Public and Professional Attitudes towards the Estuarine Crocodile (*Crocodylus porosus*) in North Queensland, Australia: Investigating Solutions for Effective Predator Conservation

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Abstract:

Public and professional attitudes towards the Estuarine Crocodile (*Crocodylus porosus*) were measured in three towns of the Daintree region of North Queensland, in order to determine the value people place on their existence in the wild. People's overall opinions for the best management and removal schemes were recorded and analysed over possible influential variables in order to determine which factors may be responsible in causing negative attitudes. The results conclude that age was the only demographic factor correlated to removal attitudes, while never having been on a crocodile tour and having personally experienced losses were most influential in fostering negative attitudes. In looking at overall attitudes across the three towns, public fears and perceptions of attacks were strongly associated with the town's coexistence ratings. Varying amounts of crocodile-based tourism in the three study sites may be the best explanation for such diverse attitudes and opinions of Estuarine Crocodiles, and the findings suggest that even small investments in predator tourism could be the best solution for improving public opinions about large carnivore conservation.

Table of Contents:

Acknowledgements

I would like to thank all those who helped in the development of this project. Thanks first to Jack, who gave me the inspiration to pursue this topic. Thanks to Tony for his unwavering support and feedback on my ideas and project status, who stuck with me and made possible my desire to study crocodiles. Thanks to Clevo for his willingness to assist and guide my studies. I would like to thank all the public and tour-operator participants for taking time out of their days to talk to me and make this study possible. Special thanks to Scott Smith of Electric Boat Cruises, who really took this experience to the next level of awesomeness for me. Also, thanks to the two extremely generous people that saved me from walking back to Cairns from Daintree Village. Lastly, thank you Mom and Dad for allowing me to come to Australia for the semester. To all who have helped, thank you for making this project possible and providing me an incredible adventure.

List of Figures and Tables

1.0 Introduction

1.1 Background

The Estuarine Crocodile (*Crocodylus porosus*—also known as the saltwater crocodile) has long been in conflict with humans (Kar and Bustard 1983), but is just one of many of the Earth's predators that are subjected to humans' unwarranted, pessimistic scrutiny (Loe and Röskaft 2004). Throughout the world, large carnivores have been subjected to public scrutiny and banishment from human-inhabited areas (Bjerke et al. 1998, , Kaltenborn and Bjerke 2002, Loe and Röskaft 2004, Röskaft et al. 2006, Kellert 1985). Many First World countries (such as the United States and Norway with wolves and bears) and Third World countries (like India and Kenya with tigers and lions, respectively) experience human-predator conflicts, which have resulted in the extensive killings of the perceived pests (Cardillo et al. 2004). Crocodilians themselves have been shunned worldwide (as is their distribution) perhaps as far back as biblical times; "the great dragon that lieth in the midst of his rivers" (Ezekiel 29.3 from "Crocodile" 2005) was most likely a Nile crocodile (*Crocodylus niloticus*) qualified by its evil, "crooked" nature. Ancient literature elucidates that crocodilian beasts were captured alive and strung up in the town centre to be publicly flogged to death, then eaten (Aelian 2: 311, from "Crocodile" 2005).

While a certain innate hatred for man-eating creatures has always existed within us (Quammen 153), motives for predator hatred today are complex. Often times, conflict arises when predators acquire a taste for livestock, placing disgruntled farmers in a financial predicament (Kellert 1985, Bjerke et al. 1998, Bjerke et al. 2001, Kaltenborn and Bjerke 2002). In addition, rapidly increasing human populations and better technologies have allowed people to inhabit more remote, rural areas, further overlapping human and predator environments (Loe and Röskaft 2004). Competition for living space has ensued more extensively in crowded Third World countries, as overpopulated cites have forced people to expanded living quarters into wilderness areas. In First World countries such as Australia (sixth least-populated country [www.worldatlas.com]) the living space conflict comes from over-pioneering rather than overpopulating, and people usually have the choice of whether to move to rural locations and reside by Estuarine

Crocodile habitats; still, Estuarine Crocodiles are one of the least-liked animals in Australia (Tisdell et al. 2004). Since their protection in Queensland in 1974, Estuarine Crocodile populations have regenerated (to some arguable but undeniable extent) and now inhabit more waterholes and billabongs than they did in their near-extinction years (QPWS 2009)(Webb and Manolis 1998). As rural development increases and human communities grow, there have been and will be more human-predator conflicts, as well as debate over whether the Estuarine Crocodile should share the same protected, unregulated growth scheme as humans (Cardillo et al. 2004, Thorbjarnarson 1999).

Still, much of the predator hysteria around today may not be rationally justified (Baenninger 1991). Baenninger (1991) theorizes that our modern dominionistic value of nature is instinctively programmed into us; humans for all time have struggled against nature and have needed to compete with other species in order to survive (as all species must do to avoid being eliminated). It would not be infrequent, then, for our early ancestors to have had to fend off large, carnivorous beasts. Today we seem to carry that same "us vs. them" mentality that predatory animals are a threat to our survival, though "such dangers to modern humans are largely imaginary" (Baenninger 1991, 2). While previously hunted and considered a widespread man-eating pest (GW&CM), Estuarine Crocodile attacks on humans are today incredibly rare--especially compared to livestock taken or considering the number of opportunities given (Kar and Bustard, 1983). Media illustration of attacks is most likely a major culprit for the distorted reality (Baenninger 1991), and our imaginations and expectations most likely have embellished these accounts (Curtin 2006). Recently we have seen a gradual shift to more conservational and pro-environment agendas on national levels, and conservation biology "heroes" like Steve Irwin and Corey Wild have brought positive media attention to wildlife conservation on a public spectrum (Paquette 2008). Even so, although this young form of entertainment may somewhat counterbalance the media's pessimistic crocodile craze it may not be enough to solely change people's attitudes toward carnivore conservation.

Conservation of carnivores is expensive (Jones 2001) and negative public attitudes can make it more difficult. Regardless, carnivores are mainly highly interactive species, and conservation of them can help protect the entire ecosystem as top predators often function as flagship species and keystone species (Jones 2001). According to

crocodile-connoisseur Grahame Webb, conservation is most effective when it is used for monetary means and has some use-value to society (Quammen, 167). Commercialised trade and consumptive uses have proven to be effective for species conservation and outweigh demand for non-consumptive uses (Tisdell et al. 2004); it has also been shown that commercialisation of an animal can increase national positive attitudes to the animal (Thorbarnarson, 1999). However, because these commercial products are elastic luxury items they are vulnerable to market fluctuations, and so conservation that relies heavily on this industry is not dependable (Thorbjarnarson 1999). Non-consumptive uses (i.e. tourism) often account for a smaller economic component of the animal, though recently have been increasing (Ryan 1999). If non-consumptive uses prove to be more influential and a more stable commerce, conservationally it may be worth investing in Estuarine Crocodile tourism rather than harvesting. The answer might lie in the public's opinions of the Estuarine Crocodile, for the predator has become an important member of Australian culture, a social totem, an economic benefactor, and an ecological stakeholder (Thorbjarnarson 1999).

1.2 Justification for Study

Several studies have been completed evaluating public attitudes toward wildlife (Bjerke et al. 1998, Bjerke et al. 2001, Kaltenborn and Bjerke 2002, Karp 1996, Kellert 1985, Kellert and Berry 1987, Røskaft et al. 2006, Tisdell et al. 2004, Tisdell et al. 2006, Wilks et al. 2008). Of the several studies that identify Queensland attitudes towards *Crocodylus porosus*, none have tested attitudes solely towards the Estuarine Crocodile without interspecies comparisons and rankings, and most studies have been economically analysed. This study, qualitatively oriented, will investigate specific perceptions of the Estuarine Crocodile and attempt to uncover the underlying themes driving different attitudes.

This study will first be able to conclude if demographics play a key role in determining attitudes, as tested to various degrees for other predators (Bjerke et al. 2001, Kaltenborn and Bjerke 2002, Kellert 1985). This study will compare public and professional ideas about Estuarine Crocodile wild populations, ecosystem importance, fear and perceived frequency of attacks, and nature values and attitudes toward the

Estuarine Crocodile; this information will be collected over three towns that employ a range of involvements in crocodile tourism, but that have similar exposures to wild Estuarine Crocodiles. As Tisdell et al. (2004) found that likeability of a species is dependent on the perceived level of endangerment, ecological importance, and tourism importance of the animal, testing the correlation of each of these factors to positive attitudes will help narrow in on a solution for conservation. One likely influence—tourism—has received speculation about its effectiveness in promoting conservation; there are those who maintain that tourism and personal experience with animals creates peak enjoyment (Curtin 2006, Duffy 2008, King 2008) and thus cultivate positive attitudes, and those that deem tourism as merely enjoyable self-fulfillment and that any educational instruction will do nothing but reinforce previous attitudes, whether good or bad (Karp 1996). If tourism proves to have a major function in influencing positive attitudes there could be implications for further wildlife tourism ventures, and the principles for carnivore conservation may carry over to other species in other countries.

In determining public attitudes to Estuarine Crocodiles, Kellert's wildlife values (Kellert 1985) will be applied. Past studies have utilized this method for comparing general nature values to individual species values (Bjerke et al. 1998, Bjerke et al. 2001, Kaltenborn and Bjerke 2002, Karp 1996, Kellert 1985, Kellert and Berry 1987, Røskaft 2006), and this study's valuation will help measure the Estuarine Crocodile in terms of its likeability and best interests for humans, so that the best conservation strategies can be formed. The values Kellert prescribes are listed on the following page.

Table 1: Values and attitudes towards animals, defined by Kellert (1985).

Naturalistic:	Primary interest and affection for wildlife and the outdoors.
Ecologistic:	Primary concern for the environment as a system, for interrelationships between wildlife species and natural habitats.
Humanistic:	Primary interest and strong affection for individual animals, principally pets. Regarding wildlife, focus on large attractive animals with strong anthropomorphic associations.
Moralistic	Primary concern for the right and wrong treatment of animals, with strong opposition to exploitation of and cruelty toward animals.
Scientific	Primary interest in the physical attributes and biological functioning of animals.
Aesthetic	Primary interest in the artistic and symbolic characteristics of animals.
Utilitarian	Primary concern for the practical and material value of animals.
Dominionistic	Primary satisfactions derived from mastery and control over animals typically in sporting situations.
Negativistic	Primary orientation an avoidance of animals due either to indifference, dislike or fear.

1.3 Aims of Study

The purpose of this study is to identify public and professional opinions of the Estuarine Crocodile, and to distinguish trends and correlations in the data that may allude to the motivations behind predator-conservation attitudes. Specifically, this study aims to:

- Gauge the public's knowledge of and attitudes toward Estuarine Crocodiles and their removal
- Discern the professional perspective on allowing Estuarine Crocodiles to remain in the wild
- Compare and contrast the different attitudes between the public and professionals across three towns
- Determine what factors may be involved in forming people's attitudes
- Offer insight for future objectives for promoting positive conservation values in the public eye

2.0 Methods

2.1 Study Locations

The study was carried out in thee North Queensland, Australia locations: Port Douglas, Mossman Township, and the Daintree River (see Appendix E). The first town, Port Douglas (16º29'S, 145º27E), has a population of 4165 (2006 [postcode 4877, www.worldatlas.com]). The town lies on the eastern shores of Dickson Inlet, which is home to several Estuarine Crocodiles. Just around 70 km north of backpacker-hub Cairns, Port Douglas's economy revolves around its tourism industry. The port serves as one of Queensland's northernmost launch points for Great Barrier Reef tourism, and its location in the midst of the Daintree Rainforest makes for opportune rainforest excursions as well. While largely known for its accessibility to reef and rainforest attractions, Port Douglas also has three wildlife attractions for visitors wishing to safely view Estuarine Crocodiles. Located in the main marina, Lady Douglas River Cruise runs wildlife and "croc-spotting" boat tours up 5 km of Dickson Inlet several times per day. About 4 km from the town centre is the Port Douglas Rainforest Habitat, which allows visitors to view and interact with Australia's rainforest fauna, including two Estuarine Crocodiles. 25 km further south is arguably Queensland's most popular crocodile farm, Harley's Crocodile Adventures, which holds an incredible amount of captive freshwater (*Crocodylus johnstoni*) and saltwater (*C. porosus*) crocodiles for viewing.

The next location studied was the town of Mossman (16º28'S, 145º22E), population 1850 (www.worldatlas.com). Mossman is located between two tourist hotspots, 18 km north of Port Douglas and 35 km south of Daintree Village. The town is more inland than Port Douglas, roughly 4 km west of Cooya Beach. The local economy is supported by the sugar mill, retail, and the local Council, and while the Mossman Sugar Mill provides some tourism the town may be most recognized for its proximity to Mossman Gorge National Park (roughly 4 km from the town centre). Mossman Gorge has colder water than *C. porosus* usually prefer, but other creeks and rivers around Mossman reputedly host the animal. Despite the animals inhabiting the area, there are no crocodile tourism ventures that operate out of Mossman.

The final and northernmost location surveyed was the Daintree River. This study site consisted mainly of Daintree Village as well as tour operator headquarters along the river. Daintree Village (16°17'S, 145°27'E) has the smallest population of the three towns at 100 (http://www.daintreevillage.asn.au/history.html), and is the furthest-inland town in this study. The local economy of Daintree Village, like Port Douglas, is supported entirely by tourism (pers. comm. Anonymous); unlike Port Douglas, however, Daintree Village tourism consists almost completely of crocodile-spotting and nature-viewing river cruises. There are at least 10 crocodile-viewing operations that offer these boat rides.

2.2 Data Collection

Methods for data collection were adopted from similar studies performed on public attitudes towards fauna (Bjerke et al. 1998, Kellert 1985, Roskaft et al. 1998). Here, both public and professional opinions were examined via oral survey ("professional" here defined by crocodile tour, crocodile farm, or wildlife zoo owners and employees; "crocodile tour" will be used hereon to refer to all such tourism involving observing Estuarine Crocodiles). Questions were asked qualitatively, allowing respondents to elaborate on their opinions. The public and professional interviews (surveys found in Appendix F and Appendix G, respectively) consisted of roughly 10 questions each, though further questions sometimes evolved from the conversations. Both parties were asked for their estimates of wild Estuarine Crocodile populations and ideal trends in population size, ecological importance of the Estuarine Crocodile, local economic importance of crocodile tourism and preferred trends, intrinsic existence values and coexistence opinions with regard to human communities, ideas about the frequency of attacks on humans, knowledge and opinions of Queensland Estuarine Crocodile removal-management legislation, and the perceived impact of crocodile tours and other media (i.e. news and wildlife programmes) on conservation education. In addition, the public were asked to rate their levels of fear of Estuarine Crocodiles, whether they had ever been on a crocodile tour or wildlife activity that included crocodiles, and demographic information. A public population sample size of 10 was used in each of the three towns; the low sample size may be lower than most public-attitude surveys, but was

somewhat compensated by the length and depth of the qualitative interviews. Small sample sizes may be criticised for lack of transferability, but the research has validity as it accurately represents the social reality of the participants, and the qualitative nature allowed core themes to be revealed (Curtin 2006). In Port Douglas, all three tour operations with crocodiles were solicited: Port Douglas Rainforest Habitat, Hartley's Crocodile Adventures, and Lady Douglas River Cruise. In Mossman, there were no crocodile tour businesses, though a resident Queensland Parks and Wildlife Services ranger was able to provide a professional local opinion. In the Daintree River, only 5 out of the 10 or more tour operators were able to be reached for this study (Table 2), but this was representative of the Daintree River professional population.

Public surveys were administered in town centres of Port Douglas, then Mossman Township, and finally Daintree Village. Professional opinions as well, for the most part, were obtained in person at each tour operation's headquarters, or in the field. Tour operators in the Daintree River area were much more difficult to reach due to transportational difficulties, and *Solar Whisper* and *Thundacroc* had to be interviewed by telephone.

Data collection took place from November 19 to November 30, 2009 (Nov. 19-22 in Port Douglas, Nov. 23-24 in Mossman, Nov. 25-30 in Daintree Village). Highest positions accessible of tour companies were sought for interviews, while the public were surveyed at random on main streets.

Table 2: Classification of participating crocodile tour operators and their operations, by town.

Town	Business Name	Zoo/Crocodile Farm	Wild Tour
Port Douglas	Port Douglas Rainforest Habitat	X	
	Lady Douglas River Cruise		X
	Hartley's Crocodile Adventures	X	
Mossman	(None)		
Daintree Village	Electric Boat Cruises		X
	Daintree River Tours		X
	Crocodile Express		X
	Thundacroc		X
	Solar Whisper		X

2.3 Data Analysis

Data from public surveys were grouped together, first by town and then analysed as the general public opinion, and were compared to opinions of professionals, grouped as well by location and then collective census. Due to the qualitative nature of the questionnaires, responses had to be evaluated in order to be grouped into categories of best fit. For example, wild population estimations of "the population around here is strong again—back to it was before hunting" and "there's a good solid chunk of them nearby" would both be categorised as "Robust" wild population perceptions. Population size opinions (Robust, Average, Weak) were then stacked against wild population trends that people felt needed to occur (Increase, Maintain, Decrease). This correlation was then compared to whether people felt Estuarine Crocodiles should remain in their current habitats or be removed. These existence values were assessed against other variables in opinions, knowledge, and attitudes: importance to the ecosystem function (Vital, Somewhat, Non-factor); ideas about attack rates (>1/year to 1/20 years); self-assessed biological knowledge (High, Medium, Low) and influence of educational mediums such as the press and crocodile tourism; knowledge of Queensland's Estuarine Crocodile Management Plan; values of nature in general (borrowed classifications from Kellert 1985—see Table 1); and demographics (age, sex, occupation, education, pets, and personal losses due to Estuarine Crocodiles). Means and modes were calculated for collective quantitative responses, but chief analysis of this study came by subjectively identifying which factors were most pertinent in determining specific rankings of values and attitudes. Trends were identified among all variables compared to existence values in order to determine which factors most influence attitudes towards Estuarine Crocodiles. While public opinions were translated into quantitative data to determine overall trends, the qualitative details were not forgotten and were used to specifically identify values towards Estuarine Crocodiles, as well as further back up conclusions drawn.

3.0 Results

Data were recorded for public and professional opinions of Estuarine Crocodile population sizes and ecologic importance, as well as attitudes towards removal. These findings were analysed over variables of age, gender, occupation, biologic knowledge, academic education, having pets, having been on a crocodile tour, and knowledge of the Queensland Estuarine Crocodile Management Plan.

3.1 Wild Populations, Ecological Importance and Biological Knowledge Values

Population Sizes and Trends

Table 3.1 (see Appendix A) holds that 80% of the total public population thought Estuarine Crocodile populations were healthy, 13.3% said wild populations were neither strong nor weak, and 6.7% thought they were too low. 50% of the total public opinion thought population sizes were fine at the current level, 30% wanted a decrease in numbers, and 20% wanted an increase.

Removal

40% of the public agreed that society should learn to live with Estuarine Crocodiles near their homes, mostly for the reason that it was their habitat first. 46.7% of the public wanted removal from some areas where people inhabit and/or just wanted some of the larger, more dangerous animals removed near communities. 13.3% wanted Estuarine Crocodiles removed from all areas that people inhabit (a total of 53.3% then desiring some degree of removal).

Ecologic Importance

Of all three public population samples, 46.7% of people said Estuarine Crocodiles are vital to the functioning of the ecosystem. "Somewhat important" and "non-factor" ecosystem-value ratings each received 26.7% of the public ballot.

Biological Knowledge

The public's biologic understanding of Estuarine Crocodiles was mostly "low," with 46.7% saying they had limited knowledge of Estuarine Crocodile Biology. 30% said they had an average understanding, and the remaining 20% believed they possessed above-average to high biological knowledge.

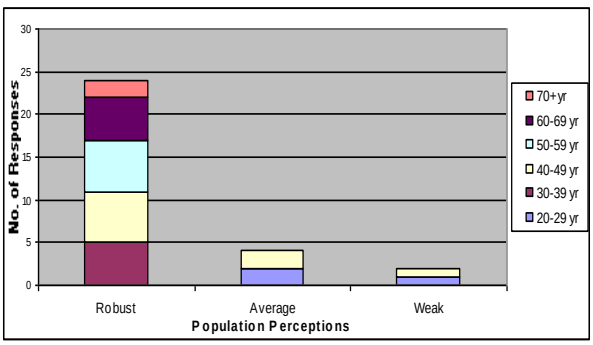
3.2 Demographic Correlations

Age

Wild Estuarine Crocodile population ideas were strongly skewed towards "Robust" numbers. All age groups said population sizes were robust and healthy, except for the youngest age group (20-29 years). "Average" and "weak" population sizes were relatively low in total number of responses, but these perceptions were made up solely of people 20-29 and 40-49 years old (Figure 1).

In analysing how ideas about population may affect ideas about whether the public wants wild populations to increase or decrease (Fig. 1), there were correlations between people saying numbers were robust and people having a desire to stabilize or decrease populations. The four age groups that had entirely "Robust" population size opinions (30-39, 50-59, 60-69, 70+ years) also strongly wanted populations to decrease or stay the same. The two age groups that were more spread out in population size ideas (20-29, 40-49) were also spread evenly in their opinions of ideal population size trends.

Attitudes towards removal were strongly linked to opinions about population sizes and trends when looking at age groups (Figure 2). People ages 20-29, who had all said numbers were either average or low but not healthy, also all said that people should be able to live with Estuarine Crocodiles and that none should be removed. People ages 50-59 and 60-69 would prefer some form of removal to complete coexistence, by majorities of 83% and 80%, respectively. All people 70 years and older wanted Estuarine Crocodiles removed. The attitudes held by people 60-70+ years for favouring removal coincide with the groups' unanimity about robust population sizes and anti-increase trends. Most public "non-factor" values of ecologic importance were made up of people ages 50-69 (Appendix A).



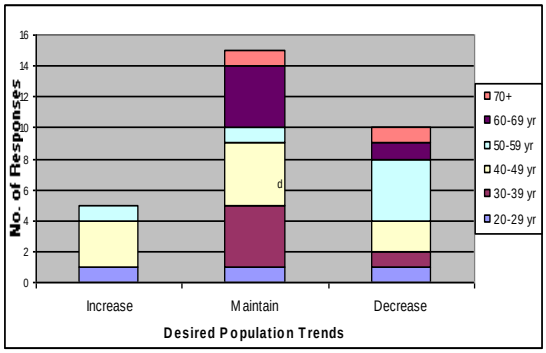


Figure 1: Total public perceptions of the current wild Estuarine Crocodile population and desired trends in population size, broken down by age.

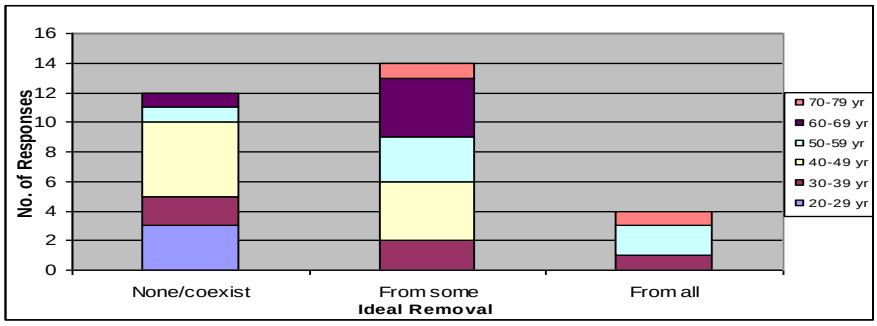


Figure 2: Total public attitudes towards removal schemes and management for wild Estuarine Crocodiles.

Gender

Gender does not play a significant role in determining attitudes toward removal. Both male and female removal attitudes followed the same normal distribution and were not significantly different (Figure 3). Female attitudes towards complete removal were higher than males, and although not significant exhibited a larger percentage difference from male opinions than in the two other removal-scheme categories. That females slightly prefer more intensive-removal ideas may be attributed to ecological importance and biologic knowledge of the Estuarine Crocodile. Figure 4 shows that male opinions of ecological importance were much skewed to the left towards "Vital," with a two-thirds majority of males reporting in this category; female ecological importance figures were more evenly distributed, with a slight majority saying the Estuarine Crocodile is of little to no importance to the function of the ecosystem. Furthermore, while male knowledge of Estuarine Crocodile biology was normally distributed around "average" (Figure 5), female biologic awareness was heavily skewed to "low" and was represented by a majority of 61.1%. Again, however, despite the strong link between biological knowledge and ecological importance, this did not play a part in determining attitudes for population management.

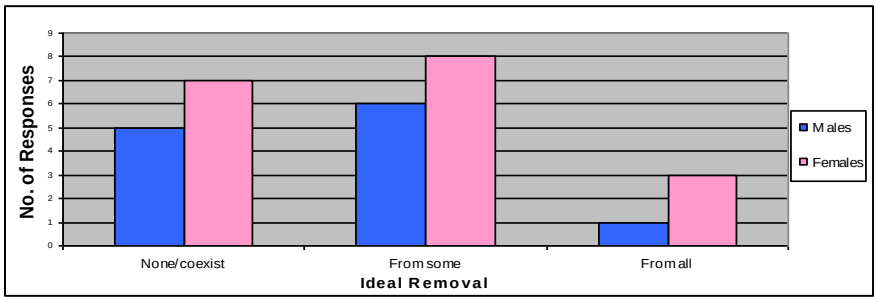


Figure 3: Total male and female attitudes towards removal schemes.

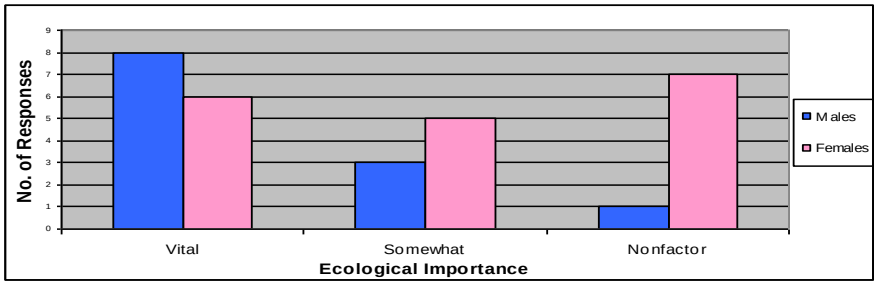


Figure 4: Total male and female perceptions of the Estuarine Crocodile's importance to its ecosystem.

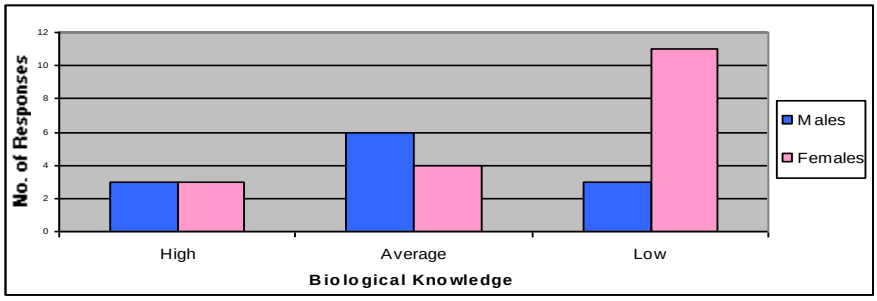


Figure 5: Total male and female knowledge of Estuarine Crocodile biology.

Education

Education supports the same relationship between ideas of ecological importance, biological understanding, and attitudes to wild Estuarine Crocodile management. In looking at importance to ecosystem function, 61.1% of people whose highest level of education was high school said that Estuarine Crocodiles were incredibly important to regulating their ecosystems (Figure 6). This 61.1% can be compared to the 25% of the same response by people of some university education. Interestingly, people of university education also rated themselves as having lower biological knowledge of

Estuarine Crocodiles than those who had not gone further than high school (Figure 7). Even so, as was demonstrated with gender demographics, neither biological knowledge nor ecosystem importance significantly affected people's removal desires, for both high school- and university-goers had similar distributions of management attitudes (Figure 8).

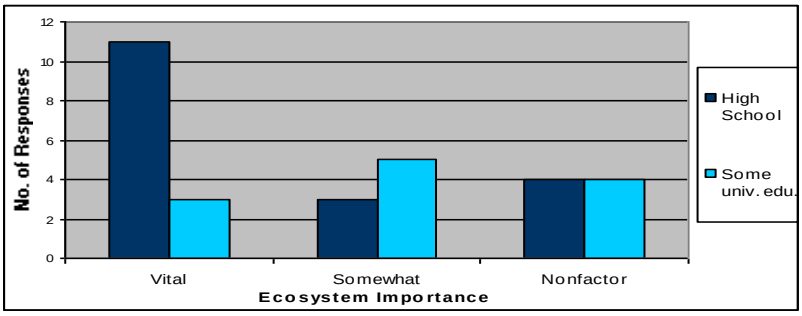


Figure 6: Rankings of Estuarine Crocodile ecosystem importance, compared across academic levels.

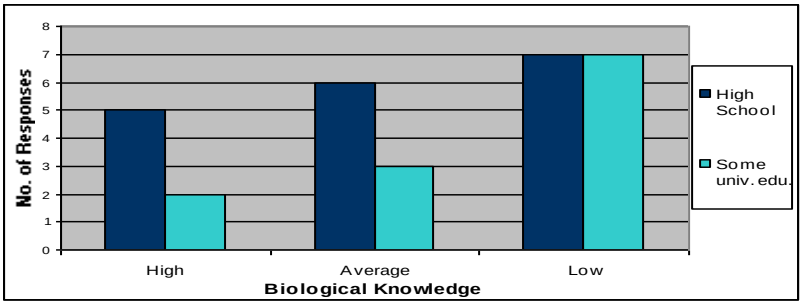


Figure 7: Biological knowledge of Estuarine Crocodiles, compared across academic levels.

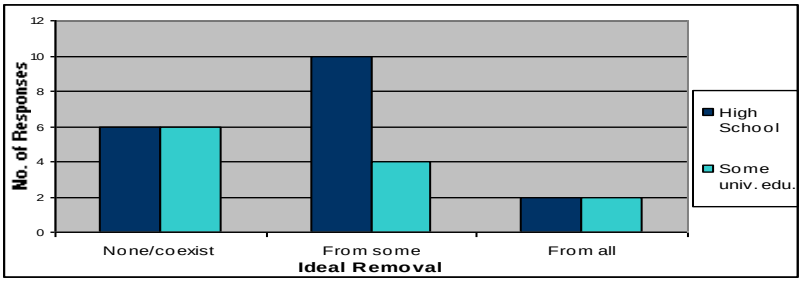


Figure 8: Attitudes towards removal of Estuarine Crocodiles, compared across academic levels.

Occupation

Looking at attitudes towards removal in terms of occupation, few trends can be determined. For the most part, nonprofessional opinions showed no clear partiality to

either population management strategy; information services, administrative services, retail, retired, and "other" professions were split between removal and coexistence (Figure 9). Interestingly, those in the accommodation/hospitality industry all agreed that people should be able to live among Estuarine Crocodiles. Professional opinions were split between complete coexistence and removal from some larger communities, but more than half favoured coexistence to removal, and none wanted total removal of the animal from all communities. On the contrary, the public more heavily favoured removal of some variety to complete, unregulated coexistence. In terms of ecosystem importance, nonprofessionals were evenly spread across levels of importance, just slightly favouring very important (Figure 10). Professionals, on the other hand, almost collectively agreed that the Estuarine Crocodile is vital to the ecosystem. Also, despite agreement between professionals and nonprofessionals on population sizes being very robust (Appendix A), professionals only wanted to see populations stay the same or increase while the public wanted to see little increase but mostly either decrease or stabilisation, irregardless of occupation (Figure 11).

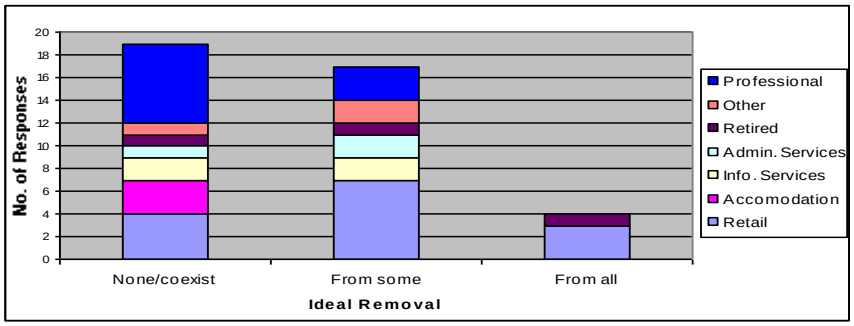


Figure 9: Total public and professional attitudes towards removal schemes, broken down by occupation.

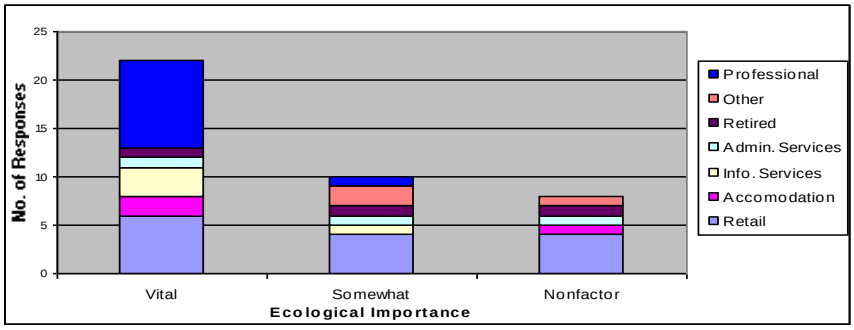


Figure 10: Total public and professional perceptions of Estuarine Crocodile ecological significance, broken down by occupation.

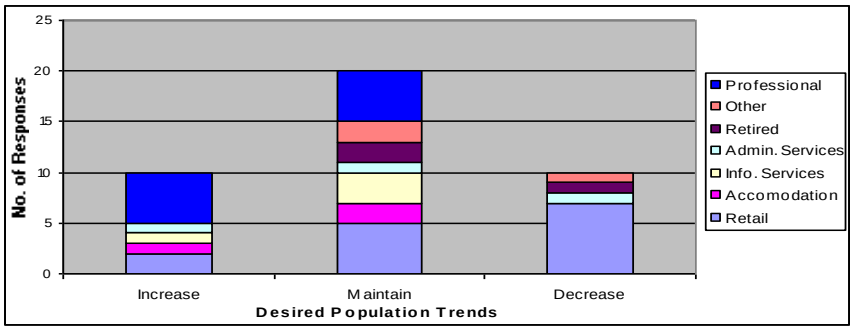


Figure 11: Total public and professional ideal trends in wild Estuarine Crocodile population size, broken down by occupation.

Crocodile Tourism

Figures for crocodile tourism may be insufficient for statistical authentication (only 3 people had never been on any type of crocodile tour); still, the data conveys some interesting results. While data for people who have been on a crocodile tour were normally distributed across opinion categories for ideal population trends (Figure 12), all those who had never been on a tour wanted to see wild populations decrease. Moreover, people who had not been on a tour wanted Estuarine Crocodiles to be removed to at least some extent (Figure 13). For people who had experienced local crocodile tourism, removal attitudes were relatively equally split between coexistence and removal, with most of the removal attitudes falling under the less-harsh "removal from some communities." Also noteworthy is that despite clashing attitudes between people who had and had not been on a crocodile tour, no remarkable differences were seen between either group's ecological importance ratings or biological knowledge values.

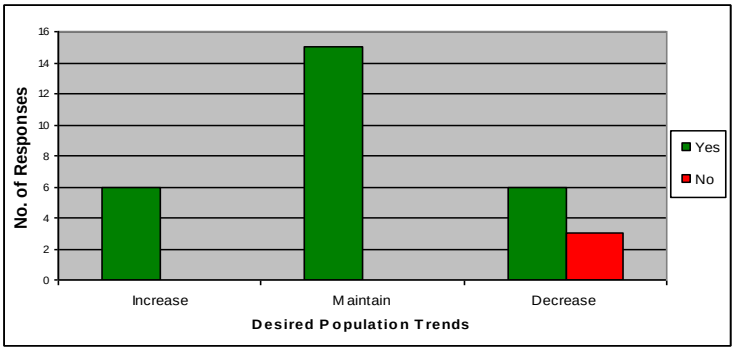


Figure 12: Total public opinions on the desired population trends for Estuarine Crocodiles, compared between having been on a crocodile tour (Yes) and having never been on one (No).

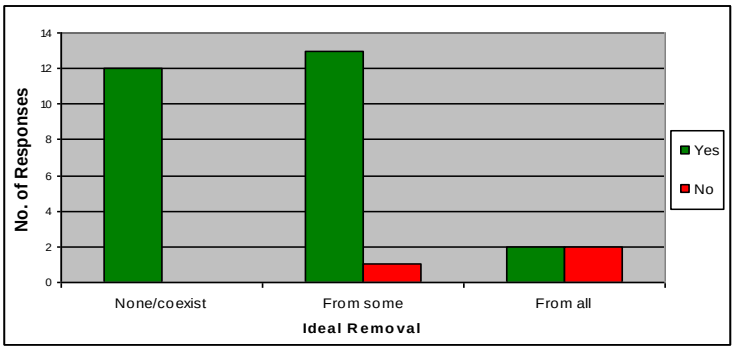


Figure 13: Total public attitudes towards removal of wild Estuarine Crocodiles from human communities, compared between having been on a crocodile tour (Yes) and having never been (No).

Personal Losses

Similar to crocodile tourism figures, data for people that had personally experienced losses due to Estuarine Crocodiles (i.e. taken friends or family members, pets, livestock) were insubstantial yet suggests notable trends. In terms of perceived population size and ideal trends, all those who had experienced losses thought the wild population to be very large and wanted to see it decreased. In comparison, while the large majority (77.8%) of people without losses also considered the wild population robust, only 26% wanted populations decreased—half the amount of people for population stabilisation (51.8%). In attitudes toward wild population management, distributions were similar to those of the Education analysis, though most likely by coincidence. People with personal losses wanted nothing but removal of some degree, while people without losses were very split between removal and coexistence. Additionally, those with losses felt undivided about the Estuarine Crocodile's minimal role in the ecosystem function, while those who had not experienced losses believed the predators play a more essential role.

Pets, Legislation Familiarity

No significant correlations were found between having pets or familiarity with the Queensland Estuarine Crocodile Management Plan and public values, attitudes, or knowledge (Appendix A).

Fear and Attacks

Levels of "Fear of Estuarine Crocodiles" were surveyed in each town: the Mossman public population affirmed the greatest average fear level, at 7.7 (1-10 scale); Daintree Village had the lowest fear level, at 5.1; and Port Douglas was nearly exactly in between, at a public fear level of 6.2 (Table 3).

Public and professional perceptions of the approximate "frequency of attacks on humans" were also recorded and compared (Table 4). The Mossman public population thought attacks occurred more often than the Port Douglas and Daintree Village populations perceived. Port Douglas also had a relatively high-frequency perception of attacks, although not as frequent as Mossman people thought, and Port Douglas' responses were more spread out across the attack-frequency categories. Daintree Village public perceptions of attacks were the most infrequent-minded, with nobody believing attacks happened more often than once every 5 years. Professional opinions were of much less-frequent nature in each town's public counterpart (Figure 14). The largest difference comes in looking at attack-frequency perceptions between the public and professional Mossman populations. The Mossman public felt attacks happen most often out of the three towns, with a median and mode each of 1 attack per year, while the professional from the area (Queensland Parks and Wildlife Services ranger) stated attacks in the area occurred just once every 10 years. In Daintree Village, professional and public perceptions of attack frequency were the lowest.

Table 3: Levels of fear of Estuarine Crocodiles (1-10 scale) expressed by the public, by town.

Town	***n***					**Fear Levels**					**Total**	**Mean**	**St. Dev**
Port Douglas	8	3	7	9	7	4	9	3	7	5	62	6.2	2.299758
Mossman	10	10	10	8	4	10	7	6	2	10	77	7.7	2.907844
Daintree Village	9	8	8	6	0	0	5	3	7	5	51	5.1	3.212822

Table 4: Public and professional perceptions of the frequency of Estuarine Crocodile attacks on humans, by town.

						Frequency of Attacks				
Town	**>1/yr**	**1/yr**	**1/5 yrs**	**1/10yrs**	**1/15 yrs**	**1/20 yrs**	**1/20+ yrs**	**Median**	**Mode**	**Range**
Port Douglas	1	3	3	2	0	1	0	1/5 years	1/1 to 5 yrs	>1/year to 1/20 years
Mossman	2	4	3	1	0	0	0	1/year	1/year	>1/year to 1/10 years
Daintree Village	0	0	2	3	1	1	0	1/10 years	1/10 years	1/5 years to 1/20 years
Town	**>1/yr**	**1/yr**	**1/5 yrs**	**1/10yrs**	**1/15 yrs**	**1/20 yrs**	**1/20+ yrs**	**Median**	**Mode**	**Range**
Pro. Opinion (PD)	0	2	1	0	0	1	0	1/1 to 5 yrs	1/year	1/year to 1/20 years
Pro. Opinion (M)	0	0	0	1	0	0	0	1/10 years	1/10 years	1/10 years
Pro. Opinion (DV)	0	0	0	2	3	0	0	1/15 years	1/15 years	1/10 years to 1/15 years

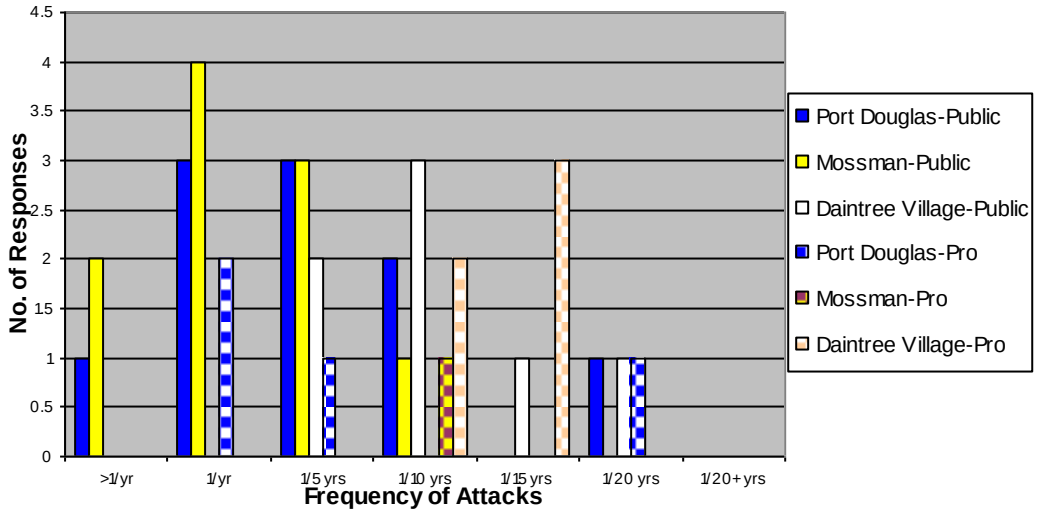


Figure 14: Public and professional ideas about frequency of attacks on humans, across 3 towns.

3.3 Town-Specific Values

Port Douglas

The public population of Port Douglas gave relatively even responses for no removal/coexistence and removal of Estuarine Crocodiles, and had a normal distribution about desired trends in population. People and professionals alike said that while tourism was essential to Port Douglas, tourism with crocodiles was unpopular compared to the other attractions, though still had a secondary role.

In analysing tendencies of qualitative responses, many Port Douglas residents who supported complete coexistence between humans and crocodiles stated that they were more afraid of teenage drivers on the Captain Cook Highway than Estuarine Crocodiles, for death by vehicle on the Captain Cook Highway is much more likely than by Estuarine Crocodile near one's home. Several people in Port Douglas that had robust views of population size and a desire for population downsizing likened Estuarine Crocodiles to the flying fox (*Pteropus scapulatus*): both animal populations have regenerated so well under protection laws that they have become detrimental to humans and their own kind.

People's wildlife values in Port Douglas were somewhat Naturalistic, Ecologistic, and Humanistic. Due to the ocean port's involvement in wildlife tourism and heavy economic reliance on nature, people in Port Douglas also had relatively high Utilitarian and Dominionistic wildlife attitudes.

Mossman

The Mossman public had the highest proportion of attitudes for removal of Estuarine Crocodiles, with the fewest responses for coexistence. The population also felt most strongly that wild populations needed to decrease, especially near the beach. Although some people said crocodile tourism from the Daintree River brings people through the town, general opinions were that tourism was trivial to the Mossman economy and crocodile tourism was nonexistent. Mossman people's wildlife attitudes toward Estuarine Crocodiles were highly Dominionistic, Utilitarian, and Negativistic.

Daintree Village

People of the Daintree Village public expressed the least desire for removal and had the most recurrent responses for unregulated coexistence. Like Port Douglas, ideal wild population trends were normally distributed over the categories. Public and professionals both asserted that tourism was the central income of the local economy, and that crocodile tourism made up nearly all of that.

Several Daintree Village residents who said that people should be able to coexist with Estuarine Crocodiles also said there was too much unjustified hype over human attacks. The animals will never be completely removed—they've been here since before the dinosaurs, after all (pers. comm. Scott Smith)—and people only need to learn respect for their habitat. People who live in the city would not blindly walk across a busy road next to their home—the same principle applies to living near Estuarine Crocodiles. Past attacks have almost always been of the person's own fault and stupidity, when they lost some respect for the animal's territory and put themselves into the crocodile's food chain. Crocodile "attacks" do not happen—only crocodile "feeding," on prey in its territory; still, the animal is always blamed instead of the human. There are risks associated with living anywhere, and Estuarine Crocodiles can never be totally extirpated, but people have the choice to live where they feel comfortable.

People's wildlife values were strongly Ecologistic, Naturalistic, Humanistic, Aesthetic, and somewhat Utilitarian due to the importance of relying on Estuarine Crocodiles for tourism income.

4.0 Discussion

4.1 Demographic Indicators

Results of this study have shown trends in public and professional values and attitudes towards the wild Estuarine Crocodile. Broken down by town, Mossman employed the most hostility for allowing the animals to remain in their habitats, wishing for a population decrease through removal; Mossman public also had the highest levels of fear and perceptions of attack frequency. Port Douglas exhibited the least inequality of opinions for either complete coexistence or removal, occupying the middle standing of the three towns in terms of attitudes to population and removal and levels of fear and attack rate. Daintree Village demonstrated the most positive coexistence values, and had the lowest levels of fear and attack frequency. Various demographics were tested against these values, but generally failed to show any substantial correlation. Contrary to Kellert and Berry (1987), and Bjerke et al. (2001), gender, occupation, pets, and education were unimportant demographic factors. While it may be understandable that biological knowledge would have a negligible affect on attitudes, perceptions of Estuarine Crocodiles' importance to the ecosystem were surprisingly also insignificant. The only factors that seemed to be highly influential were age, having been on a crocodile tour of some kind, and having personally experienced a loss due to the predator. In trying to target factors that increase conservation attitudes, intentions to change the minds of people with losses might be unrealistic, as it seems reasonable to expect that this experience would leave one irreversibly bitter. Older age again proved to be correlated with negative removal attitudes (Bjerke et al. 1998), probably due to a sense of decreasing ability to escape from a potential attack, and this may be most difficult to influence; still, this particular young generation seems to be more environmentally minded (Paquette 2008, pers. comm. Scott Smith) and age may become less of a factor as older conventionally-minded people are replaced with this generation.

4.2 The Effect of Crocodile Tourism

Elimination leaves tourism as the most likely candidate to influence positive attitudes across the board. While crocodile tourism did not prove to foster exceedingly

positive values, it did demonstrate an ability to divest the most inflexible extensive-removal attitudes. Interestingly, there was a clear correlation between each town's specific existence values and the amount of crocodile tourism offered in the town. Daintree Village, dependent on the trade, had the most positive attitudes, while croc-tour-deficient Mossman exhibited the worst attitudes. Port Douglas, with a few overshadowed crocodile tour operations, was not nearly as unreceptive to coexistence as Mossman. There is then good reason to suspect that at least some amount of crocodile tourism in a town where Estuarine Crocodiles are a problem is enough to positively influence people's attitudes towards coexistence with this predator. Whether large or small, any financial benefits gained from having to live next to Estuarine Crocodiles will help people begin to realise the animal's function in and importance to human society and local economy. If people develop this combination of naturalistic and utilitarian values towards Estuarine Crocodiles (as Daintree Village and Port Douglas have done by using the animal for monetary incentives through tourism) then conservation can be most affectively achieved (Quammen, 173).

Although crocodile tourism seemed to shift public attitudes from "remove all" to "remove some" and "live with" Estuarine Crocodiles, it should be noted that tourism did not appear to enhance people's knowledge of the animal's biology or ecologic importance. Like other demographics tests of this study, the lack of knowledge-to-tourism correlation again suggests that education of the animal itself is not the necessary path needed to created positive existence attitudes. Some level of economic benefit to the town, perhaps along with personal experiences from viewing the animal on a crocodile tour (Curtin 2006, Duffy 2008, Ryan et al. 1998), can promote positive attitudes for coexistence with the predator and substitute society's consumptive-use reliance.

4.3 Reasons for Values and Attitudes

In each of the three towns studied, levels of fear were somewhat above centre (range of 5.1 in Daintree Village to 7.7 in Mossman) and were tightly correlated with each town's perceptions of the frequency of attacks on humans, attitudes for removal, and importance of crocodile tourism to the local economy. Public ideas of attack frequency were higher than professionals' perceptions in each respective town. These figures on

fear and attack occurrence suggest that the public may be being fed inaccurate or biased information that would negatively influence their attitudes to Estuarine Crocodiles, and/or that there is some miscommunication between professionals and the public. Miscommunication between the two parties is possible, but as 90% of the public population surveyed had been on a crocodile tour and would have bridged this information gap, it is more likely that some other dynamic has negatively influenced people's perceptions of Estuarine Crocodiles. While negative attitudes and high fear and attack ratings could be due to personal contact with, and perceptions formed by living near, the Estuarine Crocodile (Røskaft et al. 2009), this is also unlikely due to the realistic paucity of attacks on humans. Any miscommunication of information between professionals (with high ecologicistic coexistence values and low-frequency attack perceptions) and the public is filled in with information from outside sources—the media. The media may in fact be quite an influential stakeholder in the public perception of Estuarine Crocodiles (Baenninger 1991).

When asked about the frequency of attacks on humans, Mossman public participants would state the frequency but then often (8 of 10) continue on about several stories they had heard of people attacked, sometimes depicting gruesome accounts. As these stories had all come from people who had not suffered any personal losses, the accounts would have most likely come from the news media and may have additionally being augmented for effect through the passing of the community over time. In comparison, responses from people of Daintree Village and Port Douglas about attacks were merely brief ideas about the figures or were listings of the same specific recent attacks, but without the detailed stories. Mossman people's infatuation with horrific attack tales is linked with their highest levels of fear, and it is likely that this buildup of stories has increased Mossman people's fears and caused most of them to believe attacks happen as often as once per year. Even though the stories would not have been able to come out as often as once per year, people's experiences and attitudes are usually a result of their imaginations (Curtin 2006). Though the Mossman public may have expanded their fears through word-of-mouth, the press might have originally instilled some of these perceptions through often exaggerated accounts of attacks for entertainment and marketing purposes. Most likely, people in Port Douglas and Daintree Village, with

similar or more personal exposure to wild Estuarine Crocodiles, would have been exposed to these same stories from the news; however, because there is no backlash against negativistic attitudes with utilitarian values derived from using Estuarine Crocodiles for economic advantages, Mossman has allowed itself to worry much more about the potential for attacks than the other two towns have. Though there may be other variables involved, there is good reason to believe that the media have amplified stories of attacks on humans, and these have been most adored by crocodile tour-absent towns such as Mossman where Estuarine Crocodiles are regarded as a nuisance. Thus, Mossman people felt much more at risk of being attacked despite probably similar numbers of wild populations in the three towns.

4.4 Ideas for Future Research

This study has found evidence that in areas where human and Estuarine Crocodile populations overlap, conflict can be drastically reduced if the town invests in providing some form of tourism to see the animal. Further studies could investigate which type of tourism (captive-viewing or wild-viewing) more heavily sways public values of Estuarine Crocodiles and their conservation, by comparing people's attitudes before and after each type of tour. The correlation between occupation and predator attitudes could be reexamined from this study, as public participants of this study held mostly "indoor" jobs, and would not be at much personal or financial risk at their job. Bjerke et al. (1998) found that farmers had especially negativistic attitudes towards wolves in Norway due to livestock losses, and livestock farmers in the Daintree region could be surveyed to see if their attitudes match those of this study and Bjerke et al.'s (1998). This study could also be refined with more study sites and redone to survey a larger public population in order to determine more accurate public values.

5.0 Conclusion

Tourism for Estuarine Crocodiles can have large implications for conservation management. Adding fiscal value to the predator will help bring pride to a community and make people recognise the animal's importance and place in society and acceptance its existence. Traditional education has here proven not to be important in determining wildlife values to the Estuarine Crocodile, but the right kind of education can help reduce bad publicity. While past losses cannot be salvaged, prevention of future ones will serve to eradicate negative media influences that are a key cause in instilling unjustified fears. Correct, unbiased education of the Estuarine Crocodile's habitat and territorial behaviour may be the best solution for eliminating the possibility for attacks and teaching people how to live amongst such a potentially terrorizing creature. People, perhaps locals especially, can occasionally lose some respect for the animal's habitat (sometimes comforted by alcohol) and test their luck against the potential disaster (Quammen 158, pers. comm. Jenny Edmonton). Others, such as young children, might simply be unaware that such a creature might reside near their homes. Educating people about living near Estuarine Crocodiles and looking out for other less-aware people and animals is vital, and proper reeducation every so often should also be stressed so that people's respect does not fatally slip. Such reeducation could come as easily as going on a crocodile tour, to safely witness the animal's power, cleverness, and ability to hide in its habitat. People also need to be taught that the removal plan is not as effective as it may seem, and that even if a large Estuarine Crocodile is removed from an area it is not safe to swim, as another could quickly reoccupy the area (pers comm. QPWS Ranger). Learning safe lifestyle practices around potential Estuarine Crocodile habitats is crucial for as long as people intend to live in North Queensland, for the primeval creatures will most likely never be wiped out (pers comm. Scott Smith).

While the media may somewhat generate the rampant, dangerous image of this predator, reality is that many more people die on the road than by attacks from Estuarine Crocodiles; their threat is nowhere near as great as some of the other anthropogenic risks society has learned to live with (i.e. human violence and fatal car accidents). Just as someone would wear his seatbelt in a car to increase the chance of survival, people can

easily live alongside an Estuarine Crocodile if they engage in precautions that will eliminate the potential for fatal attacks. Fortunately, recent pro-conservation media such as efforts by Steve Irwin has helped battle negative news, and has educated people about individual Estuarine Crocodile management (Paquette 2008). Perhaps dissimilar attitudes among ages can be explained by this new "green" media's target of younger generations, in which case broader age groups should be targeted in some other way.

Education and pro-conservation media are important on a small, individual scale for reducing attacks and increasing attitudes, but a large, societal-scale change in values of the Estuarine Crocodile will come most quickly through the presence of local tourism. In terms of predator conservation worldwide, Australia serves as a role model of how tourism based around a predator promotes positive existence values. This study has shown that people's predator attitudes are more positive and accepting in places that use the animal for economic gains through tourism, thus generating money through its conservation. Although Australia may be different in that its large carnivores are robust in numbers and have a history of outliving all other creatures, its management strategies for coexistence through tourism can be applied to other countries whose large carnivores are at a more intense battle over space, food, and survival. Both First World countries and Third World countries can adopt the strategy of turning their disliked, terrorizing carnivores into valued national emblems through non-consumptive utilisation, conserving habitats and animals alike. There will always be those waiting to pounce upon any accident that may occur to spread negative attitudes, but an economic foundation and relevance to society can help people overlook risks of living with large carnivores, as they already do for current habitual hazards.

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Scott Smith. Owner/operator for Electric Boat Cruises. November 26, 2009

Queensland Parks and Wildlife Service ranger. November 24, 2009

Appendix A: Opinions of various groups about wild Estuarine Crocodiles--Total of 3 study sites

		Population size:			Want population to:		Removal of crocodiles:				Ecological importance:			Biological knowledge:		
		Robust	Average	Weak	Increase	Maintain	Decrease	None/coexist	From some communities	From all communities	Vital	Somewhat	Nonfactor	High	Average	Low
	n															
Total Sample	**30**	**24**	**4**	**2**	**6**	**15**	**9**	**12**	**14**	**4**	**14**	**8**	**8**	**6**	**10**	**14**
Sex																
Male	**12**	**9**	**2**	**1**	**1**	**9**	**2**	**5**	**6**	**1**	**8**	**3**	**1**	**3**	**6**	**3**
Female	**18**	**15**	**2**	**1**	**5**	**6**	**7**	**7**	**8**	**3**	**6**	**5**	**7**	**3**	**4**	**11**
Age																
20-29 yr	**3**	0	**2**	**1**	**1**	**1**	**1**	**3**	0	0	**1**	**1**	**1**	**1**	0	**2**
30-39 yr	**5**	**5**	0	0	0	**4**	**1**	**2**	**2**	**1**	**2**	**2**	**1**	0	**4**	**1**
40-49 yr	**9**	**6**	**2**	**1**	**3**	**4**	**2**	**5**	**4**	0	**5**	**3**	**1**	**1**	**3**	**5**
50-59 yr	**6**	**6**	0	0	**1**	**1**	**4**	**1**	**3**	**2**	**3**	**1**	**3**	**2**	**1**	**3**
60-69 yr	**5**	**5**	0	0	0	**4**	**1**	**1**	**4**	0	**2**	**1**	**2**	**1**	**1**	**3**
70+ yr	**2**	**2**	0	0	0	**1**	**1**	0	**1**	**1**	**1**	**1**	0	**1**	**1**	0
Occupation																
Retail	**14**	**10**	**2**	**2**	**2**	**5**	**7**	**4**	**7**	**3**	**6**	**4**	**4**	**3**	4	**7**
Accommodation	**3**	**2**	**1**	0	**1**	**2**	0	**3**	0	0	**2**	0	**1**	**1**	**1**	**1**
Information services	**4**	**3**	**1**	0	**1**	**3**	0	**2**	**2**	0	**3**	**1**	0	0	**1**	**3**
Administr. services	**3**	3	0	0	**1**	**1**	**1**	**1**	**2**	0	**1**	**1**	**1**	0	**2**	**1**
Retired	**3**	**3**	0	0	0	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	0	**1**
Other	**3**	**3**	0	0	0	**2**	**1**	**1**	**2**	0	0	**2**	**1**	0	**2**	**1**
Professional*	**10**	**6**	**3**	**1**	**5**	**5**	0	**7**	**3**	0	**9**	**1**	0	**10**	0	0
Education																
Up to high school	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
High school	**18**	**16**	**1**	**1**	**3**	**9**	**6**	**6**	**10**	**2**	**11**	**3**	**4**	**5**	**6**	**7**
Some univ. edu.	**12**	**8**	**3**	**1**	**2**	**6**	**4**	**6**	**4**	**2**	**3**	**5**	**4**	**2**	**3**	**7**
Pets now																
Yes	**21**	**17**	**2**	**2**	**2**	**10**	**9**	**9**	**9**	**3**	**8**	**6**	**7**	**2**	**9**	**10**
No	**9**	**7**	**2**	0	**3**	**5**	**1**	**3**	**5**	**1**	**6**	**2**	**1**	**4**	**1**	**4**
Personal losses																
Yes	**3**	**3**	0	0	0	0	**3**	0	**2**	**1**	0	0	**3**	0	0	**3**
No	**27**	**21**	**4**	**2**	**6**	**14**	**7**	**12**	**12**	**3**	**15**	**7**	**5**	**7**	**8**	**11**
Experienced Crocodile Tour																
Yes	**27**	**22**	**3**	**2**	**6**	**15**	**6**	**12**	**13**	**2**	**12**	**8**	**7**	**4**	**10**	**13**
No	**3**	**2**	**1**	0	0	0	**3**	0	**1**	**2**	**2**	0	**1**	**2**	0	**1**
Familiarity with QLD Est. Croc. Mgmt Plan																
Yes	**12**	**9**	**3**	0	**1**	**7**	**4**	**5**	**5**	**2**	**9**	**2**	**1**	**3**	**3**	**6**
No	**18**	**15**	**1**	**2**	**4**	**8**	**6**	**7**	**9**	**2**	**5**	**6**	**7**	**3**	**7**	**8**

*Consisting of opinions from representatives of all professional participants in study. Professional opinons only included under Occupation here.

Appendix B: Opinions of various groups in Port Douglas about wild Estuarine Crocodiles

		Population size:			Want population to:		Removal of crocodiles:				Ecological importance:			Biological knowledge:		
		Robust	Average	Weak	Increase	Maintain	Decrease	None/coexist	From some communities	From all communities	Vital	Somewhat	Nonfactor	High	Average	Low
	n															
Total Sample	**10**	**5**	**3**	**2**	**3**	**5**	**2**	**4**	**4**	**2**	**4**	**3**	**3**	**2**	**2**	**6**
Sex																
Male	**5**	**2**	**2**	**1**	**1**	**3**	**1**	**1**	**3**	**1**	**3**	**2**	0	**1**	**2**	**2**
Female	**5**	**3**	**1**	**1**	**2**	**2**	**1**	**3**	**1**	**1**	**1**	**1**	**3**	**1**	0	**4**
Age																
20-29 yr	**2**	0	**1**	**1**	**1**	**1**	0	**2**	0	0	0	**1**	**1**	0	0	**2**
30-39 yr	**1**	**1**	0	0	0	**1**	0	0	**1**	0	**1**	0	0	0	**1**	0
40-49 yr	**4**	**1**	**2**	**1**	0	**3**	**1**	**2**	**2**	0	**2**	**2**	0	0	**1**	**3**
50-59 yr	**2**	**2**	0	0	**1**	0	**1**	0	**1**	**1**	0	0	**2**	**1**	0	**1**
60-69 yr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70+ yr	**1**	**1**	0	0	0	0	**1**	0	0	**1**	**1**	0	0	**1**	0	0
Occupation																
Retail	**6**	**3**	**1**	**2**	**2**	**2**	**2**	**3**	**2**	**1**	**2**	**2**	**2**	**1**	**1**	**4**
Accommodation	**1**	0	**1**	0	0	**1**	0	**1**	0	0	0	0	**1**	0	0	**1**
Information services	**1**	0	**1**	0	0	**1**	0	0	**1**	0	0	**1**	0	0	0	**1**
Administr. services	**1**	**1**	0	0	0	**1**	0	0	**1**	0	**1**	0	0	0	**1**	0
Retired	**1**	**1**	0	0	0	0	**1**	0	0	**1**	**1**	0	0	**1**	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Professional*	**4**	**1**	**2**	**1**	**4**	0	0	**1**	**3**	0	**4**	0	0	**4**	0	0
Education																
Up to high school	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
High school	**6**	**4**	**1**	**1**	**1**	**3**	**2**	**2**	**3**	**1**	**3**	**1**	**2**	**2**	**2**	**2**
Some univ. edu.	**4**	**1**	**2**	**1**	**1**	**2**	**1**	**2**	**1**	**1**	**1**	**2**	**1**	0	0	**4**
Pets now																
Yes	**6**	**3**	**1**	**2**	**1**	**3**	**2**	**3**	**2**	**1**	**2**	**2**	**2**	0	**2**	**4**
No	**4**	**2**	**2**	0	**1**	**2**	**1**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	0	**2**
Personal losses																
Yes	**1**	**1**	0	0	0	0	**1**	0	0	**1**	0	0	**1**	0	0	**1**
No	**9**	**4**	**3**	**2**	**3**	**5**	**1**	**4**	**4**	**1**	**4**	**3**	**2**	**2**	**2**	**5**
Experienced Crocodile Tour																
Yes	**8**	**3**	**3**	**2**	**3**	**5**	0	**4**	**4**	0	**3**	**3**	**2**	**1**	**2**	**5**
No	**2**	**2**	0	0	0	0	**2**	0	0	**2**	**1**	0	**1**	**1**	0	**1**
Familiarity with QLD Est. Croc. Mgmt Plan																
Yes	**4**	**2**	**2**	0	0	**2**	**2**	**1**	**1**	**2**	**2**	**1**	**1**	**1**	0	**3**
No	**6**	**3**	**1**	**2**	**2**	**3**	**1**	**3**	**3**	0	**2**	**2**	**2**	**1**	**2**	**3**

*Consisting of opinions from representatives of Port Douglas Rainforest Habitat, Lady Douglas Cruises, and Hartley's Crocodile Adventures (2). Professional opinons only included under Occupation here.

Appendix C: Opinions of various groups in Mossman about wild Estuarine Crocodiles

		Population size:			Want population to:		Removal of crocodiles:				Ecological importance:			Biological knowledge:		
		Robust	Average	Weak	Increase	Maintain	Decrease	None/coexist	From some communities	From all communities	Vital	Somewhat	Nonfactor	High	Average	Low
	n															
Total Sample	**10**	**9**	**1**	0	**1**	**3**	**6**	**2**	**6**	**2**	**4**	**3**	**3**	**2**	**5**	**3**
Sex																
Male	**3**	**3**	0	0	0	**2**	**1**	0	**3**	0	**3**	0	0	**2**	**1**	0
Female	**7**	**6**	**1**	0	**1**	**1**	**5**	**2**	**3**	**2**	**1**	**3**	**3**	0	**4**	**3**
Age																
20-29 yr	**1**	0	**1**	0	0	0	**1**	**1**	0	0	**1**	0	0	**1**	0	0
30-39 yr	**2**	**2**	0	0	0	**1**	**1**	0	**1**	**1**	0	**1**	**1**	0	**1**	**1**
40-49 yr	**3**	**3**	0	0	**1**	**1**	**1**	**1**	**2**	0	**1**	**1**	**1**	0	**2**	**1**
50-59 yr	**2**	**2**	0	0	0	0	**2**	0	**1**	**1**	**1**	**1**	0	**1**	0	**1**
60-69 yr	**1**	**1**	0	0	0	0	**1**	0	**1**	0	0	0	**1**	0	**1**	0
70+ yr	**1**	**1**	0	0	0	**1**	0	0	**1**	0	0	**1**	0	0	**1**	0
Occupation																
Retail	**7**	**6**	**1**	0	0	**2**	**5**	**1**	**4**	**2**	**3**	**2**	**2**	**2**	**3**	**2**
Accommodation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Information services	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Administr. services	**2**	**2**	0	0	**1**	0	**1**	**1**	**1**	0	0	**1**	**1**	0	**1**	**1**
Retired	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	**1**	**1**	0	0	0	**1**	0	0	**1**	0	0	**1**	0	0	**1**	0
Professional*	**1**	0	**1**	0	**1**	0	0	**1**	0	0	**1**	0	0	**1**	0	0
Education																
Up to high school	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
High school	**6**	**6**	0	0	**1**	**2**	**3**	**1**	**4**	**1**	**3**	**2**	**1**	**3**	**2**	**1**
Some univ. edu.	**4**	**3**	**1**	0	0	**1**	**3**	**1**	**2**	**1**	**1**	**1**	**2**	0	**2**	**2**
Pets now																
Yes	**8**	**7**	**1**	0	0	**2**	**6**	**1**	**5**	**2**	**3**	**2**	**3**	**1**	**4**	**3**
No	**2**	**2**	0	0	**1**	**1**	0	**1**	**1**	0	**1**	**1**	0	**1**	**1**	0
Personal losses																
Yes	**1**	**1**	0	0	0	0	**1**	0	**1**	0	0	0	**1**	0	0	**1**
No	**9**	**8**	**1**	0	**1**	**2**	**6**	**2**	**5**	**2**	**5**	**2**	**2**	**3**	**4**	**2**
Experienced Crocodile Tour																
Yes	**9**	**9**	0	0	**1**	**3**	**5**	**2**	**5**	**2**	**3**	**3**	**3**	**1**	**5**	**3**
No	**1**	0	**1**	0	0	0	**1**	0	**1**	0	**1**	0	0	**1**	0	0
Familiarity with QLD Est. Croc. Mgmt Plan																
Yes	**2**	**1**	**1**	0	0	0	**2**	**1**	**1**	0	**2**	0	0	**1**	**1**	0
No	**8**	**8**	0	0	**1**	**3**	**4**	**1**	**5**	**2**	**2**	**3**	**3**	**1**	**4**	**3**

*Consisting of opinions from representatives of the Queensland Parks and Wildlife Services. Professional opinons only included under Occupation here.

Appendix D: Opinions of various groups in the Daintree Village about wild Estuarine Crocodiles

		Population size:			Want population to:		Removal of crocodiles:				Ecological importance:			Biological knowledge:		
		Robust	Average	Weak	Increase	Maintain	Decrease	None/coexist	From some communities	From all communities	Vital	Somewhat	Nonfactor	High	Average	Low
	n															
Total Sample	**10**	**10**	0	0	**2**	**7**	**1**	**6**	**4**	0	**6**	**2**	**2**	**2**	**3**	**5**
Sex																
Male	**4**	**4**	0	0	0	**4**	0	**4**	0	0	**2**	**1**	**1**	0	**3**	**1**
Female	**6**	**6**	0	0	**2**	**3**	**1**	**2**	**4**	0	**4**	**1**	**1**	**2**	0	**4**
Age																
20-29 yr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-39 yr	**2**	**2**	0	0	0	**2**	0	**2**	0	0	**1**	**1**	0	0	**2**	0
40-49 yr	**2**	**2**	0	0	**2**	0	0	**2**	0	0	**2**	0	0	**1**	0	**1**
50-59 yr	**2**	**2**	0	0	0	**1**	**1**	**1**	**1**	0	**1**	0	**1**	0	**1**	**1**
60-69 yr	**4**	**4**	0	0	0	**4**	0	**1**	**3**	0	**2**	**1**	**1**	**1**	0	**3**
70+ yr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Occupation																
Retail	**1**	**1**	0	0	0	**1**	0	0	**1**	0	**1**	0	0	0	0	**1**
Accommodation	**2**	**2**	0	0	**1**	**1**	0	**2**	0	0	**2**	0	0	**1**	**1**	0
Information services	**3**	**3**	0	0	**1**	**2**	0	**2**	**1**	0	**3**	0	0	0	**1**	**2**
Administr. services	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Retired	**2**	**2**	0	0	0	**2**	0	**1**	**1**	0	0	**1**	**1**	**1**	0	**1**
Other	**2**	**2**	0	0	0	**1**	**1**	**1**	**1**	0	0	**1**	**1**	0	**1**	**1**
Professional*	**5**	**5**	0	0	0	**5**	0	**5**	0	0	**4**	**1**	0	**5**	0	0
Education																
Up to high school	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
High school	**6**	**6**	0	0	**1**	**4**	**1**	**3**	**3**	0	**5**	0	**1**	0	**2**	**4**
Some univ. edu.	**4**	**4**	0	0	**1**	**3**	0	**3**	**1**	0	**1**	**2**	**1**	**2**	**1**	**1**
Pets now																
Yes	**7**	**7**	0	0	**1**	**5**	**1**	**5**	**2**	0	**3**	**2**	**2**	**1**	**3**	**3**
No	**3**	**3**	0	0	**1**	**2**	0	**1**	**2**	0	**3**	0	0	**1**	0	**2**
Personal losses																
Yes	**1**	**1**	0	0	0	0	**1**	0	**1**	0	0	0	**1**	0	0	**1**
No	**9**	**9**	0	0	**2**	**7**	0	**6**	**3**	0	**6**	**2**	**1**	**2**	**3**	**4**
Experienced Crocodile Tour																
Yes	**10**	**10**	0	0	**2**	**7**	**1**	**6**	**4**	0	**6**	**2**	**2**	**2**	**3**	**5**
No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Familiarity with QLD Est. Croc. Mgmt Plan																
Yes	**6**	**6**	0	0	**1**	**5**	0	**3**	**3**	0	**5**	**1**	0	**1**	**2**	**3**
No	**4**	**4**	0	0	**1**	**2**	**1**	**3**	**1**	0	**1**	**1**	**2**	**1**	**1**	**2**

*Consisting of opinions from reps. of Electric Boat Cruises, Daintree River Tours, Crocodile Express, Thundacroc, and Solar Whisper. Professional opinions only listed under Occupation.

Appendix E: Map of Study Sites

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Appendix F: Survey for Public Population

1. How would you rate your understanding of Estuarine Crocodile biology?

2. How important are Estuarine Crocodiles to the functioning of their ecosystems?

3a. What are your ideas about or estimations of current wild population of Estuarine Crocodiles near PD/M/DV?

3b. Would you like to see wild Estuarine Crocodile populations increase, decrease, stay the same?

4. How important is tourism to the local economy in PD/M/DV?

5a. How economically important are Estuarine Crocodiles to local tourism, compared to other local attractions?

5b. Do you think there is not enough/too much crocodile tourism here?

6. Do you feel people should learn to live with Estuarine Crocodiles, or remove them?

7. On a scale of 1-10 (10 being the most), how afraid of Estuarine Crocodiles are you?

8. Do you feel Steve Irwin's approach to crocs was reasonable, educational, inspiring, unrealistic, etc?

9. How often do Estuarine Crocodiles attacks on humans occur in North Queensland?

10. Do you have any knowledge of and/or opinions of the Queensland Estuarine Croc Mgmt plan?

11. Have you ever been on a crocodile tour?

Age:
Sex:
Occupation:
Education:
Local:
Pets:
Losses:

Appendix G: Survey for Professional Population—Interview Prompt

1. About how many estuarine crocodiles exist in the wild in the Daintree region?

2. Do you feel that the wild population should be increased, reduced, stay the same, or be completely extirpated?

3. How important are saltwater crocodiles to their ecosystems in regulating populations of other species?

4. About how often do you lose crocodiles to captivity due to them becoming problem crocodiles?

How often are problem crocodiles merely transported to a more remote area?

5a. Do you believe crocodiles have a right to live in Australian wilderness?

5b. If so, when do they lose that right?

6a. Do you believe people should learn to live with crocodiles? (Would you say that Steve Irwin's approach to coinciding and interacting with wild crocodiles was reasonable/unrealistic?)

6b. What is the best solution to teaching people how to coexist with Estuarine Crocodiles?

7a. How important is tourism in general to the PD/M/DV economy?

7b. How important are crocodiles and crocodile tourism to the PD/M/DV tourism industry compared to other attractions?

8. What are past and future trends in crocodile tourism in the area?

8b. Which do you think is in greater public demand, croc tourism or croc processing?

9. What are your opinions on current management strategies for wild Estuarine Crocodiles?

10. How frequently do Estuarine Crocodile attacks occur in North Queensland?