PUBLIC OPINION RESEARCH
on Improving Leach's Storm-Petrel Conservation in Newfoundland Through an Understanding of Human Perceptions

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Final Report

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Signed: _____

Marie Louise Aastrup, Ph.D.

Date: March 31, 2022

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Executive Summary

This research was conducted to understand how locals in Conception Bay, Newfoundland and Labrador, perceive Leach's storm-petrels (*Oceanodroma leucorhoa*) (referred to as storm-petrels) and Atlantic puffins (*Fratercula arctica*) (referred to as puffins). Between 1984-2013, the Leach's storm-petrel population on Baccalieu Island declined by approximately 1.6 million breeding pairs, illustrating the urgency of storm-petrels conservation initiatives (Wilhelm et al., 2019). An unpublished report written by Canadian Parks and Wilderness Society – Newfoundland and Labrador Chapter (CPAWS-NL), documents negative perceptions of storm-petrels. To understand how widespread these negative perceptions are, and to understand the factors contributing to potential negative perceptions, a *human dimensions of wildlife* approach was adopted, using questionnaires to obtain quantitative (i.e., numeric) and qualitative (i.e., words) data on seabird perceptions.

The total estimated value of this contract amounts to CAD $39,104.89 (including HST).

Methods & Demographics

A Drop-Off-Pick-Up (DOPU) method was used to distribute the questionnaire in four towns: Holyrood, Harbour Main-Chapel's Cove-Lakeview, Clarke's Beach and Bay de Verde (Figure 2) between August – November 2021. Provincial and federal guidelines for COVID-19 during data collection (i.e., wearing mask, maintaining physical distance, and using hand sanitizer). A random proportionate sample frame was used to collect data from residents in the four towns. Participation was voluntary and only participants over the age of 18 were invited to complete the survey. A total of 764 individuals were invited to participate in this study, and 320 questionnaires were obtained, representing a 51% overall response rate. As the data were obtained in rural communities in Newfoundland, the findings cannot be extrapolated to urban centers such as St. John's.

Sampling was of an almost even split between people identifying as female and male. While the demographic profile of respondents generally reflects the 2016 census data, the data is skewed towards people of an older age. The majority of respondents were over 50 years of age thus the findings do not speak about the perceptions of younger populations. This is in part because individuals under the age of 18 were not invited to participate in the study.

Key Findings

The majority of respondents (67.64%) had not heard about the *Puffin and Petrel Patrol* and very few (0.65%) intended to participate in the *Puffin and Petrel Patrol.* Almost two-thirds of the respondents indicated that they are aware that puffins exist in Conception Bay. Around two-fifths have seen puffins in Conception Bay. Just about half of respondents were aware that storm-petrels exist in Conception Bay, with around two-fifths reporting having seen storm-petrels. Based

on respondents' answers to a series of knowledge questions, over half of the respondents (57.00%) can be considered knowledgeable about puffins and 43.00% can be characterized as unknowledgeable. A lower percentage of respondents (50.00%) can be characterized as knowledgeable about storm-petrels and 50.00% as unknowledgeable. Generally, respondents were unaware that Newfoundland and Labrador is the largest nesting site of Leach's storm-petrels in the world. Results indicate that knowledge levels for storm-petrels differ between male and female respondents, with male respondents reporting higher awareness of storm-petrels.

Data collection was on respondents' wildlife value orientations, basic beliefs held by people about the place of wildlife in the world. Wildlife value orientations can be separated into four categories: mutualists (caring and social affiliation with wildlife), traditionalists/utilitarian (hunting and use of wildlife), pluralists (individuals who hold both mutualistic and utilitarian basic beliefs), and distanced (individuals who are not particularly interested in wildlife and score low on both mutualistic and utilitarian). The majority of respondents (36.00%) hold mutualistic wildlife value orientations, followed by pluralists (29.87%), traditionalists (18.51%) and distanced (15.59%). In Holyrood (40.65%) and Harbour Main-Chapel's Cove-Lakeview (33.33%), the majority of respondents have mutualistic wildlife value orientations. In Clarke's Beach (36.84%) and Bay de Verde (33.33%), the majority have pluralistic wildlife value orientations. This has implications for framing of communication. While most respondents can be characterised as "mutualists" or "pluralists", communication efforts should target each wildlife value orientation. Communication efforts should also target the community in which they are intended, as differences in wildlife value orientations across communities were observed.

Attitudes are an individual's evaluation of an entity (e.g., person, object, action, species) and can be either favourable, neutral, or unfavourable. Overall, most respondents hold positive or neutral attitude towards puffins. Respondents indicated that they think of puffins in their community as good, beneficial, and positive. Respondents held slightly less positive attitudes toward storm-petrels. On average, respondents think of storm-petrels in their community as neither bad nor good, somewhat beneficial, and neither negative nor positive. No statistically significant differences were detected between male and female respondents across attitudes towards puffins and storm-petrels.

Emotions are physiological, cognitive, and behavioural reactions to experiences, and play a role in the intensity and direction of how an individual perceives wildlife. Seeing puffins in the community left respondents with positive emotions. Overall, respondents indicated that seeing puffins made them feel happy, compassionate, excited, pleased, and in awe. These emotions were not as pronounced for storm-petrels, where a higher number of respondents indicated that they were neutral in terms of their emotional response. Yet respondents overall reported feeling neither angry nor happy, somewhat compassionate, neither disgusted nor excited, neither upset nor pleased, and in awe when seeing storm-petrels in the community. Respondents identifying as female held slightly more positive emotions towards puffins than male respondents. No

statistically significant differences were detected for emotions towards storm-petrels between male and female respondents.

Beliefs an individual holds about a species' right to existence and the importance of species conservation for future generations are called *existence beliefs*. Respondents agree that both puffins and storm-petrels have a right to exist and should be conserved for future generations. Respondents also believe that puffins, and less so storm-petrels, have a positive impact on tourism.

To understand norms around puffins and storm-petrels, awareness of consequences of human actions on seabird conservation and the degree to which individuals ascribe responsibility to themselves were measured. Higher mean values for ascription of responsibility items were observed for puffins than storm-petrels. Respondents believe that they are responsible for the conservation of puffins, but less so for storm-petrels. On average, respondents do not feel particularly obligated to educate others about the importance of puffins or storm-petrels. On average, respondents reported high awareness of consequences: respondents indicated that their personal actions could impact the ability of puffins and storm-petrels to thrive. Respondents also indicated that they are aware of the impacts humans can have on puffins and storm-petrels.

To understand what influences perceptions, testing of interactions with the seabirds took place (awareness of their existence and seen them, vs. awareness of their existence without having seen them, vs. unaware and not seen them). No significant differences were detected in how puffins are perceived based on respondents' interactions with puffins. However, differences were detected in how storm-petrels are perceived based on interactions. For storm-petrels, a higher knowledge level and stronger existence beliefs for both awareness categories were observed. Significant differences in awareness of consequences and ascription of responsibility for respondents who are aware and have seen storm-petrels compared to respondents who were unaware and had never seen the bird were observed, with the aware respondents reporting higher levels of awareness of consequences and ascription of responsibility.

The relationships between cognitions, emotions, and personal normal (i.e., ascription of responsibility and awareness of consequences) for both seabirds were examined using linear regression. For puffins, weak relationships were detected between wildlife value orientations and attitudes, and knowledge and attitudes. A strong relationship was detected between respondents' attitudes and emotions and weaker relationships between attitudes and ascription of responsibility. Relationships between emotions and ascription of responsibility and awareness of consequences were also detected. For storm-petrels, the relationships between cognitions, emotions, and personal norms were less pronounced, with a detection of a weak relationship between knowledge and awareness of consequences. It also showed a relationship between emotions and ascription of responsibility for storm-petrels, and emotions and awareness of consequences. A weak relationship was also detected between attitudes and ascription of

responsibility. For both species, a strong relationship between the two norm variables (ascription of responsibility and awareness of consequences) was observed.

Respondents were asked to indicate the first three words that came to mind when thinking about puffins and storm-petrels respectively. The most common category of words for puffins were *bird attributes* (41.15%). Of these, the majority were positive attributes (84.11%) such as “beautiful”, “nice”, “pretty”, and “fun”, followed by neutral (8.61%), and only very few negative attributes (1.99%). The second most common category was *bird characteristics* (26.19%) such as “small”, “fast”, and “colorful”, followed by *location* (8.63%), *animals* (7.91%), and *cultural identity* (5.76%). Examples of cultural identity included “Buddy the Puffin”, “home”, and “iconic”. Words associated with puffins are generally positive in character, focused on the bird’s appearance, and specific locations where they bird can be encountered. For storm-petrels, *bird attributes* were also the most common category (23.72%). The majority were positive attributes (43.36%) such as “graceful”, “beautiful”, and “nice”, followed by negative attributes (24.78%) such as “stink”, “smelly”, “foolish”, and “odor”, and neutral attributes (14.16%) such “fast”, “free”, and “quick”. Similar to puffins, the second most common category was *bird characteristics* (22.25%), which included words like “small” and “black”, followed by *lack of knowledge* (13.69%). Other prominent categories included *meteorological conditions* (9.54%) which included weather related events that impact to storm-petrels and words like “storm”, “bad”, and “wind”. *Animals* (9.29%) was also a common category and included words like “birds”, “gulls”, “whales”, and “wildlife”. *Built environment* (8.56%) included threats to storm-petrels associated with built structures such as “attracted to light” and other infrastructure such as “oil rigs”, “streetlights”, and “windows”. Words associated with storm-petrels are less positive than for puffin, and to a larger extent focused on unawareness and threats to storm-petrel conservation.

Expected use of results & extrapolation of findings

- While puffins and storm-petrels are both seabirds, one species has been taken in as a cultural icon, the other has not. This indicates a value placed on each animal. How people value wildlife can directly influence their support of the species conservation. The residents of Conception Bay generally have positive beliefs and attitudes toward storm-petrels but they lack information which might shift them to care for the species instead of tolerating them.

- There are several species of concern that are not necessarily valued by people. Getting people to care is critical in supporting conservation planning and execution.

- Storm-petrels are not as well-known as puffins. Attitudes and beliefs were not negative, but benign. To help conservation efforts, an expansion of education programs could help garner the support of local community members.

Introduction

Baccalieu Island, located at the mouth of Conception Bay in Newfoundland, is home to the largest colony of Leach's storm-petrel (*Oceanodroma leucorhoa*) in the world and other seabird species such as the Atlantic puffin (*Fratercula arctica*) (Figure 1). Besides its ecological importance, the seabird colony on Baccalieu Island is important for tourism, research, and conservation. However, since 1984, the number of storm-petrels have drastically declined from approximately 3.6 million breeding pairs to only 2 million pairs in 2013 (Wilhelm et al., 2019). The explanation for this dramatic population decline is likely multi-faceted. One possible explanation is related to human-petrel interactions, especially regarding strandings on fishing vessels and on land.

The nature of these human-petrel interactions, their frequency, and potential effects are unknown. Anecdotal evidence suggests that storm-petrels, a small, black, bat-like seabird which has a strong musty odour, are perceived by some Newfoundlanders as "dirty" or "lousy" birds, which may pose a direct threat to stranded petrels (e. g., people not helping stranded birds) and as a barrier for community residents in participating in community-based storm-petrel conservation. Due to documented population declines, particularly in the western Atlantic (which comprises ~90% of the Atlantic basin total), Leach's storm-petrel was designated as *Globally Threatened* in 2016 and up-listed to *Vulnerable* on the IUCN Red List (BirdLife International, 2018a). Furthermore, it was designated as *Threatened* by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in November 2020 and is a strong candidate for listing under the Species at Risk Act. Atlantic puffin is listed as *Vulnerable* on the IUCN Red List globally (BirdLife International, 2018b).

Successful community-based conservation efforts to aid stranded seabirds are well documented in Newfoundland with birds such as puffins. Since 2011, the local chapter of Canadian Parks and Wilderness Society (CPAWS-NL) has been running the community-based conservation program "*Puffin Patrol*" and has recently expanded its program to include Leach's storm-petrels (now titled the *Puffin and Petrel Patrol*). The goal of CPAWS-NL's program is to train community members in helping stranded puffins and storm-petrels during the fledging period, namely August to November. Since 2018, Environment and Climate Change Canada-Canadian Wildlife Service (ECCC-CWS) has, alongside CPAWS-NL, been working to understand human-petrel interactions in Conception Bay to improve conservation efforts. A recent unpublished report based on initial research carried out in Conception Bay by CPAWS-NL provides evidence of existing misconceptions and myths around storm-petrels as "lousy," "dirty," or "diseased" birds. Such negative perceptions may affect local willingness to help stranded storm-petrels compared to the iconic Atlantic puffins. Little is known about avian-human interactions in Newfoundland and this project documents puffin and storm-petrel perceptions to understand the extent and strength of negative perceptions of storm-petrels compared puffins, the provincial bird of Newfoundland and Labrador.

Figure 1 Left: Leach's storm-petrel (*Oceanodroma leucorhoa*). Photo credits: Alix d'Entremont. Right: Atlantic puffin (*Fratercula arctica*) in Newfoundland. Photo credits: Nature Est (Simone Cominelli)

Drawing on a human dimensions of wildlife approach, this research investigates local avian perceptions. Perceptions can be defined as "(...) *the way an individual observes, understands, interprets, and evaluates a referent object, action, experience, individual, policy, or outcome*" (Bennett, 2016, p. 4). As such, perceptions are embedded in cultural context, history, customs, language, belief systems, traditions, etc., all contribute to how people interpret their reality (Munhall, 2008). Local perceptions of birds are no different. Avian perceptions are complex and culturally mediated. Whether a bird species is perceived as pest and or not reflects culturally constructed beliefs about the species (Anderson, 2010). Species deemed to have worth, such as the marketable and cute Atlantic puffin, inspire protection by law and public norms. This public support has positive implications for any community engagement in seabird conservation initiatives. Understanding how locals perceive storm-petrels and puffins in Conception Bay can provide a foundation for strategically communicated conservation efforts with constituencies (Lessard et al., 2021; Miller et al., 2018). How people relate to wildlife has often been investigated through the lens of cognition (i.e., the process of acquiring knowledge and understanding through thought and experience (Vaske & Donnelly, 1999; Vaske, 2008) and emotions (Jacobs et al., 2012; Sponarski et al., 2015).

Research objectives

A key element in improving avian conservation is through education (Anderson, 2010), and the first step in increasing local awareness and response to the declining number of storm-petrels is by understanding local knowledge and perceptions of the species. By documenting and describing local perceptions of storm-petrels and puffins in communities along Conception Bay, this research provides managerial insights that will support the design of appropriate outreach material and the implementation of the newly expanded *Puffin and Petrel Patrol*.

The overarching objective of this research is to investigate residents' perceptions of and experience with Leach's storm-petrels and Atlantic puffins in communities around Conception Bay. The purpose of this research is to understand how locals around Conception Bay perceive key seabird species with which they potentially interact with, namely: *a)* Leach's storm-petrel (when they become stranded on land or on fishing vessels), and *b)* Atlantic puffin (the provincial bird, a comical and colourful seabird used to market wildlife tourism in the province).

There are three objectives associated with this research:

Objective 1: Understand potential differences in seabird perceptions across Leach's storm-petrels and Atlantic puffins

Objective 2: Understand potential misperceptions and knowledge gaps about Leach's storm-petrels and conservation status.

Objective 3: Understand the degree of influence different factors (emotions, attitudes, cultural beliefs) have on a person's willingness to participate in seabird conservation[1].

This research will provide baseline information for ECCC-CWS to develop outreach material that directly addresses barriers preventing positive engagement in storm-petrel conservation. This study can support ECCC-CWS in understanding storm-petrel conservation needs and improving storm-petrel conservation efforts in Newfoundland and in Atlantic Canada more broadly. With the declining storm-petrel population, this work can provide information to help the recovery of the species.

Organization of the report

The methods section outlines the study area, items included in the research instrument, how sampling size was determined, how data collection was carried out, the representativeness of the sample obtained, and analyses undertaken. The findings sections provide detailed overviews of the findings. Each section introduces the reader to the theoretical background and concepts measured, followed by descriptive findings and analysis results. The management implications sections highlight managerial recommendations based on the findings. The conclusion provides the reader with concluding remarks. Survey instrument in English and French is provided in the appendices.

[1] Due to the low number of respondents (0.65%) indicating that they intend to participate in the *Puffin and Petrel Patrol*, no statistical tests predicting willingness to participate in the initiative could be run.

Methods

Study areas

Residents were recruited and invited to participate in four communities along Conception Bay (Figure 2), Holyrood, Harbour Main-Chapel's Cove-Lakeview, Clarke's Beach, and Bay de Verde (Table 1). These communities were chosen due to their geographical location along Conception Bay and their importance for stranded storm-petrels. These communities were chosen based on previously collected information where storm-petrel strandings are known to occur, as reported by the public to CPAWS-NL and ECCC-CWS.

Sample sizes

The desirable sampling size was calculated using census data for community size provided by Statistics Canada (2016) (Table 1). With a total population size of approximately 5,500 people in 2016, the desirable sampling size was calculated using equation 1.1 to be 359 completed surveys (see Appendix 1). Such a sample size is sufficient to generalize results to a population of more than 1,000,000 people, with results considered accurate in 19 out of 20 times, ± 5 percent (Vaske, 2008).

Table 1 Overview of study areas & proportionate sampling frame

Location	Dwellings[2]	Population[1]	Proportion of study area (%)	Surveys need per village
Holyrood	1106	2463	45	161
Harbour Main-Chapel's Cove-Lakeview	509	1067	19	70
Clarke's Beach	642	1558	28	102
Bay de Verde	216	392	7	26
Total	**2473**	**5480**	**100%**	**359**

[2] Based on Canada Census 2016

Figure 2 Study areas: Holyrood, Harbour Main-Chapel's Cove-Lakeview, Clarke's Beach, and Bay de Verde.

Data collection

Proportionate random sampling was used to collect data through a self-administered survey between August – November 2021. Due to the federal election in September 2021, the fieldwork was suspended temporarily, but resumed in November. Provincial and federal guidelines for COVID-19 during data collection was followed (i.e., wore mask, maintained physical distance, and used hand sanitizer). The surveys were distributed using a Drop-Off Pick Up (DOPU) sampling frame in the four communities (Vaske, 2008). In cases where the resident was interested in participating but required assistance in filling out the survey, the survey was filled out with the resident on site. Otherwise, respondents were instructed to leave the filled survey on the doorknob for picking up two days later. A two-contact point system was used, where residents who had not had the opportunity to complete the survey on the second day were provided with a prepaid envelope for mailing in the survey. A total of 105 envelopes were given out during the duration of this project, with 31 surveys returned via mail.

Only persons of legal age were invited to participate in this study. Screening criteria followed human dimensions of wildlife standards, following the "next birthday" principle (Vaske, 2008). This entails inviting the person of legal age whose birthday is coming up next to participate in the study. There were no financial or other incentives, honoraria, compensations for respondents who were involved in the study. None of the potential participants asked for French version of the questionnaire.

With an anticipated response rate around ≈ 50%, 764 people were invited to participate in this study. Of those 764 people, 628 agreed to participate in the study. A total of 320 community members completed the questionnaires, with an overall response rate of 51% (see Appendix 1).

Response rates varied in the four communities, with the lowest response rate in Clarke's Beach (39%) and the highest on Bay de Verde (79%). This variation may be due to various factors, including the timing of data collection: data collected in Clarke's Beach happened immediately before the work suspension caused by the federal election. This meant that the researchers were not able to follow up in days after data had been collected.

Some community members gave verbal explanations of why they chose not to participate in the study. Among the most common explanations were *a)* "I did not see the survey" (e.g., another household member received it; it got lost etc.); *b)* "I don't know what storm-petrels are" and/or "I wasn't aware that puffins existed in the area"; *c)* "I am not interested in birds". Other reasons for non-participation were potential respondents questioning the nature of the work (e.g., beliefs about affiliation with other organizations that the respondent did not support; misunderstandings regarding the target species). No differences were observed in respondents returning the questionnaires collected in the field and those that were mailed in.

Representativeness of sample

Participation was voluntary. Only participants over the age of 18 were invited to participate in this study. The majority of the completed surveys were obtained from Holyrood (n = 160), followed by Clarke's Beach (n = 58), Harbour Main-Chapel's Cove-Lakeview (n = 53), and Bay de Verde (n = 49) (Table 2).

Table 2 Completed surveys per community

Location	Population[1]	Proportion of study area (%)	Completed surveys obtained per community
Holyrood	2463	45	160
Harbour Main-Chapel's Cove-Lakeview	1067	19	53
Clarke's Beach	1558	28	58
Bay de Verde	392	7	49
Total	**5480**	**100%**	**320**

Except for respondents from Bay de Verde, the sample included an almost even split between respondents identifying as female or male (Table 3). Respondents were provided with a "*prefer not to answer*" option, which is not included in the table. Generally, the age of the respondents reflects the 2016 census data for the four communities (Table 3). Bay de Verde is the only exception, where the majority of respondents indicated that they were over 60 years of age.

Table 3 Comparison of census (2016) and sampling demographics. All numbers listed are proportions of the total (%).

Demographics	Holyrood		Clarke's Beach		Harbour Main-Chapel's Cove-Lakeview		Bay de Verde	
	Census	**Sample**	**Census**	**Sample**	**Census**	**Sample**	**Census**	**Sample**
Gender[3]								
Female	49.60	50.65	53.99	56.00	51.42	49.12	50.00	27.08
Male	50.20	46.10	45.62	42.00	49.53	43.86	50.00	66.67
Other	-	0.65	-	0	-	0	-	0
Age								
19 and under[4]	20.04	2.03	17.89	0	18.87	0	16.67	0
20 - 29	7.89	6.08	6.39	6.08	7.55	7.27	5.13	2.17
30 - 39	12.75	14.19	9.27	14.19	8.49	18.18	8.97	4.35
40 - 49	13.16	12.84	12.14	12.84	15.09	10.91	11.54	8.70
50 - 59	16.19	14.19	12.78	14.19	19.81	18.18	19.23	13.04
60 +	29.96	50.68	41.53	50.68	30.19	45.45	38.46	71.74

Analysis

All frequencies are reported as valid percentage (i.e., not accounting for any missing values). For descriptive statistics, mean values ($\bar{x}$), standard deviation (SD), and relative frequencies (%) are reported. All statistical tests operated with a confidence interval level of 0.95, and a $p \leq 0.05$ as the threshold for statistical significance.

The knowledge variables for puffins and storm-petrels were recoded and assigned a value (incorrect answer: -1; don't know: 0; correct answer: 1) for all answers. A summated score was then created where respondents were considered "knowledgeable" if they had more than 5 correct and less than 5 incorrect answers, and "unknowledgeable" if they had more than 5 incorrect and less than 5 correct answers. The "unknowledgeable" category also encompasses respondents who answered "don't know" to five or more items.

Independent samples T-tests and Analysis of Variance (ANOVA) were used to understand differences in mean values, with Cohen's d as an effect size measure, where a d value of 0.20 indicates a small effect, 0.50 a medium effect, and 0.80 a large effect (Vaske 2008). Based on

[3] Please note that the 2016 census only lists female and male options for gender identification.
[4] Only participants of legal age were invited to participate in this study. The proportion of sampled individuals is thus skewed towards people outside this age category [19 and under].

Levene's test, Bonferroni post-hoc test was used where equality of variance can be assumed and Tamhane post-hoc tests if equality of variance cannot be assumed for ANOVA.

Linear regression was used to understand the relationship between different cognitions. Standardized regression coefficients (ß) were used to understand the strength of the relationship, where a ß value between 0.10 – 0.30 is considered a minimal relationship, between 0.30 – 0.50 a typical relationship, and over .50 as a substantial relationship (Vaske 2008).

Crosstabulations were used to understand differences in word associations across age, gender, wildlife value orientation, species knowledge, and species interactions. Cramer's *V* was used as an effect size measure to understand the strength of association. Cramer's *V* ranges from 0 – 1. Values of around 0.1 suggest a "minimal" relationship, 0.3 a "typical" relationship, and values above 0.5 as a "substantial" relationship (Vaske, 2008). Pearson correlation (r) was used to understand the strength of association between word associations, attitudes and emotions.

Creating latent variables

Principal Component Analysis with varimax rotation was used to identify latent variables (i.e., scales). To assess the internal reliability of the scales Cronbach's Alpha was used. Cronbach's Alpha values range from 0 – 1. The values are dependent on the average inter-item correlation and number of items included in the scale. Alpha values between 0.60 - 0.70 are considered adequate, while alpha values over 0.80 are considered "good" in terms of internal consistency for the scale (Vaske, 2008). Cronbach's Alpha values for the wildlife value orientation scales (domination and mutualism) can be found in Table 4. Alpha values for attitude, emotion, existence beliefs, awareness of consequences, and ascription of responsibility for puffins can be found in Table 5 and in Table 6 for storm-petrels.

Table 4 Reliability analysis for wildlife value orientations scales (domination and mutualism).

	$\bar{x}$	SD	Item-total correlation	Cronbach's α	α if item deleted
Domination	**1.11**	**3.822**		**.695**	
Humans should manage wildlife populations so that humans benefit.	.11	1.287	.455		.651
We should strive for a world where there is an abundance of wildlife for hunting and fishing.	.86	.930	.538		.621
The needs of humans should take priority over wildlife protection.	-.30	1.041	.364		.675
Wildlife are on earth primarily for people to use.	-.65	.944	.408		.660
Hunting is a positive and humane activity.	.36	.930	.419		.657
People who want to hunt should have the opportunity to do so.	.72	.886	.402		.663
Mutualism	**4.41**	**4.931**		**.868**	
Wildlife should have rights similar to the rights of humans.	.58	1.029	.649		.849
I view all living things as part of one big family.	.95	.870	.589		.856
I feel a strong emotional bond with wildlife.	.57	.912	.650		.848
I care about wildlife as much as I do about people.	.42	1.071	.626		.853
We should strive for a world where humans and wildlife can live side by side without fear.	.73	.923	.615		.853
I value the sense of companionship I receive from wildlife.	.65	.852	.670		.846
Wildlife are like my family and I want to protect them.	.52	.922	.713		.840

All variables were coded on a 5-point scale from strongly disagree (-2) to strongly agree (+2).

Table 5 Reliability analysis for attitude, emotions, existences beliefs, awareness of consequences and ascription of responsibility scales for puffins.

	$\bar{x}$	SD	Item-total correlation	Cronbach's α	α if item deleted
Attitudes	**2.72**	**2.392**		**.936**	
Bad/Good	.95	.869	.875		.903
Harmful/Beneficial	.81	.814	.834		.934
Negative/Positive	.96	.855	.899		.883
Emotions	**5.02**	**3.750**		**.958**	
Angry/Happy	1.05	.813	.860		.952
Indifferent/Compassionate	.96	.811	.864		.951
Disgusted/Excited	1.00	.795	.918		.942
Upset/Pleased	.99	.823	.903		.945
Contemptuous/In Awe	1.02	.809	.867		.951
Existences Beliefs	**3.16**	**1.154**		**.867**	
Puffins have a right to exist	1.62	.579	.771		
Puffins should be conserved for future generations	1.54	.647	.771		
Awareness of Consequences	**1.88**	**1.540**		**.686**	
My personal actions can impact the ability of puffins to thrive	.98	.877			
I am aware of the impacts that humans can have on puffins	.91	.889			
Ascription of Responsibility	**2.37**	**2.288**		**.827**	
Individual citizens like me are responsible for the conservation of puffins	1.05	.830	.594		.845
I feel a strong personal obligation to protect puffins	.73	.921	.788		.649
I feel an obligation to educate others about the importance of puffins	.59	.902	.681		.765

Table 6 Reliability analysis for attitude, emotions, existences beliefs, awareness of consequences and ascription of responsibility scales for storm-petrels.

	$\bar{x}$	SD	Item-total correlation	Cronbach's α	α if item deleted
Attitudes	**1.59**	**2.241**		**.956**	
Bad/Good	.54	.796	.922		.922
Harmful/Beneficial	.49	.762	.906		.935
Negative/Positive	.56	.780	.890		.947
Emotions	**2.68**	**3.563**		**.958**	
Angry/Happy	.52	.761	.901		.945
Indifferent/Compassionate	.59	.824	.795		.965
Disgusted/Excited	.51	.756	.927		.941
Upset/Pleased	.49	.762	.896		.946
Contemptuous/In Awe	.57	.742	.907		.945
Existence Beliefs	**2.58**		**1.291**	**.912**	
Storm-petrels have a right to exist	1.34	.629	.844		
Storm-petrels should be conserved for future generations	1.24	.715	.844		
Awareness of consequences	**1.44**	**1.508**		**.726**	
My personal actions can impact the ability of storm-petrels to thrive	.75	.849	.570		
I am aware of the impacts that humans can have on storm-petrels	.69	.854	.570		
Ascription of Responsibility	**1.73**	**2.251**		**.881**	
Individual citizens like me are responsible for the conservation of storm-petrels	.76	.801	.678		.908
I feel a strong personal obligation to protect storm-petrels	.54	.859	.822		.783
I feel an obligation to educate others about the importance of storm-petrels	.43	.844	.815		.790

All variables were coded on a 5-point scale from strongly disagree (-2) to strongly agree (+2).

Qualitative analysis

The principal investigator read through the qualitative data points for the word associations and comments and developed two codebooks. The codebook for the word associations is presented in Table 7. Two independent coders coded the word association with an intercoder reliability of 88.95%. Following a consensus approach, the two coders discussed each discrepancy until consensus was reached (O'Connor & Joffe, 2020). All codes were bundled into categories (see codebook). Frequencies for each of the categories were calculated and crosstabulations (see above) for demographics (gender and age), wildlife value orientation typology, and knowledge were used. Only the principal investigator coded the questionnaire comments. The codebook used for the questionnaire comments is presented in Table 8.

Table 7 Codebook for word associations

Category	Code	Example
Bird characteristics:		
	Bird behavior	Fast flying, alert, burrowing
	Bird phenotype	Small, colorful, grey,
	Habitat type	Cliffs, ocean, island
Conservation efforts:		
	Conservation status	Vulnerable, rare,
	Conservation initiatives	Puffin and petrel patrol
Build environment:		
	Threats	Run into buildings, attracted to light
	Infrastructure	Oil rigs, windows, streetlights, telephone wires
Animals:		
	Other species, birds	
	Other species, fish	Capelin
	Other species, predators	Cats,
	Other species	Whales, wildlife, bird
Meteorological conditions:		
	Weather	N/E winds, winds
	Seasons	Summer, nigh
Location:		
	Specific locations	Bonavista, Elliston
Recreation:		
	Hobbies	Hunting, sports, crab fishing
Tourism:		
	Touristic offers	Boat tour, photographic
Cultural identity:		
	Part of culture	Home, Buddy the Puffin, Newfoundland bird, history
Experiences:		
	Interactions with birds	Never seen one, seen one
Lack of knowledge:		
		Not familiar with the bird, penguin, extinct,
Bird attributes:		
	Positive attributes	Beautiful, cool, nice, unique, cute
	Negative attributes	Smelly, oily, sleek, malevolent
	Neutral attributes	Hardy, comical, skilled
Emotions:		
	Positive emotions	Excited, awesome, amazing
	Negative emotions	Sad, foreboding, pity

Table 8 Codebook for questionnaire comments

Category	Code	Example
Outreach needs:		
	Lack of information	“I don't know anything about storm-petrels, I never heard of them.”
	Need for education	“More information/education needs to be done so people can help if they ever find one so far from the ocean.”
Stranding information:		
	Personal experiences	“While working on the Herbron project in Bull Arm, was sorry to see so many storm-petrels die, running into lights and oil rig. Got to save a good many with our crew, picking them up to give to the people on site, and letting them go again.”
	Stranding locations	“At Kent in CBS, the lights attract the petrels. We keep an eye out for them and make sure they get released back to sea. Sometimes there are many that don’t survive. I wish there were some kind of shield which would prevent the lights at KENT from being seen by the birds at night. I know that turning the lights off at night isn't an option for the company.”
Experiences:		
	Traditions	“We as kids thought they were blown on land by wind and thought they couldn't fly because of "oil on their wings." Our parents and elders referred to them as dirty - as oil birds.”
	Personal stories	“Just visited Bonavista Bay to view puffin population. Beautiful scenes of puffin colonies.”
	Interaction stories	“Every time I go out I see them dive under the boat/water”
Wildlife perceptions:		
	Perceptions of wildlife	“I feel unless it’s for human survival, wildlife should have same human rights”
	Wildlife behavior and ecology	“Storm petrels always go for light. I have seen many that run into lights on fishing boat that I fished on. They tend to be real active on foggy nights.”

Findings

Descriptive statistics

Of the respondents, 48.22% identified as female, 47.57% as male, 0.31% indicated that they do not identify as female nor male, and 3.88% of the respondents preferred not to disclose their gender identity. More than half (54.03%) of the respondents were over 60 years of age. The second largest group was the 50-59 years old (15.77%), followed by 40-49 (12.42%). Only a few respondents were under the age of 19 (1.01%) (Figure 3). The majority of respondents were born in Newfoundland and Labrador (90.58%). Only 2.19% of the respondents identify as Indigenous.

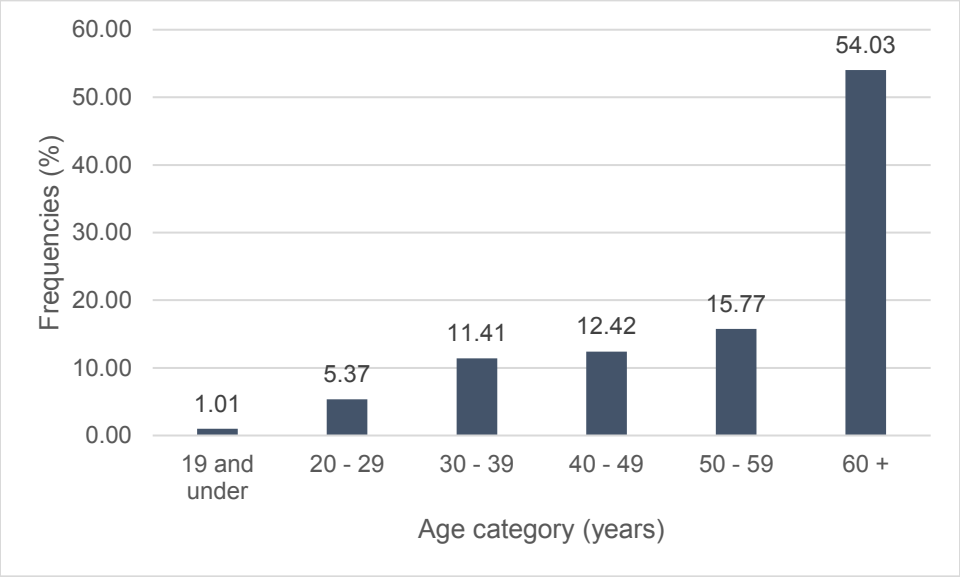

Figure 3 Respondents' reported age frequencies across six age categories

Respondents were asked if they worked in relevant sectors (oil and gas, fishing related, and tourism). Of these sectors, the most prominent one was fishing (6.62%), followed by oil and gas (5.05%), seafood processing plants (4.42%), and tourism (0.95%).

For water related recreational activities, 38.49% respondents indicated that they participate in recreational fishing in the ocean, 38.49% in recreational freshwater fishing; and 29.97% in recreational boating. On-land recreational activities included hunting (20.82%); ATVing (61.20%); hiking (52.37%); bird watching (25.55%); and 16.72% participate in wildlife photography.

Respondents were also asked if they had heard about the *Puffin and Petrel Patrol* organized by CPAWS-NL. The majority (67.64%) of respondents had not heard about the initiative. Only 4.55% of the respondents have participated in the *Puffin and Petrel Patrol* and 0.65% indicated that they intend to participate in the initiative.

Knowledge

Respondents were asked several true/false questions regarding puffin (Table 9) and storm-petrel (Table 10) conservation and behaviour. To understand the extent of the negative folklore perceptions of storm-petrels reported by CPAWS-NL, respondents were also asked if the species are dangerous to touch and bring bad luck.

Almost two-thirds (64.55%) of the respondents indicated that they are aware that puffins exist in Conception Bay. Around two-fifths (40.95%) have seen puffins in Conception Bay, with 5.07% being unsure of whether they have seen puffins in the area. Respondents reported having seen puffins on offshore oil rigs, while fishing and hunting, on tour boats, on land (incl. highways, shorelines, beaches, harbours, and in yards). Just about half (49.20%) of respondents were aware that storm-petrels exist in Conception Bay, with 40.65% reporting having seen storm-petrels and 18.39% indicating that they were unsure if they have seen storm-petrels. Respondents in Harbour Main-Chapel's Cove-Lakeview, Clarke's Beach, and Bay de Verde (Figure 2) reported a higher number of sighting locations.

The majority of respondents indicated the correct answer for the puffin knowledge items, with the exception of puffins being blown onto land by the wind and the population trend of puffins in Conception Bay (Table 9). Only 26.30% of respondents were aware that Newfoundland and Labrador is the largest nesting site of Leach's storm-petrels in the world. The majority (70.59%) indicated that they were unsure about this fact. Similarly, 49.30% were not sure that storm-petrels are dangerous for humans to touch. One tenth of the respondents indicated that storm-petrels were dangerous for people to touch. The majority (65.97%) indicated that storm-petrels do not bring bad luck (Table 10).

Based on the knowledge score (i.e., number of incorrect vs. correct answers), the following categories were created: *unknowledgeable* for respondents who mostly provided the wrong answer; *don't know* (a subcategory of unknowledgeable) for people who mostly indicated that they do not know the answer; and *knowledgeable* for respondents who mostly indicated the right answer). Over half of the respondents (57.00%) are knowledgeable about puffins. 43.00% can be characterised as "unknowledgeable", and out of which 35.00% indicated that they did not know the answer to the question (Figure 4). A lower number of respondents (50.00%) can be characterised as "knowledgeable" about storm-petrels. Half (50.00%) are characterised as "unknowledgeable", out of which 46.00% indicated that they did not know the answer to the question (Figure 5).

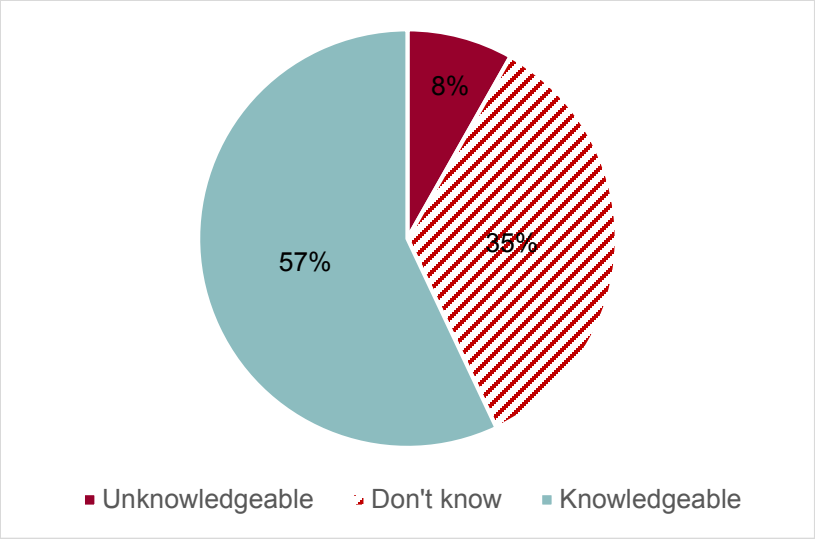

Figure 4 Respondent knowledge scores for puffins

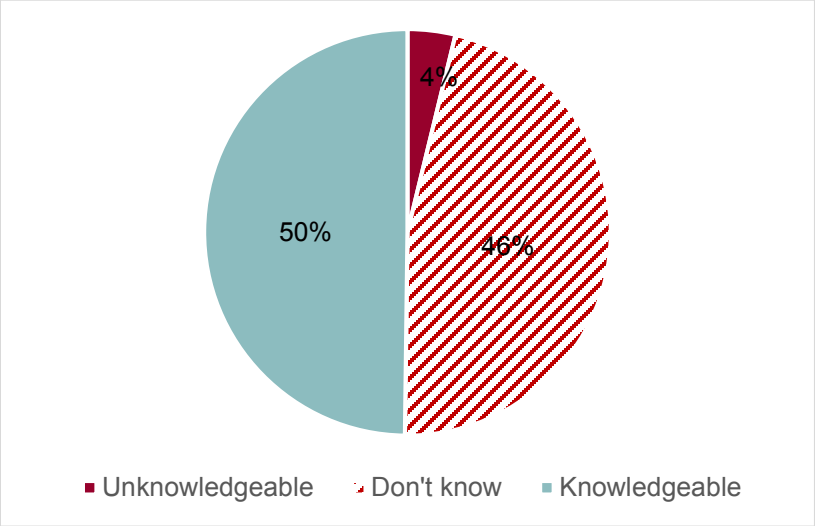

Figure 5 Respondent knowledge scores for storm-petrels.

To detect differences in knowledge level between male and female respondents, an independent samples t-test was used. No statistically significant difference in the summated knowledge scores for puffins (Figure 4) were detected. For storm-petrels, statistically significant difference in the knowledge scores[5] (t(271.426) = -2.847, p = 0.005) between male ($\bar{x}$ = 0.56, SD ± 0.56) and female ($\bar{x}$ = 0.37, SD ± 0.57) respondents were detected with a small to medium effect size (Cohen's d = 0.344).

To understand which knowledge items female and male respondents differed on, a series of crosstabulations were used across individual knowledge items, to see if there were any similarities

[5] Equal variances not assumed, based on Levene's Test with significance level of 0.05.

and differences between females and males regarding individual knowledge questions. Statistical differences for the following items were observed:

- *Storm-petrels are blown onto land by the wind* (χ^2 = 7.461, p = 0.024, Cramer's V = 0.164), where 52.11% of male and 38.80% of female respondents indicating that the statement is true.
- *Storm-petrels are attracted to light on land* (χ^2 = 6.660, p = 0.036, Cramer's V = 0.156), where 53.90% of male and 38.34% of female respondents indicating that the statement is true.
- *Storm-petrels get stranded on land* (χ^2 = 8.108, p = 0.017, Cramer's V = 0.172), where 57.86% of male and 41.35%% of female respondents indicating that the statement is true.
- *Storm-petrels spend most of their lives at sea* (χ^2 = 11.070, p = 0.004, Cramer's V = 0.201), where 59.57% of male and 39.55% of female respondents indicating that the statement is true.
- *Newfoundland & Labrador has the largest nesting site of Leach's storm-petrels in the world* (χ^2 = 6.152, p = 0.046, Cramer's V = 0.150), where 31.20% of male and 21.05% of female respondents indicating that the statement is true.
- *Stranded storm-petrels attract predators such as coyotes* (χ^2 = 7.789, p = 0.020, Cramer's V = 0.168), where 34.04% of male and 29.85% of female respondents indicating that the statement is true.
- *Storm-petrels are dangerous for humans to touch* (χ^2 = 6.799, p = 0.033, Cramer's V = 0.158), where 47.82% of male and 33.08% of female respondents indicating that the statement is false.
- *Storm-petrels are attracted to light on fishing vessels* (χ^2 = 7.820, p = 0.020, Cramer's V = 0.169), where 54.93% of male and 38.35% of female respondents indicating that the statement is true.
- *Storm-petrels are attracted to light on oil rigs* (χ^2 = 8.514, p = 0.014, Cramer's V = 0.176), where 54.93% of male and 37.59% of female respondents indicating that the statement is true.
- *Storm-petrels bring bad luck* (χ^2 = 11.040, p = 0.04, Cramer's V = 0.201), where 75.12% of male and 56.39% of female respondents indicating that the statement is false.
- *The storm-petrel population is increasing in Conception Bay* (χ^2 = 11.040, p = 0.04, Cramer's V = 0.201), where 2.84% of male and 6.72% of female respondents indicating that the statement is false.

These findings suggest that male respondents are generally more aware of issues facing storm-petrels.

Table 9 Knowledge and awareness of Atlantic puffins - frequencies (%). Bolded frequencies indicate the correct answers.

	True (%)	False (%)	Not Sure (%)
Puffins are blown onto land by the wind	27.69	**34.85**	37.46
Puffins are attracted to light on land	**46.50**	17.20	36.31
Puffins get stranded on land	**44.30**	26.06	29.64
Puffins spend most of their lives at sea	**68.79**	7.64	23.57
Stranded puffins attract predators such as coyotes	**43.83**	15.91	40.26
Puffins are dangerous for humans to touch	6.71	**65.18**	28.12
Puffins are attracted to light on fishing vessels	**44.37**[6]	14.47	41.16
Puffins are attracted to light on oil rigs	**44.37**	14.47	41.16
Puffins bring bad luck	2.55	**86.58**	10.86
The puffin population is increasing in Conception Bay	**19.16**	10.22	70.06

Table 10 Knowledge and awareness of Leach's storm-petrels - frequencies (%). Bolded frequencies indicate the correct answers.

	True (%)	False (%)	Not Sure (%)
Storm-petrels are blown onto land by the wind	**45.02**	10.31	44.67
Storm-petrels are attracted to light on land	**45.33**	6.57	48.10
Storm-petrels get stranded on land	**49.13**	9.76	41.11
Storm-petrels spend most of their lives at sea	**48.97**	8.28	42.76
Newfoundland & Labrador has the largest nesting site of Leach's storm-petrels in the world	**26.30**	3.11	70.59
Stranded storm-petrels attract predators such as coyotes	**31.03**	12.41	56.55
Storm-petrels are dangerous for humans to touch	10.14	**40.56**	49.30
Storm-petrels are attracted to light on fishing vessels	**46.02**	5.19	48.79
Storm-petrels are attracted to light on oil rigs	**45.52**	4.48	50.00
Storm-petrels bring bad luck	1.74	**65.97**	32.29
The storm-petrel population is increasing in Conception Bay	16.90	**4.48**	78.62

[6] No scientific data exists indicating if puffins are attracted to light on fishing vessels. However, based on the high proportion of responders who indicated this to be the case, it was coded accordingly.

Locations of sightings

Respondents were asked to report locations where they have encountered puffins and storm-petrels.

For Holyrood, the most common locations for puffin sightings were Holyrood, Bell Island, and Conception Bay, while the most common locations for storm-petrels were Holyrood, Harbour Main, and the main beach (Table 11). It should be noted that respondents only provided five different locations for seeing storm-petrels.

For Harbour Main-Chapel's Cove-Lakeview, the most common puffin locations were Bay Bulls, Harbour Main, and Bell Island. For storm-petrels, Holyrood, Harbour Main, and Chapels Cove were the most common locations (Table 12).

For Clarke's Beach, Conception Bay and Witless Bay were the most common puffin sightings locations, while Clarke's Beach and Holyrood were the most common for storm-petrels (Table 13).

In Bay de Verde, Bay de Verde and Baccalieu Island were the most important locations for both species, followed by Conception Bay for puffins and "everywhere" for storm-petrels (Table 14).

Table 11 Seabird sightings for Holyrood.

Holyrood:	
Puffin Location:	**Storm-Petrels Location:**
• Holyrood (11)	• Holyrood (4)
• Bell Island (5)	• Harbour Main (2)
• CBS (5)	• Main beach (2)
• Witless Bay (2)	• Colliers (1)
• Various areas throughout Conception Bay (2)	• Foxtrap area (1)
• Foxtrap (1)	
• Kelly's Island (1)	
• At bird sanctuary in Bay Bulls (1)	
• Bay Bulls (1)	
• Bay de Verde (1)	
• Cape Broyle (1)	
• Chapels Cove (1)	
• Fishing (1)	
• Harbour Grace (1)	
• Kelly's Island (1)	
• Long Pond (1)	
• Mary Browns (1)	
• Near Harbour Main (1)	
• Off Bell Island (1)	
• On back of Bell Island (1)	
• Out Tur hunting (1)	
• Outer portion North of Bell Island (1)	
• Outside of Brigus (1)	
• St. Brides (1)	
• St. Mary's Bay (1)	
• Boat tours (1)	
• West Conception Bay (1)	
• Commercial fishing (1)	

Table 12 Seabird sightings for Harbour Main-Chapel's Cove-Lakeview.

Harbour Main-Chapel's Cove-Lakeview:			
Puffin Location:		**Storm-Petrels Location:**	
• Bay Bulls	(3)	• Holyrood	(5)
• Harbour Main	(3)	• Harbour Main	(5)
• Bell Island	(2)	• Chapels Cove	(5)
• Bonavista	(2)	• Conception Bay	(3)
• Chapels Cove	(2)	• CBS	(2)
• All over Conception Bay	(2)	• Brigus	(1)
• CBS	(1)	• Avondale	(1)
• Harbour Main	(1)	• Clarkes Beach	(1)
• Holyrood Hr	(1)	• Many areas	(1)
• Newfoundland	(1)	• On the water when boating	(1)
• None	(1)	• In Holyrood after a storm	(1)
• Ocean	(1)	• Tors Cove	(1)
• Ocean in CBS	(1)	• Witless Bay	(1)
• Out by birds rock	(1)	• Colliers	(1)
• Red Rocks	(1)	• Island Rock in Harbour Main Hr	(1)
• St. Mary's	(1)	• Harbour	(1)
• The lighthouse trail	(1)	• Shorelines	(1)
• When out in boat	(1)		
• Witless Bay general area	(1)		

Table 13 Seabird sightings for Clarke's Beach.

Clarke's Beach:			
Puffin Location:		**Storm-Petrels Location:**	
• Conception Bay	(3)	• Clarke's Beach	(3)
• Witless Bay	(2)	• Holyrood	(2)
• Bay Bulls	(1)	• Everywhere	(1)
• Bay Roberts	(1)	• Bay Bulls	(1)
• Bryants Cove	(1)	• Beach	(2)
• Spaniards Bay	(1)	• My front yard	(1)
• St. John's	(1)	• Route 60 highway	(1)
• Baccalieu Island	(1)	• Cape St. Thomas	(1)
• Bauline	(1)	• Gatheralls Whale Tour	(1)
• Bay Robert's Mad Rock	(1)	• Most bodies of water	(1)
• Bay Roberts area	(1)	• On crab boats	(1)
• Bonavista	(1)	• On the highway	(1)
• Clarke's Beach	(1)	• Witless Bay	(1)
• Dildo	(1)		
• During a boat tour	(1)		
• From land sighting	(1)		
• Gatheralls Whale Tour	(1)		
• Holyrood Bay	(1)		
• Ocean off Cupids & Port-de-Grave	(1)		
• Outside of Brigus	(1)		
• Southern Ledge	(1)		

Table 14 Seabird sightings for Bay de Verde.

Bay de Verde:			
Puffin Location:		**Storm-Petrels Location:**	
• Bay de Verde	(21)	• Bay de Verde	(27)
• Baccalieu Island	(19)	• Baccalieu Island	(11)
• Conception Bay	(4)	• Everywhere	(4)
• Water	(1)	• On boats	(2)
• Trinity Bay	(1)	• Fish plant	(2)
• Tickle	(1)	• Atlantic Ocean	(1)
• Red Head Cove	(1)	• On the road	(1)
• Outside headland	(1)	• On land	(1)
• On cliffs	(1)	• Conception Bay	(1)
• Northern Bay	(1)	• Crab plant	(1)
• Mostly Baccalieu Island	(1)	• Lots of lights	(1)
• Low Point	(1)	• Mostly at sea	(1)
• In the bay	(1)	• Red Head Cove	(1)
• Fishing grounds	(1)	• Conception Bay	(1)
• Chapels Cove	(1)	• Dark nights near bright lights	(1)
• Atlantic Ocean	(1)	• Everywhere on foggy nights	(1)
• All over the bay	(1)	• Land and at sea	(1)

Wildlife Value Orientations

Value orientations form part of the cognitive hierarchy which posits that values and value orientations influence attitudes, norms, and behaviours. The relationship between these variables has been empirically tested (Homer & Kahle, 1988; Rokeach, 1973; Teel et al., 2010; Vaske & Donnelly, 2007). Values tend to be similar within a given culture, thus they are not good indicators of variation in attitudes and behaviours among different individuals within the same culture 2022-05-04 10:27:00 AM. Such variability can be explained much better by looking at the value orientations, which also have direct influence on attitudes, norms and in some cases also on individual behaviour (Vaske et al., 2011). An individual's value orientation is shaped by their basic belief patterns, which build upon their fundamental values and helps to strengthen them. Value orientations can be seen as a continuum, with anthropocentric value orientation one side, and on the other side the biocentric value orientations (Teel et al., 2010). Anthropocentric value orientations do not assign intrinsic values to the natural world. Rather, the value of the natural world is strictly related to the human utilisation of it 2022-05-04 10:27:00 AM.This means that, where a strictly biocentric value orientation would consider the intrinsic values of the natural world equally to those regarding human uses, the strictly anthropocentric value orientation would not

(Fulton et al., 1996; Teel et al., 2010; Vaske & Donnelly, 1999). How people generally value wildlife builds on the idea of anthropocentric versus biocentric value orientations (Fulton et al., 1996). There are two primary wildlife value orientations: *domination* and *mutualism.* Domination, sometimes referred to as utilitarian, is based on basic beliefs regarding use of wildlife and hunting. In contrast, mutualism is based on basic beliefs regarding caring and social affiliation with wildlife (Miller et al., 2018). Wildlife value orientations have been used to segment respondents into four overarching types. This typology is presented in Table 15. To understand how respondents generally value wildlife, the wildlife value orientations scale was used to assess the prominence of mutualism, utilitarianism, pluralistic, and distanced value orientations towards wildlife for the four communities. An overview of response frequencies for each wildlife value orientation statement is presented in Table 17.

Using Principal Component Analysis, latent wildlife value orientations were identified (Table 4). Crosstabulations were used to identify the four types of wildlife value orientations. Overall, most respondents can be characterised as *mutualist* (36.03%), followed by *pluralist* (29.87%), traditionalists (18.51%), and distanced (15.58%) (Table 15). For Holyrood and Harbour Main-Chapel's Cove-Lakeview, most respondents hold mutualistic value orientations (40.65% and 33.33% respectively). In Clarke's Beach and Bay de Verde, the majority of respondents hold pluralistic value orientations (36.84% and 33.33% respectively). Holyrood and Bay de Verde had the lowest number of people with distanced value orientations (1.4.19% and 11.11% respectively). For Harbour Main-Chapel's Cove-Lakeview and Clarke's Beach, the lowest number of people reported traditionalist value orientations (17.65% and 15.79% respectively) (Table 16).

Table 15 Wildlife Value Orientation Typology. Based on Miller et al. (2018)

		Mutualism	
		Low	High
Domination	Low	**Distanced** 15.58% (n = 48) Domination: low Mutualism: low	**Mutualist** 36.03% (n = 111) Domination: low Mutualism: high
	High	**Traditionalist** 18.51% (n = 57) Domination: high Mutualism: low	**Pluralist** 29.87% (n = 92) Domination: high Mutualism: high

Table 16 Wildlife value orientations across communities.

	Distanced	Mutualists	Traditionalist	Pluralist
Holyrood	14.19%	40.65%	18.06%	27.10%
Harbour Main-Chapel's Cove-Lakeview	21.57%	33.33%	17.65%	27.45%
Clarke's Beach	17.54%	29.82%	15.79%	36.84%
Bay de Verde	11.11%	31.11%	24.44%	33.33%

Table 17 Wildlife value orientations - frequencies (%)

*To what extent do you **disagree** or **agree** with each of the following?*	**Strongly Disagree (%)**	**Disagree (%)**	**Neutral (%)**	**Agree (%)**	**Strongly Agree (%)**
Humans should manage wildlife populations so that humans benefit.	11.5	25.6	18.4	27.5	17.0
Wildlife should have rights similar to the rights of humans.	2.9	13.7	25.5	39.5	18.3
We should strive for a world where there is an abundance of wildlife for hunting and fishing.	1.3	7.2	20.7	44.6	26.2
I view all living things as part of one big family.	.7	5.6	19.7	46.9	27.2
Hunting does not respect the lives of wildlife.	14.3	35.3	28.7	16.0	5.7
I feel a strong emotional bond with wildlife.	1.0	9.8	36.2	37.1	16.0
The needs of humans should take priority over wildlife protection.	12.8	31.9	31.3	19.4	4.6
I care about wildlife as much as I do about people.	3.3	19.7	24.3	37.7	15.1
Wildlife are on earth primarily for people to use.	16.3	47.3	22.7	11.7	2.0
Hunting is a positive and humane activity.	2.7	15.0	33.9	39.2	9.3
We should strive for a world where humans and wildlife can live side by side without fear.	1.7	8.3	23.8	46.0	20.2
I value the sense of companionship I receive from wildlife.	.3	7.5	35.0	40.8	16.3
Wildlife are like my family and I want to protect them.	1.6	11.1	34.1	39.7	13.4
People who want to hunt should have the opportunity to do so.	2.9	5.9	22.5	54.1	14.7

Attitudes

Attitudes are defined by Vaske as the "*evaluation, either favourable or unfavourable, of an entity (e.g., person, object, action)*" (2008, p. 27). Where values are only few in numbers, transcend both objects and situations, are slow to change, and central to beliefs, attitudes and behaviours are plentiful, peripheral, specific to situations, and fast to change. Thus, specific attitudes are much better predictors of intentional and overt behaviours, than general cognitions (Vaske, 2008). To assess locals' attitudes towards seabirds, a semantic differential scale consisting of a series of bipolar adjectives (e.g., good/bad) was used (Sponarski et al., 2015).

Respondents were asked to indicate how they think of puffins and storm-petrels in their community on a five-point scale. Overall, most respondents hold positive or neutral attitude towards puffins. Respondents indicated that they think of puffins in their community as good ($\bar{x}$ = 0.97, SD ± 0.870) (Figure 6); beneficial ($\bar{x}$ = 0.80, SD ± 0.814) (Figure 7); and positive ($\bar{x}$ = 0.96, SD ± 0.873) (Figure 8).

Respondents held slightly less positive attitudes toward storm-petrels. On average, respondents think of storm-petrels in their community as neither bad nor good ($\bar{x}$ = 0.55, SD ± 0.799, Figure 9); somewhat beneficial ($\bar{x}$ = 0.87, SD ± 6.145, Figure 10); and neither negative nor positive ($\bar{x}$ = 0.58, SD ± 0.808, Figure 11).

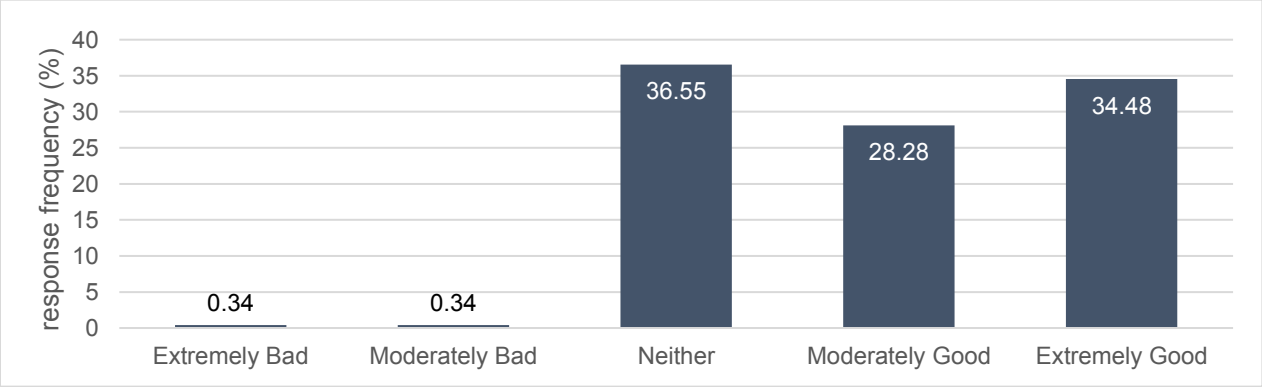

Figure 6 Attitudes towards puffins, semantic differential (bad/good) - frequencies (%)

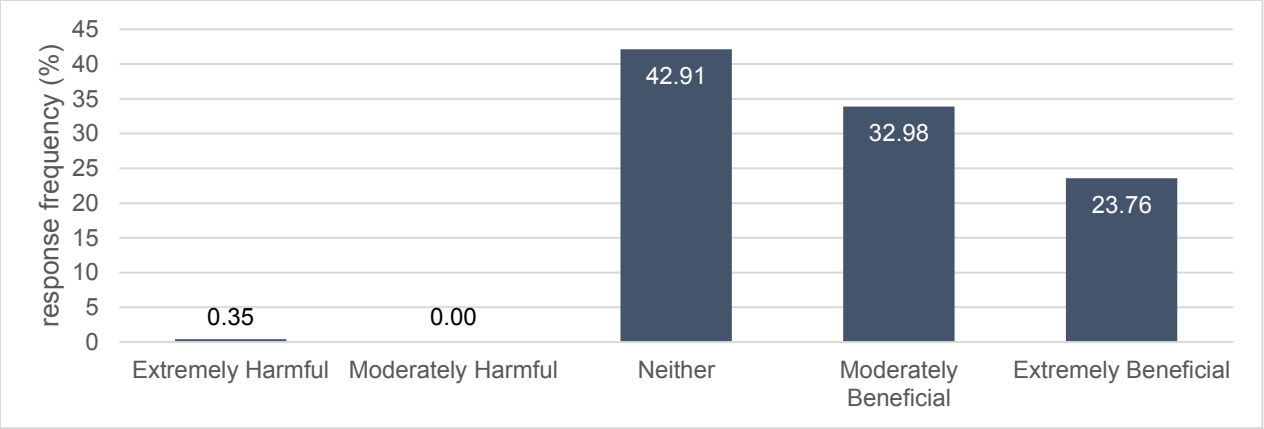

Figure 7 Attitudes towards puffins, semantic differential (harmful/beneficial) - frequencies (%)

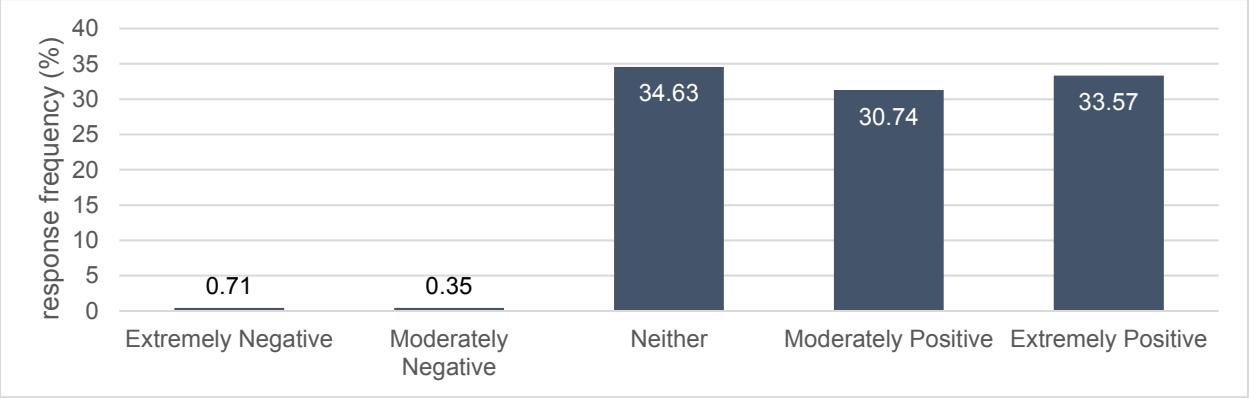

Figure 8 Attitudes towards puffins, semantic differential (negative/positive) - frequencies (%)

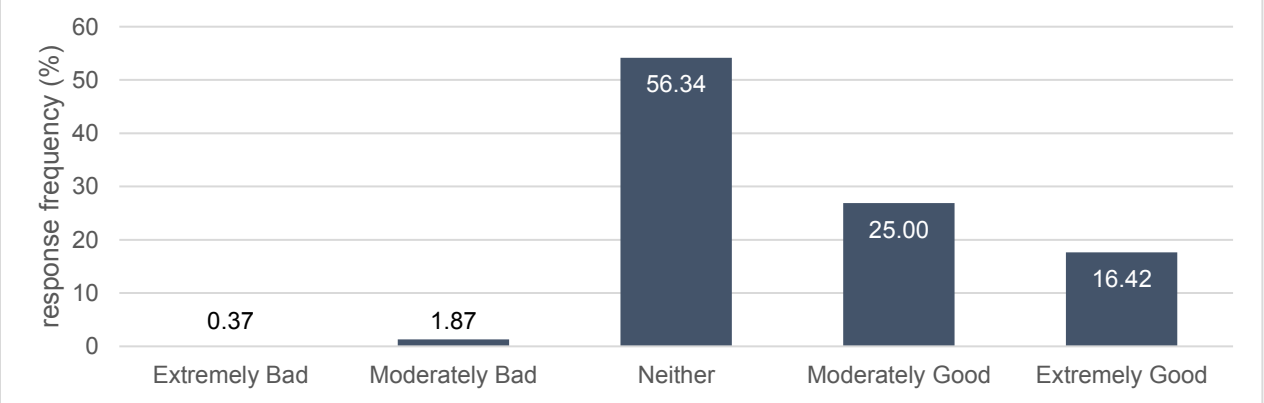

Figure 9 Attitudes towards storm-petrels, semantic differential (bad/good) - frequencies (%)

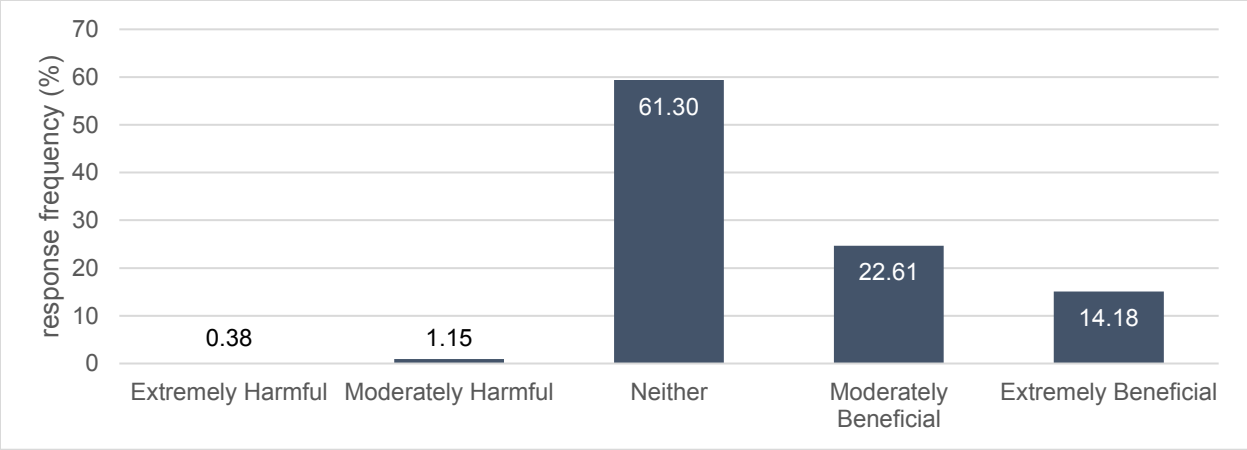

Figure 10 Attitudes towards storm-petrels, semantic differential (harmful/beneficial) - frequencies (%)

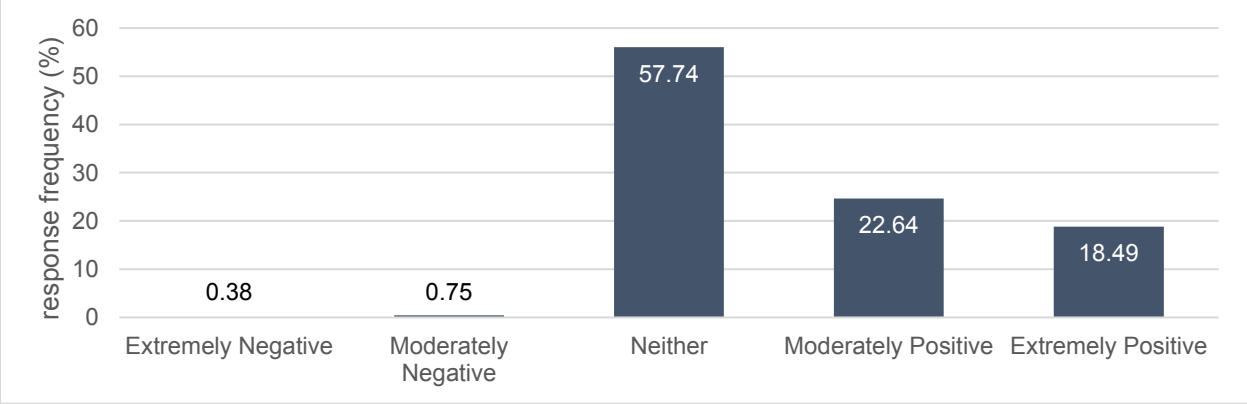

Figure 11 Attitudes towards storm-petrels, semantic differential (negative/positive) - frequencies (%)

Emotions

Emotions are physiological (e.g., increase in heart rate or expressions such as frowning), cognitive (e.g., experiencing fear), and behavioural (e.g., running), reactions to situations (Sponarski et al., 2015). Emotions can play a role in the intensity and direction of dispositions towards wildlife (Jacobs & Vaske, 2019), and are thus important for understanding human behaviours towards and acceptability of species (Jacobs & Vaske, 2019; Lessard et al., 2021). Experiences with avian wildlife can cause a variety or emotional responses in people (Cameron et al., 2020). Research has shown that emotions evoked by interactions with birds influence human behaviors related to birds (Dayer et al., 2019; Lessard et al., 2021). Given the relationship between emotions and behavioural responses to avian wildlife, it is important to understand how people feel when seeing puffins and petrels as these feelings can directly influence their support for conservation initiatives, for example.

Overall, seeing puffins in the community left respondents with positive emotions. Respondents indicated that seeing puffins makes them feel happy ($\bar{x}$ = 1.06, SD ± 0.806) (Figure 12); compassionate ($\bar{x}$ = 0.98, SD ± 0.812) (Figure 13); excited ($\bar{x}$ = 1.01, SD ± 0.792) (Figure 14); pleased ($\bar{x}$ = 1.01, SD ± 0.825) (Figure 15); and in awe ($\bar{x}$ = 1.05, SD ± 0.811) (Figure 16).

These emotions were not as pronounced for storm-petrels, where a higher number of respondents indicated that they are neutral across the items. Yet respondents overall reported feeling happy ($\bar{x}$ = 0.52, SD ± 0.758) (Figure 17); compassionate ($\bar{x}$ = 0.60, SD ± 0.825) (Figure 18); excited ($\bar{x}$ = 0.52, SD ± 0.779) (Figure 19); pleased ($\bar{x}$ = 0.49, SD ± 0.765) (Figure 20); and in awe ($\bar{x}$ = 0.97, SD ± 0.870) (Figure 21) when seeing storm-petrels in the community. It should be noted that almost 4% indicated that seeing a storm-petrel in their community makes them feel upset. This may be due to the fact that storm-petrels are present in the community only when stranded.

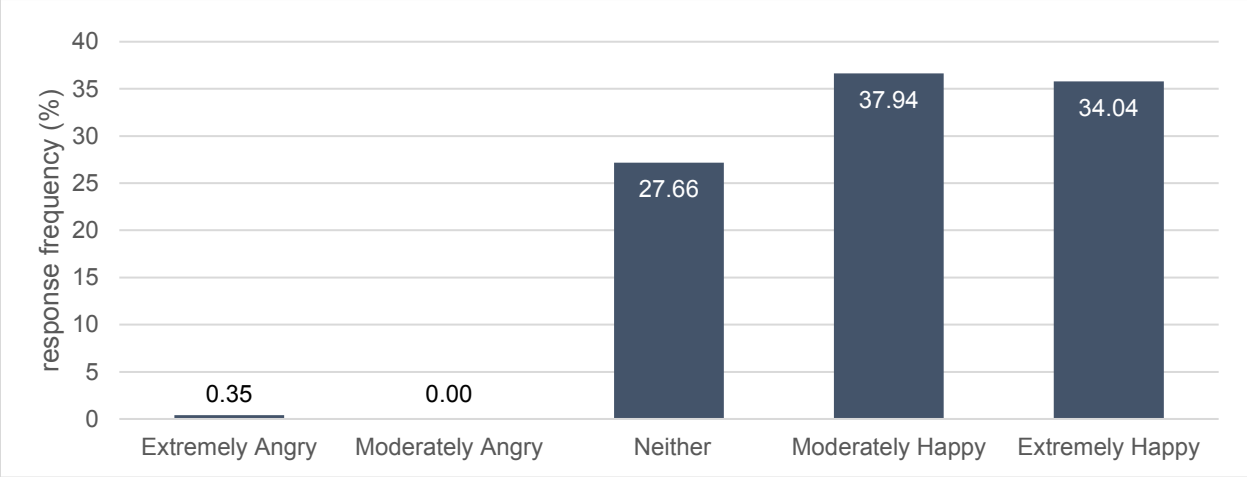

Figure 12 Emotions towards puffins (angry/happy) – frequencies (%)

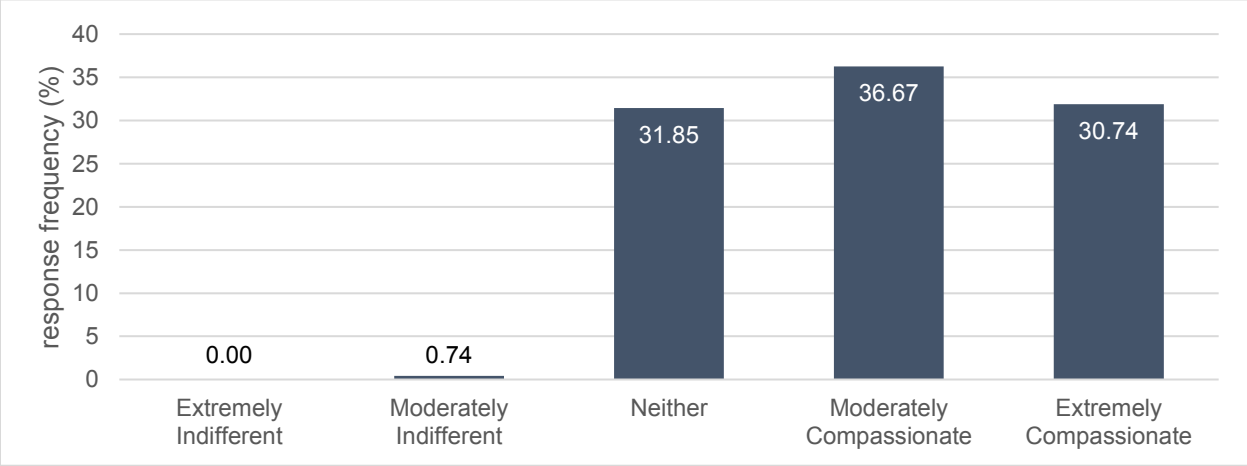

Figure 13 Emotions towards puffins (indifferent/compassionate) – frequencies (%)

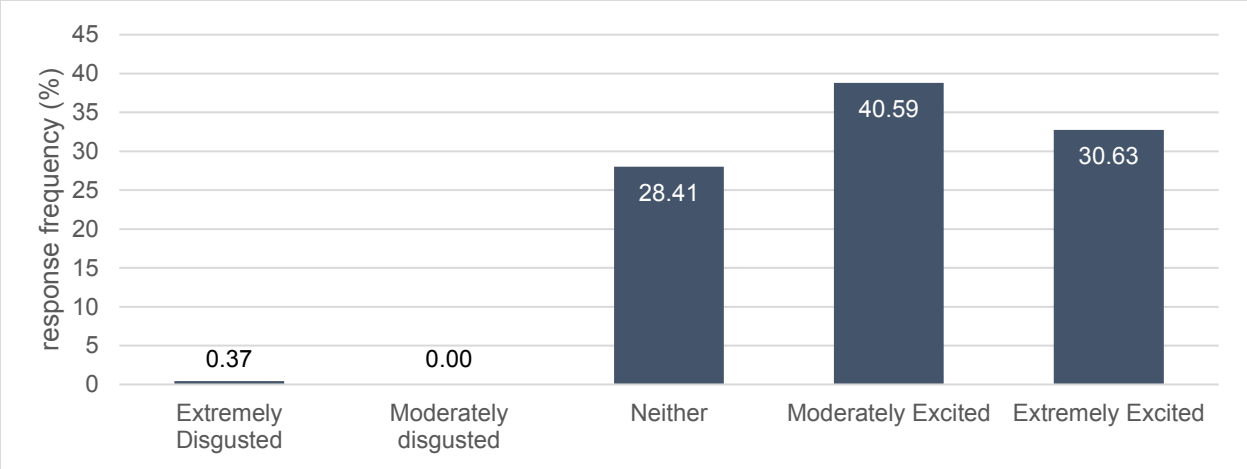

Figure 14 Emotions towards puffins (disgusted/excited) – frequencies (%)

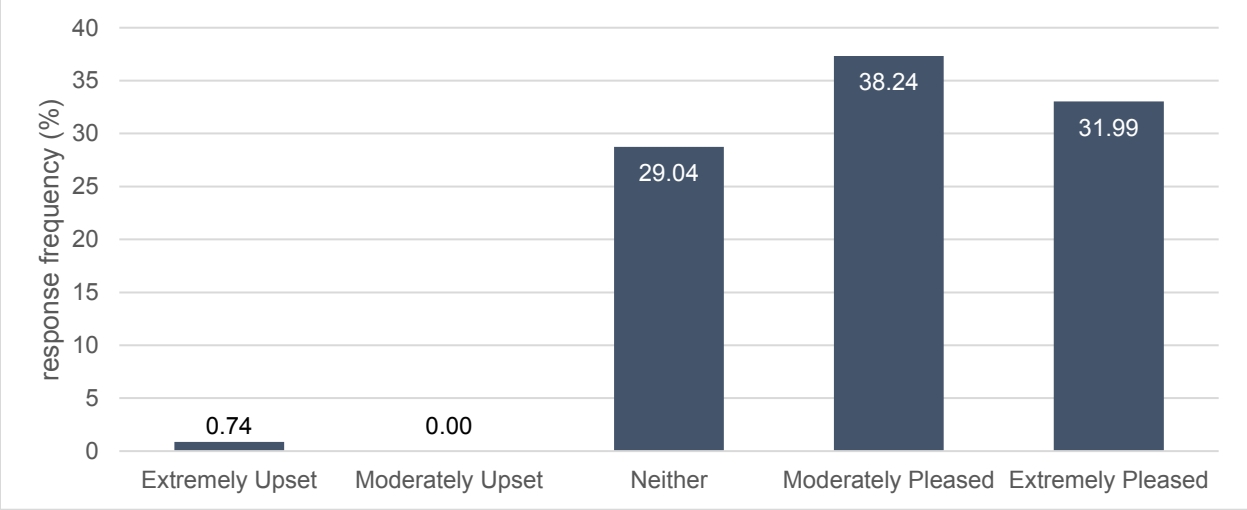

Figure 15 Emotions towards puffins (upset/pleased) – frequencies (%)

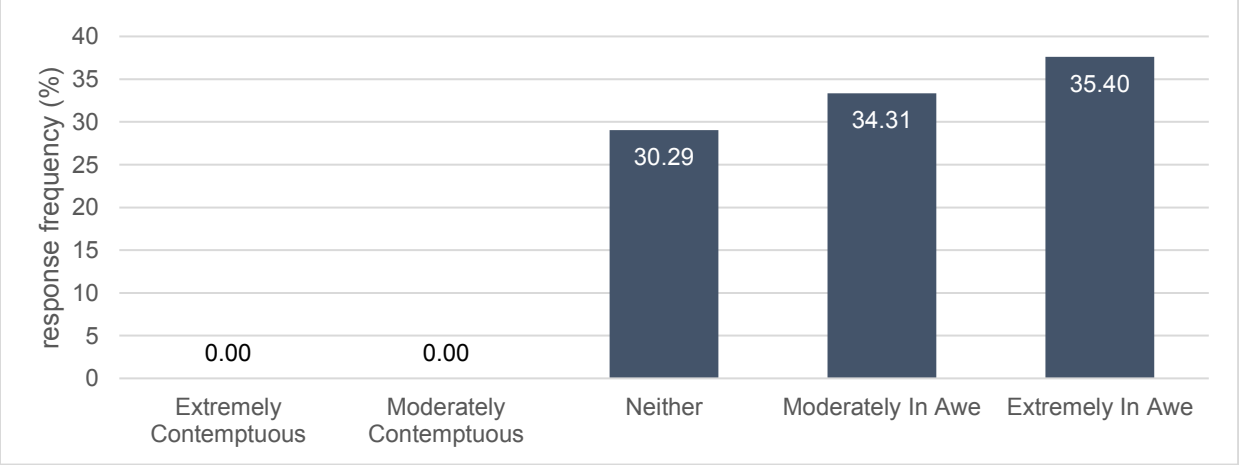

Figure 16 Emotions towards puffins (contemptuous/in awe) – frequencies (%)

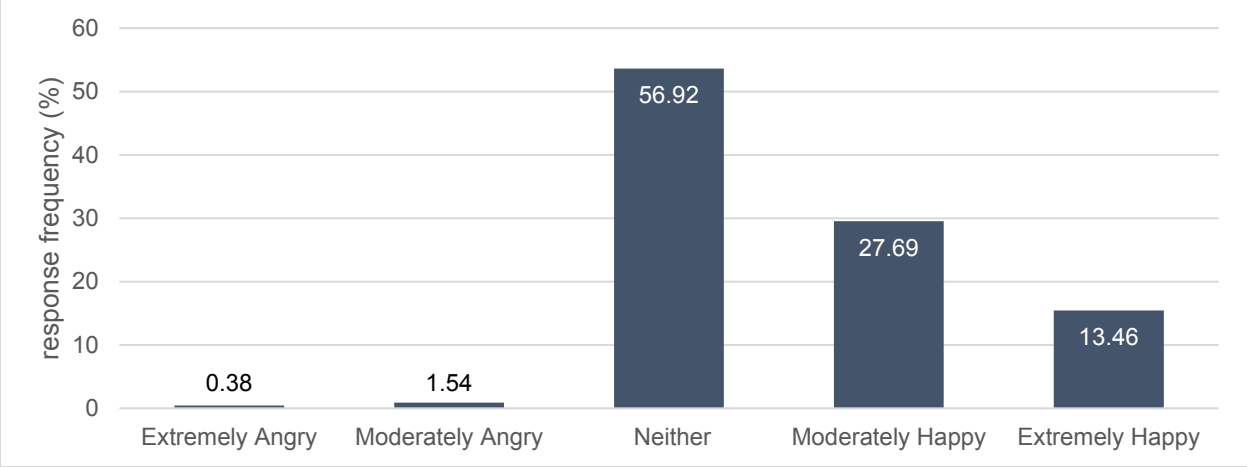

Figure 17 Emotions towards storm-petrels (angry/happy) – frequencies (%)

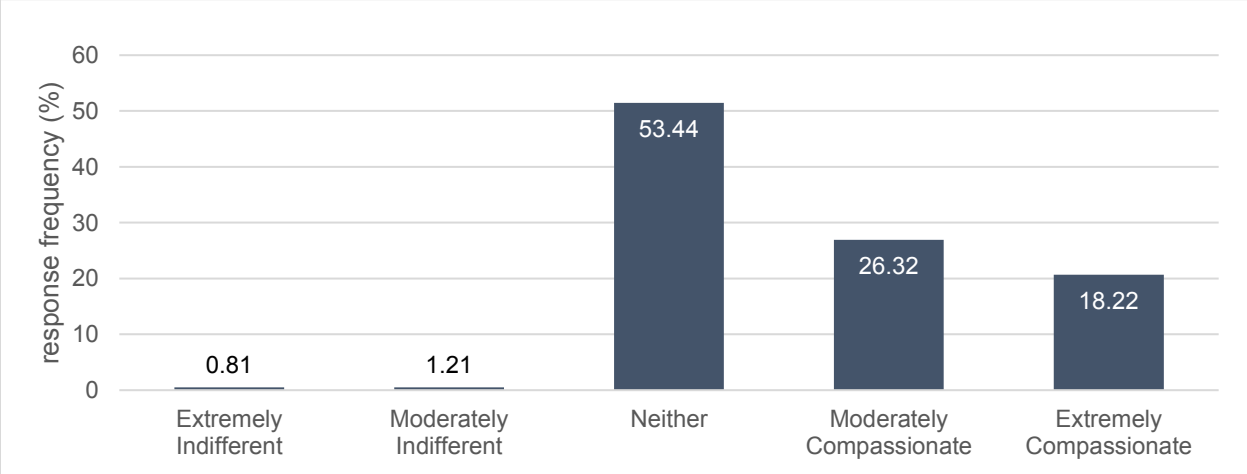

Figure 18 Emotions towards storm-petrels (indifferent/compassionate) – frequencies (%)

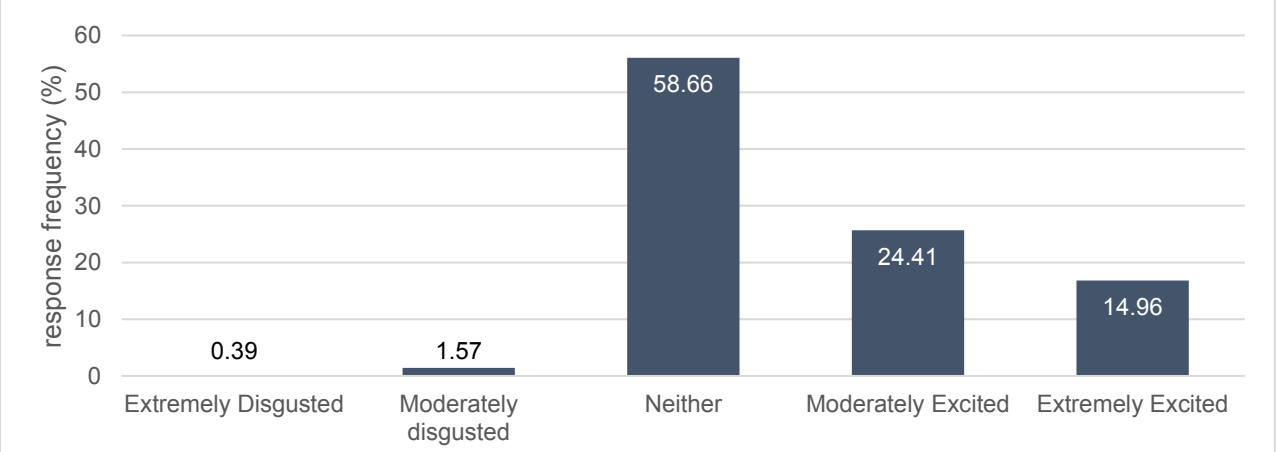

Figure 19 Emotions towards storm-petrels (disgusted/excited) – frequencies (%)

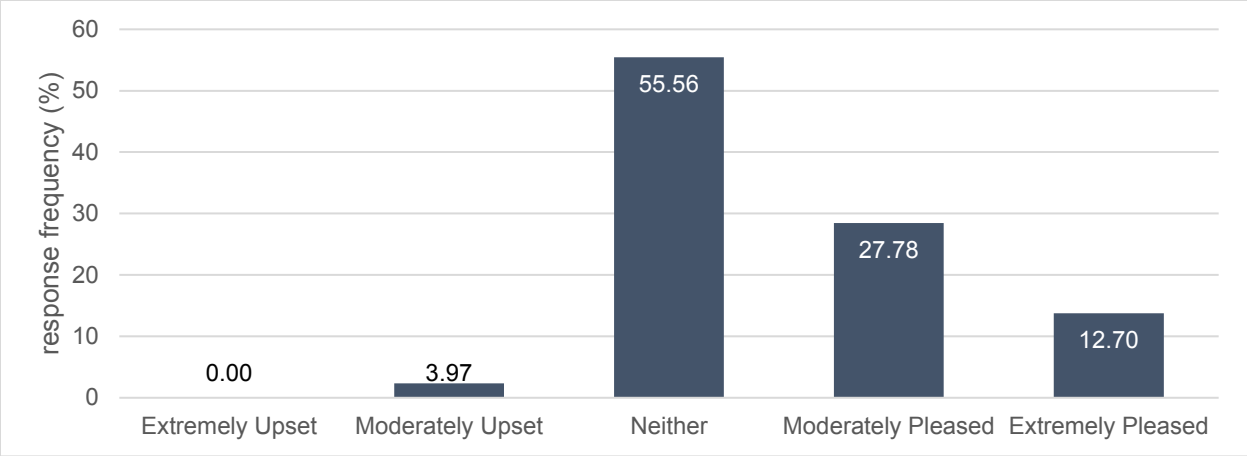

Figure 20 Emotions towards storm-petrels (upset/pleased) – frequencies (%)

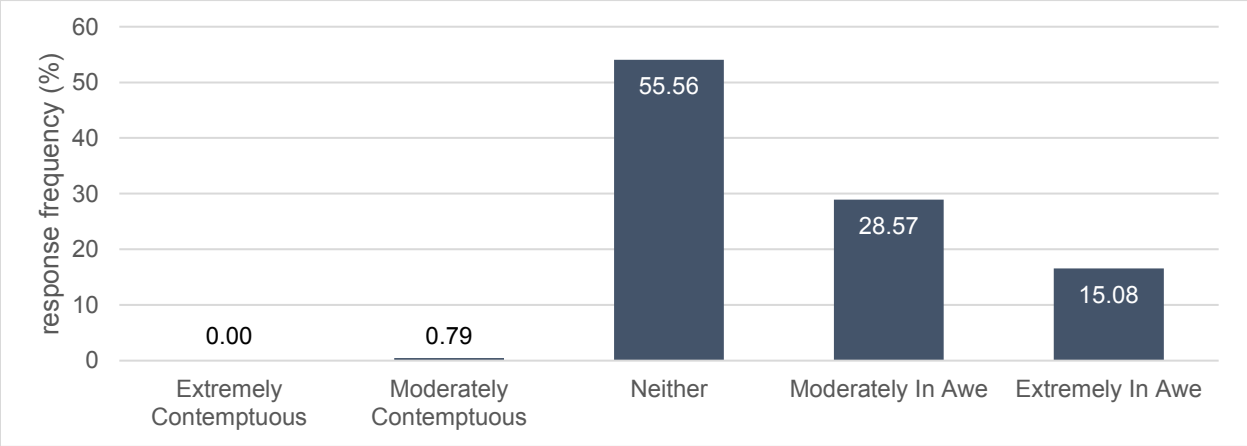

Figure 21 Emotions towards storm-petrels (contemptuous/in awe) – frequencies (%)

Existence Beliefs, Awareness of Consequences, & Ascription of Responsibility

Where wildlife value orientations are basic beliefs an individual holds toward wildlife, existence beliefs are specific beliefs an individual holds about a species' right to existe and importance of consering the species for future generations (Frank et al., 2016). Norms can be understood as what most people *are* (descriptive norms) or *ought* (injunctive norms) to be doing in a given situation (Vaske & Manfredo, 2012). Personal norms are "*individual's own expectations, learned from shared expectations and modified through interactions*" (Vaske, 2008: p 28). To understand personal norms, two norm concepts were used *a)* awareness of consequences and *b)* ascription of responsibility. Whether an individual is aware of the consequences of their actions on seabirds (awareness of consequences) and ascribe responsibility to themselves (ascription of responsibility) is predicted to influence the extent of norm activation and if individual behaviour will change (Vaske & Donnelly, 2007).

Respondents were asked to which extent they agree or disagree with several statements pertaining to existence beliefs, awareness of consequences, and ascription of responsibility for puffins (Table 18) and storm-petrels (Table 19).

Table 18 Atlantic puffins: existence beliefs, ascription of responsibility, & awareness of consequences

	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
Puffins have a right to exist	0.65	0.00	0.97	33.66	64.72
Puffins should be conserved for future generations	0.65	0.32	3.57	35.71	59.74
Puffins have a positive impact on tourism in Conception Bay	0.65	0.65	10.46	38.24	50.00
Individual citizens like me are responsible for the conservation of puffins	0.65	2.27	21.04	43.69	32.36
My personal actions can impact the ability of puffins to thrive	0.98	5.23	18.63	45.75	29.41
I am aware of the impacts that humans can have on puffins	0.98	5.57	21.64	45.25	26.56
I feel a strong personal obligation to protect puffins	0.65	6.47	36.57	32.04	24.27
I feel an obligation to educate others about the importance of puffins	1.30	6.82	40.91	33.44	17.53
It is my responsibility to protect puffins*	3.25	9.42	26.62	36.69	24.03

*Reverse coded. The original item was: "*It is **not** my responsibility to protect puffins*".

Table 19 Leach's storm-petrels: existence beliefs, ascription of responsibility, & awareness of consequences – frequencies (%)

	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
Storm-petrels have a right to exist	0.00	0.00	8.39	48.60	43.01
Storm-petrels should be conserved for future generations	0.00	0.00	16.25	43.46	40.28
Storm-petrels have a positive impact on tourism in Conception Bay	0.35	5.23	40.77	31.01	22.65
Individual citizens like me are responsible for the conservation of storm-petrels	0.70	2.45	37.06	40.56	19.23
My personal actions can impact the ability of storm-petrels to thrive	0.70	4.88	32.75	42.16	19.51
I am aware of the impacts that humans can have on storm-petrels	0.35	6.60	35.76	39.24	18.06
I feel a strong personal obligation to protect storm-petrels	0.00	7.34	48.95	26.92	16.78
I feel an obligation to educate others about the importance of storm-petrels	0.70	7.67	54.70	22.65	14.29
It is my responsibility to protect storm-petrels*	2.45	8.04	38.81	30.77	19.93

*Reverse coded. The original item was: "*It is **not** my responsibility to protect storm-petrels*".

Overall, high scores for existence beliefs were observed. Respondents agree that puffins have a right to exist ($\bar{x}$ = 1.62, SD ± 0.578) and should be conserved for future generations ($\bar{x}$ = 1.54, SD ± 0.647). Similarly for storm-petrels, respondents believe they have a right to exist ($\bar{x}$ = 1.35, SD ± 0.629) and should be conserved for future generations ($\bar{x}$ = 1.24, SD ± 0.714). Respondents also believe that puffins ($\bar{x}$ = 1.36, SD ± 0.748) and less so storm-petrels ($\bar{x}$ = 0.70, SD ± 0.889) have a positive impact on tourism. These findings indicate a generally positive perception of both seabird species.

Higher mean values for ascription of responsibility items for puffins than storm-petrels were observed. Respondents believe that they are responsible for the conservation of puffins ($\bar{x}$ = 1.05, SD ± 0.826) and less so for storm-petrels ($\bar{x}$ = 0.75, SD ± 0.815). A lower mean value was observed for the item "*I feel a strong personal obligation to protect puffins*" ($\bar{x}$ = 0.73, SD ± 0.924) than for storm-petrels ($\bar{x}$ = 0.53, SD ± 0.857). On average, respondents feel less obligated to

educate others about storm-petrels ($\bar{x}$ = 0.42, SD ± 0.853), compared to puffins ($\bar{x}$ = 0.59, SD ± 0.900). The most common response to this item for both seabirds was neutral (40.91% for puffins, 54.70% for storm-petrels). The items "*It is (**not**) my responsibility to protect…*" were reverse coded for both species. On average, neutral responses for both puffins ($\bar{x}$ = 0.69, SD ± 1.040) and storm-petrels ($\bar{x}$ = 0.58, SD ± 0.977) were observed, with a higher percentage of people agreeing that they are responsible for protecting puffins (agree: 36.69%; strongly agree: 24.03%) than storm-petrels (agree: 30.77%; strongly agree: 19.93%) This indicates that respondents generally feel less responsible for the conservation of storm-petrels than they do puffins. It should be noted that the average responses for educating others were generally low. This could pose as a potential challenge in communicating the importance of seabird conservation.

On average, respondents reported high awareness of consequences. Respondents indicated that their personal actions can impact the ability of puffins ($\bar{x}$ = 0.97, SD ± 0.883) and storm-petrels to thrive ($\bar{x}$ = 0.75, SD ± 0.849). Respondents also indicated that they are aware of the impacts humans can have on puffins ($\bar{x}$ = 0.91, SD ± 0.887) and storm-petrels ($\bar{x}$ = 0.68, SD ± 0.857).

Word associations

Respondents were asked to indicate the first three words that came to mind, when prompted to think about puffins and storm-petrels. For puffins, 257 respondents provided a first words, 231 a second, and 207 a third word, totalling to 695 words. Fewer respondents provided words for storm-petrels, with 165 respondents provided a first word, 130 a second, and 114 a third, totalling to 409 words. This may be related to the general lack of knowledge about storm-petrels, which is also reflected in the words used for storm-petrels (see below).

To create visual representations of the words respondents associated with seabirds, responses were collapsed into words of similar meaning (e.g., responses like "I don't know what they are" were collapsed into "don't know"), categories. All words were coded according to a codebook created by two independent coders. A word cloud was produced to visually illustrate the most frequently used categories. Figure 22 and 23 illustrates the words respondents thought about when they thought about puffins and storm petrels respectively. The size of the words indicates the frequency. As the word clouds show, puffin related words were generally positive in character, whereas the storm-petrel words were less positive and often related to lack of knowledge (e.g., "don't know").

Figure 22 Word cloud illustrating word associations for puffins.

Figure 23 Word cloud illustrating word associations for storm-petrels.

For puffins, the most common word category was *bird attributes* (41.15%, Table 20) such as “beautiful”, “nice”, “pretty”, and “fun”. Of these, the majority of categories were positive attributes

(84.11%), followed by neutral (8.61%) attributes such as “fluffy”, “determined”, and “innocent”. Only very few respondents included negative attributes (1.99%, Table 21) such as “helpless”, “awkward”, and “sinister”. The second most common category was *bird characteristics* (26.19%) such as “small”, “fast”, and “colorful”. *Location* (8.63%) was another common category with places such as “Elliston”, “Bonavista”, and “Newfoundland”. The category *animals* (7.91%) included words like “birds”, “capelin”, and “fish”. Examples of *cultural identity* (5.76%) included “Buddy the Puffin”, “home”, and “iconic”. Words associated with puffins are, overall, positive in character, focused on the bird’s appearance, and specific locations where they bird can be encountered.

For storm-petrels (Table 22), *bird attributes* were also the most common category (23.72%), where the majority were positive attributes (43.36%) such as “graceful”, “beautiful”, and “nice”. Negative attributes (24.78%) included words such as “stink”, “smelly”, “foolish”, and “odor”. Only 14.16% were neutral attributes such as “fast”, “free”, and “quick” (Table 23). Similar to puffins, the second most common category was *bird characteristics* (22.25%), which included words such as “small” and “black”. Another prominent category was *lack of knowledge* (13.69%), covering statements like “what’s a storm-petrel” and “don’t know them”. *Meteorological conditions* was another common category (9.54%) including “storm”, “bad”, and “wind”. The category encompasses weather related events that impact to storm-petrels. For example, N/E winds were often associated with storm-petrels stranding in communities. *Animals* (9.29%) was also a common category and included words like “birds”, “gulls”, “whales”, and “wildlife”. *Built environment* (8.56%) included threats to storm-petrels associated with built structures such as “attracted to light” and other infrastructure such as “oil rigs”, “streetlights”, and “windows”. Words associated with storm-petrels are less positive than for puffin, and to a larger extent focused on unawareness and threats to storm-petrel conservation.

To understand differences in relationships between word associations and other variables, a series of crosstabulations were used. For storm-petrels, statistically significant differences in word associations were detected across gender (χ^2 = 68.579, p = 0.013, Cramer’s V = 0.237), age category (χ^2 = 112,829, p = 0.003, Cramer’s V = 0.230), wildlife value orientation typology (χ^2 = 66.591, p = 0.020, Cramer’s V = 0.235), and knowledge of storm-petrels (χ^2 = 98.252, p = 0.000, Cramer’s V = 0.354). The effect size measures (Cramer’s V), indicate a minimal to typical relationship. No statistically significant relationships between word associations and gender, age, wildlife value orientations, and knowledge of puffins were detected. This indicate that the words used for puffins are not determined by demographic factors, experiences with the puffin and petrels patrol, or the respondents’ wildlife value orientation type.

Table 20 Word association frequencies for puffins

Category	n	Relative frequency (%)
Bird attributes:	286	41.15
Bird characteristics:	182	26.19
Location:	60	8.63
Animals:	55	7.91
Cultural identity:	40	5.76
Conservation efforts:	29	4.17
Emotions:	16	2.30
Tourism:	13	1.87
Lack of knowledge:	8	1.15
Experiences:	3	0.43
Meteorological conditions:	2	0.29
Recreation:	1	0.14
Build environment:	0	0.00
Sum	**695**	**100.00**

Table 21 Word association frequencies for puffin attributes and emotions

Category	n	Relative frequency (%)
Attributes (41.15%):		
Positive attributes	254	84.11
Negative attributes	6	1.99
Neutral attributes	26	8.61
Emotions (2.30%):		
Positive emotions	15	4.97
Negative emotions	1	0.33
Sum	**302**	**100.00**

Table 22 Word association frequencies for storm-petrels

Category	n	Relative frequency (%)
Bird attributes:	97	23.72
Bird characteristics:	91	22.25
Lack of knowledge:	56	13.69
Meteorological conditions:	39	9.54
Animals:	38	9.29
Build environment:	35	8.56
Emotions:	20	4.89
Conservation efforts:	17	4.16
Location:	5	1.22
Experiences:	5	1.22
Recreation:	4	0.98
Tourism:	1	0.24
Cultural identity:	1	0.24
Sum	**409**	**100.00**

Table 23 Word association frequencies for storm-petrels attributes and emotions

Category	n	Relative frequency (%)
Attributes (41.15%):		
Positive attributes	49	43.36
Negative attributes	28	24.78
Neutral attributes	16	14.16
Emotions (2.30%):		
Positive emotions	13	11.50
Negative emotions	7	6.19
Sum	**302**	**100.00**

Understanding seabird perceptions

An independent samples T-test was used to detect any potential difference in attitudes and emotions towards puffins and storm-petrels between respondents identifying as male or female. No statistically significant differences were detected between male and female respondents across attitudes towards puffins nor storm-petrels. Statistically significant differences were, however, detected for emotions towards[7] puffins (t(272.664) = 2.31, p = 0.022). Respondents identifying as female held slightly more positive emotions ($\bar{x}$ = 1.16; SD ± 0.77) towards puffins than male respondents ($\bar{x}$ = 0.96; SD ± 0.69) with a small effect size (Cohen's d = 0.277). No statistically significant difference were detected for emotions towards storm-petrels.

Seabird interactions' influence on cognitive components

To understand how respondents' interactions with puffins and storm-petrels impact their perception of both bird species, a *puffin interaction* variable and a *storm-petrel interaction* variable were created. These variables were based on respondents' awareness of puffins and storm-petrels in Conception Bay and whether respondents reported having seen puffins or storm-petrels in Conception Bay. The seabird interaction variables consisted of three categories:

a) Unaware of puffins/storm-petrels and never seen puffins/storm-petrels in Conception Bay
b) Aware, but never seen puffins/storm-petrels in Conception Bay
c) Aware and seen puffins/storm-petrels in Conception Bay.

A one-way ANOVA was used and no significant differences were detected between attitudes, emotions, knowledge, existence beliefs, awareness of consequences, and ascription of responsibility for puffins across the three interaction categories. This means that there are no statistically significant differences in respondents' perceptions of puffins regardless of whether respondents have interacted with the birds in Conception Bay. This may be explained by cultural significance puffin's have with the island of Newfoundland as it is the provincial bird.

The same analysis was used for storm-petrels and detected statistically significance on several items. Based on Levene's test, equality of variance was assumed for all the items and Bonferroni post hoc test was used. For knowledge, no statistically significant difference were observed (F-value: 40.239; p < 0.001) between people who were unaware/never seen ($\bar{x}$ = 0.16, SD ± 0.519) and people who were aware/never seen ($\bar{x}$ = 0.63, SD ± 0.556) and aware/seen ($\bar{x}$ = 0.78, SD ± 0.472). Based on Bonferroni post-hoc test, no differences were observed between aware/seen and aware/never seen. This was also the case for existence beliefs (F-value: 5.586; p = 0.004;

[7] Equal variances not assumed, based on Levene's test with significance level of 0.05.

unaware/never seen: $\bar{x}$ = 1.16, SD ± 0.663); aware/never seen: $\bar{x}$ = 1.50, SD ± 0.645; aware/seen: $\bar{x}$ = 1.42, SD ± 0.572). This indicates that awareness, regardless of whether respondents have had seen storm-petrels influences knowledge and existence beliefs.

For awareness of consequences, statistically significant difference (F-value: 3.673; p = 0.027) were detected between unaware/never seen ($\bar{x}$ = 0.57, SD ± 0.688) and aware/seen ($\bar{x}$ = 0.83, SD ± 0.787), but not for aware/never seen ($\bar{x}$ = 0.85, SD ± 0.829) and the other two groups. This was also the case for ascription of responsibility: statistically significant differences were detected (F-value: 5.253; p = 0.006) between unaware/never seen ($\bar{x}$ = 0.38, SD ± 0.703) and aware/seen ($\bar{x}$ = 0.72, SD ± 0.802). No difference between aware/never seen: ($\bar{x}$ = 0.68, SD ± 0.796) and the two other groups, based on Bonferroni post-hoc test, were observed. This means that respondents' who are unaware of storm-petrels existence have lower awareness of consequences and ascription of responsibility, compared to respondents who are aware and have seen storm-petrels.

While no significant difference between unaware/not seen, aware/seen, aware/seen, and perceptions of puffins were observed, the researchers investigated how knowing about the seabirds' existence may influence cognitive and emotional dispositions. A series of independent samples t-tests with the independent item "*are you aware that puffins/storm-petrels exist in Conception Bay*" were used. The dependent variables used were the scales created from the wildlife value orientations, attitude, emotion, knowledge, existence beliefs, ascription of responsibility, and awareness of consequences scales for puffins (Table 24) and storm-petrels (Table 25). For puffins, only statistically significant relationships were observed between awareness of puffins' existence and domination wildlife value orientation (t(225.8191) = -2.9435, p = 0.003; unaware: $\bar{x}$ = 0.37, SD ± 0.48516; aware: $\bar{x}$ = 0.54, SD ± 0.49940), with a small effect size. For storm-petrels, awareness of their existences positively impacts existence beliefs (t(285) = -3.863, p < 0.001; unaware: $\bar{x}$ = 1.15, SD ± 0.67290; aware: $\bar{x}$ = 1.43, SD ± 0.58696). Statistically significant differences were observed in knowledge (t(285) = -10.599, p < 0.001) between unaware ($\bar{x}$ = 0.14, SD ± 0.47646) and aware ($\bar{x}$ = 0.75, SD ± 0.49191) and ascription of responsibility (t(284.488) = -3.451, p = 0.001; unaware: $\bar{x}$ = 0.40, SD ± 0.68902; aware: $\bar{x}$ = 0.71, SD ± 0.79860). Statistically significant differences in awareness of consequences (t(286) = -3.086, p = 0.002) for unaware ($\bar{x}$ = 0.57, SD ± 0.69350) and aware ($\bar{x}$ = 0.84, SD ± 0.79278) were also detected. Generally, effect sizes were small to medium (Table 25).

Table 24 Independent t-test results for interactions with puffins across psychological dimensions. Unaware/aware denotes responses to the items "*before today, were you aware that puffins exist in Conception Bay?*".

	$\bar{x}$	SD	t	df	Sig. (2-tailed)	Cohen's d
Existence Beliefs						
Unaware	1.62	0.52660	1.00	306	0.316	0.122
Aware	1.55	0.60301				
Knowledge						
Unaware	0.49	0.59353	-0.007	274	0.994	0.001
Aware	0.49	0.67685				
Ascription of Responsibility						
Unaware	0.80	0.78520	0.166	306	0.869	0.020
Aware	0.79	0.75047				
Awareness Consequences						
Unaware	0.95	0.81534	0.0446	303	0.964	0.005
Aware	0.94	0.75363				
Attitudes						
Unaware	0.96	0.82176	0.624	294	0.533	0.076
Aware	0.89	0.82152				
Emotions						
Unaware	1.11	0.78560	0.935	290	0.351	0.113
Aware	1.02	0.71310				
Mutualism						
Unaware	0.67	0.47360	0.297	303	0.767	0.036
Aware	0.65	0.47826				
Domination						
Unaware	0.37	0.48516	-2.94	225.8191	0.003	0.351
Aware	0.54	0.49940				

*Equal variances not assumed, based on Levene's Test with 0.05 significance level.

Table 25 Independent t-test results for interactions with storm-petrels across psychological dimensions. Unaware/aware denotes responses to the items "*before today, were you aware that storm-petrels exist in Conception Bay?*".

	$\bar{x}$	SD	t	df	Sig. (2-tailed)	Cohen's d
Existence Beliefs						
Unaware	1.15	0.67290	-3.863	285	0.000	0.455
Aware	1.43	0.58696				
Knowledge						
Unaware	0.14	0.47646	-10.599	285	0.000	1.253
Aware	0.75	0.49191				
Ascription of Responsibility*						
Unaware	0.40	0.68902				
Aware	0.71	0.79860	-3.451	284.488	0.001	0.406
Awareness Consequences						
Unaware	0.57	0.69350	-3.086	286	0.002	0.365
Aware	0.84	0.79278				
Attitudes						
Unaware	0.51	0.75092	-1.094	274	0.275	0.135
Aware	1.30	8.23484				
Emotions						
Unaware	0.46	0.72585	-1.581	247	0.115	0.200
Aware	0.60	0.69586				
Mutualism						
Unaware	0.64	0.48193	-0.886	300	0.376	0.102
Aware	0.69	0.46527				
Domination						
Unaware	0.51	0.50153	0.817	300	0.415	0.094
Aware	0.46	0.50030				

*Equal variances not assumed, based on Levene's Test with 0.05 significance level.

Predicting perceptions of seabirds

The relationships between cognitions, emotions, and personal normal for puffins were examined (Figure 24, associated data is shown in Table 26). Mutualism and domination were both significant predictors of attitudes, but not knowledge. Mutualism explained almost 5% of the variance in attitudes. Domination only explained 1.57% of variance in attitudes. Knowledge only explained 2.59% of variance in attitudes and 1.49% of variance in awareness of consequences. Attitudes were a strong predictor of emotions toward puffins, with 40.77% of variance explained. Attitudes also predicted ascription of responsibility, with 13.7% of variance explained. Emotions were a predictor for ascription of responsibility (22.35% of variance explained) and awareness of consequences (18.99% of variance explained). The strongest detected relationship was between ascription of responsibility and awareness of consequences (47.5% of variance explained). This relationship is likely due to the fact that personal norms are made up of ascription of responsibility and awareness of consequences (Vaske & Donnelly, 2012). For puffins, most effect sizes (ß) ranged from minimal (0.10 – 0.30) to typical (0.30 – 0.50), except for the strength of association between attitudes and emotions, and awareness of consequences and ascription of responsibility which were both substantial (ß > 0.50).

Relationships between cognitions, emotions, and personal norms for storm-petrels are less pronounced (Figure 25 associated data is shown in Table 27). Statistically significant relationships were observed between knowledge and awareness of consequences, with a minimal strength of association and only 6.25% of variance explained by the model. The model showed a statistically significant relationships between emotions and ascription of responsibilities. This model explained 26.30% of variance and substantial strength of association. A statistically significant relationship was observed between emotions and awareness of consequences with 20.32% of variance explained and a substantial effect size. Similar to the puffin models, the strongest predictor for ascription of responsibility was level of awareness of consequences, with 59.37% of variance explained and a substantial effect size (Table 27).

Overall, the detected relationships were not very strong between the variables for either puffins or storm-petrels. For both species, the findings indicate that knowledge influences awareness of consequences, although the relationship is not substantial. This relationship is stronger for storm-petrels than it is for puffins, suggesting that knowledge of storm-petrels lead to greater awareness of consequences. Given that 50% of respondents were unknowledgeable about storm-petrels, there seems to be an opportunity where public education might support for conservation. Fewer relationships between variables were detected for storm-petrels than for puffins. For both species, substantial relationships between the two norm concepts (awareness of consequences and ascription of responsibility) were detected. For puffins, attitudes predict emotions. This was not the case for storm-petrels. For both species, emotions partially predicted the extent to which respondents ascribe responsibility to themselves.

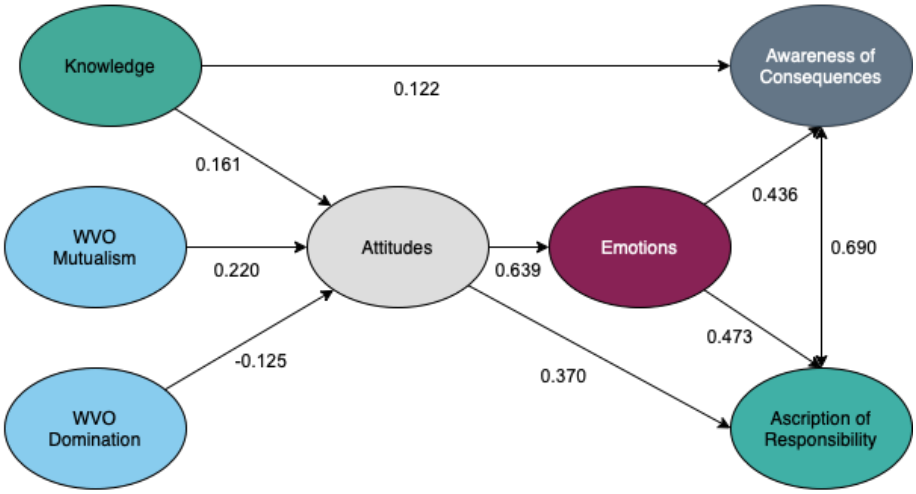

Figure 24 Linear regression model for puffins. Each bubble represents a latent construct. Numbers indicate Pearson's correlations. Only significant relationships are displayed. WVO = Wildlife Value Orientation.

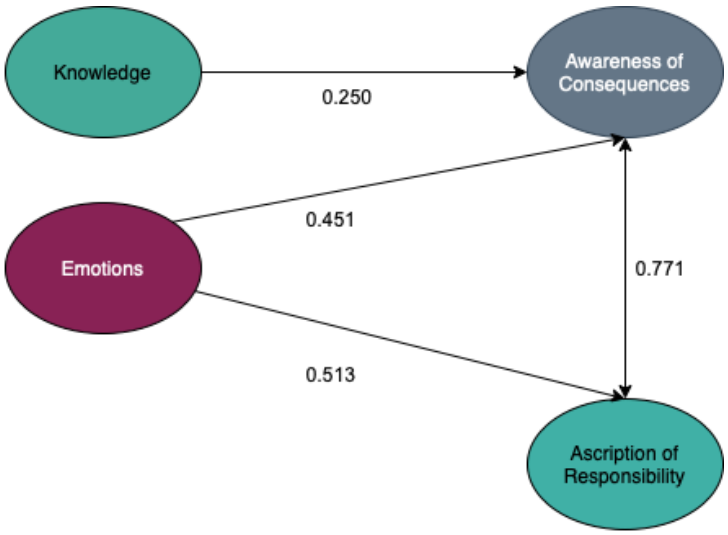

Figure 25 Linear regression model for storm-petrels. Each bubble represents a latent construct. Numbers indicate Pearson's correlations. Only significant relationships are displayed.

Table 26 Linear regression results for puffins

	F	R^2	ß
Mutualism → Knowledge	3.603	0.011	0.106
Domination → Knowledge	0.041	0.000	-0.011
Mutualism → Attitude	**16.229****	0.049	**0.220****
Domination → Attitudes	**5.076***	0.016	**-0.125***
Knowledge → Attitudes	**7.373***	0.026	**0.161***
Knowledge → Emotions	3.379	0.011	0.103
Knowledge→ Awareness of Consequences	**4.803***	0.015	**0.122***
Attitudes→Emotions	**218.930****	0.408	**0.639****
Attitudes → Ascription of Responsibility	**50.387****	0.137	**0.370 ****
Emotions → Ascription of Responsibility	**91.519****	0.223	**0.473****
Emotions → Awareness of Consequences	**74.556****	0.190	**0.436****
Awareness of Consequences→ Ascription of Responsibility	**288.240****	0.475	**0.690****

* P < 0.05; ** P < 0.001

Table 27 Linear regression results for storm-petrels

	F	R^2	ß
Mutualism → Knowledge	0.417	0.001	0.036
Domination → Knowledge	0.570	0.002	-0.042
Mutualism → Attitude	1.619	0.005	0.071
Domination → Attitudes	1.779	0.006	-0.075
Knowledge → Attitudes	1.337	0.005	0.068
Knowledge → Emotions	1.119	0.004	0.059
Knowledge→ Awareness of Consequences	**21.215****	0.063	**0.250****
Attitudes→Emotions	1.283	0.004	0.063
Attitudes → Ascription of Responsibility	2.907	0.009	0.095
Emotions → Ascription of Responsibility	**113.495****	0.263	**0.513****
Emotions → Awareness of Consequences	**81.093****	0.203	**0.451****
Awareness of Consequences→ Ascription of Responsibility	**464.664****	0.594	**0.771****

* P < 0.05; ** P < 0.001

Questionnaire comments

A total of 82 respondents left a comment at the end of the questionnaire. The questionnaire comments varied in character. Unreadable comments were excluded from the analysis. The majority of comments (Table 28) were about people's personal experiences (43 in total). These included four comments that mentioned traditional aspects of interaction with the species such as hunting puffins or being told by older generations that storm-petrels are oily and should not be touched. Other comments related to wildlife (27), outreach needs (24), and stranding information (16). Stranding information included personal experiences with stranded animals (e.g., stranding in private home, releasing stranding specimens) and locations of strandings (e.g., local hardware store, oil rigs) (Table 28).

Table 28 Themes identified in questionnaire comments.

Category	Code	Frequency
Outreach needs:		**24**
	Lack of information	16
	Need for education	8
Stranding information:		**16**
	Personal experiences	10
	Stranding locations	6
Experiences:		**43**
	Traditions	4
	Personal stories	27
	Interaction stories	12
Wildlife perceptions:		**27**
	Perception of wildlife	13
	Wildlife behavior and ecology	14

Questionnaire comments – Holyrood

Comment # 1	I have heard no story about either. I don't think they on hunter but really don't know. Suspect that, like seagulls, they are just there - part of our marine environment. Not aware that they are? I hope their population are healthy or the seagulls appear to be. I hope population are being scientifically evolved. I don’t like endangering the species. But don't want them to be like I believe seals are. Get more info out on populations.
Comment # 2	N/A I have never seen puffins or storm petrels on or around the Holyrood area. I have seen them in other areas and enjoyable watching these birds.
Comment # 3	Parents found a storm-petrel once very far inland and didn't know what kind of bird it was. This was on the Burin Peninsula. I hadn't heard of them before that. More information/education needs to be done so people can help if they ever find one so far from the ocean.
Comment # 4	I really was not away of any colonies of puffins in CBS. I've experienced many occurrences of storm petrels offshore on rigs. They are attracted to the lights of the rig and many do end up perishing onboard. However, I do know that efforts were always made to save, protect and release as many of these birds that personal would find on the decks. Would love to see both these species thrive in the CBS area and I will also look into your website to (earn more about it).
Comment # 5	Growing up in Burnt Cove/Bauline, puffin patrol was going on before Puffin Patrol was actually going on. As a child (now 30) we would find the lost puffins and return them to water the next morning. Once our house was renovated during the summer months and was opened to the elements and I found a puffin flopping around our living room.
Comment # 6	I see puffins occasionally on tours. I don't know anything about storm-petrels, I never heard of them.
Comment # 7	I worked with the Canadian Coast Guard. Flew in on a beautiful day. We were about 200 miles out. The guys managed to trap him in the officers

		dining room. They caught the bird. Let him rest for 30 minutes and set him free. They say that the bird should've be out that far.
Comment #	8	☺
Comment #	9	At Kent in CBS, the lights attract the petrels. We keep an eye out for them and make sure they get released back to sea. Sometimes there are many that don't survive. I wish there were some kind of shield which would prevent the lights at KENT from being seen by the birds at night. I know that turning the lights off at night isn't an option for the company. Good luck with your study ☺
Comment #	10	I didn't have time to fill out all of the survey completely, but I feel unless it's for human survival, wildlife should have same human rights.
Comment #	11	I personally love to watch all seabirds as they fly over the area.
Comment #	12	Every time I goes out I see them dive under the boat/water
Comment #	13	Thank you for bringing CPAWS NL to my attention
Comment #	14	I had no idea we had puffins in CBS. Would love to be able to watch them from afar. I have never heard of the storm-petrels or seen any.
Comment #	15	I only see seagulls
Comment #	16	We made our 1st trip to Elliston to see the puffins two weeks ago. Have always been a fan but OMG they are beautiful up close. They need to be protected… I would love to see the petrels as well. Even though we are hunters & fisherpersons, we follow the rules as to protect the species
Comment #	17	Stop caplin fishing

Comment #	18	I have only heard things about the puffins. I am not familiar with the storm-petrels, perhaps they have another name? It looks like a crow, is it from the same family?
Comment #	19	My sister once found a petrel a few years ago on a beach in Biscay Bay area and had to try to release it when it got dark. I've heard a few people in Holyrood that did the same. I've also seen posters in the post office to make awareness of these stranded birds. I've followed some of the patrol and think it’s amazing and hopefully will be able to assist someday.
Comment #	20	Nothing in the community but I remember storm petrels getting stranded on the rig of the Hebron GBS.
Comment #	21	I never seen storm-petrel & do not know anything about them. However, I love & enjoy all species of animals. There is a place on earth for both & it is our obligation to protect & cherish wildlife. It should not be taken for granted and abused in anyway. All living things on this earth are here for a reason that benefits our world. People should respect wildlife always. We as humans can only speculate the impact every living creature has on this planet. There is so much more that we do not know about wildlife that for exceed what we know. Every day is a learning experience & every living creature has a purpose on this planet. It is our responsibility to protect & care for all living creatures for many generations ahead. In doing so we will be protecting mankind. Without wildlife the world would not exist as we know t today. can't stress the importance of protecting wildlife. Thank you for the important work your organization is doing. There are far too many endangered species.
Comment #	22	Puffin - at one point in time I was on a boat watching puffins and they are beautiful to see, colorful and attract tourist. It was at the sanctuary. Storm petrel - didn't know the birds existed but will need some in future.
Comment #	23	Since I have done some sailing on Conception and Trinity Bay. There is always puffin around in summer but more so in the Outer Bay, Cape St. Francis & Baccalieu island area. The only times I have seem Storm Petrels in flocks in when they come up in Holyrood in strong northly wind. Most wildlife resources are poorly managed in favour of voters and

		wildlife suffers in the long run. As a young man on an island and we should so hunters and gathers but we only look what we needed to live.
Comment #	24	My understanding that the human impact of lights is disturbing the birds' natural habitat. Maybe we can research and study light frequencies that have lower impact on birds but satisfy human needs as well.
Comment #	25	I have saved many storm-petrels over the years. Love puffins but have not seen them in my area.
Comment #	26	A couple of years ago we visited Elliston in Trinity Bay. The cliffs and rocks were covered with hundreds of puffins. It was an amazing sight to see
Comment #	27	I believe that all nature must be look after. It's so important for all of us.
Comment #	28	I hope your project goes well and your research leads to positive outcomes. Thanks for stopping by. I'd love to see your results
Comment #	29	I wasn't aware these birds were coming ashore in Holyrood
Comment #	30	I am not familiar with storm-petrels so I never fully answered the questions in that section!
Comment #	31	Thank you for asking questions to the community about these animals. Some of these questions are fantastic to get people thinking about their treatment of wildlife <3
Comment #	32	Friends are involved in the puffin patrol; they describe involvement as one of pure joy. They have shared stories with me of waiting hours to spot a bird and then realizing one needs you as a great remark. Some comments shared with me are along the lines of "best moment of my life." One individual I know shared the experience with a young child to teach compassion, humans helping creatures and to encourage patience with an altruistic reward.

Comment #	33	Found petrel aboard ship in St. John's Harbour (under-repair) tended to bird for couple of days, and got it airborne and on its way :)
Comment #	34	I never seen a puffin in Conception Bay. Have had many encounters with storm petrels. See them at the end of high winds. Always a northeast wind. They seem to literally fall from the sky and get disoriented. I have placed many back in the ocean in which they fly away at the second of water contact.
Comment #	35	Never seen a puffin, they're non existent recently. In the part decades, they were slaughtered by the hundreds by the power lines
Comment #	36	Did not know that puffins existed in C Bay

Questionnaire comments – Harbour Main-Chapel's Cove-Lakeview

Comment #	1	Just visited Bonavista Bay to view puffin population. Beautiful scenes of puffin colonies. You are welcome.
Comment #	2	Like all wildlife, puffins and storm petrels have a right to exist. Humans have responsibility to protect the species while at the same time keeping their numbers controlled so that they don't over-population. We haven't seen any mother Careys chicks in Conception Bay Centre for a number of years. 50+ years ago they were plentiful...
Comment #	3	I have seen puffins from a distance by boat & thinks they are the most beautiful bird I have ever seen.
Comment #	4	Where I live, sometimes the wind scoops the petrels up from the ocean & carries them up into the woods/trees 2 separate occasions we have helped to get the petrels back to the beach, they are very docile & noisy, but much enjoyed a show box car ride back to the beach.
Comment #	5	While working on the Herbron project in Bull Arm, was sorry to see so many storm-petrels die, running into lights and oil rig. Got to save a good many with our crew, picking them up to give to the people on site, and letting them go again.

Comment #	6	As a young girl in Conception Bay Central years ago, every year the roof near my house would be littered with birds - some squat dead, some alive. We as kids thought they were blown on land by wind and thought they couldn't fly because of "oil on their wings." Our parents and elders referred to them as dirty - as oil birds. We were discouraged from touching them, i.e. on helping them. I have never seen a puffin in Conception Bay Centre (Holyrood, Hr Main, Avondale, Conception Hr or Collier)
Comment #	7	Have not seen one since 1980's. Hope they still exist. Watched documentaries on the recently. Very Informative. Thanks
Comment #	8	Thank you for this survey! I wasn't aware that they inhabit Conception Bay before now. The survey wording didn't quite capture my position on them. I believe that all animals have a right to exist within the confines of natural selection. Ergo, humans should take care not to harm them or their habitats, but in my view perhaps not artificially preserve one species at the expense of any other.
Comment #	9	I have heard local stories about stranded storm-petrels. Some people who are educated about storm-petrels often give direction on how to safely release a stranded storm-petrel. I don't know the way to safely release a storm-petrel but could easily find the info. Good luck with your research :)
Comment #	10	All creatures should be protected for our betterment
Comment #	11	None, I didn't even know that there are puffins & storm-petrels in the Conception Bay area.
Comment #	12	I can remember being a child and seeing dead petrels all over the rad. We were told not to touch them because they were sick/dirty (Here in Hr Main). For years I have noticed petrels blowing on shore by Holyrood beach. Some blow across the road, some land on the road and are killed by cars. I have heard of them striking industrial site at night (Hydro, Bull Arm, etc.)
Comment #	13	I have heard a lot about petrels hitting/landing on the Hibernia/oil rigs. There than that I was aware there were attracted to lights. I don't know much about them or puffins. Also, sorry the first survey you dropped here we missed and the animal caretaker never mentioned to us. Good luck with your studies!

Questionnaire comments - Clarke's Beach

Comment #	1	Used to rescue storm-petrels when I was small in Holyrood.
Comment #	2	One time when we were whale watching in Witless Bay, we saw a puffin dead in floating in the water. We were wondering what happened to it. There were some big birds around it.
Comment #	3	The world is wide.
Comment #	4	I did see a puffin colony in Bonavista a couple of years ago. I lived in many different places in NL and that was my first time seeing a puffin. Amazing! Storm petrels, I have heard, have been having problems with lights in our communities. I saw a notice at the local store about it a couple of years ago. I am interested to investigate this more!
Comment #	5	Storm petrels usually blow into my yard when we get seasonal storms blowing in from the north/northeast. They get stranded on the beach as well. I've managed to release a few back on the beach but unfortunately may cat finds them first and that doesn't end well for the birds.
Comment #	6	We have only just moved back to the province after 31 years away, so I don't yet have an opinion really. Sorry!
Comment #	7	Hopefully this isn't something to use against hunting/hunters! Lots of "(expletive)", but lots of us good guys too. Cheers.
Comment #	8	Thank you for conducting this research.
Comment #	9	I have only seen the puffins at Elliston and very much enjoy going to see them every year when visiting my sister who lives in Bonavista.

Questionnaire comments - Bay de Verde

Comment #	1	Storm petrels always go for light. I have seen many that run into lights on fishing boat that I fished on. They tend to be real active on foggy nights. Puffins are in numbers on Baccalieu Island and are nesting in areas on the Island that were used before. Many years ago, puffins were hunted for food but now this is not happening on a big scale, so numbers of the birds are increasing.

Comment #	2	Between the months of June-July there is an abundance of puffins at Baccalieu Island. Don't see many storm petrels but I heard there are. Lots of them on the island we see a few but I see many puffins!
Comment #	3	Did you know…. There is a tiny Island, just off of Baccalieu Island (which is known as a bird sanctuary) called Puffin Island. Going through what is known as "the tickle"(between Bay de Verde harbour & Baccalieu Island) and Puffin Island, I have never seen so many puffins in my years as a commercial fisherman :)
Comment #	4	Have a few comments to make. Puffins - These birds seem to be doing real good in this area. Did not see puffins on land except for Baccalieu Island where they come each season to have their young. Storm Petrels - These birds seems to be attracted to light. Lights on boats and plants are getting brighter with new technology. But even when plant lights is turned off, these birds still can be found around the plant. Bay de Verde has many streetlights and bright lights on other buildings. Can you tell me why these birds can only be found by plant and boats and not found in other areas? I still think wildlife should be protected to some degree.
Comment #	5	People in B.D.Verde have been seeing puffins and storm petrels since the beginning of time from what I know they respect them and indeed do not intend to harm them.
Comment #	6	We lived on Baccalieu Island for a few years in the sixties. Very familiar with puffins and petrels.
Comment #	7	The Atlantic puffin is already on the endangered species list which means you cannot hunt them and I doubt very much if anyone has hunted storm petrels. I think this is enough protection for the birds. Thank you.
Comment #	8	I spent 30+ years on Baccalieu Island as lighthouse keeper. The island has the largest colony of storm petrels in the world. It has thousands of seabirds. During my time spent there, I seen a lot of storm petrels stranded early in the morning, especially after a foggy night with some puffins. I would say that I released more storm petrels than anyone else around. We had some red foxes on the island over the years & they use to set up cashes to keep them fed in the winter, this would cut back on some of the seabirds. We also had a couple of artic fox that would come ashore on the artic ice. They closed down Baccalieu Island light station 2002. I went back to the island a few years ago, the puffins & storm petrels were nesting all over the island even where the light station was located. All the best in your future endeavors.

Comment #	9	Puffins clean bird do not have anything to do with the land it's seabird smarter than carrie/storm-petrels. Puffins have nothing to do with humans, smart bird.
Comment #	10	Over the years, I have helped put a lot of storm-petrels back to flight after they were on the grounds always checked for safety release areas before releasing. Also put a few puffins back in salt water after catching them on roads and on people's property. Always a thrill to help out in this little way.
Comment #	11	I feel that the impact gulls have on puffins and storm petrels is worse than that of humans. I've seen gulls eat whole puffins without any trouble. I think that the gull population should be culled there are destroying all baby birds in this area and especially on Baccalieu Island. Thank you.
Comment #	12	I'd just love to see a solution to all the poor careys that hit our houses on foggy nights. It would be a great opportunity if we could find a way to have wind power on the barrens without harming our wildlife.
Comment #	13	All creatures are special, but I have in an era when Tur was a main meat for the family. Most usually it was our Christmas dinner. A puffin would show up on the dinner plate even now of them. I think because they had less meat than Turs. There was only a certain time of year that Turs were Oct – Dec, over hunting. After that = poor weather. I love the beauty of wildlife even gulls - yes of course they have a right to live & should be protected, but I still enjoy a tur when I can get it. As a family, when my father brought home turs, it would be a joyful time, we watch them being picked, heard the fat pork sizzle - we even fought over who would get the heart. But I don't like over kill for sport. Like everything else it's all about balance!
Comment #	14	Before I got married, I lived home with my parents and family. There was 2 children plus mom and dad. Sometimes dad would go out hunting birds like turs and puffins for our meat for the family. Boy wouldn't it good with some onions. Birds were plentiful then, but in the last years there hasn't been that plentiful. They were more plentiful over in Trinity Bay. We can't understand why. What I believe is there must be more food for the birds in Trinity Bay for them. I was a fisherman all my life but never the sparrows & gulls & all the & the crows & blue jays. Thank you.

Management Implications

- Generally, respondents were unfamiliar with the *Puffin and Petrel Patrol* and did not intend to participate in the initiative. If this initiative expands its geographical scope to Conception Bay, efforts should focus on raising awareness of the initiative.

- Knowledge of seabird ecology and conservation can be improved. Only about half of the respondents can be considered "knowledgeable" for both species. Conservation messaging should focus on three components: *a)* conservation status of storm-petrels, incl. the ecological importance of Baccalieu Island as a nesting site; *b)* threats to storm-petrels, incl. light pollution; *c)* change misconceptions about seabirds bringing bad luck and being dangerous for humans to touch.

- While respondents generally feel responsible for the conservation of puffins and to a lesser extent storm-petrels, overall they do not feel obligated to educate others about the importance of puffins and storm-petrels. These findings indicate both an opportunity and a potential challenge in communicating the importance of seabird conservation. On one hand, respondents would agree with messaging around the right of the seabirds to exist and that they should be conserved for future generations. On the other hand, the findings indicate the community members may not actively participate in educating others. However, the findings show that improving knowledge could also lead to greater awareness of consequences for both species and improve attitudes towards puffins.

- Communication efforts should take wildlife value orientations into account, as wildlife value orientation relates to the type of information one deems relevant (Miller et al., 2018). While most respondents can be characterised as "mutualists" or "pluralists", communication efforts should target each wildlife value orientation, for highest possible reach and impact. Communication efforts should also be targeted to the community in which they are intended, as differences in wildlife value orientations across communities were observed. Research suggests that a message's relevancy increases when it matches the target audience's wildlife value orientations, thus making communication efforts more effective (Miller et al., 2018).

- The word associations show that respondents associate more positive attributes (e.g., colourful, beautiful, nice, pretty, and fun) with puffins than with petrels. Respondents also associated words related to cultural identity (e.g., *Buddy the Puffin* and "home") with puffins. This was not the case for storm-petrels, where words related to weather and not knowing about the birds were more common. This indicates a stronger sense of connection to puffins than to storm-petrels. Outreach and education efforts should also focus on increase storm-petrel knowledge, its conservation status and ecological importance for Conception Bay.

Conclusions

Generally, perceptions of storm-petrels were not as negative as expected. Overall, respondents held largely neutral attitudes and emotions to storm-petrels. Based on the quantitative and qualitative data, a general lack of knowledge and awareness of storm-petrels was observed. A knowledge deficit could be a contributing factor to the neutral attitudes and emotions reported by respondents.

Respondents were more aware of puffins' existence in Conception Bay than they were storm-petrels. About 40% of respondents reported having seen puffins or storm-petrels in Conception Bay. The findings show a potential small effect of knowing about the birds' presence in Conception Bay on cognitive components. However, no differences were detected between people who were: *a)* unaware of puffins and never seen puffins in Conception Bay**,** *b)* aware, but never seen puffins in Conception Bay**,** or *c)* aware and seen puffins in Conception Bay. This was not the case for storm-petrels, where differences were observed for knowledge and existence beliefs for respondents who were unaware of storm-petrels and had never seen them, compared to people who were aware, regardless of having seen or not seen storm-petrels. This indicates that awareness, regardless of whether respondents have seen storm-petrels, influences knowledge and existence beliefs. Differences were also observed in the extent to which people who were unaware of storm-petrels were aware of human impacts on seabirds, and the extent to which they ascribe responsibility to themselves, compared to respondents' who were aware and had seen storm-petrels in Conception Bay. This means that respondents' who are unaware of storm-petrels existence have lower awareness of consequences and ascription of responsibility, compared to respondents who are aware and have seen storm-petrels.

The findings suggest that male respondents are more aware of storm-petrels' behaviour and conservation, and that storm-petrels are not dangerous for humans to touch, nor that they bring bad luck, compared to female respondents.

Effective communication is key in natural resource management issues (Eschenfelder, 2006; Vaske & Donnelly, 1999). To ensure effective communication between management and constituents, it is necessary to understand how information is obtained and engaged with by the audience (Muter et al., 2011). Wildlife value orientations are relevant for communicating wildlife management issues. Wildlife value orientations can support strategic communication, as individuals with different wildlife value orientations are likely to differ in what they perceive to be a relevant message (Miller et al., 2018). Understanding the direction of how citizens' value wildlife (domination vs. mutualism) can thus support wildlife management initiatives. This research found that most respondents (36.0%) hold mutualistic wildlife value orientations, followed by pluralists (29.9%), traditionalists (18.5%) and distanced (15.6%). This research observed difference between the communities. In Holyrood (40.65%) and Harbour Main-Chapel's Cove-Lakeview (33.33%) the majority of respondents have mutualistic wildlife value orientations. In Clarke's

Beach (36.84%) and Bay de Verde (33.33%), the majority have pluralistic wildlife value orientations.

Generally, respondents believe that both species have a right to exist and should be conserved for future generation. Considering these findings, ensuring the conservation of both species is important to respondents. However, it should be noted that storm-petrels may be disadvantaged, as storm-petrels are not considered as important for tourism as puffins and generally are perceived less positively than puffins. This is not surprising, as puffins are the provincial bird of Newfoundland and Labrador, figure on many souvenirs, and are frequently depicted in local arts and crafts, which is not the case for storm-petrels. The neutral attitudes and emotions towards storm-petrels observed in this study may be an opportunity to formulate or change the narrative around storm-petrels. Only 26.30% of respondents knew that Baccalieu Island is the largest nesting site of Leach's storm-petrels in the world. Communicating this aspect of storm-petrel ecology may be an opportunity to enhance awareness and make storm-petrels more iconic. However, it should be noted that on average, respondents were neutral to somewhat agreeing that they feel obligated to educate others on the importance of the seabirds. Generally, a higher number of people feel responsible for educating others about puffins than about storm-petrels. On average, respondents did not feel particularly personally responsible for protecting the two species. This research found that more respondents feel responsible for protecting puffins than storm-petrels. These findings indicate that respondents generally feel less responsible for the conservation of storm-petrels than they do puffins.

For puffins, this research detected relationships between different cognitive, emotional, and personal norms constructs that were generally consistent with theoretical relationships between the constructs (e.g., Lessard et al., 2021; Sponarski et al., 2015; Vaske & Donnelly, 1999). The picture looks different for storm-petrels, where statistically significant relationships were observed between knowledge and awareness of consequences, emotions and awareness of consequences, emotions and ascription of responsibility, and awareness of consequences and ascription of responsibility. This differed from what was expected theoretically, which may be caused by a lack of knowledge and generally awareness of storm-petrels. This research found a strong relationship between awareness of consequences and ascription of responsibility for both species. Awareness of consequences encompasses awareness of humans' impact on the bird species and awareness that one's personal actions can impact the bird species. Ascription of responsibility encompasses feeling a personal obligation to protect the birds, to educate others about the birds, and being responsible for the conservation of both species.

Respondents generally associate positive words with puffins more so than with storm-petrels. Respondents used very few negative attributes to describe puffins in comparison to storm-petrels. Bird attributes (e.g., "beautiful", "smelly", "comical") and bird characteristics (e.g., words relating to bird phenotype or behaviour) were the two most common categories for both birds. For puffins, these were followed by locations, other animals, and words pertaining to cultural identity (e.g., commonly associated with "Buddy the Puffin", the ice hockey mascot for the provincial team). For

storm-petrels, the other common categories were concerned more with information and conservation. Particularly related to meteorological conditions that causes storm-petrels to get stranded, other animals, and built environment and associated threats. This research did, however, not detect as many negative words as anticipated for storm-petrels.

Study limitations

While the demographic profile of respondents generally reflects the 2016 census data (Table 3), the data is skewed towards people of an older age. This is in part due to the fact that individuals under the age of 18 were not invited to participate in the study.

Only a small proportion of the respondents worked in sectors where higher level of interactions with the seabirds could be expected. This limits the opportunities to analyse difference in perception across sectors. Future work should explore these sectors more to understand how people working in each sector perceive puffins and storm-petrels.

Only a small proportion of the respondents were aware of, had participated in, or intended to participate in the *Puffin and Petrel Patrol*. This limited the opportunity to understand how awareness and participation in the patrol influences seabird perceptions. Expanding this study to Witless Bay, where the patrol has been active since it was established, would allow us to understand how seabird perceptions may shift with participation in the *Puffin and Petrel Patrol*.

To overcome these limitations, future work should:

a) Expand the scope to the study to include other communities along the Conception Bay coastline and target relevant sectors, as well as implementing the study in Witless Bay.

b) Develop targeted education materials for storm-petrels, where messaging is grounded in different wildlife value orientations. For example, to target people with a *mutualistic* wildlife value orientation, messaging should focus on caring beliefs and having social affiliation with storm-petrels. To target people with a *traditionalist* wildlife value orientation, messaging should focus on the benefits humans derive from protecting storm-petrels.

c) Develop targeted education materials for storm-petrels that promote higher levels of ascription of responsibility and promotes personal conservation norms.

d) Cross-promote puffin and storm-petrel conservation. The findings show that people positively perceive puffins and report higher scores for all perceptions items compared to storm-petrels. Generally, respondents were less knowledgeable and aware of storm-petrels in Conception Bay.

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Appendix 1: Research methodology

Research instrument development

The questionnaire was developed adopting items from the human dimensions of wildlife literature. These included modified items on wildlife value orientations (Fulton et al., 1996), wildlife attitudes (Sponarski et al., 2015), folklore (Ceríaco, 2012), emotional dispositions (Cameron et al., 2020; Dayer et al., 2019; Jacobs & Vaske, 2019; Sponarski et al., 2015), existence beliefs (Frank et al., 2016; Sponarski et al., 2015), ascription of responsibility (Lessard et al., 2021; Vaske et al., 2007), awareness of consequences (Vaske et al., 2007), personal norms (Vaske & Manfredo, 2012) and a set of knowledge items were developed based on Leach's storm-petrels and Atlantic puffins biology, ecology, and threats (Wilhelm et al., 2019).

A mix of close-ended and open-ended questions were used, with most of the questions making up the former (see Appendix 2). Close-ended questions were asked using different formats, included five-point bipolar scales (e.g., *strongly disagree* to *strongly agree*) and true/false/not sure for knowledge questions. Semantic differential questions to were used to assess attitudes (e.g., "*In general, do you think of storm-petrels in your community as*" with response scales ranging from *Extremely Bad*; *Moderately Bad*; over *Neither*; to *Moderately Good*; and *Extremely Good*). To assess emotions, a similar response scale across different emotional dispositions (i.e., angry vs happy; indifferent vs. compassionate; disgusted vs. excited; upset vs. pleased; contemptuous vs. in awe) was used. All demographic items were worded according to the Government of Canada's standards for public opinion research for telephone surveys[8].

After completing questionnaire design, pretests were carried out on a convenience sample of 10. The respondents were between 28 - 68 in age, residents of the island of Newfoundland, and with different educational and occupational backgrounds (a scientist, a public servant, a student, a fisherman, an educator, an engineer, a receptionist, an entrepreneur, a manager, and a psychiatrist). The respondents' feedback was incorporated into the final questionnaire which was translated the questionnaire into French.

Determining sampling sizes

The desirable sampling size was calculated using census data for community size provided by Statistics Canada (2016). With a total population size of approximately 5,500 people in 2016, the desirable sampling size was calculated using equation 1.1 to be 359 completed surveys. Such a sample size is sufficient to generalize results to a population of more than 1,000,000 people, with results considered accurate in 19 out of 20 times, ± 5 percent (Vaske, 2008).

[8] No standards exist for the face-to-face DOPU surveys distribution. The Government of Canada standards can be found here: https://www.tpsgc-pwgsc.gc.ca/rop-por/telephone-eng.html

$Equation$ 1.1:

$$n = \frac{(N)(p)(1-p)}{(N-1)\left(\frac{B}{C}\right)^2 + (p)(1-p)}$$

	Description:	
n	Sample size needed	
N	Population size	
p	proportion expect to answer in certain way	(0.5)
B	acceptable level of sampling error	(0.05)
C	Z statistics for confidence interval of 95%	(1.960)

$Equation$ 1.1:

$$\frac{(5480)(0.5)(1-0.5)}{(5480-1)\left(\frac{0.05}{1.960}\right)^2 + (0.5)(1-0.5)}$$

$$n = 359$$

Location	Dwellings[9]	Population[1]	Proportion of study area (%)	Surveys need per village
Holyrood	1106	2463	45	161
Harbour Main-Chapel's Cove-Lakeview	509	1067	19	70
Clarke's Beach	642	1558	28	102
Bay de Verde	216	392	7	26
Total	**2473**	**5480**	**100%**	**359**

With an anticipated response rate around ≈ 50%, 764 people were invited to participate in this study. Of those 764 people, 628 agreed to participate in the study. A total of 320 community members completed the questionnaires, with an overall response rate of 51%. Response rates were calculated using the following equation:

[9] Based on Canada Census 2016

Equation 2.1

$$Response\ rate = \frac{Number\ of\ completed\ surveys}{Number\ of\ participating\ households} * 100\%$$

$$Response\ rate = \frac{320}{628} * 100\%$$

$$Response\ rate = 51\%$$

Response rates varied in the four communities, with the lowest response rate in Clarke's Beach (39%) and the highest on Bay de Verde (79%). This variation may be due to various factors, including the timing of data collection: data collected in Clarke's Beach happened immediately before the work suspension caused by the federal election. This meant that the researchers were not able to follow up in days after data had been collected.

Some community members gave verbal explanations of why they chose not to participate in the study. Among the most common explanations were *a)* "I did not see the survey" (e.g., another household member received it; it got lost etc.); *b)* "I don't know what storm-petrels are" and/or "I wasn't aware that puffins existed in the area"; *c)* "I am not interested in birds". Other reasons for non-participation were potential respondents questioning the nature of the work (e.g., beliefs about affiliation with other organizations that the respondent did not support; misunderstandings regarding the target species). No differences were observed in respondents returning the questionnaires collected in the field compared to those that were mailed in.

Representativeness of sample

Participation was voluntary. Only participants over the age of 18 were invited to participate in this study. The majority of the completed surveys were obtained from Holyrood (n = 160), followed by Clarke's Beach (n = 58), Harbour Main-Chapel's Cove-Lakeview (n = 53), and Bay de Verde (n = 49).

Location	Population[1]	Proportion of study area (%)	Completed surveys obtained per community
Holyrood	2463	45	160
Harbour Main-Chapel's Cove-Lakeview	1067	19	53
Clarke's Beach	1558	28	58
Bay de Verde	392	7	49
Total	**5480**	**100%**	**320**

Except for respondents from Bay de Verde, the sample included an almost even split between respondents identifying as female or male. Respondents were provided with a "*prefer not to answer*" option, which is not included in the table. Generally, the age of the respondents reflects the 2016 census data for the four communities. Bay de Verde is the only exception, where the majority of respondents indicated that they were over 60 years of age.

Demographics	Holyrood		Clarke's Beach		Harbour Main-Chapel's Cove-Lakeview		Bay de Verde	
	Census	**Sample**	**Census**	**Sample**	**Census**	**Sample**	**Census**	**Sample**
Gender[10]								
Female	49.60	50.65	53.99	56.00	51.42	49.12	50.00	27.08
Male	50.20	46.10	45.62	42.00	49.53	43.86	50.00	66.67
Other	-	0.65	-	0	-	0	-	0
Age								
19 and under[11]	20.04	2.03	17.89	0	18.87	0	16.67	0
20 - 29	7.89	6.08	6.39	6.08	7.55	7.27	5.13	2.17
30 - 39	12.75	14.19	9.27	14.19	8.49	18.18	8.97	4.35
40 - 49	13.16	12.84	12.14	12.84	15.09	10.91	11.54	8.70
50 - 59	16.19	14.19	12.78	14.19	19.81	18.18	19.23	13.04
60 +	29.96	50.68	41.53	50.68	30.19	45.45	38.46	71.74

Analysis

All frequencies are reported as valid percentage (i.e., not accounting for any missing values). For descriptive statistics, mean values ($\bar{x}$), standard deviation (SD), and relative frequencies (%) are reported. All statistical tests operated with a confidence interval level of 0.95, and a $p \leq 0.05$ as the threshold for statistical significance.

Principal Component Analysis with varimax rotation was used to identify latent variables (i.e., scales). To assess the internal reliability of the scales Cronbach's Alpha was used. Cronbach's Alpha values range from 0 – 1. The values are dependent on the average inter-item correlation and number of items included in the scale. Alpha values between 0.60 - 0.70 are considered adequate, while alpha values over 0.80 are considered "good" in terms of internal consistency for the scale (Vaske, 2008). Cronbach's Alpha values for the wildlife value orientation scales (domination and mutualism) can be found in Table 4. Alpha values for attitude, emotion, existence beliefs, awareness of consequences, and ascription of responsibility for puffins can be found in Table 5 and in Table 6 for storm-petrels.

The knowledge variables for puffins and storm-petrels were recoded and assigned a value (incorrect answer: -1; don't know: 0; correct answer: 1) for all answers. A summated score was then created where respondents were considered "knowledgeable" if they had more than 5 correct

[10] Please note that the 2016 census only lists female and male options for gender identification.
[11] Only participants of legal age were invited to participate in this study. The proportion of sampled individuals is thus skewed towards people outside this age category [19 and under].

and less than 5 incorrect answers, and “unknowledgeable” if they had more than 5 incorrect and less than 5 correct answers. The “unknowledgeable” category also encompasses respondents who answered “don’t know” to five or more items.

Independent samples T-tests and Analysis of Variance (ANOVA) were used to understand differences in mean values, with Cohen’s d as an effect size measure, where a d value of 0.20 indicates a small effect, 0.50 a medium effect, and 0.80 a large effect (Vaske 2008). Based on Levene’s test, Bonferroni post-hoc test was used where equality of variance can be assumed and Tamhane post-hoc tests if equality of variance cannot be assumed for ANOVA.

Linear regression was used to understand the relationship between different cognitions. Standardized regression coefficients (ß) were used to understand the strength of the relationship, where a ß value between 0.10 – 0.30 is considered a minimal relationship, between 0.30 – 0.50 a typical relationship, and over .50 as a substantial relationship (Vaske 2008).

Crosstabulations were used to understand differences in word associations across age, gender, wildlife value orientation, species knowledge, and species interactions. Cramer’s *V* was used as an effect size measure to understand the strength of association. Cramer’s *V* ranges from 0 – 1. Values of around 0.1 suggest a “minimal” relationship, 0.3 a “typical” relationship, and values above 0.5 as a “substantial” relationship (Vaske, 2008). Pearson correlation (r) was used to understand the strength of association between word associations, attitudes and emotions.

Qualitative analysis

The principal investigator read through the qualitative data points for the word associations and comments and developed two codebooks. The codebook for the word associations is presented below. Two independent coders coded the word association with an intercoder reliability of 88.95%. Following a consensus approach, the two coders discussed each discrepancy until consensus was reached (O'Connor & Joffe, 2020). All codes were bundled into categories (see codebook). Frequencies for each of the categories were calculated and crosstabulations (see above) for demographics (gender and age), wildlife value orientation typology, and knowledge were used. Only the principal investigator coded the questionnaire comments. The codebook used for the questionnaire comments is presented in below.

Category	Code	Example
Bird characteristics:		
	Bird behavior	Fast flying, alert, burrowing
	Bird phenotype	Small, colorful, grey,
	Habitat type	Cliffs, ocean, island
Conservation efforts:		
	Conservation status	Vulnerable, rare,
	Conservation initiatives	Puffin and petrel patrol
Build environment:		
	Threats	Run into buildings, attracted to light
	Infrastructure	Oil rigs, windows, streetlights, telephone wires
Animals:		
	Other species, birds	
	Other species, fish	Capelin
	Other species, predators	Cats,
	Other species	Whales, wildlife, bird
Meteorological conditions:		
	Weather	N/E winds, winds
	Seasons	Summer, nigh
Location:		
	Specific locations	Bonavista, Elliston
Recreation:		
	Hobbies	Hunting, sports, crab fishing
Tourism:		
	Touristic offers	Boat tour, photographic
Cultural identity:		
	Part of culture	Home, Buddy the Puffin, Newfoundland bird, history
Experiences:		
	Interactions with birds	Never seen one, seen one
Lack of knowledge:		
		Not familiar with the bird, penguin, extinct,
Bird attributes:		
	Positive attributes	Beautiful, cool, nice, unique, cute
	Negative attributes	Smelly, oily, sleek, malevolent
	Neutral attributes	Hardy, comical, skilled
Emotions:		
	Positive emotions	Excited, awesome, amazing
	Negative emotions	Sad, foreboding, pity

Category	Code	Example
Outreach needs:		
	Lack of information	“I don't know anything about storm-petrels, I never heard of them.”
	Need for education	“More information/education needs to be done so people can help if they ever find one so far from the ocean.”
Stranding information:		
	Personal experiences	“While working on the Herbron project in Bull Arm, was sorry to see so many storm-petrels die, running into lights and oil rig. Got to save a good many with our crew, picking them up to give to the people on site, and letting them go again.”
	Stranding locations	“At Kent in CBS, the lights attract the petrels. We keep an eye out for them and make sure they get released back to sea. Sometimes there are many that don’t survive. I wish there were some kind of shield which would prevent the lights at KENT from being seen by the birds at night. I know that turning the lights off at night isn't an option for the company.”
Experiences:		
	Traditions	“We as kids thought they were blown on land by wind and thought they couldn't fly because of "oil on their wings." Our parents and elders referred to them as dirty - as oil birds.”
	Personal stories	“Just visited Bonavista Bay to view puffin population. Beautiful scenes of puffin colonies.”
	Interaction stories	“Every time I go out I see them dive under the boat/water”
Wildlife perceptions:		
	Perceptions of wildlife	“I feel unless it’s for human survival, wildlife should have same human rights”
	Wildlife behavior and ecology	“Storm petrels always go for light. I have seen many that run into lights on fishing boat that I fished on. They tend to be real active on foggy nights.”

Appendix 2: Research instrument in English

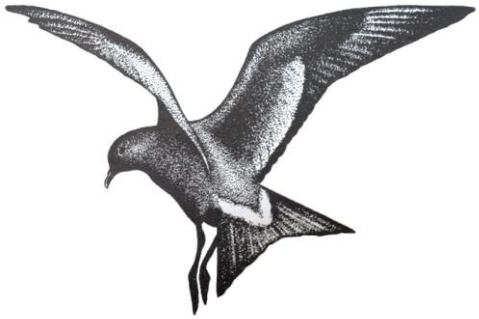
HOW DO YOU FEEL ABOUT

PUFFINS

&

STORM-PETRELS

IN CONCEPTION BAY?



Thank you for sharing your opinion and participating in this research project.
Participation is **voluntary, confidential** and responses will remain **anonymous.**

The project is carried out by Dr. Marie Louise Aastrup in collaboration with Canadian Parks and Wilderness Society – Newfoundland and Labrador Chapter (CPAWS-NL) and Environment and Climate Change Canada - Canadian Wildlife Service (ECCC-CWS)

Artwork by Dawn Laurel Nelson (courtesy of the Whale Release & Strandings Group).

HOW DO YOU FEEL ABOUT PUFFINS & STORM-PETRELS?

Conception Bay, Newfoundland & Labrador

Atlantic puffins
Fratercula arctica

Leach's storm-petrels
Oceanodroma leucorhoa

Also known as:
Caries chicks
Caries hens
Saltwater hens
Mother Carey's chicks

Dear resident,

You are invited to participate in a study to understand how residents think and feel about puffins and storm-petrels in the Conception Bay area. The study is carried out by Dr. Marie Louise Aastrup in collaboration with the Canadian Parks and Wilderness Society – Newfoundland and Labrador Chapter (CPAWS-NL) and Environment and Climate Change Canada - Canadian Wildlife Service (ECCC-CWS).

Your participation is **voluntary, confidential,** and responses will remain **anonymous**. Your participation is valuable to our study and we would appreciate your help. We encourage you to answer all questions in a way that accurately reflects your own feelings and beliefs, whether negative, neutral, or positive. **The questionnaire takes about 10 - 15 minutes to complete**. Your individual responses will be kept confidential and names will not be associated with the survey. Please answer the questions as openly as possible. At no point will your personal information be collected in association with this study. The information collected in this study will be used to understand how locals feel about storm-petrels and puffins in the area and will be used to inform efforts to reduce conflicts between seabirds and communities in the area.

We request the adult, a person 18 years and older, with the most recent birthday should complete the questionnaire.

Thank you in advance for your help with this important study. If you have any questions about the study or need help completing your questionnaire, please do not hesitate to contact Dr. Marie Louise Aastrup at (709) 330-9014 or by email at aastrupml@gmail.com

Sincerely,

Dr. Marie Louise Aastrup	Suzanne Dooley	Dr. Sabina Wilhelm
Aastrup Consulting	CPAWS-NL	ECCC-CWS
(709) 330-9014	(709) 726-5800	(709) 764-1957
aastrupml@gmail.com	sdooley@cpaws.org	sabina.wilhelm@canada.ca

How do you feel about wildlife in general?

1. To what extent do you **disagree** or **agree** with each of the following?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Humans should manage wildlife populations so that humans benefit.	❑	❑	❑	❑	❑
Wildlife should have rights similar to the rights of humans.	❑	❑	❑	❑	❑
We should strive for a world where there is an abundance of wildlife for hunting and fishing.	❑	❑	❑	❑	❑
I view all living things as part of one big family.	❑	❑	❑	❑	❑
Hunting does not respect the lives of wildlife.	❑	❑	❑	❑	❑
I feel a strong emotional bond with wildlife.	❑	❑	❑	❑	❑
The needs of humans should take priority over wildlife protection.	❑	❑	❑	❑	❑
I care about wildlife as much as I do about people.	❑	❑	❑	❑	❑
Wildlife are on earth primarily for people to use.	❑	❑	❑	❑	❑
Hunting is a positive and humane activity.	❑	❑	❑	❑	❑
We should strive for a world where humans and wildlife can live side by side without fear.	❑	❑	❑	❑	❑
I value the sense of companionship I receive from wildlife.	❑	❑	❑	❑	❑
Wildlife are like my family and I want to protect them.	❑	❑	❑	❑	❑
People who want to hunt should have the opportunity to do so.	❑	❑	❑	❑	❑

This section is about Atlantic puffins

1. Before today, were you aware that **puffins** exist in Conception Bay? ❑ Yes ❑ No

2. Have you ever seen a **puffin** in Conception Bay? ❑ Yes ❑ No ❑ Don't Know

3. If yes, in which locations have you seen **puffins**? _____

4. What are the **three first words** that come to mind when you think about **puffins**?

   i. _____

   ii. _____

   iii. _____

5. For ***each*** of the following statements, indicate whether you ***believe*** it is "**True**", "**False**", or are "**Not Sure**". *(Please **circle** your response)*

Puffins are blown onto land by the wind	T	F	Not Sure
Puffins are attracted to light on land	T	F	Not Sure
Puffins get stranded on land	T	F	Not Sure
Puffins spend most of their lives at sea	T	F	Not Sure
Stranded puffins attract predators such as coyotes	T	F	Not Sure
Puffins are dangerous for humans to touch	T	F	Not Sure
Puffins are attracted to light on fishing vessels	T	F	Not Sure
Puffins are attracted to light on oil rigs	T	F	Not Sure
Puffins bring bad luck	T	F	Not Sure
The puffin population is increasing in Conception Bay	T	F	Not Sure

6. **In general,** do you ***think*** of **puffins** in your community as: *(For **each row**, tick the box that best represents your response.)*

❑ Extremely Bad	❑ Moderately Bad	❑ Neither	❑ Moderately Good	❑ Extremely Good
❑ Extremely Harmful	❑ Moderately Harmful	❑ Neither	❑ Moderately Beneficial	❑ Extremely Beneficial
❑ Extremely Negative	❑ Moderately Negative	❑ Neither	❑ Moderately Positive	❑ Extremely Positive

7. How do you ***feel*** when you see a **puffin** in your community? *(For **each row**, tick the box that best represents your response.)*

❑ Extremely Angry	❑ Moderately Angry	❑ Neither	❑ Moderately Happy	❑ Extremely Happy
❑ Extremely Indifferent	❑ Moderately Indifferent	❑ Neither	❑ Moderately Compassionate	❑ Extremely Compassionate
❑ Extremely Disgusted	❑ Moderately Disgusted	❑ Neither	❑ Moderately Excited	❑ Extremely Excited
❑ Extremely Upset	❑ Moderately Upset	❑ Neither	❑ Moderately Pleased	❑ Extremely Pleased
❑ Extremely Contemptuous	❑ Moderately Contemptuous	❑ Neither	❑ Moderately In Awe	❑ Extremely In Awe

8. Given that puffins are present in Newfoundland & Labrador, how do you ***feel*** about ***each*** of the following? *(For **each statement**, check the box that best represents your response.)*

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Puffins have a right to exist	❑	❑	❑	❑	❑
Puffins should be conserved for future generations	❑	❑	❑	❑	❑
Puffins have a positive impact on tourism in Conception Bay	❑	❑	❑	❑	❑
Individual citizens like me are responsible for the conservation of puffins	❑	❑	❑	❑	❑
My personal actions can impact the ability of puffins to thrive	❑	❑	❑	❑	❑
I am aware of the impacts that humans can have on puffins	❑	❑	❑	❑	❑
I feel a strong personal obligation to protect puffins	❑	❑	❑	❑	❑
I feel an obligation to educate others about the importance of puffins	❑	❑	❑	❑	❑
It is ***not*** my responsibility to protect puffins	❑	❑	❑	❑	❑

This section is about Leach's storm-petrels (Mother Carey's chicks)

9. Before today, were you aware that **storm-petrels** exist in Conception Bay? ❑ Yes ❑ No

10. Have you ever seen a **storm-petrel** in Conception Bay? ❑ Yes ❑ No ❑ Don't Know

11. If yes, in which locations have you seen **storm-petrels**? _____

4

12. What are the **three first words** that come to mind when you think about **storm-petrels**?

i. _____

ii. _____

iii. _____

13. For ***each*** of the following statements, indicate whether you ***believe*** it is "**True**" (T), "**False**" (F), or are "**Not Sure**". *(Please **circle** your response)*

Storm-petrels are blown onto land by the wind	T	F	Not Sure
Storm-petrels are attracted to light on land	T	F	Not Sure
Storm-petrels get stranded on land	T	F	Not Sure
Storm-petrels spend most of their lives at sea	T	F	Not Sure
Newfoundland & Labrador has the largest nesting site of Leach's storm-petrels in the world	T	F	Not Sure
Stranded storm-petrels attract predators such as coyotes	T	F	Not Sure
Storm-petrels are dangerous for humans to touch	T	F	Not Sure
Storm-petrels are attracted to light on fishing vessels	T	F	Not Sure
Storm-petrels are attracted to light on oil rigs	T	F	Not Sure
Storm-petrels bring bad luck	T	F	Not Sure
The storm-petrel population is increasing in Conception Bay	T	F	Not Sure

14. **In general**, do you ***think*** of **storm-petrels** in your community as: *(For **each row**, tick the box that best represents your response.)*

❑ Extremely Bad	❑ Moderately Bad	❑ Neither	❑ Moderately Good	❑ Extremely Good
❑ Extremely Harmful	❑ Moderately Harmful	❑ Neither	❑ Moderately Beneficial	❑ Extremely Beneficial
❑ Extremely Negative	❑ Moderately Negative	❑ Neither	❑ Moderately Positive	❑ Extremely Positive

15. How do you ***feel*** when you see a **storm-petrel** in your community? *(For **each row**, tick the box that best represents your response.)*

❑ Extremely Angry	❑ Moderately Angry	❑ Neither	❑ Moderately Happy	❑ Extremely Happy
❑ Extremely Indifferent	❑ Moderately Indifferent	❑ Neither	❑ Moderately Compassionate	❑ Extremely Compassionate
❑ Extremely Disgusted	❑ Moderately Disgusted	❑ Neither	❑ Moderately Excited	❑ Extremely Excited
❑ Extremely Upset	❑ Moderately Upset	❑ Neither	❑ Moderately Pleased	❑ Extremely Pleased
❑ Extremely Contemptuous	❑ Moderately Contemptuous	❑ Neither	❑ Moderately In Awe	❑ Extremely In Awe

16. Given that storm-petrels are present in Newfoundland & Labrador, how do you ***feel*** about ***each*** of the following? *(For **each statement**, check the box that best represents your response.)*

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Storm-petrels have a right to exist	❑	❑	❑	❑	❑
Storm-petrels should be conserved for future generations	❑	❑	❑	❑	❑
Storm-petrels have a positive impact on tourism in Conception Bay	❑	❑	❑	❑	❑
Individual citizens like me are responsible for the conservation of storm-petrels	❑	❑	❑	❑	❑
My personal actions can impact the ability of storm-petrels to thrive	❑	❑	❑	❑	❑
I am aware of the impacts that humans can have on storm-petrels	❑	❑	❑	❑	❑
I feel a strong personal obligation to protect storm-petrels	❑	❑	❑	❑	❑
I feel an obligation to educate others about the importance of storm-petrels	❑	❑	❑	❑	❑
It is ***not*** my responsibility to protect storm-petrels	❑	❑	❑	❑	❑

This section is about you (responses will remain anonymous)

1. In what year were you born? _____

2. What is your gender? ❑ Female ❑ Male ❑ Other ❑ Prefer not to answer

3. Were you born in Newfoundland & Labrador? ❑ Yes ❑ No

4. Do you identify as Indigenous? ❑ Yes ❑ No ❑ Prefer not to answer
   If yes, are you: ❑ First Nation ❑ Métis ❑ Inuk (Inuit) ❑ Prefer not to answer

5. Have you heard about the *Puffin and Petrel Patrol* organized by CPAWS NL? ❑ Yes ❑ No
   If you would like to know more, please visit the *Puffin & Petrel Patrol NL* site on Facebook.

6. Have you participated in the Puffin and Petrel Patrol organized by CPAWS NL?
   ❑ Yes ❑ No ❑ I intend to participate in the *Puffin and Petrel Patrol*

7. Do you work in any of the following? (*Check all that apply*)
   ❑ Tourism ❑ Seafood processing plants ❑ Fishing ❑ Oil and gas ❑ N/A

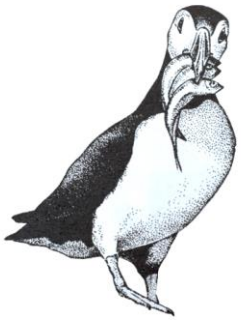
8. Do you participate in any of the following recreational activities in your free time?
   ❑ Recreational fishing in freshwater ❑ Recreational boating ❑ ATVing ❑ Bird watching
   ❑ Recreational fishing in the ocean ❑ Hunting ❑ Hiking ❑ Wildlife photography

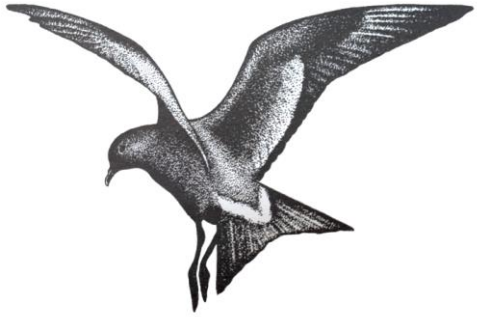
Do you have any **thoughts** or **stories** about puffins and storm-petrels that you have heard in your community that you would like to share with us?

Thank you for participating.

Appendix 3: Research instrument in French

QUE PENSEZ-VOUS
DES MACAREUX
ET
DES OCÉANITES
DE LA BAIE DE CONCEPTION?





Merci de votre opinion et de votre participation à ce projet de recherche. La participation est **volontaire** et **confidentielle** et les réponses resteront **anonymes**.

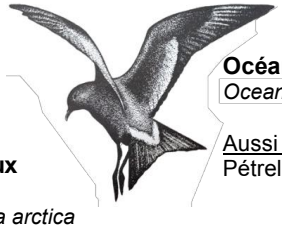
Le projet est mené par Marie Louise Aastrup, Ph. D., en collaboration avec le bureau régional de Terre-Neuve-et-Labrador de la Société pour la nature et les parcs du Canada et le Service canadien de la faune d'Environnement et Changement climatique Canada (SCF-ECCC).

Œuvre d'art de Dawn Laurel Nelson (avec l'aimable autorisation du Whale Release and Strandings Group).

QUE PENSEZ-VOUS DES MACAREUX ET DES OCÉANITES?

Baie de la Conception, Terre-Neuve-et-Labrador

Macareux moine
Fratercula arctica



Océanite cul-blanc
Oceanodroma leucorhoa

Aussi appelé :
Pétrel cul-blanc

Madame,
Monsieur,

Vous êtes invité à participer à une étude destinée à connaître ce que les résidents pensent et ressentent à propos des macareux et des océanites dans la région de la baie de la Conception. Le projet est mené par Marie Louise Aastrup, Ph. D., en collaboration avec le bureau régional de Terre-Neuve-et-Labrador de la Société pour la nature et les parcs du Canada et le Service canadien de la faune d'Environnement et Changement climatique Canada (SCF-ECCC).

Votre participation est **volontaire** et **confidentielle**, et vos réponses demeureront **anonymes**. Votre participation est précieuse pour notre étude et nous vous remercions de votre aide. Nous vous encourageons à répondre à toutes les questions de manière à refléter fidèlement vos sentiments et convictions, qu'ils soient négatifs, neutres ou positifs. **Il vous faudra de 10 à 15 minutes pour remplir le questionnaire.** Chacune de vos réponses restera confidentielle et aucun nom ne sera associé au questionnaire. Veuillez répondre de la manière la plus exhaustive possible. À aucun moment, vos informations personnelles ne seront recueillies dans le cadre de cette étude. Les informations colligées seront utilisées pour comprendre ce que les résidents ressentent à l'égard des océanites et des macareux dans la région. Elles serviront à orienter les efforts visant à réduire les conflits entre les oiseaux de mer et les collectivités de la région.

Nous demandons à l'adulte (personne âgée de 18 ans ou plus) qui a célébré son anniversaire le plus récemment de remplir le questionnaire.

Merci à l'avance de votre aide pour cette étude importante. Si vous avez des questions ou si vous avez besoin d'aide pour remplir le questionnaire, n'hésitez pas à communiquer avec Marie Louise Aastrup, au 1-709-330-9014 ou à aastrupml@gmail.com.

Veuillez agréer, Monsieur, Madame, mes salutations respectueuses.

Marie Louise Aastrup, Ph. D.	Suzanne Dooley	Sabina Wilhelm, Ph. D.
Aastrup Consulting +1-709-330-9014 aastrupml@gmail.com	Bureau régional de Terre-Neuve-et-Labrador de la Société pour la nature et les parcs du Canada +1-709-726-5800 sdooley@cpaws.org	SCF-ECCC +1-709-764-1957 sabina.wilhelm@canada.ca

Que pensez-vous de la faune et de la flore en général?

1. Dans quelle mesure êtes-vous en **accord** ou en **désaccord** avec chacun des énoncés suivants?

	Fortement en désaccord	En désaccord	Neutre	En accord	Tout à fait en accord
Les humains devraient gérer les populations sauvages de manière à en tirer des avantages.	❑	❑	❑	❑	❑
Les espèces sauvages devraient avoir des droits semblables à ceux des humains.	❑	❑	❑	❑	❑
Nous devrions chercher à créer un monde où les espèces sauvages abondent pour la chasse et la pêche.	❑	❑	❑	❑	❑
Tous les êtres vivants font partie d'une seule grande famille.	❑	❑	❑	❑	❑
La chasse ne respecte pas la vie des animaux sauvages.	❑	❑	❑	❑	❑
J'éprouve un attachement profond pour les espèces sauvages.	❑	❑	❑	❑	❑
Les besoins des humains devraient l'emporter sur la protection de la faune et de la flore.	❑	❑	❑	❑	❑
Je me soucie autant des espèces sauvages que des humains.	❑	❑	❑	❑	❑
La faune et la flore existent surtout pour que les gens l'utilisent.	❑	❑	❑	❑	❑
La chasse est une activité positive et humaine.	❑	❑	❑	❑	❑
Nous devrions chercher à créer un monde où les humains et les espèces sauvages peuvent se côtoyer sans crainte.	❑	❑	❑	❑	❑
Je valorise le sentiment de camaraderie que me procurent les espèces sauvages.	❑	❑	❑	❑	❑
Je considère les espèces sauvages comme des membres de ma famille et je veux les protéger.	❑	❑	❑	❑	❑
Les gens qui veulent chasser devraient avoir la possibilité de le faire.	❑	❑	❑	❑	❑

Cette partie porte sur les macareux moines

1. Avant aujourd'hui, saviez-vous que les **macareux moines** étaient présents dans la baie de la Conception? ❑ Oui ❑ Non

2. Avez-vous déjà vu un **macareux moine** dans la baie de la Conception? ❑ Oui ❑ Non ❑ Je ne sais pas

3. Si oui, à quels endroits avez-vous vu des **macareux moines**? _____

4. Quels sont les **trois premiers mots** qui vous viennent à l'esprit lorsque vous pensez aux **macareux moines**?

   i. _____

   ii. _____

   iii. _____

5. Pour ***chacun*** des énoncés suivants, indiquez s'il s'agit, selon vous, d'un énoncé « **Vrai** » ou « **Faux** », ou choisissez « **Incertain** ». *(Veuillez **encercler** votre réponse.)*

Les macareux sont poussés sur la terre ferme par le vent.	V	F	Incertain
Les macareux sont attirés par la lumière sur la terre ferme.	V	F	Incertain
Les macareux s'échouent sur la terre ferme.	V	F	Incertain
Les macareux passent la plus grande partie de leur vie en mer.	V	F	Incertain
Les macareux échoués attirent les prédateurs tels que les coyotes.	V	F	Incertain
Il est dangereux pour les humains de toucher les macareux.	V	F	Incertain
Les macareux sont attirés par la lumière des bateaux de pêche.	V	F	Incertain
Les macareux sont attirés par la lumière des plateformes pétrolières.	V	F	Incertain
Les macareux portent malheur.	V	F	Incertain
La population de macareux moines augmente dans la baie de la Conception.	V	F	Incertain

6. **En général, pensez-vous** que les **macareux moines** de votre région sont : *(Pour **chaque ligne**, cochez la case qui correspond le mieux à votre réponse.)*

❑ Très mauvais	❑ Modérément mauvais	❑ Ni l'un ni l'autre	❑ Modérément bons	❑ Très bons
❑ Très nuisibles	❑ Modérément nuisibles	❑ Ni l'un ni l'autre	❑ Modérément bénéfiques	❑ Très bénéfiques
❑ Très négatifs	❑ Modérément négatifs	❑ Ni l'un ni l'autre	❑ Modérément positifs	❑ Très positifs

7. Comment vous **sentez-vous** lorsque vous voyez un **macareux** dans votre région? *(Pour **chaque ligne**, cochez la case qui correspond le mieux à votre réponse.)*

❑ Très en colère	❑ Modérément en colère	❑ Ni l'un ni l'autre	❑ Modérément content	❑ Très content
❑ Très indifférent	❑ Modérément indifférent	❑ Ni l'un ni l'autre	❑ Modérément compatissant	❑ Très compatissant
❑ Très dégoûté	❑ Moyennement dégoûté	❑ Ni l'un ni l'autre	❑ Modérément enthousiaste	❑ Très enthousiaste
❑ Très contrarié	❑ Modérément contrarié	❑ Ni l'un ni l'autre	❑ Modérément satisfait	❑ Très satisfait
❑ Très méprisant	❑ Modérément méprisant	❑ Ni l'un ni l'autre	❑ Modérément en admiration	❑ Très en admiration

8. Devant la présence des macareux à Terre-Neuve-et-Labrador, comment vous ***sentez-vous*** par rapport à ***chacun*** des éléments suivants? *(Pour **chaque énoncé**, cochez la case qui correspond le mieux à votre réponse.)*

	Fortement en désaccord	**En désaccord**	**Neutre**	**En accord**	**Tout à fait en accord**
Les macareux ont le droit d'exister.	❑	❑	❑	❑	❑
Les macareux doivent être conservés pour les générations futures.	❑	❑	❑	❑	❑
Les macareux ont un impact positif sur le tourisme de la région de la baie de la Conception.	❑	❑	❑	❑	❑
Tous les citoyens, dont je suis, sont responsables de la conservation des macareux.	❑	❑	❑	❑	❑
Mes actions peuvent avoir des répercussions sur la capacité des macareux à s'épanouir.	❑	❑	❑	❑	❑
J'ai conscience des répercussions que les humains peuvent avoir sur les macareux.	❑	❑	❑	❑	❑
Je ressens une forte obligation personnelle de protéger les macareux.	❑	❑	❑	❑	❑
Je ressens l'obligation d'éduquer les autres sur l'importance des macareux.	❑	❑	❑	❑	❑
C'est ***n'est pas*** ma responsabilité de protéger les macareux.	❑	❑	❑	❑	❑

Cette partie porte sur les océanites cul-blanc

9. Avant aujourd'hui, saviez-vous que **les océanites cul-blanc** étaient présents dans la baie de la Conception? ❑ Oui ❑ Non

10. Avez-vous déjà vu un **océanite cul-blanc** dans la baie de la Conception? ❑ Oui ❑ Non ❑ Je ne sais pas

11. Si oui, à quels endroits avez-vous vu des **océanites cul-blanc**? _____

12. Quels sont les **trois premiers mots** qui vous viennent à l'esprit lorsque vous pensez aux **océanites cul-blanc**?
    i. _____
    ii. _____
    iii. _____

13. Pour ***chacun*** des énoncés suivants, indiquez s'il s'agit, **selon vous**, d'un énoncé « **Vrai** » ou « **Faux** », ou choisissez « **Incertain** ». *(Veuillez **encercler** votre réponse.)*

Les océanites sont poussés sur la terre ferme par le vent.	V	F	Incertain
Les océanites sont attirés par la lumière de la terre ferme.	V	F	Incertain
Les océanites s'échouent sur la terre ferme.	V	F	Incertain
Les océanites passent la plus grande partie de leur vie en mer.	V	F	Incertain
Terre-Neuve-et-Labrador possède le plus grand site de nidification d'océanites cul-blanc du monde.	V	F	Incertain
Les océanites échoués attirent les prédateurs tels que les coyotes.	V	F	Incertain
Il est dangereux pour les humains de toucher les océanites.	V	F	Incertain
Les océanites sont attirés par la lumière des bateaux de pêche.	V	F	Incertain
Les océanites sont attirés par la lumière des plateformes pétrolières.	V	F	Incertain
Les océanites portent malheur.	V	F	Incertain
La population d'océanites cul-blanc augmente dans la baie de la Conception.	V	F	Incertain

14. **En général, pensez-vous** que les **océanites** de votre région sont : *(Pour **chaque ligne**, cochez la case qui correspond le mieux à votre réponse.)*

❑ Très mauvais	❑ Modérément mauvais	❑ Ni l'un ni l'autre	❑ Modérément bons	❑ Très bons
❑ Très nuisibles	❑ Modérément nuisibles	❑ Ni l'un ni l'autre	❑ Modérément bénéfiques	❑ Très bénéfiques
❑ Très négatifs	❑ Modérément négatifs	❑ Ni l'un ni l'autre	❑ Modérément positifs	❑ Très positifs

15. Comment vous ***sentez-vous*** lorsque vous voyez un **océanite** dans votre région? *(Pour **chaque ligne**, cochez la case qui correspond le mieux à votre réponse.)*

❑ Très en colère	❑ Modérément en colère	❑ Ni l'un ni l'autre	❑ Modérémen content	❑ Très content
❑ Très indifférent	❑ Modérément indifférent	❑ Ni l'un ni l'autre	❑ Modérément compatissant	❑ Très compatissant
❑ Très dégoûté	❑ Moyennement dégoûté	❑ Ni l'un ni l'autre	❑ Modérément enthousiaste	❑ Très enthousiaste
❑ Très contrarié	❑ Modérément contrarié	❑ Ni l'un ni l'autre	❑ Modérément satisfait	❑ Très satisfait
❑ Très méprisant	❑ Modérément méprisant	❑ Ni l'un ni l'autre	❑ Modérément en admiration	❑ Très en admiration

16. Devant la présence des océanites à Terre-Neuve-et-Labrador, comment vous ***sentez-vous*** par rapport à ***chacun*** des éléments suivants? *(Pour **chaque énoncé**, cochez la case qui correspond le mieux à votre réponse.)*

	Fortement en désaccord	**En désaccord**	**Neutre**	**En accord**	**Tout à fait en accord**
Les océanites ont le droit d'exister.	❑	❑	❑	❑	❑
Les océanites doivent être conservés pour les générations futures.	❑	❑	❑	❑	❑
Les océanites ont un impact positif sur le tourisme de la région de la baie de la Conception.	❑	❑	❑	❑	❑
Tous les citoyens, dont je suis, sont responsables de la conservation des océanites.	❑	❑	❑	❑	❑
Mes actions peuvent avoir des répercussions sur la capacité des océanites à s'épanouir.	❑	❑	❑	❑	❑
J'ai conscience des répercussions que les humains peuvent avoir sur les océanites.	❑	❑	❑	❑	❑
Je ressens une forte obligation personnelle de protéger les océanites.	❑	❑	❑	❑	❑
Je ressens l'obligation d'éduquer les autres sur l'importance des océanites.	❑	❑	❑	❑	❑
C'est ***n'est pas*** ma responsabilité de protéger les océanites.	❑	❑	❑	❑	❑

Cette partie vous concerne (les réponses resteront anonymes)

1. Quelle est votre année de naissance? _____

2. Quel est votre genre? ❑ Femme ❑ Homme ❑ Autre ❑ Je préfère ne pas répondre

3. Êtes-vous né à Terre-Neuve-et-Labrador? ❑ Oui ❑ Non

4. Vous identifiez-vous comme un Autochtone? ❑ Oui ❑ Non ❑ Je préfère ne pas répondre

   Dans l'affirmative, faites-vous partie : ❑ d'une Première Nation ❑ des Métis ❑ des Inuits ❑ Je préfère ne pas répondre

5. Avez-vous entendu parler de la patrouille des macareux et des océanites (*Puffin and Petrel Patrol*), organisée par le bureau régional Terre-Neuve-et-Labrador de la Société pour la nature et les parcs du Canada? ❑ Oui ❑ Non

   Si vous souhaitez en savoir plus, consultez la page Facebook *Puffin and Petrel Patrol NL*.

6. Avez-vous participé à la patrouille des macareux et des océanites organisée par le bureau régional Terre-Neuve-et-Labrador de la Société pour la nature et les parcs du Canada?

   ❑ Oui ❑ Non ❑ J'ai l'intention de participer à la patrouille des macareux et des océanites.

7. Travaillez-vous dans l'un des domaines suivants? (*Cochez toutes les cases qui s'appliquent.*)

   ❑ Tourisme ❑ Usines de transformation des produits de la mer ❑ Pêche ❑ Pétrole et gaz ❑ s. o.

8. Participez-vous à l'une des activités <u>récréatives</u> suivantes pendant votre temps libre?

   ❑ Pêche récréative en eau douce ❑ Navigation de plaisance ❑ VTT ❑ Observation des oiseaux

   ❑ Pêche récréative en mer ❑ Chasse ❑ Randonnée ❑ Photos de la faune et de la flore

Avez-vous eu entendu des **réflexions** ou des **histoires** sur les macareux et les océanites dans votre localité que vous aimeriez nous communiquer?

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Merci de votre participation.

Appendix 4: Tabulated data

Factor analysis	$\bar{x}$	SD	Item-total correlation	Cronbach's α	α if item deleted
Domination	**1.11**	**3.822**		**.695**	
Humans should manage wildlife populations so that humans benefit.	.11	1.287	.455		.651
We should strive for a world where there is an abundance of wildlife for hunting and fishing.	.86	.930	.538		.621
The needs of humans should take priority over wildlife protection.	-.30	1.041	.364		.675
Wildlife are on earth primarily for people to use.	-.65	.944	.408		.660
Hunting is a positive and humane activity.	.36	.930	.419		.657
People who want to hunt should have the opportunity to do so.	.72	.886	.402		.663
Mutualism	**4.41**	**4.931**		**.868**	
Wildlife should have rights similar to the rights of humans.	.58	1.029	.649		.849
I view all living things as part of one big family.	.95	.870	.589		.856
I feel a strong emotional bond with wildlife.	.57	.912	.650		.848
I care about wildlife as much as I do about people.	.42	1.071	.626		.853
We should strive for a world where humans and wildlife can live side by side without fear.	.73	.923	.615		.853
I value the sense of companionship I receive from wildlife.	.65	.852	.670		.846
Wildlife are like my family and I want to protect them.	.52	.922	.713		.840

Factor analysis	$\bar{x}$	SD	Item-total correlation	Cronbach's α	α if item deleted
Attitudes	**2.72**	**2.392**		**.936**	
Bad/Good	.95	.869	.875		.903
Harmful/Beneficial	.81	.814	.834		.934
Negative/Positive	.96	.855	.899		.883
Emotions	**5.02**	**3.750**		**.958**	
Angry/Happy	1.05	.813	.860		.952
Indifferent/Compassionate	.96	.811	.864		.951
Disgusted/Excited	1.00	.795	.918		.942
Upset/Pleased	.99	.823	.903		.945
Contemptuous/In Awe	1.02	.809	.867		.951
Existences Beliefs	**3.16**	**1.154**		**.867**	
Puffins have a right to exist	1.62	.579	.771		
Puffins should be conserved for future generations	1.54	.647	.771		
Awareness of Consequences	**1.88**	**1.540**		**.686**	
My personal actions can impact the ability of puffins to thrive	.98	.877			
I am aware of the impacts that humans can have on puffins	.91	.889			
Ascription of Responsibility	**2.37**	**2.288**		**.827**	
Individual citizens like me are responsible for the conservation of puffins	1.05	.830	.594		.845
I feel a strong personal obligation to protect puffins	.73	.921	.788		.649
I feel an obligation to educate others about the importance of puffins	.59	.902	.681		.765

Factor analysis	$\bar{x}$	SD	Item-total correlation	Cronbach's α	α if item deleted
Attitudes	**1.59**	**2.241**		**.956**	
Bad/Good	.54	.796	.922		.922
Harmful/Beneficial	.49	.762	.906		.935
Negative/Positive	.56	.780	.890		.947
Emotions	**2.68**	**3.563**		**.958**	
Angry/Happy	.52	.761	.901		.945
Indifferent/Compassionate	.59	.824	.795		.965
Disgusted/Excited	.51	.756	.927		.941
Upset/Pleased	.49	.762	.896		.946
Contemptuous/In Awe	.57	.742	.907		.945
Existence Beliefs	**2.58**		**1.291**	**.912**	
Storm-petrels have a right to exist	1.34	.629	.844		
Storm-petrels should be conserved for future generations	1.24	.715	.844		
Awareness of consequences	**1.44**	**1.508**		**.726**	
My personal actions can impact the ability of storm-petrels to thrive	.75	.849	.570		
I am aware of the impacts that humans can have on storm-petrels	.69	.854	.570		
Ascription of Responsibility	**1.73**	**2.251**		**.881**	
Individual citizens like me are responsible for the conservation of storm-petrels	.76	.801	.678		.908
I feel a strong personal obligation to protect storm-petrels	.54	.859	.822		.783
I feel an obligation to educate others about the importance of storm-petrels	.43	.844	.815		.790

All variables were coded on a 5-point scale from strongly disagree (-2) to strongly agree (+2).

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
PuffKnowledge_Scale Puff Knowledge summated	Equal variances assumed	.026	.873	-1.657	259	.099	-.13386	.08081	-.29298	.02526
	Equal variances not assumed			-1.653	254.011	.100	-.13386	.08097	-.29331	.02560

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.461[a]	2	.024
Likelihood Ratio	7.491	2	.024
Linear-by-Linear Association	1.660	1	.198
N of Valid Cases	276		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 14.08.

Symmetric Measures

		Value	Asymptotic Standardized Error[a]	Approximate T[b]	Approximate Significance
Nominal by Nominal	Phi	.164			.024
	Cramer's V	.164			.024
Interval by Interval	Pearson's R	.078	.060	1.290	.198[c]
Ordinal by Ordinal	Spearman Correlation	.098	.060	1.633	.104[c]
N of Valid Cases		276			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.108[a]	2	.017
Likelihood Ratio	8.151	2	.017
Linear-by-Linear Association	4.437	1	.035
N of Valid Cases	273		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 13.64.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	11.070[a]	2	.004
Likelihood Ratio	11.146	2	.004
Linear-by-Linear Association	8.552	1	.003
N of Valid Cases	275		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 11.21.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.152[a]	2	.046
Likelihood Ratio	6.340	2	.042
Linear-by-Linear Association	5.504	1	.019
N of Valid Cases	274		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 4.37.

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
SP_Attitudes SPAtt1, SPAtt2, SPAtt3	1.078	2	227	.342
SP_Emotions PuffAtt1, PuffAtt2, PuffAtt3	.029	2	206	.971

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
SP_Attitudes SPAtt1, SPAtt2, SPAtt3	Between Groups	53.530	2	26.765	.625	.536
	Within Groups	9726.053	227	42.846		
	Total	9779.583	229			
SP_Emotions PuffAtt1, PuffAtt2, PuffAtt3	Between Groups	.649	2	.324	.655	.520
	Within Groups	101.954	206	.495		
	Total	102.603	208			

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
SP_Attitudes SPAtt1, SPAtt2, SPAtt3	1.078	2	227	.342
SP_Emotions PuffAtt1, PuffAtt2, PuffAtt3	.029	2	206	.971
SPKnowledge_Scale SP Knowledge summated	2.170	2	238	.116
SP_EB Petrels Existence Beliefs	.039	2	238	.962
SP_AscriptionRes Petrels Ascription of Responsibility 1 2 3 (1/3)	1.863	2	238	.157
SP_AwarenessCons Petrels Ascription of Responsibility 1 2 (1/2)	1.735	2	239	.179

Puffins	$\bar{x}$	SD	t	df	Sig. (2-tailed)	Cohen's d
Existence Beliefs						
Unaware	1.62	0.52660	1.00	306	0.316	0.122
Aware	1.55	0.60301				
Knowledge						
Unaware	0.49	0.59353	-0.007	274	0.994	0.001
Aware	0.49	0.67685				
Ascription of Responsibility						
Unaware	0.80	0.78520	0.166	306	0.869	0.020
Aware	0.79	0.75047				
Awareness Consequences						
Unaware	0.95	0.81534	0.0446	303	0.964	0.005
Aware	0.94	0.75363				
Attitudes						
Unaware	0.96	0.82176	0.624	294	0.533	0.076
Aware	0.89	0.82152				
Emotions						
Unaware	1.11	0.78560	0.935	290	0.351	0.113
Aware	1.02	0.71310				
Mutualism						
Unaware	0.67	0.47360	0.297	303	0.767	0.036
Aware	0.65	0.47826				
Domination						
Unaware	0.37	0.48516	-2.94	225.8191	0.003	0.351
Aware	0.54	0.49940				

Storm-petrels	$\bar{x}$	SD	t	df	Sig. (2-tailed)	Cohen's d
Existence Beliefs						
Unaware	1.15	0.67290	-3.863	285	0.000	0.455
Aware	1.43	0.58696				
Knowledge						
Unaware	0.14	0.47646	-10.599	285	0.000	1.253
Aware	0.75	0.49191				
Ascription of Responsibility*						
Unaware	0.40	0.68902				
Aware	0.71	0.79860	-3.451	284.488	0.001	0.406
Awareness Consequences						
Unaware	0.57	0.69350	-3.086	286	0.002	0.365
Aware	0.84	0.79278				
Attitudes						
Unaware	0.51	0.75092	-1.094	274	0.275	0.135
Aware	1.30	8.23484				
Emotions						
Unaware	0.46	0.72585	-1.581	247	0.115	0.200
Aware	0.60	0.69586				
Mutualism						
Unaware	0.64	0.48193	-0.886	300	0.376	0.102
Aware	0.69	0.46527				
Domination						
Unaware	0.51	0.50153	0.817	300	0.415	0.094
Aware	0.46	0.50030				

Linear regressions results, puffins	**F**	**R^2**	**ß**
Mutualism → Knowledge	3.603	0.011	0.106
Domination → Knowledge	0.041	0.000	-0.011
Mutualism → Attitude	**16.229****	0.049	**0.220****
Domination → Attitudes	**5.076***	0.016	**-0.125***
Knowledge → Attitudes	**7.373***	0.026	**0.161***
Knowledge → Emotions	3.379	0.011	0.103
Knowledge→ Awareness of Consequences	**4.803***	0.015	**0.122***
Attitudes→Emotions	**218.930****	0.408	**0.639****
Attitudes → Ascription of Responsibility	**50.387****	0.137	**0.370 ****
Emotions → Ascription of Responsibility	**91.519****	0.223	**0.473****
Emotions → Awareness of Consequences	**74.556****	0.190	**0.436****
Awareness of Consequences→ Ascription of Responsibility	**288.240****	0.475	**0.690****

* P < 0.05; ** P < 0.001

Linear regressions results, storm-petrels	**F**	**R^2**	**ß**
Mutualism → Knowledge	0.417	0.001	0.036
Domination → Knowledge	0.570	0.002	-0.042
Mutualism → Attitude	1.619	0.005	0.071
Domination → Attitudes	1.779	0.006	-0.075
Knowledge → Attitudes	1.337	0.005	0.068
Knowledge → Emotions	1.119	0.004	0.059
Knowledge→ Awareness of Consequences	**21.215****	0.063	**0.250****
Attitudes→Emotions	1.283	0.004	0.063
Attitudes → Ascription of Responsibility	2.907	0.009	0.095
Emotions → Ascription of Responsibility	**113.495****	0.263	**0.513****
Emotions → Awareness of Consequences	**81.093****	0.203	**0.451****
Awareness of Consequences→ Ascription of Responsibility	**464.664****	0.594	**0.771****

* P < 0.05; ** P < 0.001