-face interpretation. Furthermore, the face-to-face interpretation in my study was not ad-hoc as was the case in Mony (2007), but was in the form of animal talks, similar to Smith and Broad (2008). Thus, the first objective of this chapter was to assess the effectiveness, measured by message recall (Niederdeppe, 2005), of signs and animal talks (a form of face-to-face interpretation) for advocating a conservation behaviour.

However, recalling the message is only the first critical step in a persuasive communication campaign. Ultimately to influence behaviour change, relevant and interesting information must be provided in a format that provokes cognitive processing in the individual (Brinol & Petty, 2006; Rimer & Glanz, 2005). The Elaboration Likelihood Model is a communication theory that postulates that relevant and interesting messages are remembered and recalled more, are thought about or elaborated on more, and ultimately lead to behaviour change (Bagozzi, Gurhan-Canli, & Priester, 2002; Petty et al., 1992; Petty & Wegener, 1999). ELM outlines the steps required in a persuasive communication campaign to produce a long-lasting change in beliefs that ultimately results in behaviour change (Petty & Cacioppo, 1996). Chapter 3 concluded that norms and attitudes were significant

predictors of intention to engage in the targeted behaviour. ELM was selected as the persuasive model because ELM has proven to be effective when norms and attitudes are key to intention, but perceived behaviour control has minimal effect (Hardeman et al., 2002). In Chapter 3 the targeted beliefs that were linked to the intention to engage in the behaviour were identified using TPB. ELM and TPB are complimentary: TPB identifies the salient beliefs that are linked to behavioural intention and these beliefs can be integrated into future communication campaigns to influence intention i.e., *what* is communicated; where as ELM guides the design and communication strategy of the message for maximum impact, i.e., *how* it is communicated (Cappella, 2006; Curtis, 2008; Ham et al., 2007). The use of TPB to identify the salient beliefs to target followed by the use of ELM to design how the message is delivered has been effective in encouraging visitors to pick up or avoid littering (Brown, Ham, & Hughes, 2010), refrain from feeding deer (Hockett & Hall, 2007), protecting a national park (Tubb, 2003), and to take public transportation (Curtis, 2008). In short, combining TPB and ELM provides a strong theoretical and practical approach to a behaviour change campaign (Fishbein & Cappella, 2006; Ham et al., 2007).

If a key objective of zoos is to facilitate conservation behaviour in the visitors (World Zoo and Aquarium Conservation Strategy, 2005), zoos first need to ensure that the communication mode and content of the message are being effectively communicated. In this study, I compare animal talks and signs that are based on ELM to a control group (i.e., conventional talks and signs designed without the guidance of ELM), and postulate that the ELM signs and talks will elicit greater recall of the advocated behaviours and more elaboration, both necessary precursors to behaviour change. This is the first study to date in a zoo in which a

communication campaign incorporates visitor beliefs about a targeted behaviour (L Smith et al., 2008) and evaluates the success of ELM-based communication. While ELM has not been applied to shape communication campaigns in zoos, it has been successfully applied in other informal learning environments, such as national parks, botanic gardens, and beaches (Ham, 1992; 2009; Ham & Krumpe, 1996). The results from this research will guide future programmes at zoos so they can more effectively communicate to visitors via signs and talks. I begin by reviewing ELM and its potential role in behaviour change campaigns.

Elaboration Likelihood Model

ELM is a well utilised communication theory for designing behaviour change programmes (Brinol & Petty, 2006; Rimer, & Glanz, 2005), has a well-developed body of literature (Rucker & Petty, 2006), and experimental manipulation of the components of ELM has led to a robust understanding of the model (e.g., Tarrant, Overdevest, Bright, Cordell, & English, 1997). ELM is based on a dual route to persuasion (Figure 4.1). The central route is activated when persuasion is the result of effortful thinking about the argument and when the receiver of the message can draw upon past experience and knowledge to scrutinise and evaluate the information presented. The receiver of the message must be motivated and have the ability to think about the content of the message at that time. In addition, the arguments presented must be of high merit. The central route generally results in more long-term positive attitude change and is more predictive of future behaviour than the alternative route (Petty, Cacioppo, & Schumann, 1983) However, people can not think critically about every message they receive. Therefore, the peripheral route is utilised in situations where intense scrutiny is not required or when people have low knowledge of the issue (Petty & Cacioppo, 1996). This route occurs when
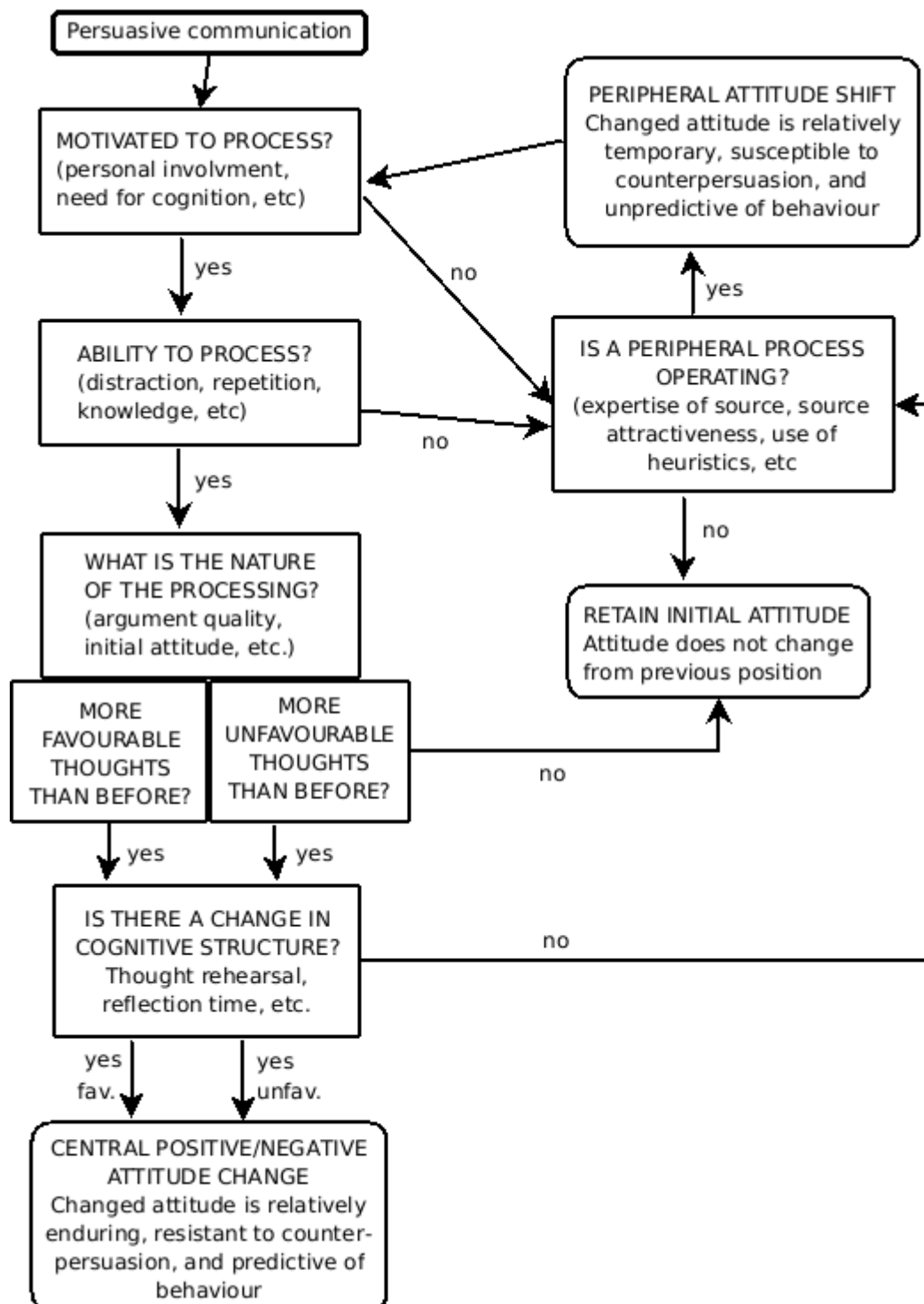
Figure 4.1. The Elaboration Likelihood Model (ELM) (Petty & Wegener, 1999)

elaboration is low due to low personal relevance, knowledge, complex messages, or distractions and is the more common route of persuasion processing. Persuasion via the peripheral route is the result of several low effort change processes (e.g., number of arguments, attractiveness, credibility or power of the source, social role, mood) (Petty & Cacioppo, 1996). Although the peripheral route may not have as enduring an effect on attitude change, it can have a strong short-term influence. Each component of ELM and the pathway via peripheral or central route is detailed below. What follows is a summary of the ELM model (Petty & Cacioppo, 1996) as it applies to my research. A more thorough explanation of the model can be found in Petty & Cacioppo (1996), Petty et al. (1983), Petty et al. (1992), Petty & Wegener (1999).

Elaboration

According to ELM, the degree to which the issue evokes a person to elaborate, or think, about the issue is the initial and often the most critical step in achieving attitude change, as well as determining whether behaviour change occurs via the central or peripheral route (Petty & Wegener, 1999). Elaboration leads to increased long-term storage of the information (Tubb, 2003), and in turn more likely leads to a shift in attitude (Petty & Cacioppo, 1996) or strengthening of an existing attitude (Petty & Wegener, 1999), and can guide behaviour (Bagozzi et al., 2002).

People are more likely to elaborate on issues that are relevant to them, which results in the creation of an informed attitude about the issue (Petty & Cacioppo, 1996). Relevance is individual specific, as an issue may be relevant to one person but not another. In addition some people tend to elaborate on a large number of issues and enjoy thinking (Petty & Cacioppo, 1996). Relevancy is often an underemphasised but critical component to encouraging conservation action. Making conservation issues locally relevant may be the key to bridging the gap between

conservation awareness and action (Novacek, 2008). People are more likely to take action on issues they feel personally connected to or are relevant to their daily life. By making the conservation issues relevant to the individual and not speaking in broad global terms, conservation behaviour may increase (Uzzell, 2000). The degree of relevancy can also be increased or decreased when different cognitive processes are employed, such as asking rhetorical questions or using second person pronouns. In contrast, effort may be reduced by individuals in a collective group known as social loafing (Petty & Cacioppo, 1996).

Motivation and ability to think

Levels of motivation and elaboration help determine the pathway taken to persuasion in ELM. If a person is motivated and has the ability to think about the issue in the specific context, then the central route of persuasion is most applicable. Several factors influence a person's motivation and ability to think about the message: time constraints, knowledge of the issue, number of message sources, number of others listening to message, mood, repetition, recipient posture, and speed of speech (Petty & Wegener, 1999). However, the influence of these variables does not necessarily have a linear relationship with attitude change. For example, Petty and Cacioppo (1996) found that agreement with a position was strongest when the message was moderately repeated (three times) and actually decreased when the message was repeated at a high frequency (five times). People must also have the ability to think and not be distracted to continue on the central route. A message that is repeated a few times increases the likelihood a person will have the opportunity to think about the message (Petty et al., 1992), especially if the message is complex. In contrast, if the speaker speaks too fast the message is considered distracting and decreases the processing of the message (Petty et al., 1992).

Nature of cognitive processing (arguments in the message)

The nature and strength of the argument is critical for continuing on the central route. The arguments quality can vary, and if arguments are favourable and of a high quality, persuasion is more likely to happen (Petty et al., 1983). However, weak arguments can still be effective if the receiver is already familiar with the issue and the argument matches an existing attitude, because weak arguments can cause people to retrieve their own stored information about the topic and think about it, which leads to increased persuasion (Petty et al., 1992). However, strong persuasive arguments are less likely to persuade when listeners hold strong opposing attitudes (Meadow, Reading, Phillips, Mehringer, & Miller, 2005). Finally, simple arguments are more effective, as increasing complexity in arguments can result in listeners returning to their original attitude (Petty & Cacioppo, 1996).

Cognitive structure change (nature of advocacy)

Finally, the listener will think about the information presented and decide if they support it. Persuasion will occur if the listener adopts and stores the messages into memory. If these critical steps occur, then the resulting attitude is relatively enduring and resistant, as well as predictive of behaviour (Petty, Cacioppo, Strathman, & Priester, 2005).

Methods

Similar to other zoos, Wellington Zoo communicates to on-site visitors through two key methods: signs and animal talks. Animal talks are conducted throughout the day and visitors are advised of the talk times upon entry to the zoo. Exit questionnaires show the talks have been popular since implementation in 2004

and 52% of visitors attend the talks (Wellington Zoo exit questionnaire summary 2008). Because the talks are delivered by approximately 20 staff members, a training programme was developed based on the principles of ELM. Prior to this training programme, staff received no talk training and were only given fact sheets for each animal that emphasised natural history information (e.g., Appendix 4.1). Similarly the zoo did not have standardised conservation actions advocated to visitors and any conservation messaging was at the discretion of the individual staff member.

Signs are a key form of interpretation (Munro et al., 2008) and Wellington Zoo spends approximately $40,000 a year on supplies, design, installation and staffing costs associated with operational signs (i.e., species signs and directional signs). Almost all zoos have a traditional animal identification sign at each exhibit which contains the name, distribution, and various facts about the animal (Fraser, Bicknell, Sickler, & Taylor, 2009). In some locations, i.e., New South Wales, Australia, the content and display of species signs at exhibits is mandated by law. However, no study to date has assessed the effectiveness of signs in communicating specific conservation behaviours. In this study, I apply the communication theory ELM and evaluate the overall effectiveness (as determined by recall of the conservation message and elaboration and its antecedents relevancy and satisfaction) of signs and animal talks in communicating conservation behaviour change messages to zoo visitors.

Talk training programme

A training programme was initiated to teach staff how to deliver a talk that advocated the conservation behaviour of purchasing sustainable/FSC timber, (Appendix 3.2) effectively. One possible reason for Mony (2007) finding face-to-face interpretation to be ineffective at communicating conservation behaviour was

the volunteer docents were not trained in persuasive communication techniques and given little guidance on how to incorporate conservation behaviours into their visitor interactions. To alleviate this problem, staff members were enrolled in an intensive talk training programme. The programme was designed to increase the ELM cognitive processes of elaboration and its antecedents, relevancy and satisfaction. Furthermore, message recall was measured to ensure that visitors were hearing and retaining the conservation behaviour that was advocated, a necessary component for visitors to engage in the behaviour in the future (Niederdeppe, 2005). The training programme consisted of a series of weekly half-day workshops (November – December 2007) and emphasised different ELM elements to facilitate elaboration (Table 4.1). I ran the first, second, fifth and sixth workshop and the third and fourth workshops were conducted by external contractors. At the sixth workshop all staff members presented a talk in front of a peer group and were provided feedback using an assessment form (Appendix 4.2). For the final phase of the training programme, I observed staff giving a talk to visitors and used the assessment form to provide feedback.

As discussed above, ELM states that persuasion can occur via two routes: central and peripheral. The route is individual specific and in this study it was not possible to track the processing of each visitor before and after each talk. Thus, the training programme taught techniques that stimulated visitor to process information via the peripheral route or the central route. For visitors to process information via the central route, elaboration must occur. To stimulate elaboration, the topic must be relevant and satisfying. Relevancy can be enhanced by the use of second person pronouns (Petty et al., 1992), hands on activities (Falk & Gillespie, 2009), similes and metaphors (Ham, 1992), and personification (Benton, 2008).

Table 4.1

Persuasive communication elements taught during the training programme.

Communication Element Taught	Reference
Speed, tone, and projection of speech	Petty 1992
Repetition of messages	Petty 1999, Petty 1983
Strong arguments	Petty 1983
Structure of talk is themed	Ham 1992, Ham 2007
Hands on activity/ create arousal	Falk and Gillespie, 2009
Use of props, role playing	Petty 1996
Asking questions	Petty 1996, 1992
Use second person pronouns	Petty 1992; Burnkrant and Unnava 1989
Use of similes and metaphors	Ham 1992
Personalise the animals/ personification	Benton 2008
On time	Ham 1992
Appropriate dress	Ham 1992
Introduce self and staff position	Curtis, 2008

Satisfaction can be developed by delivering the talk at an appropriate speed, tone, and projection (Petty et al., 1992), and by having a coherent structure and theme to the talk (Ham, 1992). Finally elaboration can be fostered by having strong arguments (Petty et al., 1983). To achieve this, staff were taught to have the conservation message as the theme and provide three supporting examples, as suggested by (Ham, 1992). In the training programme, staff members were taught to draw parallels between the animals and the visitors, and to use anthropomorphisms. The objective of this was to increase visitors feeling of emotional connection to the animal, which has been shown to be linked to short-term learning (Ballantyne, Packer, & Falk, in press). Providing hands-on experiences with the conservation issue also increases elaboration thus staff members were encouraged to use props that related to the animal (such as food items or fur) or engage visitors in a game to illustrate a concept. By having direct experience with the prop or acting out a concept, the issue becomes more relevant and thus elaboration should increase.

The peripheral route is often overlooked, but can still be an effective means of persuasion as it relies on simple cues that may be more achievable in an informal learning environment (Ham, 2007; Petty et al., 1992). The techniques that were taught to facilitate persuasion via the peripheral route included saying staff member's name and position to enhance credibility (Fraser, Taylor, Johnson, & Sickler, 2008), background on their job at the zoo (Curtis, 2008), being on time and dressed appropriately (Ham, 1992), and the use of props (Petty & Cacioppo, 1996).

The training programme also incorporated communication methods to increase message recall. Message recall is necessary to measure as there is direct link between exposure to the message and engaging in the behaviour. The main reason communication campaigns fail is due to low message recall (Niederdeppe, 2005) but

few communication campaigns measure it. To enhance message recall, messages need to be repeated to increase exposure to the message (Niederdeppe, 2005). Hence staff was instructed to say the conservation behaviour at least three times during the talk, with the first time being when an animal was introduced in the presentation. For example, when the cockatoo was flying over the audience the presenter discussed the need for protecting old growth trees for nesting sites and introduced the concept of FSC wood. Thus, in this instance the animal was used to capture the visitor's attention and increased attention should lead to an increase in message recall (Rimer & Kreuter, 2006). At the conclusion of the presentation, the presenter reiterated the conservation behaviour and how it would conserve animals in the wild.

In Study 2 (see Chapter 3), I identified the following beliefs that were highly correlated with the intent to purchase sustainable (FSC) timber:

- Buying FSC products is pleasant

- Buying FSC products is beneficial

- Buying FSC products is enjoyable

- Buying FSC products will protect the environment

- People like me buy FSC products

Staff were instructed to interject these statements into talks and incorporate them into the theme of the talk. This is the first study to date in a zoo in which a communication campaign incorporated visitor beliefs about a targeted behaviour (Smith et al., 2008). By targeting these beliefs, people should be more likely to adopt the conservation behaviour (McKenzie-Mohr & Smith, 1999).

I surveyed visitors attending talks both before (11 November to 31 December 2007) and after (24 May to 7 September 2008) the staff training programme. Name of the speaker, the subject animal, the staff position (guide or keeper), the day of the

week, weather, time of day, and total visitor attendance at the talk were all recorded to test for any confounding effects.

Sign development

Two new versions of signs were created:

- Non-ELM – Signs contained species name, photograph, and distribution map and three factual statements regarding the physiology, behaviour, or ecology of the animal (Appendix 4.3).

- ELM – Signs contained species name, photograph, and distribution map. The text contained the same three facts as above but the information was written to be relevant [use of second person pronouns (Burnkrant & Unnava, 1989; Petty et al., 1992); use of similes and metaphors (Ham, 1992); personification of the animal (Benton, 2008)] and satisfying [presented in a theme (Ham, 1992); format easy for processing (Ham et al., 2007)] to the reader. The sign communicated a conservation behaviour.

The two versions of the signs were identical in style and size. Manipulation checks were conducted to validate ELM and non-ELM signs for relevancy, satisfaction, and elaboration (Lackey & Ham, 2003). The function of a manipulation check is to determine if the variables I was manipulating (relevancy, satisfaction, and elaboration) were being conveyed accurately to visitors (Lackey, Ham, & Hall, 2002). Five Wellington Zoo visitors were presented with the drafts of both signs and asked to rate on a scale of 1 to 7 (7 being the greatest) the following questions:

- How relevant is the information in the sign to you?

- How satisfying was it to read the sign?

- Did the sign make you think?

The ELM sign was rated higher in relevancy ($\bar{x}_{ELM}$= 5.8 +/- .09; $\bar{x}_{Non\text{-}ELM}$= 5.6 +/- .11), satisfaction ($\bar{x}_{ELM}$= 5.9 +/- .03; $\bar{x}_{Non\text{-}ELM}$= 5.6 +/- .13), and elaboration ($\bar{x}_{ELM}$= 5.8 +/- .07; $\bar{x}_{Non\text{-}ELM}$= 5.6 +/- .13) than non-ELM signs and confirmed the theoretical basis of the signs.

Signs were placed at two well-recognised species exhibits (lion and giraffe) and two iconic New Zealand species (kiwi and tuatara) exhibits. Only one sign was on display each week with the ELM and non-ELM signs rotated each week. The day of the week, weather, time of day, and total visitor attendance was also recorded.

Participants

I conducted the sign and talk study in succession during the summer and school holiday periods of 2007 and 2008 when visitation was high.

For the animal talk research component, I surveyed zoo visitors over the age of 18 as they left animal talks. Visitors were surveyed before the talk training programme (11 November to 31 December 2007) and after (May 24 to 7 September 2008). I selected potential respondents using the next-to-pass method (the first visitor to pass an imaginary line was approached). In the case of a group, the person selected for the questionnaire was the nth member of the group, with n randomly chosen each day. As the questionnaires were self-complete, as soon as one person agreed to fill out the questionnaire, I approached the next person to pass the imaginary line. If a person declined, they were thanked and the next person to pass the line was approached. Refusal rate was <5%.

For the sign research component, I surveyed zoo visitors over the age of 18 as they approached the sign. Research was conducted in January and February 2007. Sampling was conducted daily between 11:00 to 13:00 with each session lasting one hour. The study population was all visitors who read the sign. I defined reading the

sign as looking at the sign for at least 3 seconds. Subjects were also selected based on the next to pass method. As visitors exited the viewing platform and were approximately 5m from the exhibit's exit, I approached those who read the sign with the questionnaire. To reduce error, potential survey participants were asked if they had read the sign before being asked to fill out the questionnaire. If the person agreed, he or she was given the questionnaire. If the person did not acknowledge reading the sign or declined to participate in the questionnaire, he or she was thanked. As the questionnaires were self-complete, as soon as one person agreed to fill out the questionnaire I approached the next person to pass the imaginary line.

Questionnaire

The first section of the questionnaire was a commercially available questionnaire created by Sustainable Tourism Cooperative Research Centre, QLD Australia (Sustainable Tourism Cooperative Research Centre, 2006) (Appendix 4.4 for the talk study and Appendix 4.5 for the sign study) and was constructed based on communication theory, in particular ELM. This questionnaire has been used in other zoo research (i.e. Weiler & Smith, 2009). The questionnaire took approximately ten minutes to complete. Visitors responded to 29 questions with all answers presented on an ordinal scale. While the questionnaire had 11 domains, only three were relevant and used in my study:

- Satisfaction (4 questions: 1a, 1f, 1j, 1o; 0.84 reliability)

- Relevancy (4 questions: 1b, 1g, 1k, 1p; 0.67 reliability)

- Elaboration (5 questions: 1c, 1h, 1l, 1q, 1s; 0.88 reliability)

According to ELM, satisfaction and relevancy are the antecedents to elaboration, and in turn were selected to examine their impact on elaboration.

Participants also provided information on their age, gender, and education level as these variables can have an impact on environmental attitudes and behaviour (Dietz, Kalof, & Stern, 2002; Fransson & Garling, 1999; Kellert & Berry, 1987; Zelezny, Chua, & Aldrich, 2000). Data on number of people in the group were also collected to test for social loafing (Karau & Williams, 1993).

For the talks study, one additional question was added to the questionnaire "did the talk make you think of a way you can save this animal?" This was followed by an open-ended question asking them to explain how the animal could be saved. This question served as a direct measurement of message recall. In short, this questionnaire examined if a talk training programme and signs based on ELM would increase recall of a conservation behaviour by zoo visitors (message recall), as well as relevancy, satisfaction and elaboration, all antecedents to visitors engaging in the behaviour.

Results

During the first week of the sign study, three sessions were conducted and 163 adults passed the ELM signs (100 at the lion enclosure and 63 at the tuatara enclosure) and 0 people met the inclusion criteria of reading the sign. During the second week, two sessions were conducted and 83 adults passed the non-ELM signs (58 at the lion enclosure and 25 at the tuatara enclosure) and 0 people met the inclusion criteria of reading the sign. Data collection was stopped at this point and overall no questionnaires were completed. The lack of reading of signs by visitors is discussed below.

For the talk study, seventy-eight questionnaires were collected prior to the training programme and 95 after the training programme. All questionnaires were

completed in full and used in the analysis. Following the talk training programme, staff communicated a conservation behaviour in 64% of the talks compared to 17% prior to training. Supporting predictions, the training programme, and the resulting communication of conservation behaviours based on ELM led to an increase of message recall. When a conservation behaviour was communicated in the talks, 34% of visitors recalled the message in talks prior to the training programme and 83% of visitors recalled the message in talks following the training programme. The majority of post-training talks contained messages about sustainable wood products (67%), whereas the predominate message in pre-training talks was about recycling (75%). Following the training programme, ninety-seven percent of visitors hearing talks that contained a message about sustainable wood recalled the message and 33% of visitors hearing talks that contained a message about recycling recalled the message (Table 4.2).

The Likert-scale data was treated as continuous as warranted by Rasmussen (1989). I found no significant difference between the groups (pre- and post-training) in terms of age (p = 0.126, Fisher's exact test) and gender (p = 0.612, Fisher's exact test) of visitors but there was a significant difference in education (p = 0.021, Fisher's exact test) with the post training group containing more visitors with a bachelors degree (Table 4.3). Further analysis revealed no significant difference between education level and the dependent variables. Cronbach's alpha was calculated for each indicator and were similar to previously published parameters ($\alpha_{satisfaction}$ = .878, $\alpha_{elaboration}$ = .814, $\alpha_{relevance}$= .668, $\alpha_{atttidue}$ = .693), supporting the reliability of the questionnaire instrument. The dependent variables did not violate the assumptions of normal distribution. Species of animal, staff position (guide or

keeper), and number of children and adults in group had no significant effect on dependent variables.

Analysis of variance (ANOVA) tests were used to determine if the training programme resulted in a significant change in visitor satisfaction, relevancy, and elaboration. Again, supporting my hypothesis, the pre-training and post-training groups differed significantly on satisfaction ($F(1, 171) = 81.31$, $p < 0.001$), but no statistical difference was observed for relevancy ($F(1, 171) = 0.02$, $p > 0.05$) or elaboration ($F(1, 171) = 0.379$, $p > 0.05$) (Table 4.2), albeit both did increase in the predicted direction post-training.

Discussion

This study is the first to compare the effectiveness of both signs and animal talks in communicating conservation behaviour to zoo visitors, and the first to apply the psychological model ELM to both methods to determine if this results in an increase in cognitive processing in visitors. My results found animal talks to be a superior method to signs in communicating conservation messages. If a novel conservation message was communicated, almost all visitors recalled the message. However, some staff did not incorporate conservation messages and this is discussed later. The training programme was effective in increasing one component of ELM, satisfaction, but it did not significantly increase relevancy or elaboration. Previous studies had limitations and drew contradictory conclusions on the effectiveness of either signs or face-to-face interpretation, and no previous study has compared both communication methods simultaneously (e.g., Bashaw & Maple, 2001; Mony, 2007; Smith & Broad, 2008).

Table 4.2

Mean ELM elements and message recall (+SE) of pre-training (n = 78) and post-training (n = 95) visitors. * = p<.001

	Pre-Training (non-ELM)	Post-Training (ELM-based)
Satisfaction	5.228 +/- 0.068	6.187 +/- 0.081*
Relevancy	5.5278 +/- 0.1070	5.621 +/- 0.104
Elaboration	5.486 +/- 0.123	5.586 +/- 0.111
Conservation Message in Talk	17%	64%
⁻ FSC	2%	67%
⁻ Reduce/Reuse/Recycle	75%	33%
Recall of message	34%	83%
⁻ FSC	1%	97%
⁻ Reduce/Reuse/Recycle	33%	33%

Table 4.3

Demographic summary of the pre-training (n = 78) and post-training visitors (n = 95)

Demographic	Pre-training	Post-training
Gender	Male – 36%	Male – 38%
	Female – 59%	Female – 60%
	Blank – 5%	Blank – 2%
Age	18 to 24 – 13%	18 to 24 – 21%
	25 to 49 – 67%	25 to 49 – 68%
	50 to 64 – 12%	50 to 64 – 8%
	65 or over – 4%	65 or over – 0%
	Blank – 4%	Blank – 2%
Education	Fifth Form – 22%	Fifth Form – 19%
	High School – 17%	High School – 8%
	Bachelors – 35%	Bachelors – 54%
	Higher Degree – 18%	Higher Degree – 8%
	Blank – 9%	Blank – 11%

My research contradicts Mony's (2007) findings that visitors acquire most of their information about conservation behaviours from signs, and instead reinforces the limited reading rate of signs by zoo visitors (Wellington Zoo internal report, 2003; Churchman, 1985; Johnston, 1998). Due to the lack of visitors reading the signs, I was unable to test if signs written based on the persuasive communication theory ELM were more effective than non-ELM signs. This is an important result as no zoo has specifically compared these two forms of communication (i.e., signs vs. animal talks) in their ability to communicate conservation behaviour. My results suggest that zoos' investment in signage may be misplaced and the money and resources should be redirected to other more effective forms of communication, i.e., face-to-face interpretation. Again, it is necessary for each zoo to conduct research on effectively communicating to visitors (Ballantyne et al., 2007) and then to tailor their specific communication strategy accordingly, however few zoos conduct such research (MacDonald & Linklater, 2006). My results highlight the need for more social science research in zoos, which can provide critical information for the effective allocation of resources to achieve the zoo mission of eliciting conservation behaviour in their visitors.

At Wellington Zoo, animal talks were a more effective communication method for conveying conservation messages to zoo visitors than signs; when a message was advocated in a talk following the training programme 83% of visitors recalled the message. This recall rate is similar to Smith et al.'s (2008) findings in which 81% of visitors recalled a conservation behaviour following a birds of prey presentation. My results address a flaw in Mony's (2007) study of assessing the effectiveness of face-to-face interpretation: zoo docents were untrained in persuasive communication and received minimal training for interacting with visitors.

Furthermore, the messages that were communicated were broad environmental concepts (e.g., extinction is happening faster than before) and most visitors were aware of these prior to coming to the zoo. Both of these aspects may have contributed to visitors not attributing conservation messaging to the face-to-face interpretation with the docent. In my study, a comparison between the visitors who attended talks before and after the training programme, suggest that if a specific conservation message is communicated a majority of visitors will recall it (34% pre-training message recall; 83% post-training message recall). Again it is still essential to measure message recall as this is the key cause for communication campaigns to fail (Niederdeppe, 2005). Thus, at the most fundamental level implementing a training programme in which specific conservation messages are advocated results in visitors recalling the message. Future success or failure of Wellington Zoo visitors implementing the conservation behaviours long term can rule out the lack of message recall, which is a vital step in any behaviour change campaign.

Another key finding from my study is almost one-third (36%) of the animal talks following the training programme did not have a conservation message advocated. Thus some staff failed to implement the basic objective of the training programme, to communicate a specific conservation action to visitors. Furthermore, some staff opted not to communicate the specified conservation behaviour of purchasing sustainable/FSC wood and instead integrated a message of reduce/reuse/recycle. However, recall of the specific conservation message (i.e., purchase sustainable/FSC wood) was much greater (97%) compared to only one-third of visitors recalling the reduce/reuse/recycle message. These results suggests the training programme was not completely effective in teaching staff the techniques to incorporate a message about conservation behaviour, or that staff did not prioritise

incorporating the specified behaviour into a talk. Despite their strong mission to facilitate conservation behaviour in visitors, there is reluctance in zoos, similar to all informal learning environments, to engage and encourage discussion about societal issues and to advocate action (Schwarzer & Koke, 2007). There may also be concern by staff that advocating conservation behaviours may take on the form of 'nagging' visitors, but recent results suggest that promoting conservation behaviour to visitors actually has the opposite effect. Visitors expect to be asked to engage in conservation behaviour and overall the promotion of conservation behaviour actually improves the visitor experience (Smith, Van Dijk, Curtis, & Pahlow, 2010). Thus my results provide useful feedback to staff and encourage integration of conservation messages in all talks. It is necessary for zoos to take a much stronger role in communicating specific conservation behaviours based on persuasive communication theory. Future staff training should focus on the staff members who do not integrate conservation messages into talks. While the majority of visitors recalled a message after the training programme, this alone will not result in long-term behaviour change. Deeper cognitive processing of the message is required for ultimate behaviour change (Bagozzi et al., 2002), and thus a training programmes based on ELM was implemented to elicit greater elaboration, relevancy, and satisfaction in zoo visitors.

The training programme based on ELM also had mixed results in terms of the critical variables in the ELM model: visitor satisfaction significantly increased following the training programme but elaboration and relevancy, while they did increase, it did not increase significantly. Satisfaction is a critical first step in ELM as visitors must enjoy and pay attention to the talk first before they can elaborate on the message (Petty & Cacioppo, 1996). Furthermore, visitor satisfaction is a key element of Wellington Zoo's vision statement. However, while an increase in visitor

satisfaction achieved one aspect of the zoo's mission, the degree to which satisfaction impacts long term conservation behaviour change is unknown and should be the focus of future research.

Along with satisfaction, relevancy is a key antecedent to elaboration. Communication that is linked to experiences related to people and their concerns (e.g., ourselves, loved one, beliefs and values or to ubiquitous human activities such as love, food, and home-life) is more relevant and people then tend to pay more attention to these communication messages (Ham, 1992; Petty & Cacioppo, 1979), which increases recall (Benton, 2008). However, visitors attending talks after the training programme did not rate the talks higher on relevancy. Although staff were trained to draw parallels between the animals and the lives of the visitors, staff implementation of this technique is unknown and anecdotal evidence suggest anthropomorphising the animals was difficult as staff had previously been instructed not do this prior to 2006. In the future an independent observer should watch the talks and rate the staff member on implementing relevant-inducing techniques. Thus the lack of increase in visitor relevancy could be attributed to staff inability to implement relevant-eliciting techniques and additional training programmes may resolve this issue. Regardless, future research needs to be conducted on developing alternative and innovative techniques to increase relevancy and thus ultimately elaboration in visitors.

The lack of change in visitor elaboration following the training programme may be due to a number of factors. First, the training programme may not have been successful in training staff to deliver talks that increased elaboration. Although staff members were taught methods to increase elaboration, this study did not triangulate visitor elaboration with staff implementation of elaborative techniques. Again, a

trained observer could watch all presentations and rank the staff member on implementation of relevant, satisfying, and elaborative techniques. These scores could be triangulated with visitor scores of the same items. Thus the lack of change in elaboration before and after the training programme may be due to staff inability to implement the communication techniques, and not a reflection on the elaboration capacity of zoo visitors.

A threshold effect may also exist in terms of elaboration in zoo visitors as a large majority of zoo visitors were also rated highly in terms of elaboration prior to the training programme. To increase elaboration significantly during a ten-minute talk may require more substantial efforts by zoos and their staff members. Furthermore, additional innovative techniques to communicate besides those implemented in the training programme need to be developed, researched, and applied in zoos to reach all visitors as learning is individualistic and complex (Dierking et al., 2004). For some visitors attending a talk may not be the most effective method of communication (Ballantyne & Packer, 2005). Another possibility is elaboration has reached a threshold in zoo visitors and the role of other factors that may influence behaviour change will need to be examined. However, because my study used a commercially available questionnaire, a comparison can be made to the only other published study that used this questionnaire in a zoo (at Weribee Open Range Zoo in Melbourne, Australia) to determine if zoo visitors are demonstrating a threshold effect in elaboration.

Weiler and Smith (2009) found that the more interpretative forms (up to four) a zoo visitor experienced, the greater their elaboration. Looking at the averages of the indicators that both studies used, Wellington Zoo visitors were comparable to the Weribee visitors who experienced at least one form of face-to-face interpretation: a

keeper talk, interaction with a volunteer or actor, or a tour. Weiler and Smith (2009) did not find a threshold effect for elaboration levels, with elaboration increasing to nearly 7 (the maximum) when visitors experienced all four forms of interpretation. Weiler and Smith's (2009) findings have implications for my study and suggest visitors are capable of increased elaboration, but attending a single talk may not be sufficient. Zoos will need to employ greater resources to develop additional interpretive techniques to increase elaboration in visitors and to evaluate the success of these techniques. Furthermore zoos may need to increase the quantity (i.e., repeating the message across the zoo by delivering it in numerous formats) in addition to the quality of the programmes to elicit greater elaboration in visitors. Repetition has been shown to increase persuasion in certain contexts (Cacioppo & Petty, 1989; Zhang & Zinkham, 1991). Smith et al. (2010) found repetition of a conservation message across the zoo site increased visitor recall and also enhanced the visitor experience. Results indicated that zoos were not asking visitors enough to engage in conservation behaviour, as 62% of the visitors felt they could have been asked more often to engage in the conservation behaviour. Thus zoos are not providing enough face-to-face interpretation opportunities that advocate specific conservation behaviour to visitors. This has key implications for how zoos plan their visitor communication strategies as it will require research and prioritising of resources to face-to-face interpretation programmes.

At Wellington Zoo, 52% of visitors attend animal talks. Thus the 48% of visitors who do not attend talks may not be exposed to conservation messages, as the signs that are throughout the zoo are not an effective mode of communication. A strategy to communicate to this proportion of the zoo visitors face-to-face but not via

animal talks needs to be developed to ensure the zoo is meeting its mission of eliciting conservation behaviour in all visitors.

A fortuitous finding of my study was the greater recall (97%) of the novel conservation action (purchase FSC products) compared to the non-novel action (reduce, reuse, recycle; 33%) following the training programme. The purchasing of FSC products was considered a novel message based on the elicitation study in Chapter 2 in which less than 10% of the visitors were aware of FSC and none of the visitors could identify the FSC symbol. I considered reduce, reuse, recycle not novel based of the widespread recycling campaigns in the Wellington community. This finding, of a greater recall of an advocated novel action compared with a well-known action, parallels findings in two other recent zoo studies (Lowry, 2010; Smith et al., 2010). Similarly Werner et al (2009) found that communicating a well-known behaviour (recycling) but in a novel way was significantly more effective in sustaining long-term action compared to using conventional messaging. The use of novelty in communication may enhance elaboration and in turn impact recall of the action, which is the pre-cursor to behaviour change. Non-novel messages may not stimulate elaboration among visitors because the information is too basic (Bucy, 2005). My results paired with other recent findings suggest novel messaging is highly effective in increasing elaboration and recall of the action. Thus organisations trying to implement behaviour change should become creative in their messaging and avoid the same, repetitive rhetoric.

My study did have some limitations. As previously discussed, an independent observer should have watched the talks and rate the speaker on use of techniques to evoke elaboration, satisfaction, and relevancy. These scores could be compared with visitor ratings to determine if the techniques are being implemented and if so what

effect they have on the targeted cognitive elements. The current study also used a post-only measure, in which visitors were only questionnaireed after the talk to minimise visitor inconvenience. This approach is widely used (e.g., Falk et al., 2007), but is only quasi-experimental and subject to validity problems (Marino, Lilienfield, Malamud, Nobis, & Broglio, 2010).

Another potential limitation of the current research is this study investigated message recall and the cognitive elements of elaboration, satisfaction, and relevancy, which are predictors of behaviour (Bagozzi et al., 2002). However, the link between these elements and taking action after a zoo visit needs to be the focus of future research to assess visitor behaviour change as a result of a zoo visit.

A final limitation to this study is an overall criticism to ELM as a persuasive communication model. Cook et al. (2004) summarise the criticism of ELM as being primarily a descriptive theory and not providing *a priori* hypothesis. Furthermore, ELM is difficult to falsify and because a single variable can play several roles in the model and it is difficult to identify at which level persuasion is occurring. While these criticisms are recognised, the purpose of this study was to test if signs and animal talks based on ELM would increase elaboration (and its antecedent's satisfaction and relevancy) and not the overall robustness of ELM as a theory. ELM was chosen as the persuasive model because Study 2 found norms and attitudes to be significant predictors of intention to engage in behaviour and ELM is most effective under these circumstances (Hardeman et al., 2002). Furthermore, ELM has been used successfully to target behaviours in wildlife settings, but this is the first study to test its application in a zoo.

In conclusion, this study has several significant implications for how zoos communicate conservation behaviour to visitors and reiterates the need for zoos to

conduct pre-testing when implementing a persuasive conservation communication campaign (Weinreich, 1999). First, although signs are widely used by zoos throughout the world and cost tens of thousands of dollars a year to create and maintain, signs may be ineffective for communicating conservation behaviour to zoo visitors due to the low reading rate. Instead, animal talks may be more effective in eliciting message recall in visitors. However, the training programme based on ELM did not increase elaboration as it was designed to do. This result may be initially disappointing, but it provides critical insights into zoo visitors and zoo programmes. It may be that increasing visitor elaboration is not necessary and zoo visitors, by the biased nature of their interest in wildlife, are high elaborators and primed to implement the advocated conservation behaviour. Therefore, one critical first step may be that zoos just need to ensure novel communication of conservation messages, which can increase visitor recall. Alternatively, if an increase in visitor elaboration is required to ultimately achieve post-visit behaviour change, a re-examination of the training programme and ensuring all staff implement conservation messages is require. This will require zoos to invest in research to understand visitor behaviour to truly meet their goal of having a significant impact on visitor conservation behaviour.

Chapter 5

Conclusion:

Implications for zoo programming and future research directions

Zoos can play a key role in conservation by facilitating behaviour change in their 600 million visitors annually (World Association of Zoos and Aquariums, 2009). This role is even more significant because a majority of environmental learning is acquired in informal learning environments such as zoos (Falk & Dierking, 2010; Falk, 2005). However, while numerous articles reinforce the potential zoos have in influencing conservation behaviour in visitors (e.g., Ballantyne & Packer, 2005; Ballantyne, Packer, Hughes, & Dierking, 2007; Miller et al., 2004; Ogden & Heimlich, 2009; Smith, 2006; Tribe & Booth, 2003), only a few zoos have quantified the impact a visit has on visitor conservation behaviour (e.g., Dierking et al., 2004; Dierking et al., 2002; Ogden et al., 2004; Smith et al., 2008; Swanagan, 2000). In this thesis, I applied a persuasive communication framework (McKenzie-Mohr & Smith, 1999; Weinreich, 1999) to develop a conservation communication campaign at Wellington Zoo. My results make a significant contribution to the body of literature that evaluates communicating conservation behaviour to zoo visitors and suggest future directions zoos can take to achieve their goal of facilitating conservation behaviour in their visitors. Each chapter is analogous to a single study, with individual theoretical and applied results discussed at the end of each chapter. In this chapter I summarise and link the findings together and also discuss the overall contribution of the thesis.

Theoretical implications

My thesis will contribute to future programming in zoos to fulfil zoos'
mission of facilitating conservation behaviour in visitors, and this is discussed further
below. Additionally, my thesis also makes critical contributions to the broader field
of environmental attitudes and behaviour and conservation communication. Although
there has been significant research on general environmental attitudes and behaviour
(e.g., Dunlap & Liere, 1978; Kellert & Clark, 1991) and specific environmental
behaviours such as recycling (Cheung et al., 1999), research specific to wildlife
conservation and conservation psychology, especially in New Zealand (Allen &
Kilvington, 1999), is still an emerging field (Clayton & Brook, 2005). Human
behaviour is a key source of current conservation crisis, and to resolve these
problems people must change to more sustainable behaviours (De Young, 1993).
However, changing behaviour is complex (Aronson, 2008) and a better
understanding of the psychological factors that lead to behaviour change is an
important first step in solving the conservation crisis (Uzzell & Rathzel, 2009). New
Zealand has a high proportion of endemic species and one of the highest extinction
rates in the world (Hitchmough, 2002). Species loss has been the result of human
action, primarily through habitat loss (fires and land clearance) and introduced pest
species (Environment New Zealand, 2007). Recent research by the New Zealand
Department of Conservation found New Zealanders value conservation but have
minimal awareness of specific conservation issues (Johnson et al., 2007).
Furthermore, most funding in New Zealand focuses on the biological aspect of
conservation and not on the human dimension and behavioural changes required for
solving the conservation crisis (Allen & Kilvington, 1999). Thus my study is of local
importance as it investigates the behaviour and attitudes of New Zealanders about

local conservation threats and mitigating behaviour. My thesis is also of international significance as it contributes to the wider body of research that is focused on understanding the underlying psychological constructs that lead to conservation behaviour, especially environmental communication theory.

Study 1 findings – perceptions of zoo visitors and environmental professional related to global and local conservation threats and actions

The critical finding from my first study (see Chapter 2 for details) was to document environmental hyperopia in zoo visitors. Environmental hyperopia is based upon people's perception that environmental problems that are geographically further away are more severe than local problems (Uzzell, 2000). This phenomenon has been documented in environmental problems (Bonaiuto et al., 1996; Garcia-Mira & Real, 2005) and climate change (Milfont, 2010), but this is the first study to specifically document environmental hyperopia in wildlife conservation. The biased perception of environmental threats can result in inaction as people often believe that they do not have control over distant global problems. Thus, while people may perceive there is a problem globally, they do not believe they can affect it. In contrast, at the local level they may believe they can make an impact, but they do not perceive a problem so they do not take action (Garcıa-Mira & Real, 2005). Thus, a state of inertia is created with individuals not taking action. However, public participation in environmental solutions is essential for solving the conservation crisis (Dietz et al., 2009), and therefore understanding the underlying mechanisms of environmental hyperopia and the psychological constructs that facilitate individuals from taking conservation action is critical.

There are several explanations for environmental hyperopia. Optimism bias, which is the perception that negative events are more likely to happen to others

whereas positive events are more likely to occur to oneself, may be a driver of environmental hyperopia (Milfont, 2010). Recognising and understanding how geographic proximity impacts perceptions of conservation threats and how it translates into conservation action will be a challenge for future research. This is discussed further in the next section. Alternatively, environmental hyperopia may be linked to the knowledge-deficit hypothesis which states a lack of action is due to the lack of knowledge and awareness of the problem. However, in Study 2 (Chapter 3) I did not find a link between knowledge and behavioural intention; and it has been repeatedly shown that a high level of knowledge does not lead to environmental action (Ogden et al., 2004). Again, it will be essential to further research environmental hyperopia with the aim to facilitate conservation behaviour that has both local and global impact. In countries like New Zealand which have a unique biodiversity which is declining rapidly, it will be critical for local people to understand the need for action to save the nation's flora and fauna.

My first study was also the first to document a discrepancy between experts and lay people (i.e. visitors) in perceptions of threats to wildlife and conservation mitigation actions. Visitors may have a lower perception of conservation threats that are slow and cumulative, similar to other environmental threats (Slovic 1987). Furthermore, lay people primarily base their perceptions on mass media (Kahlor & Rosenthal, 2009) whereas experts base their perceptions on research (Blok et al., 2008). My study also found experts placed less emphasis on individual actions at the local level, and instead shift to actions implemented by government or large organisations. Although experts may find engaging with lay people challenging (Weber & Word, 2001), it is essential to interact and facilitate with lay people as solutions to environmental problems rely on collective actions (Vugt, 2009) or the

collective voice calling on government reform (Novacek, 2008). New Zealand's Ministry for the Environment recognised that an increase in small individual actions can have a cumulative and positive impact on New Zealand's environment (Ministry for the Environment, 2007). Thus the expert's emphasis on government mandate as opposed to individual action at the local level will need to be addressed, as engaging with the public and ultimately their combined collective action is a critical step for any solution to the conservation crisis (Allen & Kilvington, 1999; Petts, 2006).

Study2 findings – the application of the Theory of Planned Behaviour to two conservation behaviours

The second study (Chapter 3) validated the Theory of Planned Behaviour for identifying the beliefs linked to behavioural intention for bringing cats in at night and purchasing FSC product. This was the first study at a zoo to use TPB to identify the beliefs linked to behavioural intention. These beliefs were the foundation of the subsequent communication campaign in Chapter 4. Furthermore, despite the conservation implications of these behaviours, this is the first time TPB has been applied to these two specific conservation behaviours and there has been virtually no research conducted on the attitudes and behavioural intention of either of these behaviours. My results reinforce other studies that found TPB robust in explaining behavioural intention (Bamberg & Möser, 2007). This systematic assessment of cognitive beliefs linked to intention resulted in an efficient and effective behaviour change campaign.

Attitude was the most important variable of the TPB elements, supporting the principal of compatibility (Ajzen, 1991; Ajzen & Fishbein, 2005). The principal of compatibility states that attitudes will correlate to behaviour if they are measured on the same scale, in a specific context, and in a given timeframe. My results found

overall attitudes were significantly correlated to intention. Furthermore, my results

identified the specific beliefs that were highly correlated to intention and these

beliefs became the content of the communication campaign in Study 3.

Norms were of similar importance to attitudes in predicting intention. My

findings support recent communication campaigns based on norms that were

effective in changing behaviour (Schultz et al., 2008; Schultz et al., 2007). The effect

of injunctive and descriptive norms varied for the two behaviours and this has

implications for creating the content of the communication campaign. For purchasing

FSC products, injunctive and descriptive norms did not vary in their impact on

behavioural intention. However for cats in at night, there was an interaction between

norms and past behaviour. People who kept their cat outside exclusively at night

were significantly influenced by descriptive norms. Thus future campaigns should

focus on emphasising the behaviours of others to this group. Comparatively, people

who allowed their cat to come and go from the house at night were more influenced

by injunctive norms. To influence this group, communication campaigns should

focus on normative groups such as veterinarians. My results emphasise the need to

research the underlying beliefs of behavioural intention as it will vary from

behaviour to behaviour and also be influenced by context and individuals (Cialdini et

al., 1990), and suggest the importance of normative messaging, a method that is

novel to most zoos.

Study 3 findings – evaluating the method of communicating conservation
messages to visitors: message recall and applying the Elaboration Likelihood Model
(ELM)

In the final empirical study of my thesis (Chapter 4), I implemented a

conservation communication campaign based on the proceeding chapters and

measured the effectiveness of the channels of communication. My results have

important implications for the environmental communication literature as a significant portion of learning about environmental problems occurs outside the classroom in places such as zoos, museums, and parks (Falk & Dierking, 2010). The first critical finding of this study was the ineffectiveness of signs at exhibits to communicate conservation messages to visitors. Instead, communicating conservation behaviour messages in animal talks was much more effective, with 83% of visitors recalling the message. This has important implications for zoos, as discussed below further, but also the wider conservation communication community. It is essential to identify the most effective method for communication, yet this is rarely done (Ballantyne et al., 2007). If communication campaigns do not evaluate the communication channel, there is a risk the method will not be effective and thus the campaign may fail. However, while animal talks were an effective communication method for those visitors that chose to attend animal talks, almost one-half of Wellington Zoo visitors did not attend animal talks. Again, it is important to recognise that alternative communication methods need to be identified, researched and implemented so that every sector of the visitor population can be reached in order to achieve the overall mission of zoos in facilitating conservation behaviour.

A second key finding of study 3 was the effectiveness of a staff training programme. Visitor recall, a key component for communication campaigns to be successful, was almost ubiquitous (97%) when the novel message of purchasing FSC products was incorporated into animal talks. However, when the advocated message was the well-known message of reduce-reuse-recycle, only one-third of visitors recalled the message. These findings support the emerging evidence that novel messaging has a greater recall (Lowry, 2010; Smith et al., 2010). These results

provide insight into the receptivity of visitors to conservation messages and suggest recall will be biased toward novel behaviours. Thus significant consideration should be placed on the actual conservation behaviour that will be advocated, as a campaign based on well-known behaviours may not be as successful. Implications for zoo programming is discussed below but these results are also important for the environmental communication community as advocating well-known messages such as reduce-reuse-recycle may not be an effective use of communication budgets. Alternative behaviours and innovative ways to communicate these messages need to be investigated to result in more effective communication campaigns. Although the staff training increased visitor recall of the conservation message, visitor elaboration, a cognitive antecedent to behaviour, did not significantly increase in visitors who attended animal talks following the staff training programme. It is plausible that zoo visitors, biased on the biased nature the sample (these individuals are already choosing to visit the zoo) are already high elaborators for the focal topics and are at an elaboration threshold that can not be increased by a single talk. This is supported by the evidence that Wellington Zoo visitors reported similar elaboration levels of visitors to Weribee Open Range Zoo, Australia who experienced a single face-to-face programme (Weiler & Smith, 2009). However, elaboration was increased in Weribee visitors if they experienced additional programming. Combined with my results, this suggests that visitors attending a single face-to-face programme may exhibit an elaboration threshold and the content and delivering of a single programme may not be sufficient to increase elaboration above this threshold. Instead, to increase elaboration additional programming is required so visitors are exposed to the conservation behaviour and elaborative opportunities repeatedly. Again, the impact on zoo programming is discussed more below.

Implications and future recommendations for zoos

The use of social science research in New Zealand zoos has been limited (MacDonald & Linklater, 2006), and most zoos have focused on communicating broad environmental concepts and/or influencing environmental attitudes (Ogden et al., 2004), without a clear theory-driven approach towards changing visitors' conservation behaviours. My results show that visitors are receptive to and can recall specific messages about conservation behaviours.

My PhD thesis provides significant guidance to zoos for the design and implementation of more effective conservation communication campaigns. First and foremost, my results indicate that zoos should adopt a persuasive communication framework and invest more resources into researching their ability to communicate and elicit conservation behaviour in visitors. Current communication methods, such as signs, and the content may not be effective, and may be a misuse of resources. Future conservation persuasive campaigns should consider the following results:

- Communicate specific relevant conservation actions; do not communicate global conservation problems (Study 1). Visitors have a high awareness of global threats over local threats, possibly due to optimism bias. Pick specific locally relevant actions (Ballantyne & Packer, in press; Koepfler, Heimlich, & Yocco, 2010), as visitors already have a high knowledge of broad environmental concepts (Mony, 2007).

- Integrate psychological models such Theory of Planned Behaviour and the Elaboration Likelihood Model to develop more robust communication campaigns. There was no relationship between knowledge of the conservation behaviour and intention to engage in the behaviour (Study

2). Conservation communication in zoos often focuses on increasing visitor knowledge (e.g., Nakamichi, 2007) but this will have little impact on visitor conservation behaviour (Ogden et al., 2004). My results align with the larger body of environmental behaviour literature which finds knowledge is not related to behaviour (Bamberg & Möser, 2007).

- Zoos need to embrace their role as conservation advocates. Although almost all visitors recalled the specific conservation message when it was communicated, one-third of staff did not integrate a conservation message into their talks (Study 3). A major challenge is the reluctance of zoos to communicate specific conservation action to visitors for fear of detracting from the visitor experience, but advocating conservation behaviour to visitors actually improves the visitors experience (Smith et al., 2010). Thus, if the message is said, a large majority of visitors will hear it. Zoos simply need to say the message louder and clearer.

- Train staff to communicate and integrate conservation behaviours to increase the effectiveness of face-to-face interpretation; a drawback of (Mony, 2007). A training programme for staff increases message recall in visitors (Study 3).

- Conduct research to understand why staff (one-third in my study) are reluctant to communicate conservation messages investigate at the organisation and individual staff member level the possible conflicting priorities and values that lead to lack implementing the conservation communication objectives; investigate alternative methods to engage with staff members and ensure greater uptake and implementation of zoo's strategic decision to communicate conservation actions

- Conduct research to determine the underlying beliefs that may drive behaviour. Results from these studies should be the foundation for content of the messaging (Study 2). Beliefs that impact intention are not necessarily intuitive, and, in turn zoo staff should not be selecting the content of the conservation messages without data on the beliefs that drive conservation behaviour.

- Select novel behaviours to advocate to visitors in consultation with experts; well known behaviours such as reduce/reuse/recycle are less likely to be recalled (Study 3).

- The focus of behaviour change communication campaigns should be face-to-face (e.g., animal talks) and not via signs. Visitors do not read signs, but more than two-thirds of visitors recalled conservation messages advocated in animal talks (Study 3).

The above recommendations will assist zoos in developing more robust communication campaigns but continued research is required to elucidate some of the preliminary findings in this PhD.

Future research directions for zoos

The results of my thesis provide an excellent foundation for zoos to improve their effectiveness in communicating conservation behaviour to visitors. But there are several areas of future research that could further enhance conservation communication at zoos.

First, zoo visitors had a greater perception of global threats than local threats and this may be due to optimism bias (Weinstein, 1980). However, the key to solving conservation problems is to offer solutions, not more information and facts about the

problem (Ballantyne & Packer, in press).Thus an increase in awareness of local threats may not transmit into conservation action. Research needs to be conducted to better understand the relationship between optimism bias and facilitating conservation behaviours. There are two scenarios for communicating conservation messages and their relation to geographic proximity. First, because visitors have an increased awareness of global problems, communication campaigns could leverage this and advocate locally relevant actions that have a global effect (i.e., think global, act local) (Uzzell, 2000). This scenario utilises optimism bias to an advantage. Zoos could communicate a conservation behaviour that is conducted locally (e.g., purchase FSC wood products) after hearing a talk that links the actions to saving tigers in India (i.e., a global problem). However, in the long term low awareness of local problems may have detrimental effects on local political and social issues and thus the second scenario for conservation campaigns may focus on local problems and local solutions (Garcia-Mira & Real, 2005). This method will have to address and overcome optimism bias, which is a complex cognitive process (Pahl et al., 2005). In this instance, zoos could communicate a conservation behaviour that is conducted locally (e.g., purchase FSC wood products) after hearing a talk that links the action to saving New Zealand native animals such as kiwi and falcon (i.e., a local problem). These results would provide a better understanding to the motivation of visitors engaging in conservation behaviour and its link the global proximity of the threat and action.

Attendance at a single animal talk did not increase elaboration. Future research should focus on how to increase elaboration in visitors who attend a single talk. It is possible that the training programme was not effective in empowering staff to implement techniques that increase relevancy and elaboration. Thus, the study could be repeated with an observer in the audience who records the presenter's

communication skills, which can be compared with the visitor questionnaire answers. This would determine if the lack of increase in elaboration by visitors was due to staff communication abilities. If staff members are implementing the techniques as outlined in the training programme, then alternative methods to increase elaboration in a single 10 to 15 minute animal talk will need to be developed, researched, and implemented.

Alternatively, increasing elaboration in visitors may not require more intense development of single animal talks, but instead depend on increasing visitor exposure to the conservation behaviour (Smith et al., 2010). Simply the message highlighting the conservation behaviour may need to be repeated throughout the zoo in a variety of formats so visitors hear it repetitively. Repetition of messaging has been linked to cognitive processing (Petty & Wegener, 1999), but only tested in a single instance in zoos (Smith, Van Dijk, & Curtis, 2010). Future research could compare days with high message repetition to control days. A variety of interpretative techniques could be employed, with visitor exit questionnaires attempted to be designed to link message, message source(s), and visitor levels of elaboration, relevancy and satisfaction. These results would assist zoos in future programme development to ensure programming matches the objective of facilitating conservation behaviour in visitors.

Forty-eight percent of visitors do not attend talks at Wellington Zoo. Because signs at exhibits were ineffective as a method for communicating conservation messages, future research needs to address different communication methods to reach this population to ensure all zoo visitors are recipients of the conservation behaviour messages. The ineffectiveness of signs placed at exhibits to communicate conservation messages in my thesis is not indicative of signs overall being an

ineffective method of communication. Instead, the placement of the sign next to the exhibit may have placed the sign in competition with the live animal which resulted on 0% of visitors reading the signs. Future research should look at placing conservation also along paths when there are no other competing stimuli (i.e. animals) to detract from the visitor's attention (Thompson, 1990).

Finally, although I measured behavioural intention in Study 2 and elaboration and message recall in Study 3, which are both key precursors to behaviour change, I did not measure actual behaviour change after a zoo visit. In future studies, the link between behavioural intention and actual implementation of the conservation behaviour after a zoo visit will need to be established. Interestingly, only a few studies have implemented a behaviour change programme that measured actual behaviour (Fife-Schaw et al., 2007). A review by Hardeman (2002) found only 24 interventions based on TPB studies. Half of these studies were effective at changing intention and one-third resulted in behaviour change. Thus the last step in Weinrich's (1999) persuasive communication framework, implementation, is underutilised. Future research should examine the impact of zoo communication campaigns on long-term behaviour change at home.

Significant future effort will need to focus on the tenuous link between intention and implementation of the behaviour. As discussed above, there is a scarcity of research programmes that evaluate behaviour change campaigns, with a majority measuring behavioural intention and not behaviour. The minority of programmes that have measured behaviour found a significant decline from behavioural intention and behaviour. A possible reason for the lack of consistency between behavioural intention and behaviour may be social desirability, where respondents answering in a way they believe is desired by the researcher or others

(Bernard, 2006). Although, recent research shows social desirability has only a weak relationship on environmental attitudes (Milfont, 2008) the role social desirability moderated the relationship between intention and behaviour still needs to be investigated. Additionally, several methods should be explored to strengthen the relationship between intention and actual behaviour, such as incentives, memory devices, activity packs or email reminders (Anderson, Storksdieck, & Spock, 2007; Ballantyne & Packer, in press; Hughes & Carlsen, 2008; McKenzie-Mohr & Smith, 1999).

Conclusion

In conclusion, my thesis has significant implications for zoos, and how and what they communicate to zoo visitors. Because little social science research is being conducted in zoos, visitor perception of conservation issues and their cognitive capacity linked to conservation behaviour is rarely known. At the commencement of this thesis in 2006, no zoo in the 90 zoos who were members of Australasian Regional Association of Zoological Parks and Aquaria (ARAZPA) had a staff member who designed, implemented, and evaluated conservation persuasive communication campaigns. In 2011, there are now three zoos (Melbourne Zoo, Taronga Zoo, and Auckland Zoo) with a staff member whose primary objective is to foster conservation behaviour change in visitors. While this is an improvement, all zoos must increase their research and development of conservation behaviour campaigns if they are to meet their objectives of fostering conservation action and being leaders in the conservation field. To help guide this process, zoos can look to other successful persuasive communication campaigns that focus on environmental behaviours (Abraham & Michie, 2008) or public health (e.g., Snyder et al., 2004) as

they have a long history of researching and implementing successful behaviour change campaigns. While there is still significant scope for future research, my thesis provides essential formative information for the effective communication of conservation behaviours to zoo visitors.

Appendices

Appendix 1.1 Human ethics application and approval

<div align="center">

VICTORIA UNIVERSITY OF WELLINGTON
Te Whare Wananga o te Upoko o te Ika a Maui

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HUMAN ETHICS COMMITTEE

<div align="center">

Application for Approval of Research Projects
Please write legibly or type if possible. **Applications must be signed by supervisor (for student projects) and Head of School**

</div>

Note: The Human Ethics Committee attempts to have all applications approved within three weeks but a longer period may be necessary if applications require substantial revision.

1   NATURE OF PROPOSED RESEARCH:

(a) Staff Research ☐	Student Research ☒	(tick one)
(b) If Student Research	Degree PhD	Course Code Envi 690
(c) Project Title: Applying behaviour change theory to design more effective conservation communication		

2   INVESTIGATORS:

(a) Principal Investigator	
Name	Edy MacDonald
e-mail address	edy.macdonald@vuw.ac.nz
School/Dept/Group	School of Geography, Environment, and Earth Sciences

(b) Other Researchers Name	Position

(c) Supervisor (in the case of student research projects)

Mike Gavin	Lecturer

3 DURATION OF RESEARCH

(a) Proposed starting date for data collection   15 Ocotober 2007
>   (Note: that NO part of the research requiring ethical approval may commence prior to approval being
>   given)

(b)   Proposed date of completion of project as a whole   15 October 2008 (data collection);
PhD completed 2010

4 PROPOSED SOURCE/S OF FUNDING AND OTHER ETHICAL

CONSIDERATIONS

(a) Sources of funding for the project
>   Please indicate any ethical issues or conflicts of interest that may arise because of sources
of funding
>   e.g. restrictions on publication of results

n/a

(b) Is any professional code of ethics to be followed   **Y** ☐ **N** ☒

   If yes, **name**

(c) Is ethical approval required from any other body   **Y** ☐ **N** ☒
   If yes, name and indicate when/if approval will be given

5 DETAILS OF PROJECT

   Briefly Outline:

(a) The objectives of the project

To apply theories of behaviour change to conservation communication at an informal learning setting (i.e. zoo)

b) Method of data collection

3 questionnaires (all self report and anonymous). Questionnaire 3 will be mailed to pre-selected professionals and questionnaire 1 & 2 will be completed by randomly selected zoo visitors.

(c) The benefits and scientific value of the project

To assess if the effectiveness of communication (written and oral) methodology increases using psychological models

(d) Characteristics of the participants

Questionnaire 1 & 2 – Wellington Zoo visitors
Questionnaire 3 – environmental professionals

(e) Method of recruitment

Questionnaire 1 & 2 – randomly selected visitors at Wellington Zoo
Questionnaire 3 – mail survey following pre-survey letter

(f) Payments that are to be made/expenses to be reimbursed to participants

(g) Other assistance (e.g. meals, transport) that is to be given to participants

(h) Any special hazards and/or inconvenience (including deception) that participants will   encounter

none			

(i) State whether consent is for:

(i)	the collection of data	**Y** ⊠	**N** ☐
(ii)	attribution of opinions or information	**Y** ☐	**N** ⊠
(iii)	release of data to others	**Y** ☐	**N** ⊠
(iv)	use for a conference report or a publication	**Y** ⊠	**N** ☐
(v)	use for some particular purpose (specify)	**Y** ☐	**N** ⊠

PhD thesis

Attach a copy of any questionnaire or interview schedule to the application

(j) How is informed consent to be obtained (see sections 4.1, 4.5(d) and 4.8(g) of the Human Ethics Policy)

      (i) the research is strictly <u>anonymous,</u> an information sheet is supplied and informed consent is implied by voluntary participation in filling out a questionnaire for example (include a copy of the information sheet)   **Y** ⊠ **N** ☐

      (ii) the research is <u>not anonymous</u> but is confidential and informed consent will be obtained through a signed consent form (include a copy of the consent form and information sheet)
                                      Y ☐ **N** ⊠

      (iii) the research is <u>neither anonymous or confidential</u> and informed consent will be obtained through a signed consent form (include a copy of the consent form and information sheet)
                                        Y ☐ **N** ⊠

      (iv) informed consent will be obtained by some other method (please specify and provide details)
                                        Y ☐ **N** ⊠

With the exception of anonymous research as in (i), if it is proposed that written consent will not be obtained, please explain why

it is anonymous

(k)   If the research will not be conducted on a strictly anonymous basis state how issues of confidentiality of participants are to be ensured if this is intended. (See section 4..1(e) of the Human Ethics Policy). (e.g. who will listen to tapes, see questionnaires or have access to data). <u>Please ensure that you distinguish clearly between anonymity and confidentiality</u>. Indicate which of these are applicable.

    (i) access to the research data will be restricted to the investigator

                                  Y ☐ **N** ☒

    (ii) access to the research data will be restricted to the investigator and their supervisor (student research)
                        Y ☒ **N** ☐

    (iii) all opinions and data will be reported in aggregated form in such a way that individual persons or organisations are not identifiable
                Y ☒ **N** ☐

    (iv) Other (please specify)

(l)   Procedure for the storage of, access to and disposal of data, both during and at the conclusion of the research. (see section 4.12 of the Human Ethics Policy). Indicate which are applicable:

    (i) all written material (questionnaires, interview notes, etc) will be kept in a locked file and access is restricted to the investigator
           Y ☒ N ☐

    (ii) all electronic information will be kept in a password-protected file and access will be restricted to the investigator
                Y ☒ **N** ☐

    (iii) all questionnaires, interview notes and similar materials will be destroyed:
    (a) at the conclusion of the research
           Y ☐ **N** ☒

or (b)   3 years after the conclusion of the research   **Y** ☒ **N** ☐

    (iv) any audio or video recordings will be returned to participants and/or electronically wiped

☐   **N** ☐ **none collected**

(v) other procedures (please specify):

If data and material are not to be destroyed please indicate why and the procedures envisaged for ongoing storage and security

(m)   Feedback procedures (See section 7 of Appendix 1 of the Human Ethics Policy). You should indicate whether feedback will be provided to participants and in what form. If feedback will not be given, indicate the reasons why.

Preliminary report available on Wellington Zoo website. Participants can contact researcher for complete report or obtain through the VUW library.

(n)   Reporting and publication of results. Please indicate which of the following are appropriate. The proposed form of publications should be indicated on the information sheet and/or consent form.

(i) publication in academic or professional journals
Y ☒ **N** ☐

(ii) dissemination at academic or professional conferences   **Y** ☒   **N** ☐

(iii) deposit of the research paper or thesis in the University Library (student research)

Y ☒ **N** ☐

(iv) other (please specify)

Signature of investigators as listed on page 1 (including supervisors) and Head of School.

NB: All investigators and the Head of School must sign before an application is submitted for approval

Date 2 Oct 2007
Date 2 Oct 2007
Date

Head of School:

Date 3/10/2007

6

138

Appendix 1.2. Participant Information Sheet for Study 1.

VICTORIA UNIVERSITY OF WELLINGTON
Te Whare Wānanga o te Ūpoko o te Ika a Māui

Participant Information Sheet

PhD Thesis Research Project
Applying behaviour change theory to design more effective conservation communication

October 2007

Researcher: Edy MacDonald Telephone: (04) 803-0776 Supervisor: Mike Gavin Supervisor phone: (04) 463-5195 Email: edy.macdonald@vuw.ac.nz	School of Geography, Environment and Earth Sciences (SGEES) Victoria University of Wellington PO Box 600 Wellington 6140 (04) 463-5337

Dear Participant,

This questionnaire is part of a study that is being conducted to identify the conservation messages Wellington Zoo may promote to visitors over the next few years. You are being asked to take part in this questionnaire as part of research for a PhD thesis at Victoria University of Wellington.

The purpose of this short questionnaire is to find out what <u>you</u> think the major wildlife conservation issues are, globally and locally, and what actions the average Wellingtonian can take to help remedy them.

I am inviting you to participate because you visited Wellington Zoo today and data will be collected using the attached questionnaire you complete.

The project is a joint venture between Wellington Zoo and Victoria University of Wellington, School of Geography, Environment, and Earth Science.

Anonymous and Confidential
The information on the questionnaire is anonymous; you will not be asked your name or other sensitive information. The questionnaires are not coded and there is no means of identifying your responses. You will be asked to remove the questionnaire and insert it into the envelope yourself to ensure the researchers do not handle your questionnaire. All opinions will be reported in aggregate form in such a way that individuals will not be identifiable.

Storage and Disposal of Data
Access to the written and electronic material will be restricted to me. All written material will be kept in a locked file, and all electronic material will be password protected. At the conclusion of the research, questionnaires will be destroyed.
The results collected will be reported in my thesis and will be potentially presented in academic journals and conferences. The thesis will be submitted for marking to the School of Geography, Environment and Earth Sciences, Victoria University of Wellington.

Right of Withdrawal
During the course of completing the questionnaire, you have the right to withdraw from completing the questionnaire or refuse to answer any question(s) at any time. Once you have completed the questionnaire, you may request that your questionnaire be destroyed and not used in the study, for any reason. You have four weeks from today to request that your questionnaire be withdrawn from the study.

Provision of Feedback
You have the right to check the completed questionnaire and will be able to provide any corrections at any time, prior to final analysis of data. You have four weeks from today to request to view your questionnaire

Community Access to Research Results
Once the study is complete, a preliminary report will be available on the zoo website (www.wellingtonzoo.com). Furthermore, copies of the completed research output will be available from the School of Geography, Environment, and Earth Sciences Library and in the Victoria University of Wellington electronic database of theses.

If you have any questions about this project, please feel free to ask me now, or contact me, or my supervisor, Mike Gavin, from the contact details on the front of this sheet.

Thank you for participating.

Sincerely,

Edy MacDonald

Appendix 2.1. List of organisations that received questionnaire 1 in study 1.

Animals In School Education Trust
Biosecurity NZ
Department of Conservation
Environmental Risk Management
Authority
Federation of Maori Authorities Inc
Fish & Game
Forest & Bird

Friends of Tawa Bush Reserves
Friends of the Wellington Town Belt
Guardians of Pauatahanui Inlet
Greater Wellington Regional Council
Island Bay Marine Education Centre
Karori Wildlife Sanctuary
Landcare Research
Ministry of Agriculture and Fisheries
Maungatautari Ecological Island Trust
Ministry for the Environment
Museum of Wellington City & Sea
New Zealand Landcare Trust
New Zealand Veterinary Association
Nga Uruora - Kapiti Project Charitable
Trust
NZ Association for Environmental
Education

Office of the Minister of Conservation
Ornithological Society
Otari Bush Reserve

Pukaha Mount Bruce
Queen Elizabeth II National Trust
Royal Society of NZ - Wellington Branch
South Coast Gateway Charitable Trust
Society for the Protection and Care of
Animals
Staglands Wildlife Reserve and Café
Sustainable Wellington Net
Te Papa Museum of New Zealand
The Royal Society of New Zealand
Victoria University of Wellington
Waste Awareness Officer
Wellington Botanical Society
Wellington City Council
Whitireia Park Board
Wilderness Lodge Moeraki
World Wildlife Fund New Zealand

Appendix 2.2. Pre-questionnaire letter sent to environmental experts in study 1.

VICTORIA UNIVERSITY OF WELLINGTON
Te Whare Wānanga o te Ūpoko o te Ika a Māui

WELLINGTON ZOO

Dear <insert>,

A few days from now you will receive in the mail a request to fill out a brief questionnaire for an important research project being conducted by Wellington Zoo and Victoria University of Wellington, School of Geography, Environment, and Earth Science.

The purpose of this 10 minute questionnaire is to seek your opinion on what the most pressing wildlife conservation issues are today, what conservation actions people can take, and how to effectively convey information to Wellingtonians.

Using the information you provide, we will be creating an intensive conservation communication project at Wellington Zoo designed for our 170,000 annual visitors.

I am writing in advance because we have found many people like to know ahead of time that they will be contacted. The questionnaire is confidential. Once the study is complete, a report will be available to all participants.

Thank you for your time and consideration with this important research.

Sincerely,

Edy MacDonald

PhD candidate, *Victoria University of Wellington, School of School of Geography, Environment and Earth Sciences*
                    and
Manager Visitor Experience, *Wellington Zoo*

(04) 803-0776
edy.macdonald@vuw.ac.nz

Appendix 2.3. Questionnaire 1 for study 1. The first page was included when sent to environmental experts. For zoo visitors, questions 7-12 were replaced with alternative questions 7-13.

VICTORIA UNIVERSITY OF WELLINGTON
Te Whare Wānanga o te Ūpoko o te Ika a Māui

WELLINGTON Zoo

Dear <insert>,

We want your opinion on what the most pressing wildlife conservation issues are today, what conservation actions people can take, and how to effectively convey information to Wellingtonians.

This questionnaire is part of a study that is being conducted to identify the conservation messages the Wellington Zoo may promote to the visitors over the next few years.

The questionnaire is anonymous. Once the study is complete, a report will be available on the Zoo website no later than October 2008. If you would like to know more about the results or this study please contact us.

The project is a joint venture between Wellington Zoo and Victoria University of Wellington, School of Geography, Environment, and Earth Science.

THE QUESTIONAIRE WILL TAKE LESS THAN 10 MINUTES OF YOUR TIME.

Thank you for your time.

Edy MacDonald

PhD candidate, *Victoria University of Wellington, School of School of Geography, Environment and Earth Sciences*
                    and
Manager Visitor Experience, *Wellington Zoo*

(04) 803-0776
edy.macdonald@vuw.ac.nz

1. How much knowledge do you think the average Wellingtonian has about wildlife conservation problems?

□ significant knowledge
□ some knowledge
□ little knowledge
□ no knowledge

2. How much impact do you think the average Wellingtonian can have in solving wildlife conservation problems?

□ significant impact
□ some impact
□ little impact
□ no impact

3. In your opinion, what are the top three problems facing wildlife conservation <u>globally</u>?

a. _____

b. _____

c. _____

4. What actions would you suggest Wellingtonians could take to help solve the global wildlife conservation problems you stated in #3?

For the issue you wrote in space **A** above. _____

_____

For the issue you wrote in space **B** above._____

_____

For the issue you wrote in space **C** above._____

_____

5. In your opinion, what are the top three problems facing wildlife conservation locally (i.e., Wellington region)?
  (these may be the same or different to the global issues you stated in question 3. If they are the same, write "same as above")

a. _____

b. _____

c. _____

6. What actions would you suggest Wellingtonians take to help solve the local wildlife conservation problems you stated in #5
   (these may be the same or different to the global actions you stated in # 4. If they are the same, write "same as above")

    For the issue you wrote in space **A** above. _____

    _____

    For the issue you wrote in space **B** above._____

    _____

    For the issue you wrote in space **C** above._____

    _____

7. How would you best describe the organisation you work for (pick the one that applies the best):

    ☐ government
    ☐ academic
    ☐ non-governmental organization
    ☐ other (please describe _____)

8. How would you best describe the job you do (pick the one that applies the best):

    ☐ researcher
    ☐ educator
    ☐ policy/ advisor
    ☐ other (please describe _____)

9. How would you best describe your area of expertise:

please describe _____

10. What is your gender?
  ☐ male
  ☐ female

11. What is your age in years?

  ☐ 18-24
  ☐ 25-49
  ☐ 50-64
  ☐ 65 or over

12. What is your highest level of education? (if you are currently enrolled, check the box for the degree in which you are enrolled in)

  ☐ Fifth or sixth form qualification (School Certificate passes, National Certificate Level 1 or 2, Sixth From Certificate, or University Entrance prior to 1986)
  ☐ High school qualification (University Bursary Entrance Exam, scholarship, Higher School Certificate, National Certificate Level 3)
  ☐ Bachelor degree or vocational qualification (BA, BSc, New Zealand Diploma, New Zealand certificate, national diploma, Trade certificates, apprenticeships, national certificate, bridging certificates, foundation certificates)
  ☐ Higher degree (PhD, MA, post graduate diploma)

Thank you for your time.
If you would like to tell us anything else, please write it in the space below.

7. Not counting today, how many times have you visited Wellington Zoo in the last 5 years?

  ☐ none
  ☐ 1-3
  ☐ 4-10
  ☐ More than 10

8. Including yourself, how many people are in your group at Wellington Zoo?

  Number of adults (including yourself): _____

  Number of children (under 18): _____
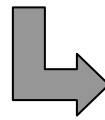
  Of the total children how many children are:

  Under 5 years_____

  5-11 years_____

  12-17 years _____

9. Do you have an annual pass or are a Zoo Crew member?

  ☐ Yes
  ☐ No

10. Where do you live?

  ☐ The Wellington region
  ☐ Another part of New Zealand
  ☐ Another country

11. What is your gender?

☐ Male

☐ Female

12. What is your age in years?

☐ 18-24

☐ 25-49

☐ 50-64

☐ 65 or over

13. What is your highest level of education? (if you are currently enrolled, check the box for the degree in which you are enrolled in)

☐ Fifth or sixth form qualification (School Certificate passes, National Certificate Level 1 or 2, Sixth From Certificate, or University Entrance prior to 1986)

☐ High school qualification (University Bursary Entrance Exam, scholarship, Higher School Certificate, National Certificate Level 3)

☐ Bachelor degree or vocational qualification (BA, BSc, New Zealand Diploma, New Zealand certificate, national diploma, Trade certificates, apprenticeships, national certificate, bridging certificates, foundation certificates)

☐ Higher degree (PhD, MA, post graduate diploma)

Thank you for your time.
If you would like to tell us anything else about your visit, please write it in the space below

Appendix 2.4. Categories used to classify conservation threats in study 1. Categories one to nine are based on World Conservation Union – Conservation Measurement Partnership (IUCN, 2006a). Category ten is generated from a coding frame (Bucy, 2005).

Level of Classification	Definition *Examples*	Exposition
1. Residential & Commercial Development	Threats from human settlements or other non-agricultural land uses with a substantial footprint	These are threats tied to a defined and relatively compact area, which distinguishes them from those in **4. Transportation & Service Corridors** which have a long narrow footprint, and **6. Human Intrusions & Disturbance** which do not have an explicit footprint.
1.1 Housing & Urban Areas List the type of development	Human cities, towns, and settlements including non-housing development typically integrated with housing *urban areas, suburbs, villages, ranchettes, vacation homes, shopping areas, offices, schools, hospitals, birds flying into windows*	This category obviously dovetails somewhat arbitrarily with **1.2 Commercial and Industrial Areas**. As a general rule, however, if people live in the development, it should fall into this category.
1.2 Commercial & Industrial Areas List the type of development	Factories and other commercial centers *military bases, factories, stand-alone shopping centers, office parks, power plants, train yards, ship yards, airports, landfills*	Shipyards and airports fall into this category, whereas shipping lanes and flight paths fall under **4. Transportation & Service Corridors.** Dams are NOT included here, rather they are in **7.2 Dams & Water Management/Use.**
1.3 Tourism & Recreation Areas List the type of development	Tourism and recreation sites with a substantial footprint *ski areas, golf courses, resorts, cricket fields, county parks, afghan goat polo fields, campgrounds*	There is a fine line between housing and vacation housing/resorts. Be careful not to confuse this category, which focuses on the habitat effects of recreation areas, with those in **6.1 Recreational Activities**, which focuses on the disturbance effects posed by recreation.
2. Agriculture & Aquaculture	Threats from farming and ranching as a result of agricultural expansion and intensification, including silviculture, mariculture and aquaculture	Threats resulting from the use of agrochemicals, rather than the direct conversion of land to agricultural use, should be included under **9.3 Agricultural & Forestry Effluents.**
2.1 Annual & Perennial Non-	Crops planted for food, fodder,	

Timber	fiber, fuel, or other uses	
List the specific crop(s) or farming system	*wheat farms, sugar cane plantations, rice paddies, hillside rice production, household swidden plots, banana or pineapple plantations, mango or apple orchards, olive or date groves, vineyards, oil palm plantations, tea or coffee plantations, mixed agroforestry systems, coca plantations*	
2.2 Wood & Pulp Plantations List the specific crop(s) or farming system	Stands of trees planted for timber or fiber outside of natural forests, often with non-native species *teak or eucalyptus plantations, loblolly pine silviculture, Christmas tree farms*	If it is one or a couple timber species that are planted on a rotation cycle, it belongs here. If it is multiple species or enrichment plantings in a quasi-natural system, it belongs in **5.3 Logging & Wood Harvesting.**
2.3 Livestock Farming & Ranching List the specific animals and/or farming/ranching system	Domestic terrestrial animals raised in one location on farmed or nonlocal resources (farming); also domestic or semi-domesticated animals allowed to roam in the wild and supported by natural habitats (ranching) *cattle feed lots, chicken farms, dairy farms, cattle ranching, goat, camel, or yak herding*	In farming, animals are kept in captivity; in ranching they are allowed to roam in wild habitats. If a few animals are mixed in a subsistence cropping system, it belongs in **2.1 Annual & Perennial Non-Timber Crops**. Forage of wild resources for stall-fed animals falls under **5.2 Gathering Terrestrial Plants.**
2.4 Marine & Freshwater Aquaculture List the specific animals and/or system	Aquatic animals raised in one location on farmed or non-local resources; also hatchery fish allowed to roam in the wild *shrimp or fin fish aquaculture, fish ponds on farms, hatchery salmon, seeded shellfish beds, artificial algal beds*	Farmed animals are kept in captivity; hatchery fish are put into wild habitats and are the aquatic equivalent of terrestrial ranching.
3. Energy Production & Mining	Exploring, developing, and producing renewable energy Threats from production of non-biological resources Exploring for, developing, and producing petroleum and other liquid hydrocarbons	Various forms of water use (for example, dams for hydro power) could also be put in this class, but these threats seemed more related to other threats that involve alterations to hydrologic regimes. As a result, they should go in **7.2 Dams & Water Management/Use.**

3.1 Oil & Gas Drilling List the specific resource(s) and production method	Exploring for, developing, and producing petroleum and other liquid hydrocarbons *oil wells, deep sea natural gas drilling*	Oil and gas pipelines go into **4.2 Utility & Service Lines**. Oil spills that occur at the drill site should be placed here; those that come from oil tankers or pipelines should go in **4. Transportation & Service Corridors** or in **9.2 Industrial & Military Effluents**, depending on your perspective.
3.2 Mining & Quarrying List the specific resource(s) and production method	Exploring for, developing, and producing minerals and rocks *coal strip mines, alluvial gold panning, gold mines, rock quarries, sand/salt mines, coral mining, deep sea nodules, guano harvesting, dredging outside of shipping lanes*	It is a judgement call whether deforestation caused by strip mining should be in this category or in **5.3 Logging & Wood Harvesting** - it depends on whether the primary motivation for the deforestation is access to the trees or to the minerals. Sediment or toxic chemical runoff from mining should be placed in **9.2 Industrial & Military Effluents** if it is the major threat from a mining operation. List the specific resource(s) and
3.3 Renewable Energy List the specific resource(s) and production method	Exploring, developing, and producing renewable energy *geothermal power production, solar farms, wind farms (including birds flying into windmills), tidal farms*	Hydropower should be put in **7.2 Dams & Water Management/Use.**
4. Transportation & Service Corridors	Threats from long narrow transport corridors and the vehicles that use them including associated wildlife mortality	This class includes transportation corridors outside of human settlements and industrial developments. These corridors create specific stresses to biodiversity including especially fragmentation of habitats and lead to other threats including farms, invasive species, and poachers.
4.1 Roads & Railroads List the specific type of road	Surface transport on roadways and dedicated tracks *highways, secondary roads, primitive roads, logging roads, bridges & causeways, road kill, fencing associated with roads, freight/passenger/mining*	Off-road vehicles are treated in the appropriate category in **6. Human Intrusions & Disturbance**. If there are small roads associated with a major utility line, they belong in **4.2. Utility & Service Lines.**

	railroads	
4.2 Utility & Service Lines List the specific type of utility line	Transport of energy & resources *electrical & phone wires, aqueducts, oil & gas pipelines, electrocution of wildlife*	Cell phone and other communication towers connected by small access roads belong here. If there are small utility lines using a road right of way, they belong in **4.1 Roads & Railroads.** Oil spills from pipelines should go in **9.2 Industrial & Military Effluents.**
4.3 Shipping Lanes List the specific type of shipping lane	Transport on and in freshwater and ocean waterways *dredging, canals, shipping lanes, ships running into whales, wakes from cargo ships*	This category includes dredging and other activities that maintain shipping lanes. Anchor damage from dive boats belongs in **6.1 Recreational Activities.**
4.4 Flight Paths List the specific type of path	Air and space transport *flight paths, jets impacting birds*	Airports fall into **1.2 Commercial & Industrial Areas**.
5. Biological Resource Use	Threats from consumptive use of "wild" biological resources including both deliberate and unintentional harvesting effects; also persecution or control of specific species	Consumptive use means that the resource is removed from the system or destroyed - multiple people cannot use the same resource, as they could under **6. Human Intrusions & Disturbance.** Threats in the class can affect both target species (harvest of desired trees or fish species) as well as "collateral damage" to non-target species (trees damaged by felling or fisheries bycatch) and habitats (coral reefs destroyed by trawling). Persecution/control involves harming or killing species because they are considered undesirable.
5.1 Hunting & Collecting Terrestrial Animals List the specific animal(s) and the method	Killing or trapping terrestrial wild animals or animal products for commercial, recreation, subsistence, research or cultural purposes, or for control/persecution reasons; includes accidental mortality/bycatch *bushmeat hunting, trophy hunting of lions, beaver trapping, butterfly collecting, honey or*	This category focuses on animals that primarily live in a terrestrial environment. There are obviously some species that live on the terrestrial/aquatic boundary. Hunting otters, beavers, amphibians, polar bears, penguins, waterfowl, and sea birds should (somewhat arbitrarily) go here. Hunting seals, whales and other marine mammals, and freshwater and marine turtles

	bird nest hunting, wolf control, pest *control, persecution of snakes because of superstition*	go in **5.4 Fishing & Harvesting Aquatic Resources.** Yes, most people "gather" honey, eggs, or insects or other slow moving targets, rather than "hunt" them. But it seems cleaner to keep all animal products as being hunted.
5.2 Gathering Terrestrial Plants List the specific product(s) harvested and the method used	Harvesting plants, fungi, and other non-timber/non-animal products for commercial, recreation, subsistence, research or cultural purposes, or for control reasons *wild mushroom collection, forage for stall fed animals, orchid* *collection, rattan harvesting, control of host plants to combat timber diseases*	This category focuses on plants, mushrooms, and other non-animal terrestrial species except trees which are treated in **5.3 Logging & Wood Harvesting.**
5.3 Logging & Wood Harvesting List the specific product(s) harvested and the method used	Harvesting trees and other woody vegetation for timber, fiber, or fuel *clear cutting of hardwoods, selective commercial logging of ironwood, pulp or woodchip operations, fuel wood collection, mangrove charcoal production*	Felling trees to clear agricultural land goes in the appropriate category in **2. Agriculture & Aquaculture.** If it is a few timber species that are planted on a rotation cycle, it belongs in **2.2 Wood & Pulp Plantations.** If it is multiple species or enrichment plantings in a quasi-natural system, it belongs here.
5.4 Fishing & Harvesting Aquatic Resources List the specific resource(s) and the method used	Harvesting aquatic wild animals or plants for commercial, recreation, subsistence, research, or cultural purposes, or for control/persecution reasons; includes accidental mortality/bycatch *trawling for tuna, blast fishing for grouper, spear fishing for sharks, shellfish harvesting, whaling, seal hunting, turtle egg collection, live coral collection, seaweed collection*	This category focuses on all kinds of species that are primarily found in an aquatic environment. There are obviously some species that live on the terrestrial/aquatic boundary. Hunting otters, beavers, amphibians, polar bears, penguins, waterfowl, and sea birds should (somewhat arbitrarily) go in **5.1 Hunting & Collecting Terrestrial Animals.** Hunting seals, whales and other marine mammals, and freshwater and marine turtles go here.
6. Human Intrusions & Disturbance	Threats from human activities that alter, destroy and disturb habitats and species associated with non-	Non-consumptive use means that the resource is not removed - multiple people can use the same resource (for

	consumptive uses of biological resources	example, birdwatching). These threats typically do not permanently destroy habitat except perhaps in extremely severe manifestations.
6.1 Recreational Activities List the specific activity	activity *off-road vehicles, motorboats, motorcycles, jet-skis, snowmobiles, ultralight planes, dive boats, whale watching, mountain bikes, hikers, cross-country skiers, hangliders, birdwatchers, scuba divers, pets brought into recreation areas, temporary campsites, caving, rock-climbing*	This category does not include work involving consumptive use of biodiversity - for example disturbance impacts from loggers or hunters would be in the appropriate category in **5. Biological Resource Use.** Vehicles and boats in established transport corridors go in **4. Transportation & Service Corridors.** The development of permanent recreational or tourist facilities (such as hotels and resorts) should be included under section **1.3 Tourism & Recreation Areas** rather than here.
6.2 War, Civil Unrest & Military Exercises List the specific	Actions by formal or paramilitary forces without a permanent footprint *armed conflict, mine fields, tanks & other military vehicles, training exercises & ranges, defoliation, munitions testing*	This category focuses on military activities that have a large impact on natural habitats, but are not permanently restricted to a single area. Permanent military bases should go under **1.2 Commercial & Industrial Areas**. Other military activities might best be assigned to other categories. For example, hunting of specific animals by soldiers living off the land fits under **5.1 Hunting & Collecting Terrestrial Animals.**
6.3 Work & Other Activities List the specific activity	People spending time in or traveling in natural environments for reasons other than recreation or military activities *law enforcement, drug smugglers, illegal immigrants, species research, vandalism*	This will probably not be a commonly used category.
7. Natural System Modifications	Threats from actions that convert or degrade habitat in service of "managing" natural or semi-natural systems, often to improve human	This category deals primarily with changes to natural processes such as fire, hydrology, and sedimentation, rather than land use. Thus it

	welfare	does not include threats relating to agriculture (which should be under **2. Agriculture & Aquaculture**), or infrastructure (**1. Residential & Commercial Development** and **4. Transportation & Service Corridors**)
7.1 Fire & Fire Suppression List the specific source of the fire or lack of fire	Suppression or increase in fire frequency and/or intensity outside of its natural range of variation *fire suppression to protect homes, inappropriate fire management, escaped agricultural fires, arson, campfires, fires for hunting*	This category focuses on the human activities that lead to either not enough fire or too much fire in the ecosystem in question. If fire escapes from established agricultural lands, it belongs here, if fire is used to clear new agricultural lands, it belongs in the appropriate category in **2. Agriculture & Aquaculture.** It also includes damaging "natural" fires in systems that have lost their natural resilience.
7.2 Dams & Water Management/Use List the specific source of the alteration	Changing water flow patterns from their natural range of variation either deliberately or as a result of other activities *dam construction, release of too little or cold water from dam operations, sediment control, change in salt regime, wetland filling for mosquito control, levees and dikes, surface water diversion, groundwater pumping, channelization, ditching,*	This category focuses on the human activities that lead to either not enough water or too much water in the ecosystem in question. Note that homogenizing flows to a constant level may be outside the "natural range of variation." Dredging belongs in **4.3 Shipping Lanes.**
7.3 Other Ecosystem Modifications List the specific source of the alteration	Other actions that convert or degrade habitat in service of "managing" natural systems to improve human welfare *land reclamation projects, abandonment of managed lands, riprap along shoreline, mowing grass, tree thinning in parks, beach construction, removal of snags from streams*	
8. Invasive & Other Problematic Species & Genes	Threats from non-native and native plants, animals, pathogens/microbes, or genetic materials that have or are predicted	We spent a lot of time talking to experts about the subdivisions and phrasing of this class. They would like to restrict the use of "invasive

	to have harmful effects on biodiversity following their introduction, spread and/or increase in abundance	species" to refer to nonnative species to keep things simple for policy makers. They recommended using the term "problematic native species" to refer to native species that have become superabundant or otherwise cause problems. If possible, also record the source of the invasive species and/or conditions that exacerbate their effect.
8.1 Invasive Non-Native/Alien Species List the specific plant, animal, or microbe	Harmful plants, animals, pathogens and other microbes not originally found within the ecosystem(s) in question and directly or indirectly introduced and spread into it by human activities *feral cattle, household pets, zebra mussels, Dutch elm disease or chestnut blight, Miconia tree, introduction of species for biocontrol, chytrid fungus affecting amphibians outside of Africa*	We are defining non-native/alien/exotic species as those brought either intentionally or accidentally by humans in the last 10,000 years.
8.2 Problematic Native Species List the specific plant, animal, or microbe	Harmful plants, animals, or pathogens and other microbes that are originally found within the ecosystem(s) in question, but have become "out-of-balance" or "released" directly or indirectly due to human activities *overabundant native deer, overabundant algae due to loss of native grazing fish, native plants that hybridize with other plants, plague affecting rodents*	It is a bit of a judgement call as to when a species becomes "problematic" (aka outside its natural range of variation). This category could probably be refined over time.
8.3 Introduced Genetic Material List the specific material or organism	Human altered or transported organisms or genes *pesticide resistant crops, hatchery salmon, restoration projects using non-local seed stock, genetically modified insects for biocontrol, genetically modified trees, genetically modified*	Hatchery fish are not necessarily invasive species, but they can upset the gene pool of native fish.

9. Pollution	Threats from introduction of exotic and/or excess materials or energy from point and nonpoint sources	This class deals with exotic or excess materials introduced to the environment. There is obviously a fine distinction when the pollution comes from another threat - for example, should an oil spill from a pipeline be classified as **4.2 Utility & Service Lines** or **9.2 Industrial & Military Effluents**? You will have to exercise some judgement here as to which represents the direct threat in your situation. In some cases, the source of the pollution may be either unknown or from a historical source (e.g., heavy metals buried in sediments). In these cases, you may have to make an educated guess as to which category to assign the pollutant.
9.1 Household Sewage & Urban Waste Water List the type, source, and if possible, the specific pollutants of concern	Water-borne sewage and non-point runoff from housing and urban areas that include nutrients, toxic chemicals and/or sediments *Discharge from municipal waste treatment plants, leaking septic systems, untreated sewage, outhouses, oil or sediment from roads, fertilizers and pesticides from lawns and golf-courses, road salt*	This category does not include major industrial discharge, which falls under **9.2 Industrial & Military Effluents**. It does include chemicals and next generation pollutants (caffeine or pharmaceuticals) in household waste streams. Technically, sewage from a pipe is "point-source" whereas a leaking septic system is "nonpoint-source." This category does not include agricultural runoff, which falls under **9.3 Agricultural & Forestry Effluents**.
9.2 Industrial & Military Effluents List the type, source, and if possible, the specific pollutants of concern	Water-borne pollutants from industrial and military sources including mining, energy production, and other resource extraction industries that include nutrients, toxic chemicals and/or sediments *toxic chemicals from factories, illegal dumping of chemicals, mine tailings, arsenic from gold mining, leakage from fuel tanks, PCBs in river sediments*	The source of the pollution is often far from the system – an extreme example are the heavy metals that migrating eels bring to the Sargasso Sea. Often, the pollutants only become a problem when they bioconcentrate through the food chain. Oil spills from pipelines should generally go here.

9.3 Agricultural & Forestry Effluents List the type, source, and if possible, the specific pollutants of concern	Water-borne pollutants from agricultural, silivicultural, and aquaculture systems that include nutrients, toxic chemicals and/or sediments including the effects of these pollutants on the site where they are applied *nutrient loading from fertilizer run-off, herbicide run-off, manure from feedlots, nutrients from aquaculture, soil erosion*	Wind erosion of agricultural sediments or smoke from forest fires goes in **9.5 Air-Borne Pollutants**.
9.4 Garbage & Solid Waste List the type, source, and if possible, the specific pollutants of concern	Rubbish and other solid materials including those that entangle wildlife *municipal waste, litter from cars, flotsam & jetsam from recreational boats, waste that entangles wildlife, construction debris*	This category generally is for solid waste outside of designated landfills - landfills themselves should go in **1.2 Commercial & Industrial Areas.** Likewise, toxins leaching from solid waste - for example, mercury leaking out of a landfill into groundwater - should go in **9.2 Industrial & Military Effluents**.
9.5 Air-Borne Pollutants List the type, source, and if possible, the specific pollutants of concern	Atmospheric pollutants from point to nonpoint sources *acid rain, smog from vehicle emissions, excess nitrogen deposition, radioactive fallout, wind dispersion of pollutants or sediments, smoke from forest fires or wood stoves*	It may be difficult to determine the sources of many atmospheric pollutants – and thus hard to take action to counter them.
9.6 Excess Energy List the type, source, and if possible, the specific pollutants of concern	Inputs of heat, sound, or light that disturb wildlife or ecosystems *noise from highways or airplanes, sonar from submarines that disturbs whales, heated water from power plants, lamps attracting insects, beach lights disorienting turtles, damaging atmospheric radiation resulting from ozone holes*	These inputs of energy can have strong effects on some species or ecosystems.
10. Geological Events		
10.1 Volcanoes	*eruptions, emissions of volcanic gasses*	
10.2 Earthquakes/Tsunamis	*earthquakes, tsunamis*	
10.3 Avalanches/Landslides	*avalanches, landslides, mudslides*	

11. Climate Change & Severe Weather Threats from long-term climatic changes which may be linked to global warming and other severe climatic/weather events that are outside of the natural range of variation, or potentially can wipe out a vulnerable species or habitat		
11.1 Habitat Shifting & Alteration	Major changes in habitat composition and location *sea-level rise, desertification, tundra thawing, coral bleaching*	
11.2 Droughts	Periods in which rainfall falls below the normal range of variation *severe lack of rain, loss of surface water sources*	
11.3 Temperature Extremes	Periods in which temperatures exceed or go below the normal range of variation *heat waves, cold spells, oceanic temperature changes, disappearance of glaciers/sea ice*	
11.4 Storms & Flooding	Extreme precipitation and/or wind events *thunderstorms, tropical storms, hurricanes, cyclones, tornados, hailstorms, ice storms or blizzards, dust storms, erosion of beaches during storms*	
12. Human Factors		
12.1 Social Factors	refers to human attitude, awareness, or education *ignorance, lack of education*	
12.2 Population Growth	human expansion with no specific mention of its effect *more houses, more people*	
12.3 Funding	money and resources (or lack of)	
12.4 Humans	includes "humans" or "mankind"	
13. Other		Not included in any other category

Appendix 2.5. Categories used to classify conservation actions in study 1 (IUCN, 2006b).

Level of Classification	Definition *Examples*	Exposition
1. Land/Water Protection	Actions to identify, establish or expand parks and other legally protected areas	This class contains all actions designed to directly protect biodiversity through parks, reserves, easements, or other similar means.
1.1 Site/Area Protection List the type of reserve	Establishing or expanding public or private parks, reserves, and other protected areas roughly equivalent to IUCN Categories I-VI *national parks, town wildlife sanctuaries, private reserves, tribally owned hunting grounds*	For many years, this was the primary action used by conservationists. The actual management of protected areas fall into **2.1 Site/Area Management**.
1.2 Resource & Habitat Protection List the type of protection	Establishing protection or easements of some specific aspect of the resource on public or private lands outside of IUCN Categories I-VI *easements, development rights, water rights, instream flow rights, wild & scenic river designation*	This category is for efforts to legally protect some part of the overall resource rather than the entire entity.
2. Land/Water Management	Actions directed at conserving or restoring sites, habitats and the wider environment	This class contains all actions involved in directly managing habitats.
2.1 Site/Area Management List the specific action	Management of protected areas and other resource lands for conservation *site design, demarcating borders, putting up fences, training park staff, control of poachers*	The establishment of protected areas goes into the appropriate category in **1. Land/Water Protection** – this category covers the actual management of the land or water.
2.2 Invasive/Problematic Species Control List the specific species and action	Controlling and/or preventing invasive and/or other problematic plants, animals, and pathogens *cutting vines off trees, preventing ballast water discharge*	This could arguably fit into **2.1 Site/Area Management** and others, but it is such a vital action it gets its own category.
2.3 Habitat & Natural Process Restoration	Enhancing degraded or restoring missing habitats and ecosystem functions; dealing with pollution	This category involves the restoration of degraded lands and natural processes as

List the specific restoration	*creating forest corridors, prairie re-creation, riparian tree plantings, coral reef restoration, proscribed burns, breaching levees, dam removal, fish ladders, liming acid lakes, cleaning up oil spills*	opposed to the protection of existing ones.
3. Species Management	Actions directed at managing or restoring species, focused on the species of concern itself	This class contains all actions involved in directly managing species. For you literal minded people interested in drawing black lines on gray areas, the difference between land/water management and species management is defined as follows: If the action targets 2 or fewer specific species, it's species; if it targets 3 or more, it's land/water. For example fish ladders aimed at one salmon species fit in species recovery; fish ladders aimed at several different species fit in natural process restoration.
3.1 Species Management List the specific species and action	Managing specific plant and animal populations of concern *harvest management of wild mushrooms, culling buffalo to keep population size within park carrying capacity, controlling fishing effort*	Note that culling deer to save a rare plant that they are eating is **2.2 Invasive/Problematic Species Control** whereas culling deer to manage the deer population itself fits here.
3.2 Species Recovery List the specific species and action	Manipulating, enhancing or restoring specific plant and animal populations, vaccination programs *manual pollination of trees, artificial nesting boxes/platforms, clutch manipulation, supplementary feeding, disease/pathogen/parasite management*	
3.3 Species Re-Introduction	Re-introducing species to places where they formally occurred or benign introductions	Re-introductions are to areas where the species formerly occurred following IUCN re-introduction guidelines.

List the specific species and action	*re-introduction of wolves*	Benign introductions are to areas outside of the species' historic range, but within an appropriate habitat and done deliberately for conservation reasons.
3.4 *Ex-situ* Conservation List the specific species and action	Protecting biodiversity out of its native habitats *captive breeding of gorillas, artificial propagation of orchids, genebanking*	This is one of the key strategies practiced by zoos and aquaria interested in conservation.
4. Education & Awareness	Actions directed at people to improve understanding and skills, and influence behavior	This class obviously overlaps a bit with **7. External Capacity Building**; actions in this class tend to target individuals rather than organizations.
4.1 Formal Education List the specific type of education	Enhancing knowledge and skills of students in a formal degree program *public schools, colleges & universities, continuing education*	
4.2 Training List the specific type of training and target audience	Enhancing knowledge, skills and information exchange for practitioners, stakeholders, and other relevant individuals in structured settings outside of degree programs *monitoring workshops or training courses in reserve design for park managers, learning networks or writing how-to manuals for project managers, stakeholder education on specific issues*	This category refers to training outside of formal degree programs.
4.3 Awareness & Communications List the specific type of awareness raising	Raising environmental awareness and providing information through various media or through civil disobedience *radio soap operas, environmental publishing, web blogs, puppet shows, door-to-door canvassing, tree sitting, protest marches*	This is a large category that involves many different efforts to raise awareness about conservation issues in specific stakeholder groups and the general public. There is a grey area between general awareness campaigns which belong in this category versus campaigns to enact specific legislation which belong in **5. Law & Policy**. Many mainstream conservation organizations do not use the more disruptive and

		illegal forms of moral confrontation -- inclusion of them in an effort to make this taxonomy comprehensive should by no means constitute an endorsement of them.
5. Law & Policy	Actions to develop, change, influence, and help implement formal legislation, regulations, and voluntary standards	This class contains a series of strategies aimed at using government powers at all levels to protect biodiversity. There is a sequence embedded in this class that involves enacting or changing the legislation, policy, or standard and then promoting compliance or enforcement of it. Some organizations do both, others only one or the other.
5.1 Legislation **List the level and type of legislation and the specific action being taken**	Making, implementing, changing, influencing, or providing input into formal government sector legislation or polices at all levels: international, national, state/provincial, local, tribal Global: promoting conventions on biodiversity, wildlife trade laws like CITES National: work for or against government laws such as the US Endangered Species Act, influencing legislative appropriations State/Provincial: state ballot initiatives, providing data to state policy makers, developing pollution permitting systems, dam relicensing Local: developing zoning regulations, countryside laws, species protection laws, hunting bans Tribal: creating tribal laws	Public legislation refers to the official legal code governing society – what some people refer to as "hard law."
5.2 Policies & Regulations **List the type of policy or regulation and the specific action being taken**	Making, implementing, changing, influencing, or providing input into policies and regulations affecting the implementation of laws at all levels: international, national, state/provincial, local/community, tribal Input into agency plans regulating certain species or resources, working with local governments or communities to implement	Policies and regulations are how legislation gets implemented – what some people refer to as "soft law." This is a relatively narrow definition of the word "policy."

	zoning regulations; promoting sustainable harvest of timber on state forest lands	
5.3 Private Sector Standards & Codes **List the type of standard or**	Setting, implementing, changing, influencing, or providing input into voluntary standards & professional codes that govern private sector practice Marine & Forest Stewardship Councils, Conservation Measures Partnership (CMP) Open Standards, corporate adoption of forestry best management practices, sustainable grazing by a rancher	These are codes of practice that are adopted by an organization or industry on a voluntary (as opposed to mandated) basis. Mandatory laws and regulations fall under 5.1 Legislation or 5.2 Policies & Regulations.
5.4 Compliance & Enforcement **List the action**	Monitoring and enforcing compliance with laws, policies & regulations, and standards & codes at all levels Water quality standard monitoring, initiating criminal and civil litigation	Laws, policies, regulations, and standards are useless if they are not implemented and enforced. Some organizations merely try to monitor compliance whereas others have the power of enforcement.
6. Livelihood, Economic & Other Incentives	Actions to use economic and other incentives to influence behavior	This class of actions has been gaining in popularity in the past few years.
6.1 Linked Enterprises & Livelihood Alternatives **List the type**	Developing enterprises that directly depend on the maintenance of natural resources or provide substitute livelihoods as a means of changing behaviors and attitudes ecotourism, non-timber forest product harvesting, harvesting wild salmon to create value for wild population	In linked enterprises, the health of the enterprise directly depends on the health of the biodiversity - for example, a community homestay that depends on tourists coming to visit an intact coral reef. Livelihood alternatives are established to move people from destructive actions to non-destructive ones -- for example, a community homestay that keeps the operator from working as a logger.
6.2 Substitution **List the type**	Promoting alternative products and services that substitute for environmentally damaging ones Viagra for rhino horn, farmed salmon as a replacement for pressure on wild populations, promoting recycling and use of recycled materials	This category involves developing products and services explicitly to remove pressure from biodiversity.

6.3 Market Forces **List the type**	Using market mechanisms to change behaviors and attitudes certification, positive incentives, boycotts, negative incentives, grass & forest banking, valuation of ecosystem services such as flood control	This category includes both positive and negative incentives for conservation. This category deals with incentive-based standards; non-incentive standards go in 5.2 Policies & regulations.
6.4 Conservation Payments **List the type**	Using direct or indirect payments to change behaviors and attitudes quid-pro-quo performance payments, resource tenure incentives	This category involves a direct payment for conservation behaviors.
6.5 Non-Monetary Values **List the type**	Using intangible values to change behaviors and attitudes spiritual, cultural, links to human health	This category cuts across the others in this class, but involves those cases where the incentives are not financial.
7. External Capacity Building		As discussed in greater detail in the introduction, every organization has to develop its own capacity to design, implement, manage, and learn from its work. These basic functions should not be considered part of this classification. However, if a group does this type of work to help partner organizations, then it should be part of this class.
7.3 Institutional & Civil Society Development **List the type**	Creating or providing non-financial support & capacity for non-profit, government agencies, communities, and for-profits creating new local land trusts, providing circuit riders to help develop organizational capacity	Building conservation institutions.
7.3 Alliance and Partnership Development **List the type**	Forming and facilitating partnerships, alliances, and networks of organizations country networks, Conservation Measures Partnership (CMP)	Promoting cross-organizational informational sharing, learning, and collaboration.
7.3 Conservation Finance **List the type**	Raising and providing funds for conservation work private foundations, debt-for-nature swaps	Providing the financial resources for conservation.

Appendix 3.1. Sustainable purchasing of wood (Forest Stewardship Council, 2007).

Globally, harvesting of indigenous forests, especially in the tropics and northern Asia, has a huge impact on the natural environment, destroying the habitat of endangered species, and contributing to climate change.

FSC 10 PRINCIPLES (abridged):
1. Forest management shall respect all applicable laws of the country in which they occur, and international treaties and agreements to which the country is a signatory.
2. Long term tenure and use rights to the land and forest resources shall be clearly defined documented and legally established.
3. The legal and customary rights of indigenous peoples to own use and manage their lands, territories, and resources shall be recognised and respected.
4. Forest management operations (FMO) shall maintain or enhance the long-term social and economic well being of forest workers and local communities.
5. FMO shall encourage the efficient use of the forests multiple products and services to ensure economic viability and a wide range of social benefits
6. Forest management shall conserve biological diversity and its associated values, water resources, soils, and unique and fragile ecosystems and landscapes, and, by so doing, maintain the ecological functions and the integrity of the forest.
7. Appropriate management plans will be written, implemented and kept up to date.
8. Appropriate monitoring shall be conducted.
9. Management activities in high conservation forests shall maintain or enhance the attributes, which define such forests.
10. While plantations can provide an array of social and economic benefits, and can contribute to satisfying the worlds needs for forest products, they should compliment the management of, reduce pressures on, and promote the restoration and conservation of natural forests.

Appendix 3.2. Elicitation questionnaire for cats in at nig

Date:	
Time:	

Do you currently have a cat in your house?   □ yes   □ No
Have you ever lived in a house with a cat?   □ yes   □ No
Do you keep your cat inside at night?   □ yes   □ No

If you do not currently have a cat, answer the following questions as if you did have a cat.

<u>Attitudes</u>
What do you believe are the advantages or good things of keeping a cat inside at night?

What do you believe are the disadvantages or bad things of keeping a cat inside at night?

<u>Norms</u>
Who (individuals or groups) do you think would support or approve of you of keeping a cat inside at night?
   o How much does their opinion matter to you?

Who (individuals or groups) do you think would object or disapprove of you of keeping a cat inside at night?
   o How much does their opinion matter to you?

<u>Perceived Behaviour Control</u>
How difficult is it to keep your cat inside at night?

What factors or circumstances would enable you to keep a cat inside at night?

What factors or circumstances would make it impossible to keep a cat inside at night?

How confident are you that you could keep you cat inside at night?

Is keeping the cat inside at night up to you?

Are there any factors beyond your control that would effect you being able to keep the cat in at night?

<u>Demographics</u>
Where do you live?
  ☐ The Wellington region
  ☐ Another part of New Zealand
  ☐ Another country

What is your gender?
  ☐ Male
  ☐ Female

What is your age in years?
  ☐ 18-24
  ☐ 25-49
  ☐ 50-64
  ☐ 65 or over

Appendix 3.3. Elicitation questionnaire for purchasing of FSC produc

In the last 12 months have you bought any raw timber?   □ yes   □ no

In the last 12 months have you bought any new furniture made from wood?   □ yes   □ no

Do you know what this symbol means? (show A4 picture)   □ yes   □ no
        If Yes, can you me what it means _____

Have you ever heard of FSC (Forest Stewardship Council)?   □ yes   □ no

If "No", FSC is a label that allows consumers worldwide to recognize products that support the growth of responsible forest management worldwide[3]. It means that the wood product with this symbol (either gown in NZ or elsewhere in the world) adheres to social, economical, and environmental standards.
        Do you get the general idea?
        □ yes   □ No

Attitudes
What do you believe are the advantages or good things of buying New Zealand pine (FSC)?

What do you believe are the disadvantages or bad things of buying New Zealand pine (FSC)?

Norms
Who (individuals or groups) do you think would support or approve of you of buying New Zealand pine (FSC)?
        o   How much does their opinion matter to you?

Who (individuals or groups) do you think would object or disapprove of you buying New Zealand pine(FSC)?
        o   How much does their opinion matter to you?

Perceived Behaviour Control
How difficult is it to buy New Zealand pine(FSC)?

What factors or circumstances would enable you to buy New Zealand pine(FSC)?

What factors or circumstances would make it impossible to buy New Zealand pine(FSC)?

How confident are you that you could buy FSC?

Is buying New Zealand pine (FSC) up to you?

Are there any factors beyond your control that would effect you being able to buy New Zealand pine(FSC)?

Demographics
Where do you live?
        □   The Wellington region
        □   Another part of New Zealand
        □   Another country

What is your gender?
        □   Male
        □   Female

---

[3] http://www.fsc.org/en/about

What is your age in years?

☐ 18-24
☐ 25-49
☐ 50-64
☐ 65 or over

Appendix 3.4. Questionnaire for the intention to bring cats in at night based on the theory of planned behaviour.

WE NEED YOUR OPINION
About a conservation issue

The purpose of this short questionnaire is to find out how you feel about a conservation issue. Please know that there are no right or wrong answers to the questions, nor are some responses better or worse than others. We simply want to know your honest opinions about your experiences. It will assist us in future planning of conservation messages at the zoo.

THE QUESTIONNAIRE WILL TAKE LESS THAN 5 MINUTES OF YOUR TIME.

Thank you!

WELLINGTON
ZOO

VICTORIA UNIVERSITY OF WELLINGTON
Te Whare Wānanga o te Ūpoko o te Ika a Māui

Instructions (do not answer these example questions)

For each question, circle the number that best describes your opinion.

Example: How do you feel when it rains?

If you feel very sad when it rains you would circle a mark at the following:

When it rains I feel   happy 1   2   3   4   5   6   (7)   sad

If you feel neither sad nor happy when it rains you would circle a mark at the following:

When it rains I feel   happy 1   2   3   (4)   5   6   7   sad

A. Do you currently have a cat in your house?

       ☐ yes   ☐ no

B. Have you ever lived with a cat in your house?

       ☐ yes   ☐ no

NOTE: If you do not currently have a cat, answer the following questions as if you did have a cat.

C. What best describes what you did with your cat at night in the last month?

    ☐ the cat stayed outside all night

    ☐ we have a cat flap/window/door and the cat could come and go as it wanted during the night

    ☐ the cat was locked inside all night

D. Why did you do this?

_____

_____

_____

E. How often do you do the above with your cat?

It varies from night to night	1	2	3	4	5	6	7	We do the same thing every night

Please circle the number that best represents your answer to the question. Note that some questions appear similar, but they are addressing slightly different things.

In answering the questions, all night is considered from dusk to dawn.

1	If I bring my cat inside all night, it will be good for the cat's health	Unlikely	1	2	3	4	5	6	7	Likely
2	Keeping my cat inside all night will protect the native wildlife	Unlikely	1	2	3	4	5	6	7	Likely
3	If my cat is inside all night, it will wake me	Unlikely	1	2	3	4	5	6	7	Likely

			1	2	3	4	5	6	7	
4	At night time, my cat likes to come inside	Unlikely	1	2	3	4	5	6	7	Likely
5	My cat will urinate/defecate inside my house if kept inside all night	Unlikely	1	2	3	4	5	6	7	Likely
6	Cats hunt at night to follow their natural instincts	Unlikely	1	2	3	4	5	6	7	Likely
7	I plan to keep my cat inside all night this coming month	Strongly agree	1	2	3	4	5	6	7	Strongly disagree
8	I am	Less likely	1	2	3	4	5	6	7	More likely
	to keep my cat inside all night if it uses the litter box correctly									
9	I am	Less likely	1	2	3	4	5	6	7	More likely
	to keep my cat inside all night if my house is set up to keep my cat inside									
10	I am	Less likely	1	2	3	4	5	6	7	More likely
	to keep my cat inside all night if they liked staying inside all night									
11	I am	Less likely	1	2	3	4	5	6	7	More likely
	to keep my cat inside all night if I could get my cat inside									
12	Overall I think that keeping my cat inside all night is	Unpleasant	1	2	3	4	5	6	7	Pleasant
13	Overall I think that keeping my cat inside all night is	Harmful	1	2	3	4	5	6	7	Beneficial
14	People in my household think it is a good thing to keep my cat inside all night	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
15	Whether or not I keep my cat inside all night is up to me	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
16	For me, protecting native wildlife is	Extremely undesirable	1	2	3	4	5	6	7	Extremely desirable

17	Caring for my cat's health is	Extremely undesirable	1	2	3	4	5	6	7	Extremely desirable
18	I intend to keep my cat inside all night this coming month	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
19	I can control keeping my cat inside all night	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
20	Conservation organisations would	Disapprove	1	2	3	4	5	6	7	Approve

of me keeping my cat inside all night

21	The SPCA would	Disapprove	1	2	3	4	5	6	7	Approve

of me keeping my cat inside all night

22	Overall I think that keeping my cat inside all night is	The wrong thing to do	1	2	3	4	5	6	7	The right thing to do
23	My house is set up to keep my cat inside all night	Unlikely	1	2	3	4	5	6	7	Likely
24	I will talk to people who are important to me about keeping cats in at night over the next month	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
25	My cat urinating/defecating inside my house is	Extremely undesirable	1	2	3	4	5	6	7	Extremely desirable
26	Having my cat wake me at night is	Extremely undesirable	1	2	3	4	5	6	7	Extremely desirable
27	Doing what my veterinarian thinks I should do is important to me	Not at all Important	1	2	3	4	5	6	7	Extremely important
28	Doing what the SPCA thinks I should do is important to me	Not at all important	1	2	3	4	5	6	7	Extremely important
29	I am confident I could keep my cat inside all night	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
30	My cat likes to stay inside all night	Unlikely	1	2	3	4	5	6	7	Likely

31	Overall I think that keeping my cat inside all night is	Unenjoyable	1	2	3	4	5	6	7	Enjoyable
32	Keeping my cat inside all night is difficult	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
33	People like me keep their cat inside at night	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
34	Having my cat inside at night is	Extremely undesirable	1	2	3	4	5	6	7	Extremely desirable
35	Letting my cat follow its natural instincts is	Extremely undesirable	1	2	3	4	5	6	7	Extremely desirable
36	My veterinarian would	Disapprove	1	2	3	4	5	6	7	Approve

of me keeping my cat inside all night

37	Doing what conservation organisations think I should do is important to me	Not at all important	1	2	3	4	5	6	7	Extremely important
38	I will try to keep my cat inside all night this coming month	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
39	People who are important to me keep their cat inside all night	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
40	My house is set up to keep my cat inside at night	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
41	My cat will use a litter box when kept inside all night	Unlikely	1	2	3	4	5	6	7	Likely
42	I can get my cat inside at night	Unlikely	1	2	3	4	5	6	7	Likely

43. Do you belong or support any of the following conservation or animal organisations?

Organisation	Yes	No
SPCA	☐	☐
Department of Conservation	☐	☐
Forest and Bird	☐	☐
Wellington Zoo	☐	☐
Karori Wildlife Sanctuary	☐	☐
World Wildlife Fund (WWF)	☐	☐
Restoration/planting group	☐	☐
Fish and Game	☐	☐
Deerstalkers' Association	☐	☐
Ornithological society/bird watching group	☐	☐
Other: _____	☐	☐
Other: _____	☐	☐
Other: _____	☐	☐
Other: _____	☐	☐

In this section, we want to find out about your trip to Wellington Zoo.

mark the box that corresponds to your answer

---

44.   Not counting today, how many times have you visited Wellington Zoo in the last 5 years?

☐ none

☐ 1-3

☐ 4-10

☐ More than 10

45. Including yourself, how many people are in your group at Wellington Zoo?

Number of adults (including yourself): _____

Number of children (under 18): _____
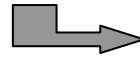
Of the total children how many children are:

Under 5 years_____

5-11 years_____

12-17 years _____

46. Do you have an annual pass or are a Zoo Crew member?

☐ Yes

☐ No

47. Where do you live?

☐ The Wellington region

☐ Another part of New Zealand

☐ Another country

What region?

_____

48. What is your gender?

☐ Male

☐ Female

49. What is your age in years?

☐ 18-24

☐ 25-49

☐ 50-64

☐ 65 or over

50. What is your highest level of education? (if you are currently enrolled, check the box for the degree in which you are enrolled in)

☐ Fifth or sixth form qualification (School Certificate passes, National Certificate Level 1 or 2, Sixth From Certificate, or University Entrance prior to 1986)

☐ High school qualification (University Bursary Entrance Exam, scholarship, Higher School Certificate, National Certificate Level 3)

☐ Bachelor degree or vocational qualification (BA, BSc, New Zealand Diploma, New Zealand certificate, national diploma, Trade certificates, apprenticeships, national certificate, bridging certificates, foundation certificates)

☐ Higher degree (PhD, MA, post graduate diploma)

Thank you for your time.
If you would like to tell us anything else about your visit, please write it in the space below

Appendix 3.5. Key to cats in at night questionnaire questionnaire. For the elicited beliefs statements, the statistics presented (i.e., mean, SD, and correlation) are based on the product of the belief times the outcome evaluation. For the two constructs that were significant to intention (attitude and norm) the correlation and standard deviation between the belief and intention is reported.

Past Behaviour		Question		
Do you currently have a cat in your house?		A		
Have you ever lived with a cat in your house?		B		
What best describes what you do with your cat at night?		C		
Why did you do this?		D		
How often do you do the above with your cat?		F		
Attitude	**Construct measured**	**Question**	**Mean (SD)**	**Correlation to Intention**
Overall I think that keeping my cat inside all night is pleasant/unpleasant	Global measure	12	4.726 (1.954)	.675**
Overall I think that keeping my cat inside all night is harmful/beneficial	Global measure	13	5.000 (1.650)	.599**
Overall I think that keeping my cat inside all night is the wrong/right thing to do	Global measure	22	5.009 (1.940)	.659**
Overall I think that keeping my cat inside all night is unejoyable/enjoyable	Global measure	31	4.575 (1.826)	.697**
If I bring my cat inside all night, it will be good for the cat's health	Behaviour belief	1	3.406 (2.106)	.366**
Keeping my cat inside will protect the native wildlife	Behaviour belief	2	5.557 (1.837)	.427**
If my cat is inside all night, it will wake me	Behaviour belief	3	3.576 (2.406)	.292**
At night time, my cat likes to come inside	Behaviour belief	4	5.349 (1.852)	.576**
My cat will urinate/defecate inside my house if kept inside all night	Behaviour belief	5	3.094 (2.340)	.393**
Cats hunt at night to follow their natural instincts	Behaviour belief	6	5.849 (1.712)	-.112
For me, protecting native wildlife is undesirable/desirable	Outcome evaluation	16		
Caring for my cat's health is extremely undesirable/desirable	Outcome evaluation	17		
My cat urinating/defecating inside my house is extremely undesirable/desirable	Outcome evaluation	25		
Having my cat wake me all night is extremely undesirable/desirable	Outcome evaluation	26		
Having my cat inside all night is extremely undesirable/desirable	Outcome evaluation	34		
Letting my cat follow its natural instincts is extremely undesirable/desirable	Outcome evaluation	35		
Norm				
People who are important to me	Global measure	39	3.915	.473**

keep their cat inside all night	-descriptive		(1.826)	
People in my household think it is a good thing to keep my cat inside all night	Global measure - injunctive	14	4.396 (2.003)	.565**
People like me keep their cat inside all night	Global measure - descriptive	33	4.076 (1.666)	.451**
Conservation organisations would disapprove/approve of me keeping my cat inside all night	Normative belief	20	5.830 (1.564)	.199*
The SPCA would disapprove/approve of me keeping my cat inside all night	Normative belief	21	5.255 (1.898)	.417**
My veterinarian would disapprove/approve of me keeping my cat inside all night	Normative belief	36	4.906 (1.653)	.547**
Doing what conservation organisations think I should do is important to me	Motivation to comply	37		
Doing what my veterinarian thinks I should do is important to me	Motivation to comply	27		
Doing what the SPCA thinks I should do is important to me	Motivation to comply	28		
Perceived Behaviour Control				
Whether or not I keep my cat inside all night is up to me	Global measure - control	15	5.179 (1.891)	
I can control keeping my cat inside all night	Global measure - control	19	5.462 (2.020)	
Keeping my cat inside all night is difficult	Global measure – self efficacy	32	4.387 (2.059)	
I am confident I could keep my cat inside all night	Global measure – self efficacy	29	5.189 (1.913)	
My house is set up to keep my cat inside all night	Control belief strength	23	4.519 (2.126)	
My cat will use a litter box when kept inside all night	Control belief strength	41	4.293 (2.350)	
I can get my cat inside all night	Control belief strength	42	5.425 (1.872)	
My cat likes to stay inside all night	Control belief strength	30	4.642 (2.134)	
I am more/less likely to keep my cat inside all night if it uses the litter box correctly	Control belief power	8		
I am more/less likely to keep my cat inside all night if my house is set up to keep my cat inside	Control belief power	9		
I am more/less likely to keep my cat inside all night if they liked staying inside all night	Control belief power	10		
I am more/less likely to keep my cat inside all night if I could get my cat inside	Control belief power	11		
Intention				
I intend to keep my cat inside all night this month		18	4.047 (2.416)	
I will try to keep my cat inside all night this month		38	4.349 (2.416)	
I plan to keep my cat inside all night this month		7	4.443 (2.208)	
I will talk to people who are important		24	4.311	

to me about keeping cats in at night over the next month			(2.153)	
Group Membership				
Do you belong or support any of the following conservation or animal organisations?		43		

* p < .05
** p < .01

Appendix 3.6. Questionnaire for intention to purchase FSC products.

<div style="border: 1px solid black; background-color: #cccccc; text-align: center;">

WE NEED YOUR OPINION
About a conservation issue

</div>

The purpose of this short questionnaire is to find out how you feel about a conservation issue. Please know that there are no right or wrong answers to the questions, nor are some responses better or worse than others. We simply want to know your honest opinions about your experiences. It will assist us in future planning of conservation messages at the zoo.

THE QUESTIONNAIRE WILL TAKE LESS THAN 5 MINUTES OF YOUR TIME.

Thank you!

WELLINGTON ZOO

VICTORIA UNIVERSITY OF WELLINGTON
Te Whare Wānanga o te Ūpoko o te Ika a Māui

Instructions (do not answer these example questions)

For each question, circle the number that best describes your opinion.

Example: How do you feel when it rains?

If you feel very sad when it rains you would circle a mark at the following

When it rains I feel   happy   1   2   3   4   5   6   ⑦   sad

If you feel neither sad nor happy when it rains you would circle a mark at the following

When it rains I feel   happy   1   2   3   ④   5   6   7   sad

A. In the last 12 months have you bought any raw timber?

        ☐ yes   ☐ no

B. In the last 12 months have you bought any <u>new</u> furniture made from wood?

        ☐ yes   ☐ no

C. Do you know what this symbol means? — — — — — — →

        ☐ yes   ☐ no

D. Have you ever heard of the Forest Stewardship Council (FSC)?

        ☐ yes   ☐ no

FSC is a label on timber and wood products that means that the wood product (either grown in NZ or elsewhere in the world) adheres to social, economical, and environmental standards.

There are 77 New Zealand companies, primarily pine foresters, that are FSC certified.

The symbol can appear on raw timber or a finished product (e.g. a bed, desk,

E. In the last 12 months have you purchased any FSC products?

        ☐ yes   ☐ no   ☐ I don't know

Please circle the number that best represents your answer to the question. Note that some questions appear similar, but they are addressing slightly different things.

1	If I buy FSC products, I will help the New Zealand economy	Unlikely	1	2	3	4	5	6	7	Likely
2	Buying FSC products will protect the environment	Unlikely	1	2	3	4	5	6	7	Likely

			1	2	3	4	5	6	7	
3	If I buy FSC products it will reduce carbon emissions	Unlikely	1	2	3	4	5	6	7	Likely
4	FSC products look just as good as non FSC products	Unlikely	1	2	3	4	5	6	7	Likely
5	FSC products are of the same quality as non FSC products	Unlikely	1	2	3	4	5	6	7	Likely
6	Doing what environmental organisations think I should do is important to me	Not at all	1	2	3	4	5	6	7	Extremely
7	Doing what the government thinks I should do is important to me	Not at all	1	2	3	4	5	6	7	Extremely
8	FSC products are sold in the stores I shop at	Unlikely	1	2	3	4	5	6	7	Likely
9	I plan to buy FSC products the next time I purchase wood products	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
10	Overall I think that buying FSC products is	Unpleasant	1	2	3	4	5	6	7	Pleasant
11	Overall I think that buying FSC products is	Harmful	1	2	3	4	5	6	7	Beneficial
12	People who are important to me buy FSC products	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
13	People in my household think it is a good thing to buy FSC products	Strongly disagree	1	2	3	4	5	6	7	Strongly agree

14	I am confident I could buy FSC products	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
15	Helping the New Zealand economy is	Extremely undesirable	1	2	3	4	5	6	7	Extremely desirable
16	Protecting the environment is	Extremely undesirable	1	2	3	4	5	6	7	Extremely desirable
17	Reducing carbon emissions is	Extremely undesirable	1	2	3	4	5	6	7	Extremely desirable
18	Wood products that look good are	Extremely undesirable	1	2	3	4	5	6	7	Extremely desirable
19	FSC products are clearly labelled at the stores I shop at	Unlikely	1	2	3	4	5	6	7	Likely
20	FSC products cost the same as other products	Unlikely	1	2	3	4	5	6	7	Likely
21	Overall I think that buying FSC products is	The wrong thing to do	1	2	3	4	5	6	7	The right thing to do
22	Overall I think that buying FSC products is:	Unenjoyable	1	2	3	4	5	6	7	Enjoyable
23	People who influence my decision think that I should buy FSC products	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
24	I have complete control over buying FSC products	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
25	I am	Less likely	1	2	3	4	5	6	7	More likely

to buy FSC products if they are sold in the stores I shop at

26	I am	Less likely	1	2	3	4	5	6	7	More likely
		to buy FSC products if they are clearly labelled at the stores I shop at								

27	I am	Less likely	1	2	3	4	5	6	7	More likely
		buy FSC products if they cost the same as other products								

28	Using high quality wood products is	Extremely undesirable	1	2	3	4	5	6	7	Extremely desirable

29	I will try to buy FSC products the next time I purchase wood products	Strongly disagree	1	2	3	4	5	6	7	Strongly agree

30	Environmental organisations would	Disapprove	1	2	3	4	5	6	7	Approve
		of me buying FSC products								

31	The government would	Disapprove	1	2	3	4	5	6	7	Approve
		of me buying FSC products								

32	New Zealand forest owners would	Disapprove	1	2	3	4	5	6	7	Approve
		of me buying FSC products								

33	Indigenous people living in overseas forests would	Disapprove	1	2	3	4	5	6	7	Approve
		of me buying FSC products								

34	People like me buy FSC products	Strongly disagree	1	2	3	4	5	6	7	Strongly agree

35	Whether or not I buy FSC products is up to me	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
36	Buying FSC products is difficult	Strongly disagree	1	2	3	4	5	6	7	Strongly agree
37	Doing what New Zealand forest owners think I should do is important to me	Not at all	1	2	3	4	5	6	7	Extremely
38	Doing what indigenous people living in overseas forests think I should do is important to me	Not at all	1	2	3	4	5	6	7	Extremely

---

In this section, we want to find out about your trip to Wellington Zoo.

mark the box that corresponds to your answer

---

40.   Not counting today, how many times have you visited Wellington Zoo in the last 5 years?

☐ none

☐ 1-3

☐ 4-10

☐ More than 10

41.   Including yourself, how many people are in your group at Wellington Zoo?

Number of adults (including yourself): _____

Number of children (under 18): _____
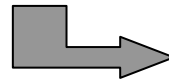
Of the total children how many children are:

Under 5 years_____

5-11 years_____

12-17 years _____

42.   Do you have an annual pass or are a Zoo Crew member?

☐ Yes

☐ No

43.   Where do you live?

☐ The Wellington region

☐ Another part of New Zealand → What region?

☐ Another country

_____

44.   What is your gender?

☐ Male

☐ Female

45.   What is your age in years?

☐ 18-24

☐ 25-49

☐ 50-64

☐ 65 or over

46. What is your highest level of education? (if you are currently enrolled, check the box for the degree in which you are enrolled in)

☐ Fifth or sixth form qualification (School Certificate passes, National Certificate Level 1 or 2, Sixth From Certificate, or University Entrance prior to 1986)

☐ High school qualification (University Bursary Entrance Exam, scholarship, Higher School Certificate, National Certificate Level 3)

☐ Bachelor degree or vocational qualification (BA, BSc, New Zealand Diploma, New Zealand certificate, national diploma, Trade certificates, apprenticeships, national certificate, bridging certificates, foundation certificates)

☐ Higher degree (PhD, MA, post graduate diploma)

Thank you for your time.
If you would like to tell us anything else about your visit, please write it in the space below

Appendix 3.7. Key for FSC TPB questionnaire. For the elicited beliefs statements, the statistics presented (i.e., mean, SD, and correlation) are based on the product of the belief times the outcome evaluation. For the two constructs that were significant to intention (attitude and norm) the correlation and standard deviation between the belief and intention is reported.

Past Behaviour		Question		
In the last 12 months have you bought any raw timber?		A		
In the last 12 months have you bought any new furniture made from wood?		B		
Do you know what this symbol means?		C		
Have you ever heard of the Forest Stewardship Council (FSC)?		D		
In the last 12 months have you purchased any FSC products?		E		
Attitude	**Construct measured**	**Question**	**Mean (std error)**	**Correlation to Intention**
Overall I think buying FSC products is pleasant/unpleasant	Global measure	10	5.632 (1.160)	.465*
Overall I think that buying FSC products is harmful/beneficial	Global measure	11	5.955 (1.273)	.438*
Overall I think buying FSC products is unenjoyable/enjoyable	Global measure	22	5.305 (1.287)	.628*
Overall I think buying FSC products is the wrong/right thing to do	Global measure	21	5.991 (1.190)	.484*
If I buy FSC products, I will help the New Zealand economy	Behaviour belief	1	5.405 (1.510)	.227*
Buying FSC products will protect the environment	Behaviour belief	2	6.090 (1.202)	.441*
If I buy FSC products it will reduce carbon emissions	Behaviour belief	3	4.936 (1.798)	.230*
FSC products look just as good as other products	Behaviour belief	4	5.557 (1.369)	.261*
FSC products are of the same quality as non FSC	Behaviour belief	5	5.450 (1.530)	.269*
Helping the New Zealand economy is extremely undesirable/desirable	Outcome evaluation	15		
Protecting the environment is extremely undesirable/desirable	Outcome evaluation	16		
Reducing carbon emissions is extremely undesirable/desirable	Outcome evaluation	17		
Wood products that look good are extremely undesirable/desirable	Outcome evaluation	18		
Using high quality wood products is extremely undesirable/desirable	Outcome evaluation	28		
Norm				
People who influence my decision think that I should keep buy FSC products	Global measure - descriptive	23	4.200 (1.596)	.305*
People who are important to me buy FSC products	Global measure -injunctive	12	4.218 (1.331)	.347*
People in my household think it is a good thing to buy FSC products	Global measure – descriptive	13	4.870 (1.592)	.377*

People like me buy FSC products	Global measure -injunctive	34	5.245 (1.364)	.430*
Environmental organisations would approve/disapprove of me buying FSC products	Normative belief	30	6.264 (1.178)	.574*
The government would approve/disapprove of me buying FSC products	Normative belief	31	5.691 (1.413)	.174
New Zealand forest owners would approve/disapprove of me buying FSC products	Normative belief	32	5.900 (1.291)	.352*
What indigenous people living in overseas forests would approve/disapprove of me buying FSC products	Normative belief	33	5.514 (1.568)	.462*
Doing what environmental organisations think I should do is important to me	Motivation to comply	6		.
Doing what the government thinks I should do is important to me	Motivation to comply	7		
Doing what New Zealand forest owners think I should do is important to me	Motivation to comply	37		
Doing what indigenous people living in overseas forests think I should do is important to me	Motivation to comply	38		
Perceived Behaviour Control				
Whether or not I buy FSC products is up to me	Global measure - control	35	6.018 (1.312)	
I have complete control over buying FSC products	Global measure - control	24	5.109 (1.448)	
Buying FSC products is difficult	Global measure – self efficacy	36	4.514 (1.210)	
I am confident I could buy FSC products	Global measure – self efficacy	14	5.398 (1.311)	
FSC products are sold in the stores I shop at	Control belief strength	8	4.087 (1.463)	
FSC products are clearly labelled at the stores I shop at	Control belief strength	19	3.641 (1.406)	
FSC products are the same cost as other products	Control belief strength	20	3.814 (1.355)	
I am more/less likely to buy FSC products if they are sold in the stores I shop at	Control belief power	25		
I am more/less likely to buy FSC products if they are clearly labelled at the stores I shop at	Control belief power	26		
I am more/less likely buy FSC products if they are the same price as other products	Control belief power	27		
Intentions				
I plan to buy FSC products the next time I purchase wood products		9	4.817 (1.077)	
I will try to buy FSC products the next time I purchase wood products		29	5.908 (1.273)	

* p < .01

Appendix 4.1. Script used for talks prior to talk training programme. Emphasis is on natural history and facts

Welcome to the cheetah talk, my name is…….and I am a guide here at Wellington zoo. We have two cheetahs at Wellington zoo. Charlie and Delta, who were born in March, 2004 at De Wildt Cheetah and Wildlife Breeding and Research Centre in South Africa. These two brothers were then hand reared at a place called Cheetah Outreach in Cape Town, South Africa.

Charlie and Delta (as of the 14/08/06) weigh 46 kgs, they have approximately 6 months of growing to do and expected to reach approximately 50kgs. Females will weigh a maximum of approximately 35 kgs.

Because cheetahs are the most easily trained of all the big cats we have trained Delta and Charlie to interact with the public during an encounter. More information on these can be obtained at the front desk.

The Cheetah's habitat covers southern and eastern Africa, the Middle East (Iran). Cheetahs are an endangered species with their population estimated at around 12,000.

Did you know that the word cheetah in Hindi means "spotted one"? Or that unlike other big cats Cheetahs do not roar? Instead they make chirping sounds, and hiss or spit when they are angry or feel threatened. Interestingly Cheetahs are the only big cat that can purr and they often purr quite loudly when they are content.

They are a very unique big cat, in fact they are so different from other cats that they have their own genus, *Acinonyx*, and are the only living members of this genus. They are also the oldest of all 37 species of cats.

History

Cheetahs have a lineage that dates back 4 million years. They have been associated with humans from about 3,000 BC, when a leashed cheetah, with a hood on its head, is depicted on an official Sumerian seal.

In early Lower Egypt, the cheetah was known as the MAFDET cat-goddess and was revered as a symbol of royalty. Tame cheetahs were kept as close companions to pharaohs, and they were considered a symbolic protection to the throne. Statues and paintings of cheetahs have been found in royal tombs, and it was believed that the cheetah would quickly carry away the pharaoh's spirit to the after

life. By the 18th and 19th dynasties, paintings indicated that the cheetah rivalled dogs in popularity as hunting companions.

A body built for speed….

It is well known that the cheetah is the fastest land animal. In three seconds, a cheetah can hit speeds of 60 km/h and can reach a top speed of 112 km/h. So if you imagine that you are out driving in the countryside doing the speed limit, a cheetah could easily overtake you.

A cheetah's body is made for running. This animal is a natural sprinter and has a flexible spine, oversized liver, enlarged heart, wide nostrils, increased lung capacity and thin muscular body which make these animals capable of incredible bursts of speed. A cheetah's claws are straight and not curved like other cats, and remain exposed even when retracted to provide traction. Black "tear marks", which run from the corner of its eyes down the sides of the nose to its mouth, keep the sun out of its eyes and aid in hunting.

When running, a cheetah can cover a distance of eight metres in a single stride –which is about the length of a school bus. Only one foot touches the ground at a time and at two points in the stride, no feet touch the ground at all. When a cheetah is after its prey, it will chase it for about 20 seconds, and rarely longer than a minute and is only successful in capturing it about 50 per cent of the time. This is because it can run only 360 to 550 meters before it is exhausted, and after this it is extremely vulnerable to other predators, which may not only steal its prey, but attack it as well.

Lifecycle

In the wild cheetahs live up to 7 years but can reach 15 years in captivity. Their diet is made up of different species of antelope (small antelope and the young of large antelope), warthog, hares, rodents, game birds and young zebra. Cheetahs will hunt in the late morning and early evening and capture their prey by stalking it until it is close enough (within 10-30 meters) to chase. The cheetah usually kills its prey by biting it on underside of the throat, suffocating it.

Here at the zoo our Cheetahs receive bits of horse or beef, whole chickens, whole rabbits or guinea pigs. Unlike the other big cats here at the zoo, our Cheetahs only have one starve day a week (as opposed to two days), as in the wild they only eat enough to survive. They only have a small stomach as the rest of their body is

taken up with their larger internal organs which give them their speed. An interesting fact is Cheetahs can go up to 4 days without drinking water, as they get most of their fluids that they need from the liver or blood of their prey.

A male cheetah can have a range of around 1,500 to 3,000 square kilometres and may live and hunt in groups of up to 5, often brothers. In contrast female cheetahs live a solitary life. A female will only live with other cheetahs when she is caring for cubs. Cheetah cubs are born in litters of up to 8 and are blind at birth. Once their eyes are open their mother will move them to a different den every few days for safety. Cubs are often killed by other predators (leopards, lions, hyenas, and baboons), so the mother hides them while she is hunting, staying close to them at all other times. The mother teaches them hunting skills until they are about two years old and siblings will often hunt together.

In the Serengeti, 90 per cent of cheetah cubs don't make it past 3 months of age. In areas where there are large numbers of lions, 50 per cent of cheetah cub deaths can be attributed to lion attacks. Another reason for the high death rate of cubs is that Cheetahs have genetic problems linked to a high rate of inbreeding.

Genetics

What this means is that in some point in the past cheetah numbers become so low that they were involved in a genetic bottle neck, where there were so few animals that inbreeding became a problem and all their descendants come those few animals. Actually cheetahs went through not one but two genetic bottleneck periods. The first time around 10 thousand years ago, at the last Ice Age, wiped out all the cheetahs in North America, Europe and a large majority in Asia and Africa. The second bottleneck was more recent, most likely within the last 100 years and is due to over hunting by humans and loss of habitat. A series of tests on various cheetahs from Africa has determined their genetic diversity is very limited because of this. Interestingly if you test the genetics of two random African cheetahs you will find that they are more genetically similar than identical human twins. They have less than one percent genetic diversity, compared to 37 per cent in humans. With such low genetic diversity, the cheetahs of southern Africa are extremely vulnerable to the effects of

disease, and also have an extremely poor sperm count (with levels that would be considered 'infertile' in other mammals).

Conservation issues

Aside from their genetic issues, other problems they face are loss of habitat, and the resulting lack of food which have affected their numbers in both Africa and Asia. The cheetah became extinct in India in the 1950s. Like other threatened or endangered species around the world, the cheetah is being poached and hunted to critically low levels in its African habitat. In Namibia, for example, which has the largest cheetah population in the world, their numbers have dropped from 6,000 in 1980 to about 2,500 today

Estimates put the number of cheetahs in the wild at less than 12,000 worldwide. At the turn of the last century their numbers where around 100,000.

While the future of these extraordinary animals sounds very bleak, there is still hope for them. People's attitudes towards wildlife are slowly changing and there are a lot of conservation projects being worked on to help people and endangered animals coexist. In Namibia 95 per cent of the cheetah population now roams on farmland. You may have heard of dolphin friendly tuna. This is where tuna is fished in such a way that no dolphins were killed in the process. A similar concept to this, which relates to the cheetah, is cat friendly' meat, where no big cats are harmed in the production of meat.

Ninety-five per cent of cheetahs live on commercial farmland or ranches. Through educating locals there a conservation group called the Cheetah Conservation Fund is teaching local people better methods for dealing with cheetahs, to help stop their numbers from dropping even more. Farmers are being educated to build larger and more robust fences to protect livestock. They are also being provided with shepherd dogs. It's much easier for farmers to tend to their herds of livestock when a protective large dog is there to ward off opportunistic cheetah attacks as even cheetahs are intimidated by these dogs.

In contrast to reaching for a gun, this is a non-aggressive and non-fatal approach for farmers to protect their livelihood.

Well thank you for listening to my talk today, the next talk will be at the ……………..enclosure at ……………. If you have any questions please feel free to ask me now or you can ask any of the guides we have here at the zoo today, we are the ones in blue, otherwise have a lovely day.

Appendix 4.2. Assessment form used for peer and author-review after talks.

Animal: _____ **Date:** _____ **Keeper/guide:**
_____**Observer:**_____

Presenter	Poor			Excellent		Comments
• professional demeanour & appearance	1	2	3	4	5	
• on time (5 mins early)		No		yes		
• face the audience and make eye contact	1	2	3	4	5	
Technique						
• introduces themselves		No		yes		
• speaks clearly	1	2	3	4	5	
• audible (use of microphone when needed)	1	2	3	4	5	
• appropriate speed	1	2	3	4	5	
• appropriate use of varied tone and inflection	1	2	3	4	5	
• appropriate vocabulary	1	2	3	4	5	
• interactive with audience (ask questions)	1	2	3	4	5	
• use of props	1	2	3	4	5	
Structure						
• stimulating introduction	1	2	3	4	5	
• interpret animals' behaviour	1	2	3	4	5	
• clear theme	1	2	3	4	5	
• what was the theme	Name it:					
• use analogies, metaphors, etc	1	2	3	4	5	
• conservation message stated	Name it:					
• conservation message well integrated	1	2	3	4	5	

Additional comments: (including audience)

_____

_____

Appendix 4.3 Non-ELM Sign displayed at the lion enclosure.

AFRICAN LION

- The roar of an adult lion can be heard up to 5km away.
- Lions sleep on average 19 hours a day.
- Lions fail at hunting 70% of the time.

WELLINGTON

Zoo

Appendix 4.4. Questionnaire completed by zoo visitors after attending a talk.

<div style="border:1px solid black; background:#cccccc; text-align:center;">
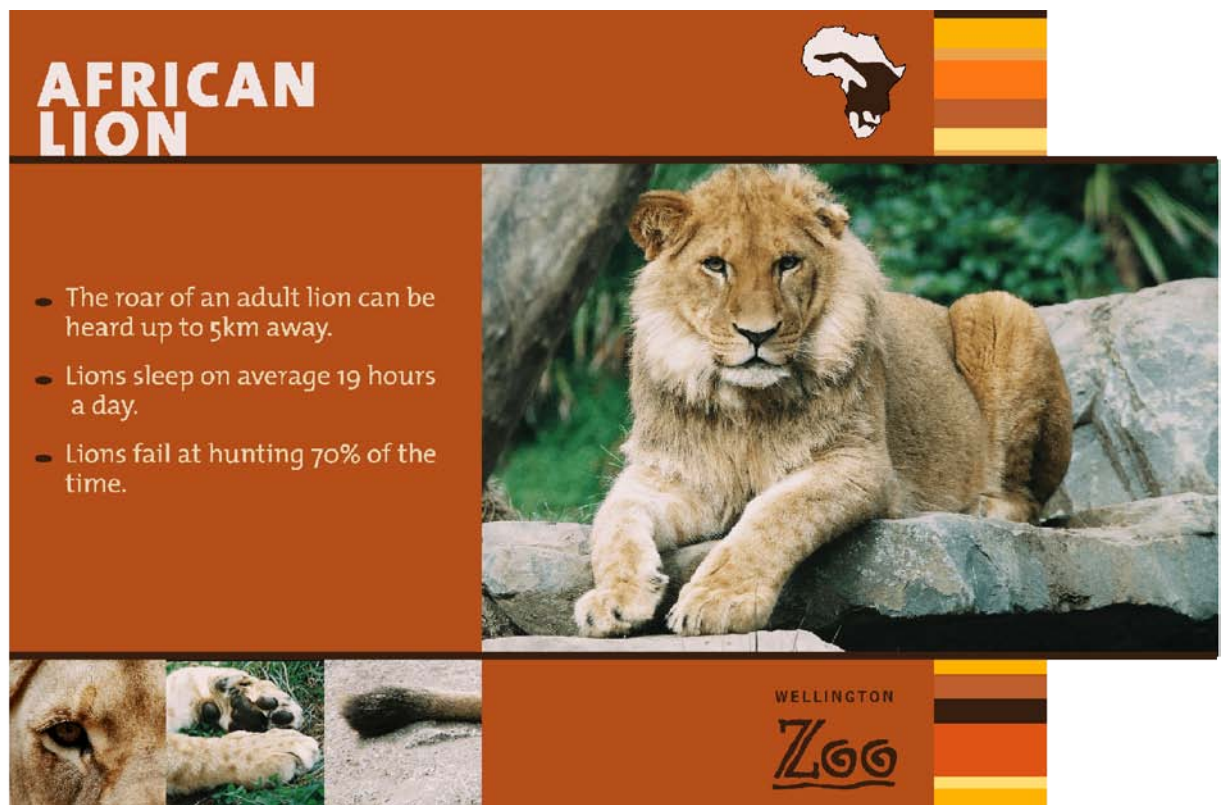
WE NEED YOUR OPINION
about the talk you just hear

</div>

The purpose of this short questionnaire is to find out about the talk you just attended. Please know that there are no right or wrong answers to the questions, nor are some responses better or worse than others. We simply want to know your honest opinions about your experiences. It will assist us in future planning of conservation messages at the zoo.

THE QUESTIONNAIRE WILL TAKE LESS THAN 10 MINUTES OF YOUR TIME.

Thank you!

WELLINGTON ZOO

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Question 1:

Overall, the talk I attended today . . . .

A.)

was enjoyable _____ : _____ : _____ : _____ : _____ : _____ : _____ was *un*enjoyable

B.)

was
meaning*less* _____ : _____ : _____ : _____ : _____ : _____ : _____ was meaningful

C.)

                                                               did *not* make me
made me curious _____ : _____ : _____ : _____ : _____ : _____ : _____ curious

D.)

made conserving   made conserving
nature seem *less*   nature seem
important _____ : _____ : _____ : _____ : _____ : _____ : _____ more important

E.)

impacted my   did *not* impact
appreciation of   my appreciation
the values   of the values
indigenous   indigenous
people attach to   people attach
the land _____ : _____ : _____ : _____ : _____ : _____ : _____ to the land

F.)

was bad _____ : _____ : _____ : _____ : _____ : _____ : _____ was good

G.)

was relevant to   was *not*
me _____ : _____ : _____ : _____ : _____ : _____ : _____ relevant to me

H.)

did *not* make
me think _____ : _____ : _____ : _____ : _____ : _____ : _____ made me think

I.)

made me value
nature   made me value
conservation   nature
more _____ : _____ : _____ : _____ : _____ : _____ : _____ conservation *less*

J.)
   was satisfying _____ : _____ : _____ : _____ : _____ : _____ : _____ was *not* satisfying

K.)

was *not*
connected to   was connected
anything I care   to things I care
about_____ : _____ : _____ : _____ : _____ : _____ : _____ about

L.)

                                   did *not* make me want
made me want to talk   to talk about what I
about what I heard _____ : _____ : _____ : _____ : _____ : _____ : _____ heard

M.)
   made conserving   made conserving
   nature seem *less*   nature seem
      justifiable _____ : _____ : _____ : _____ : _____ : _____ : _____ more justifiable

N.)
   impacted my   did *not* impact
 appreciation of   my appreciation
   indigenous   of indigenous
views of the land_____ : _____ : _____ : _____ : _____ : _____ : _____ views of the land

O.)
      was boring _____ : _____ : _____ : _____ : _____ : _____ : _____ was interesting

P.)
  was connected   was *not*
 to things I know   connected to
    about _____ : _____ : _____ : _____ : _____ : _____ : _____ things I know about

Q.)
  did *not* make me
   want to know   made me want to
      more _____ : _____ : _____ : _____ : _____ : _____ : _____ know more

R.)
   impacted my   did *not* impact
 appreciation of   my appreciation
   views of   of indigenous
   wildlife_____ : _____ : _____ : _____ : _____ : _____ : _____ views of wildlife

S.)
  intrigued me _____ : _____ : _____ : _____ : _____ : _____ : _____ did *not* intrigue me

T.)

did *not* impact
my appreciation
of the historic
relationship that
indigenous
people have with
the land ____ : ____ : ____ : ____ : ____ : ____ : ____

impacted my
appreciation of
the historic
relationship that
indigenous people
have with the land

Question 2:

Please indicate how much you would be inclined to <u>tell another person</u> each of the following things about this place:

A.)

you should
visit ____ : ____ : ____ : ____ : ____ : ____ : ____

you should *not*
visit

B.)

the place
is boring ____ : ____ : ____ : ____ : ____ : ____ : ____

the place is
interesting

C.)

coming
here is
worth the
money ____ : ____ : ____ : ____ : ____ : ____ : ____

coming here is
not worth the
money

D.)

coming
here is *not*
enjoyable ____ : ____ : ____ : ____ : ____ : ____ : ____

coming here is
enjoyable

Question 3:

Please circle YES or NO for each statement.

A.) The talk I attended today made me want to attend/participate.   YES   NO
in another talk

B.) The talk I attended today made me want to stay longer.   YES   NO

C.) The talk I attended today made me want to return for another   YES   NO
visit in the future.

D.) The talk I attended today made me want to purchase   YES   NO
memento or souvenir related to this place.

4. Did the talk make you think of a way <u>you</u> can help this animal?

     ☐   Yes   ⟹   If Yes, what can you do?
     ☐   No

_____

_____

_____

_____

**In this section, we want to find out about your trip
to Wellington Zoo.**
mark the box that corresponds to your answer

---

5. Not counting today, how many times have you visited Wellington
Zoo in the last 5 years?
     ☐   none
     ☐   1-3
     ☐   4-10
     ☐   More than 10

6. Including yourself, how many people are in your group at Wellington Zoo?

Number of adults (including yourself): _____

Number of children (under 18): _____

Of the total children
how many children are:
Under 5 years_____
5-11 years_____
12-17 years _____

7. Do you have an annual pass or are a Zoo Crew member?

☐ Yes
☐ No

8. Where do you live?

☐ The Wellington region
☐ Another part of New Zealand
☐ Another country

9. What is your gender?

☐ Male
☐ Female

10. What is your age in years?

☐ 18-24
☐ 25-49
☐ 50-64
☐ 65 or over

11. What is your highest level of education? (if you are currently enrolled, check the box for the degree in which you are enrolled in)

☐ Fifth or sixth form qualification (School Certificate passes, National Certificate Level 1 or 2, Sixth From Certificate, or University Entrance prior to 1986)

☐ High school qualification (University Bursary Entrance Exam, scholarship, Higher School Certificate, National Certificate Level 3)

☐ Bachelor degree or vocational qualification (BA, BSc, New Zealand Diploma, New Zealand certificate, national diploma, Trade certificates, apprenticeships, national certificate, bridging certificates, foundation certificates)

☐ Higher degree (PhD, MA, post graduate diploma)

Thank you for your time.
If you would like to tell us anything else about your visit, please write it in the space below

Appendix 4.5 Questionnaire completed by zoo visitors after reading a sign based on ELM or non-ELM.

WE NEED YOUR OPINION
about the sign at the LION enclosure

The purpose of this short questionnaire is to find out how the sign you just read at the **lion** enclosure. Please know that there are no right or wrong answers to the questions, nor are some responses better or worse than others. We simply want to know your honest opinions about your experiences. It will assist us in future planning of conservation messages at the zoo.

When answering, consider <u>only</u> the sign you just read at the <u>lion enclosure</u> and not other signs through out the zoo

THE QUESTIONNAIRE WILL TAKE LESS THAN 5 MINUTES OF YOUR TIME.

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Thank you!

Overall, the sign at the Lion enclosure . . . .

A.)
was enjoyable _____ : _____ : _____ : _____ : _____ : _____ : _____ was *un*enjoyable

B.)
was
meaning*less* _____ : _____ : _____ : _____ : _____ : _____ : _____ was meaning*ful*

C.)
did *not* make me
made me curious _____ : _____ : _____ : _____ : _____ : _____ : _____ curious

D.)
made conserving   made conserving
nature seem *less*   nature seem
important _____ : _____ : _____ : _____ : _____ : _____ : _____ more important

E.)
impacted my   did *not* impact
appreciation of   my appreciation
the values   of the values
indigenous   indigenous
people attach to   people attach
the land _____ : _____ : _____ : _____ : _____ : _____ : _____ to the land

F.)
was bad _____ : _____ : _____ : _____ : _____ : _____ : _____ was good

G.)
was relevant to   was *not*
me _____ : _____ : _____ : _____ : _____ : _____ : _____ relevant to me

H.)
did *not* make
me think _____ : _____ : _____ : _____ : _____ : _____ : _____ made me think

I.)
made me value   made me value
nature   nature
conservation   conservation
more_____ : _____ : _____ : _____ : _____ : _____ : _____ less

J.)
was satisfying _____ : _____ : _____ : _____ : _____ : _____ : _____ was *not* satisfying

K.)

was *not*
connected to   was connected
anything I care   to things I care
about_____ : _____ : _____ : _____ : _____ : _____ : _____ about

L.)

did *not* make me want
made me want to talk   to talk about what
about what I heard _____ : _____ : _____ : _____ : _____ : _____ : _____ heard

M.)

made conserving   made conserving
nature seem *less*   nature seem
justifiable _____ : _____ : _____ : _____ : _____ : _____ : _____ more justifiable

N.)

impacted my   did *not* impact
appreciation of   my appreciation
indigenous   of indigenous
views of the land_____ : _____ : _____ : _____ : _____ : _____ : _____ views of the land

O.)

was boring _____ : _____ : _____ : _____ : _____ : _____ : _____ was interesting

P.)

was connected   was *not*
to things I know   connected to
about _____ : _____ : _____ : _____ : _____ : _____ : _____ things I know about

Q.)

did *not* make me
want to know   made me want to
more _____ : _____ : _____ : _____ : _____ : _____ : _____ know more

R.)

impacted my   did *not* impact
appreciation of   my appreciation
views of   of indigenous
wildlife_____ : _____ : _____ : _____ : _____ : _____ : _____ views of wildlife

S.)
intrigued me _____ : _____ : _____ : _____ : _____ : _____ : _____ did *not* intrigue me

T.)
did *not* impact
my appreciation   impacted my
of the historic   appreciation of
relationship that   the historic
indigenous   relationship that
people have with   indigenous people
the land _____ : _____ : _____ : _____ : _____ : _____ : _____ have with the land

2. Did the sign make you think of a way <u>you</u> can help this animal?

If Yes, what can you do?

☐ Yes ⟹

_____

☐ No

_____

_____

_____

_____

> **In this section, we want to find out about your trip**
>
> **to Wellington Zoo.**
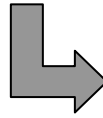>
> *mark the box that corresponds to your answer*

5. Not counting today, how many times have you visited Wellington Zoo in the last 5 years?
   ☐ none
   ☐ 1-3
   ☐ 4-10
   ☐ More than 10

6. Including yourself, how many people are in your group at Wellington Zoo?

    Number of adults (including yourself): _____

    Number of children (under 18): _____

                                              Of the total children how many children are:

                                              Under 5 years_____

                                                  5-11 years_____

                                            12-17 years _____

7. Do you have an annual pass or are a Zoo Crew member?
   - ☐ Yes
   - ☐ No

8. Where do you live?
   - ☐ The Wellington region
   - ☐ Another part of New Zealand
   - ☐ Another country

9. What is your gender?
   - ☐ Male
   - ☐ Female

10. What is your age in years?
   - ☐ 18-24
   - ☐ 25-49
   - ☐ 50-64
   - ☐ 65 or over

11. What is your highest level of education? (if you are currently enrolled, check the box for the degree in which you are enrolled in)

☐ Fifth or sixth form qualification (School Certificate passes, National Certificate Level 1 or 2, Sixth From Certificate, or University Entrance prior to 1986)

☐ High school qualification (University Bursary Entrance Exam, scholarship, Higher School Certificate, National Certificate Level 3)

☐ Bachelor degree or vocational qualification (BA, BSc, New Zealand Diploma, New Zealand certificate, national diploma, Trade certificates, apprenticeships, national certificate, bridging certificates, foundation certificates)

☐ Higher degree (PhD, MA, post graduate diploma)

Thank you for your time.
If you would like to tell us anything else about your visit, please write it in the space below

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