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How Messaging Shapes Attitudes toward Sea Otters as a Species at Risk

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ABSTRACT

To address the drivers of biodiversity loss, conservation efforts must attend to public attitudes toward endangered species. Using sea otters as a species at risk, we examined how messaging shapes people's attitudes toward this species. Participants viewed a message about sea otters that was either positive (sea otters as keystone species), negative (resource conflict with local fishermen), or neutral (biological facts). The impact of the message on people's attitudes was measured using Kellert's typology of basic attitudes toward wildlife. We found that the negative message promoted people's interests in the practical value of sea otters (utilitarian-consumption attitudes), their habitats (utilitarian-habitat attitudes), and control over sea otters (dominionistic attitudes), even though the negative message was perceived as less convincing and believable than positive or neutral messages. The positive message decreased utilitarian-consumption attitudes, and the neutral message decreased utilitarian-habitat attitudes. Our findings suggested that messaging can influence public attitudes toward wildlife.

KEYWORDS

Conservation psychology; endangered species; messaging; persuasive communication; sea otters

Introduction

The exploitation of resources is a major cause of biodiversity loss (Burney & Flannery, 2005). Current extinction rates driven by human activities are substantially outpacing rates in the fossil record (Barnosky et al., 2011; Dirzo et al., 2014). To mitigate biodiversity loss, conservation efforts include addressing human behavior (St John, Edwards-Jones, & Jones, 2010), and attitudes toward natural resources and endangered species (Clayton, Litchfield, & Geller, 2013). Attitudes—as learned predispositions to respond in a favorable or unfavorable manner with respect to a given object (Fishbein & Ajzen, 1975)—are important because they guide how people process information from the environment, and also have significant influences on human behavior. This suggests that attitudes can determine the way people navigate the environment in terms of how they see, hear, think, or act (Bohner & Dickel, 2011). Understanding which factors determine public attitudes toward biodiversity has important implications for conservation (Pelletier & Sharp, 2008).

The fate of endangered species partly depends on direct and indirect interactions with humans. Endangered species partially rely on people who co-exist with them within their home range, because people can protect, damage, harvest, or poach them (Browne-Nuñez,

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Jacobson, & Vaske, 2013; Browne-Nuñez, Treves, MacFarland, Voyles, & Turng, 2015). These species also depend on the support from broader audiences (i.e., the general public), who can have a profound impact on fundraising for conservation campaigns (Smith, Veríssimo, Isaac, & Jones, 2012), and on setting the conservation agenda by supporting or hindering conservation policies (Smith, Veríssimo, & MacMillan, 2010). Understanding public attitudes toward endangered species and the factors that shape such attitudes is essential for ensuring successful conservation (Manfredo, 2008a; Vaske & Donnelly, 1999).

As pointed out by Clayton et al. (2013), policies and campaigns that promote the conservation of endangered species are more effective if they are informed by psychological research. Psychologists have extensively studied people's attitudes toward social categories and events, and factors driving attitude change (see Bohner & Dickel, 2011). Less research on attitudes and attitude change has been conducted in the context of conservation (Clayton et al., 2013). Some research has addressed people's perceptions of species (Browne-Nuñez et al., 2013; Draheim, Rockwood, Guagnano, & Parsons, 2011; Teel & Manfredo, 2010; Woods, 2000), but overall psychological methods and social marketing campaign methods remain underutilized in conservation contexts (Veríssimo, 2013). There is tremendous potential for examining factors that determine people's attitudes toward endangered species to achieve broader conservation goals.

Study rationale

A prominent psychological method for shaping public attitudes is through persuasive communication, which encompasses message tailoring (i.e., designing messages with specific content for a specific target population, Dillard & Shen, 2012), and message framing (i.e., using positive or negative statements to convey a message, Nisbet, 2009) that together are often called messaging (Steckenreuter & Wolf, 2013). Messaging has been used to promote pro-environmental behavior through changing people's (i.e., a target audience) attitudes toward a specific proposition (Petty, Wegener, & Fabrigar, 1997), and can impact decision making and interpretations of information in various contexts (Sorensen, Clark, & Jordan, 2015). For example, messaging has been used to reduce resource consumption such as water (Goldstein, Cialdini, & Griskevicius, 2008), and energy (Abrahamse, Steg, Vlek, & Rothengatter, 2007), and to garner support for environmental issues such as climate change (Nisbet, 2009; Sorensen et al., 2015). Fewer studies, however, have used messaging to shape people's attitudes toward endangered species and their management (Clayton et al., 2013; Veríssimo, 2013). Past studies have experimentally tested the effects of different media commercials (Schroepfer, Rosati, Chartrand, & Hare, 2011) and images (Ross, Vreeman, & Lonsdorf, 2011) on public perceptions of chimpanzees (*Pan troglodytes*) and coyotes (*Canis latrans*) (Draheim et al., 2011), but experimental studies that use messaging to change public attitudes toward endangered species are still scarce. Here we recognize that in practice, messaging is widely used in conservation campaigns. For instance, conservation nongovernmental organizations (NGOs) often use flagship species to evoke people's affective responses toward wildlife for fundraising (Smith et al., 2012). Nonetheless, decisions regarding message contents ought to be informed by empirical testing and relevant psychological research (Clayton et al., 2013). This occurs because people are constantly exposed to messages that portray animals in different ways, including presenting information on different aspects of the species (e.g., behavioral traits, aesthetic appeal). To our knowledge, few studies have evaluated

the impact of different message contents on people's perceptions of endangered species. We designed the current study to test how different messages shape people's attitudes toward an endangered species, using sea otters (*Enhydra lutris*) as a case study.

Case study

We examined sea otters in British Columbia (BC) as a case study to understand attitudes of Vancouver residents toward endangered species and to experimentally test how messaging can change public attitudes toward this species. We chose sea otters because they are listed under Canada's Species at Risk Act (SARA) and the implementation of recovery strategies and management policies are largely dependent on public opinion, as the public can socially approve or disapprove actions and policies that affect them. To our knowledge, only one other study has evaluated public perceptions of otter species (Scott, 2015) and was conducted in parallel while we conducted this research. Given the conservation context of sea otters in Western Canada, it was appropriate to evaluate the perception of this species with people from this region. Sea otters are listed as an endangered species under the International Union for Conservation of Nature Red List (Doroff & Burdin, 2013), and as a species of Special Concern SARA (Fisheries and Oceans Canada, 2007). They once ranged from northern Japan to central Baja California, but during the 18th and 19th centuries intensive fur trade caused the extirpation of the species in more than half of their historical range, including BC populations (Estes & Duggins, 1995; Kenyon, 1969). Sea otters' declines induced a trophic cascade in kelp forest ecosystems that enabled a population explosion of sea urchins and a consequent loss in kelp biomass (Estes & Duggins, 1995; Steneck et al., 2002), leaving widespread "urchin barrens" (Filbee-Dexter, 2014).

In the 1970s, 89 sea otters from Amchitka and Prince William Sound, Alaska, were reintroduced in BC (i.e., to Checleset Bay on the West Coast of Vancouver Island) in an effort to re-establish sea otter populations (Bigg & MacAskie, 1978). By 2005 sea otters had repopulated 25–33% of their historic range in the province (Nichol, Watson, Ellis, & Ford, 2005). However, as sea otters recovered, the abundance of their prey (i.e., shellfish) declined, as also occurred in central California (Estes & VanBlaricom, 1985; Woodroffe, Thirgood, & Rabinowitz, 2005), generating a conflict with shellfish fisheries. Economic losses are estimated to be between $30–50 million (Canadian) per year once their populations are fully recovered (Fisheries and Oceans Canada, 2007). First Nations on the West Coast of Vancouver Island are concerned with the impact of sea otters on their local fishing and economies (Fisheries and Oceans Canada, 2007), and have stated that they would like to exercise their right to harvest sea otters for food, social, and ceremonial purposes (Fisheries and Oceans Canada, 2007).

The human–otter conflict has polarized public opinion among BC residents. Although the recovery of sea otter populations reflects successful biological conservation, the social and economic impacts have induced negative attitudes among local coastal communities, and sea otters have been found shot (Hume, 2014).

Methods

Experimental design

We conducted an experiment with a before-after-control-impact design, to see what effect messaging (negative, neutral, or positive) had on people's stated agreement with a suite of

value statements. To determine the sample size, we conducted a power analysis using G*Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007) based on a meta-analysis of effect sizes in persuasion research (Wilson & Sherrell, 1993). Our power analysis was calculated with the following parameters: average effect size $F = .3$; *alpha* = .05, *power* = .95, three between-subjects groups, two within-subjects groups, and a correlation between pre and post measures of .8. According to the power analysis, we needed a minimum of 159 subjects in total to detect differences across conditions. Based on this minimum number, we doubled our sample size to 324, to ensure sufficient statistical power.

The 623 participants (graduate and undergraduate students) in total were recruited on the University of British Columbia campus ($M_{age} = 20.67$, $SD = 4.60$, 473 female, 148 male, 2 other) and were randomly assigned to two groups: in Group 1 participants ($n = 324$) received a survey assessing their attitudes toward sea otters, then viewed one of three different messages, and took the survey a second time. Qualtrics was used for survey design and data collection, and a unique subject ID was given for every respondent, allowing us to pair the pre and post responses for every participant. In Group 2 participants ($n = 299$) viewed the messages first and then filled out the survey (i.e., they only completed the survey once, after seeing the message). Since every participant in Group 1 completed the same survey twice, any change in the post-message responses could be driven by the fact that the participant completed the same survey a second time. Thus, Group 2 served as a control group, who were first randomly assigned to view either positive ($n = 97$), negative ($n = 95$), or neutral ($n = 107$) messages, and then completed the survey only once after seeing the message.

The survey was a questionnaire with 40 value statements adapted from Kellert's previous research questionnaires (Kellert, 1985) (Table 1), which align with Kellert's (1985) typology of basic attitudes toward animals and the natural environment. The 40 statements were grouped in 10 categories, each measuring one basic attitude toward sea otters (Table 2). Participants rated their agreement with the 40 statements based on a scale ranging from −5 (Strongly disagree) to 5 (Strongly agree).

Participants in Group 1 were then randomly assigned to view one of the three messages: positive ($n = 107$), negative ($n = 106$), or neutral ($n = 111$) (Table 3). The positive message described the ecological importance of sea otters in maintaining the balance within kelp forest ecosystems. The negative message described the resource conflict between sea otters and local fishermen. The neutral message presented physiological facts about sea otters. These messages were selected because they represent the current conflicting arguments of conservationists (i.e., kelp forests restoration) and fisheries (i.e., economic losses due to resource competition) in Vancouver Island. After viewing the message, participants rated how convincing (i.e., How convincing do you think this message is?) and believable the message was (i.e., How much do you believe in the information presented?) via using a scale ranging from −5 (Not at all) to 5 (A lot). Afterward, participants completed the same questionnaire. We were primarily interested in the difference between the pre-message and the post-message responses. We hypothesized that different message contents would generate attitude changes on different dimensions of attitudes. Specifically, the positive message was expected to increase people's ecologistic attitudes toward sea otters, because the positive message presented information about the ecological roles of sea otters and how kelp forest ecosystems benefit from their presence. The negative message was expected to increase people's utilitarian-consumption

Table 1. Statements presented in the questionnaire. All the statements were coded to one of Kellert's basic attitudes toward wildlife, and were presented in random order.

Attitude	Statement
Aesthetic	Sea otters symbolize to me the beauty and wonder of nature
	Sea otter sightings are special because they remind us to keep a posture of humility toward the natural world
	When I see a sea otter I feel amused and fascinated
	The slaughter of sea otters should be immediately stopped even if it means some people will be out of work
Dominionistic	Management plans for sea otters should enable active human use of this species
	People occasionally have to hunt sea otters or they will lose their fear of people and increasingly become a problem
	I believe people have the right to exert mastery and control over the marine mammals of the world
	We should reduce the populations of sea otters if they become so abundant and cause damage to the fisheries
Ecologistic	It is important to maintain healthy sea otter populations to contribute to healthy ecosystems
	Protecting an endangered species, such as sea otters, requires the protection of the other species that interact with them and their habitat
	The presence of sea otters in a determined spot is a sign of a healthy environment
	Strictly limit the human catch of clams and crabs in order to prevent harm to sea otter populations
Humanistic	I enjoy watching sea otters in aquaria
	I think sea otter stuffed animals are great for kids
	I think adopting a sea otter is a great idea to protect them and their habitat
	Set up a rehabilitation centre for wounded or orphaned sea otters
Moralistic	Sea otters should have clean waters to live in
	The rights of people and the rights of sea otters are equally important
	The conservation of endangered animals should be ensured by law
	Do nothing. Sea otters have a right to live in the same place as fishermen
Naturalistic	I have great affection for sea otters
	Going on a camping trip or boat trip is more exciting if I see sea otters
	The government should provide urban residents with convenient ways to enjoy wildlife
	Though fishing in places where sea otters exist poses a risk, people could learn to accept the risk and co-exist with these animals
Negativistic	I would feel scared or angry to see a real sea otter in the wild
	I cannot imagine how some people can say they love sea otters
	It is foolish to impose large fines for the killing or harming of endangered or threatened species
	Capture and relocate sea otters, even if this is a very expensive control method
Scientistic	It is acceptable for humans to cause the loss of some individual animals of sea otters as long as their populations are not jeopardized
	I have little interest in learning about the ecology or population dynamics of whales or sea otters
	It is important to maintain sea otter in order to maintain the ecosystem functioning
	Maintain sea otter populations at levels sufficient to play their natural ecological role as predators
Utilitarian-consumption	Sea otters have to be controlled when they cause major economic losses to commercial fishermen
	There is nothing wrong with harvesting sea otters as long as it is properly regulated
	Sea otters reduce fishing opportunities and hurt the economy
	Compensate fishermen for their losses to sea otters
Utilitarian-habitat	It is important to maintain healthy sea otter populations in order to maximize economic benefits from fisheries
	Sea otter watchers should help pay for the cost of marine wildlife conservation just as hunters contribute through license fees and taxes on hunting equipment
	Given the economic problems facing our world, it makes little sense to spend money on programs helping people observe and learn from wildlife
	Manage sea otters for maximum economic benefit

attitude, because the negative message presented information about the human costs of sea otters from the human–otter conflict. The neutral message was not expected to impact the attitudes because it presented neutral physiological facts of sea otters. We further hypothesized that the perceived credibility of the message was positively correlated with attitude change (Petty et al., 1997). That is, we expected that people who believed in the message content were likely to change their attitudes after reading the messages.

Table 2. Kellert's typology of basic attitudes toward animals and the natural environment to describe fundamental values and meanings attributed to species and environments.

Attitude	Meaning
Aesthetic	Primary interest in the artistic and symbolic characteristics of animals.
Dominionistic	Primary satisfactions derived from the mastery and control over animals.
Ecologistic	Primary concern for the environment as a system, for interrelationships between species and natural habitats.
Humanistic	Primary interest and strong affection for individual animals, mostly pets and species with strong anthropomorphic associations.
Moralistic	Primary concern for animal rights, with strong opposition to exploitation of and cruelty toward animals.
Naturalistic	Primary interest and affection for wildlife and the outdoors.
Negativistic	Primary orientation and avoidance of animals for dislike, indifference, or fear.
Scientistic	Primary interest in the physical attributes and biological functioning of animals.
Utilitarian-habitat	Primary interest in the practical human value of land associated with wildlife.
Utilitarian-consumption	Primary interest in the practical value of animals.

Source: modified from (Kellert, 1985)

Table 3. Messages presented to participants.

Type	Message content
Positive (n = 107)	One contribution of sea otters to ecosystems is that they maintain kelp forests. Kelps are large brown algae that live in shallow water close to shore. Kelps can grow densely in "kelp forests," which are one of the most productive and dynamic ecosystems on Earth. Sea otters eat sea urchins, which are capable of preventing the growth of kelp forests by eating kelp "holdfasts" (roots). A 34 kg male sea otter has a daily energy requirement of 4600 kcal, the equivalent of more than 100 urchins per day. This predation on urchins enables kelp forest expansion. In the North Pacific, kelp forests are much larger and deeper in the presence of sea otters. Many animals eat kelp or kelp particles, or use kelp forests as protective habitat or feeding grounds. Accordingly, sea otters indirectly benefit many species (likely including salmon and halibut) by enhancing kelp forest growth.
Negative (n = 106)	Sea otters feed on invertebrates such as crabs, clams and sea urchins. A 34 kg male sea otter has a daily energy requirement of 4600 kcal, the equivalent of more than 100 urchins per day. In general, sea otters eat so much that they can seriously impact shellfish aquaculture and wild populations. The 14 tribes of the Nuu-chah-nulth First Nations on the West Coast of Vancouver Island in Canada rely on shellfish harvesting for their economy and for subsistence. Since the sea otter population has exploded in their territory, they have been less able to harvest shellfish, because now the otters are eating the resources that they used to fish. Therefore, sea otters compete with fishermen for food in some places.
Neutral (n = 111)	Unlike other mammals, sea otters do not have a layer of fat to keep them warm, but they have the densest fur of all mammals (approximately 100,000 hairs per square centimeter). Sea otters must consume the equivalent of 23% to 33% of their body weight each day to maintain their internal heat production. The metabolic rate of a sea otter is 2.4 to 3.2 times higher than that of terrestrial mammals of a similar size. Sea otters' diet consists mainly of invertebrates such as crabs, clams and sea urchins. Researchers have found that sea otters use rocks to open shellfish. They are one of the few mammals that use tools.

We chose Kellert's typology of basic attitudes toward wildlife because it is a well-known scale that has been used in various studies (Drews, 2003; Prokop & Kubiatko, 2008; Thompson & Mintzes, 2010). While we recognize that Kellert's typology has been criticized for its lack of conceptual clarity and for its construct validity (Manfredo, 2008a), this typology was useful in the current study because it allowed us to quantify attitude change as a result of messaging by measuring the difference in pre-message and post-message responses. Our main goal was to evaluate the effect the messages had on people's attitudes toward sea otters, rather than to evaluate the robustness of Kellert's typology. While other

researchers have developed scales for measuring people's attitudes toward nature (Dunlap, 2015; Nisbet, Zelenski, & Murphy, 2009), Kellert's typology is nonetheless the most suitable scale for the purposes of our study because it can be adapted to individual species (in our case sea otters). Other prominent scales test people's attitudes and connectedness with nature more broadly, which makes them difficult to adapt for studying attitudes toward individual species.

In addition, student sampling in experiments is a widely accepted practice in psychology (Schroepfer et al., 2011). We acknowledge that using a student sample has limitations because it may not fully reflect the wider population. This limitation is not critical to our study, however, because whereas a different sample may differ on baseline (pre-message) attitudes (Henrich, Heine, & Norenzayan, 2010), we were primarily interested in studying the attitudinal change caused by the messages, independent from the baseline attitudes. As young educated adults of voting age, undergraduate students are likely to influence future conservation policy, such that understanding how messaging changes their attitudes toward endangered species is important.

Data analysis

We first examined whether any change in the post-message responses was driven by the fact that participants completed the same questionnaire twice, by comparing the post-message responses between the two groups of participants. There was no reliable difference between their post-message responses ($F(1,6218) = 2.55$, $p = .11$, $\eta_p^2 < .001$) between the two groups, suggesting that completing the questionnaire for a second time had little impact on people's responses among participants in Group 1. Therefore for all subsequent analyses we only used the data from Group 1 ($n = 324$) because for them we had recorded baseline attitudes, allowing us to evaluate attitude change caused by the different messages.

To examine how participants perceived sea otters, we averaged the responses for each attitude and plotted the average across participants for each attitude (Figure 1). A one-way analysis of variance (ANOVA) and *t*-tests were conducted to see if certain attitudes were more prominent than others. We then applied Bonferroni corrections to all significant *p* values ($p < .05$) to minimize type I errors. To examine how messages influenced people's attitudes toward sea otters, we conducted a two-way mixed-design ANOVA (message: positive, negative, neutral, between-subjects factor, × time: pre, post message, within-subjects factor) for each attitude. This analysis allowed us to compare people's attitudes before and after they viewed each message and across the three messaging conditions.

Results

The average scores of the 10 attitudes toward sea otters are presented in Figure 1. Overall, there was a significant difference in mean values of the 10 attitudes ($F(9,6470) = 820.80$, $p < .001$, $\eta_p^2 = .53$), which allowed us to reject the null hypothesis that the 10 attitudes had the same mean value. Specifically, participants scored the highest on moralistic ($M = 2.57$, $SD = 1\ .41$) and ecologistic ($M = 2.25$, $SD = 1.21$) attitudes, and they were not reliably different from each other (Tukey's HSD $p = .56$). Out of all possible pairwise comparisons between mean attitude values (i.e., all comparisons between A and J in Figure 1) most attitudes were significantly different from each other (Tukey HSD $p < .05$), with the

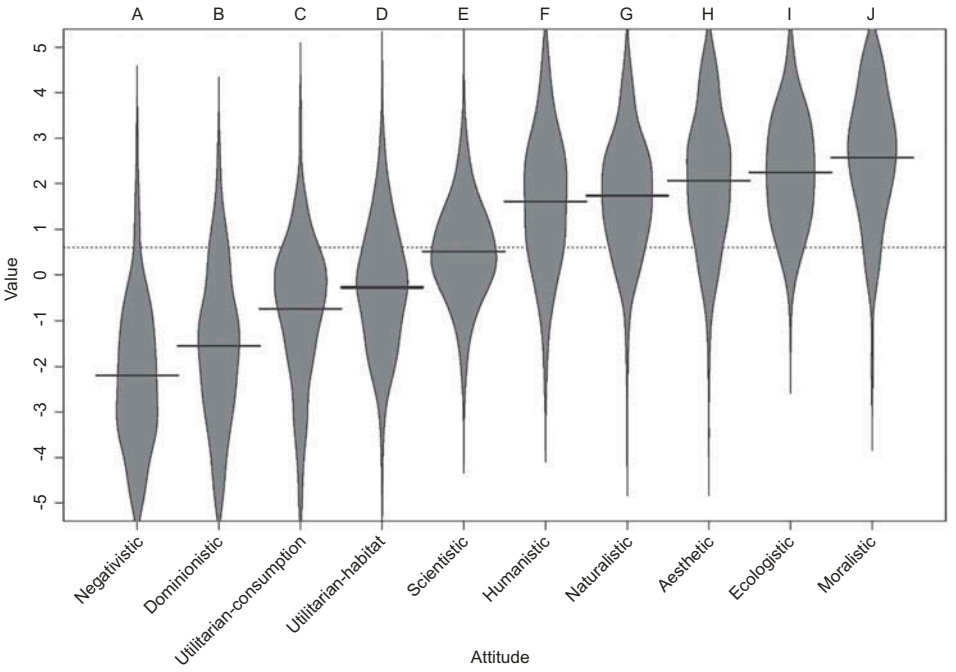

Figure 1. Beanplot showing the distributions of participants' attitudes toward sea otters before seeing the messages (n = 324), using scales from −5 (strongly disagree) to 5 (strongly agree). Moralistic and ecologistic attitudes are the most salient. The black line in each bean plot shows the mean value for each attitude. The dotted line indicates the overall mean of attitude values.

exception of four comparisons that were not significant (Tukey's HSD for I vs. J $p = .56$; I vs. H $p = .84$; G vs. H $p = .09$; G vs. F $p = .98$).

The two-way ANOVA (message × time) revealed significant interactions for utilitarian-habitat ($F(2,321) = 8.86$, $p_{adj} = .002$, $\eta_p^2 = .97$), utilitarian-consumption ($F(2,321) = 28.93$, $p_{adj} < .001$, $\eta_p^2 = .89$), and dominionistic attitudes ($F(2,321) = 6.86$, $p_{adj} = .01$, $\eta_p^2 = .71$) (Figure 2). Specifically, the scores for utilitarian-consumption attitudes decreased among those participants who viewed the positive message (Table 4): people who viewed the positive message were less likely to agree with the active management of otters (e.g., culling) for human gain. The positive message, which focused on the ecological benefit of sea otters, represented the interrelationships between species and their natural habitats. However, since the ecologistic attitude was the second highest scored attitude (many respondents scored high, prohibiting a further increase due to a ceiling effect), we examined the data from the lowest quartile of ecologistic attitudes ($n = 30$) to analyze the impact of the positive message on ecologistic values. As hypothesized, we found that after viewing the positive message, people were more likely to agree with ecologistic statements ($t(29) = 2.87$, $p = .007$, $d = .52$). We also found that the utilitarian-habitat attitude decreased for participants who viewed the neutral message (Table 4): when presented with physiological facts about sea otters, people agreed less with statements prioritizing the management of sea otters and their habitats primarily for human gain. The utilitarian-habitat, utilitarian-consumption, and dominionistic attitude scores increased

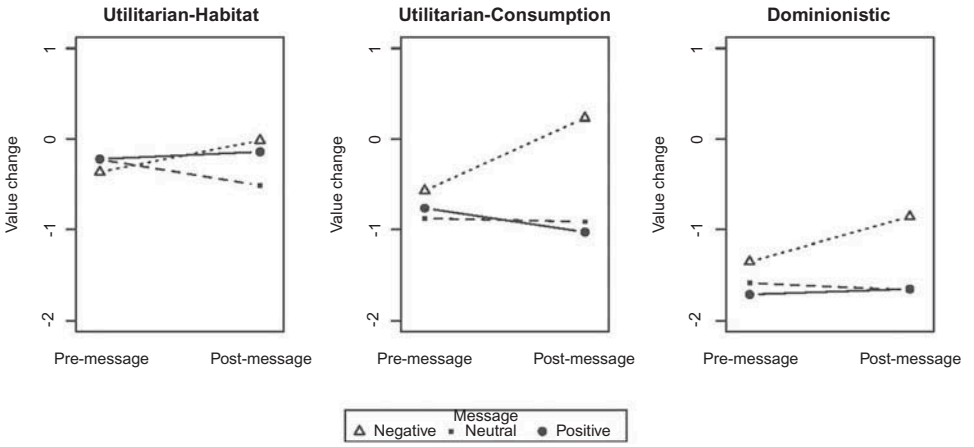

Figure 2. Attitude change by message and time. Pre-message presents the baseline attitude values (before message), and Post-message presents the attitude values after seeing the message. The negative message increased the utilitarian-habitat attitude (p = 0.02), while the neutral message decreased the utilitarian-habitat attitude (p = 0.01). The negative message increased the utilitarian-consumption attitude (p < 0.001), while the positive message decreased the utilitarian-consumption attitude (p < 0.05). The negative message increased the dominionistic attitude (p < 0.001).

Table 4. Measuring attitude change between pre-message and post-message responses.

Attitude	Message	*t*-tests (*p* values corrected for multiple comparisons using Bonferroni methods)	Attitude change results
Utilitarian-habitat	Negative	$t(105) = 2.95$, $p = .02$, $d = .29$	Significant decrease in mean attitude value
	Neutral	$t(110) = 2.89$, $p = .01$, $d = .27$	Significant decrease in mean attitude value
	Positive	$t(106) = .76$, $p = 1$, $d = .07$	Nonsignificant attitude change
Utilitarian-consumption	Negative	$t(105) = 8.51$, $p < .001$, $d = .83$	Significant decrease in mean attitude value
	Neutral	$t(110) = .35$, $p = 1$, $d = .03$	Nonsignificant attitude change
	Positive	$t(106) = 2.45$, $p < .05$, $d = .24$	Significant increase in mean attitude value
Dominionistic	Negative	$t(105) = 3.90$, $p < .001$, $d = .38$	Significant decrease in mean attitude value
	Neutral	$t(110) = .66$, $p = 1$, $d = .06$	Nonsignificant attitude change
	Positive	$t(106) = .65$, $p = 1$, $d = .06$	Nonsignificant attitude change

for the people who viewed the negative message (Table 4). People who viewed the negative message portraying the human–otter conflict were more likely to agree with the active management of otters and their habits for human gain, and with satisfactions derived from the mastery and control over sea otters.

Results also showed significant differences in the mean scores given for convincingness and believability of the three messages ($F(2,321) = 13.11$, $p < .001$, $\eta_p^2 = .08$). Particularly, the mean score value given for the convincingness of the negative message ($M = 1.39$, $SD = 2.13$) was lower than the mean score value for the positive ($M = 2.46$, $SD = 1.50$; $t(211) = 4.21$, $p < .001$, $d = .57$) and neutral messages ($M = 2.52$, $SD = 1.75$; $t(215) = 4.27$, $p < .001$, $d = .58$). The mean score value for the believability of the negative message ($M = 1.02$, $SD = 2.09$) was also rated as lower ($F(2,321) = 19.17$, $p < .001$, $\eta_p^2 = .11$) than the believability of the positive ($M = 2.34$, $SD = 1.66$; $t(211) = 5.07$, $p < .001$, $d = .69$), and the neutral message ($M = 2.54$, $SD = 2.05$; $t(215) = 5.38$, $p < .001$, $d = .73$). We tested the correlation between convincingness and believability to see if the

two measures examined the same construct: the perceived validity of the message. We found a positive correlation between the two for all groups (negative message: $r(104) = .72$, $p < .001$; positive: $r(105) = .66$, $p < .001$; and neutral: $r(109) = .64$, $p < .001$); which indicated that convincingness and believability measured the perceived validity of the message. There was a positive correlation between the magnitude in change for the utilitarian-consumption attitude and how convincing ($r(104) = .28$, $p = .004$), and believable ($r(104) = .20$, $p = .04$) the negative message was perceived, but not for the change in utilitarian-habitat or dominionistic attitudes.

Discussion

Evaluating and understanding public attitudes toward endangered species and how their attitudes might be changed is important for preventing species loss. It is now widely recognized that conservation is not only about the biology of endangered species, but also about people and people's attitudes and behaviors that affect the endangered species (Manfredo, 2008b; Saunders, 2003; Smith et al., 2010). The current study shows that many Vancouver university students have positive attitudes toward sea otters. Specifically, they hold moralistic and ecologistic views about sea otters, showing that they care about sea otters' rights and sea otters' interactions with other species in their habitats. Previous research has shown that Canadians regularly participate in nature-related activities and have a unifying love of nature (Boyd, 2003). Our findings are consistent with past work that elucidates such biospheric values among Canadians (e.g., Deng, Walker, & Swinnerton, 2006; Franzen, 2003). Moreover, given that the majority of our participants was female, our findings are also consistent with work showing that women on average show high levels of positive behaviors and attitudes toward animals (Herzog, 2007). We recognize that the baseline attitudes exhibited by our sample could have been affected by gender differences, but our primary focus was on attitude changes.

Using a messaging experiment, we showed that the negative message had the strongest impact because it caused significant changes in three attitudes, even though the negative message was perceived as the least convincing and believable (see Figure 2 and Table 4). We also found that the positive message reduced people's utilitarian-consumption attitudes, and that the neutral message reduced utilitarian-habitat attitudes. This strongest effect of the negative message may be largely due to the overall strong positive preexisting views of respondents toward sea otters; in this context, it might be surprising that the positive and neutral messages had any significant effects. A puzzling finding was the positive correlation between the credibility of the negative message and the attitude change for only the utilitarian-consumption attitude, but not for the other attitudes in which attitude change was significant (i.e., utilitarian-habitat and dominionistic attitudes). This effect may be due to the fact that the negative message presented threats that sea otters pose to humans in terms of economic losses. Similar loss-framed messages have been shown to be more persuasive in affecting attitude change than gain-framed messages in cases where threats are amplified (Rothman, Salovey, Antone, Keough, & Martin, 1993; Tversky & Kahneman, 1991). Additionally, negative messages about sea otters may be less frequent in the media than positive/neutral messages; so the negative message may have appeared most surprising to participants, generating the strongest attitude change.

The current study examined whether messaging has the potential for changing public attitudes toward sea otters. The increasing body of research seeking the integration of

psychology and conservation (Clayton et al., 2013), as well as the integration of social marketing techniques and conservation (Smith et al., 2010, 2012) has suggested the importance of framing and messaging in conservation and has raised awareness among conservationists to pay attention to message contents and framings. However, few studies have provided empirical evidence for how messages are perceived and whether they induce attitude change. Our findings provide empirical evidence to support that messaging is an effective method for causing attitude change associated with the conservation of endangered species (Goldstein et al., 2008; Saunders, 2003; Schroepfer et al., 2011; St John et al., 2010). Conservation generally addresses ecological questions (e.g., identifying threatened species) but little attention has been given to public attitudes toward species that contribute to overall conservation goals. This study provides empirical evidence showing how messaging can influence public attitudes toward endangered species, and enhance utilitarian views toward wildlife. Practically, our findings suggest that messages presenting information about endangered species could be used to persuade people to think differently about species. Messaging is a useful tool that informs conservation campaigns and stirs conversations about conservation policies. However, as with many other social influence practices, the opposite effects are also possible: negative attitudes toward wildlife may also be enhanced, depending on message contents. With this study we found that negative messages about wildlife can be effective at increasing the support for management that enhances human benefit to the detriment of wildlife, including through culling a highly charismatic species. Interestingly, our study findings suggest that such messages can have force, affecting support for intrusive management, *even if the message is not generally deemed credible*. We recognize that communication campaign directors may be aware of this and that in practice they might already account for this when designing campaigns, but our research provides evidence and shows that this happens in a conservation context. In addition, our results contradict the credibility hypothesis, indicating that attitude change is possible even when participants report low message credibility.

Considering the initial attitudes of target audiences is important for the design of conservation messages. Identifying the salient attitudes toward endangered species and their management allows campaigns to focus on the most important concerns of a targeted audience, and to garner support for specific actions by understanding the purposes of the persuasion. Our study suggests that when the baseline for a particular attitude is high in a given target audience, a message that aims to change that attitude is likely to have little positive effect. Measuring the baseline attitudes before designing campaigns is important. We acknowledge the work conducted by several organizations including the "Pride Campaigns" led by Rare who have taken into account such attitude baselines (e.g., Martinez, Green, & DeWan, 2013). We recognize that people who are directly affected by the sea otters (e.g., First Nations' fishermen in BC) might have different baseline attitudes toward sea otters compared to our study population, thus one limitation of our study is that these results might not be replicated with such people. However, our results suggest that messaging can shape public attitudes toward endangered species among Vancouver students. Since provincial legislation and local conservation campaigns rely largely on public opinions, our results can inform sea otter management in the BC context. Future research could examine species that have negative connotations in order to test the effectiveness of positive or negative messaging on changing people's attitudes toward these species. Finally, more studies are needed to examine species that

have broader geographic ranges and involve diverse demographic groups that are vastly different in terms of socioeconomic and cultural factors (e.g., tiger *Panthera tigris* and its distribution in Southeast and Eastern Asia). We recognize some NGOs are doing this on the ground, but we think that the results are not being shared. We think that more studies that provide empirical evidence on the sociocultural differences attributed to the human dimensions of wildlife are needed in the conservation literature.

It is important to note that negative messages can occur unintentionally. For example, the negative message in this study was not the kind of colorful angry statement that one might hear in coastal communities on Vancouver Island, where sea otters are routinely called "fleabags" and "rats of the ocean." Rather, it was a statement about the diet of sea otters, accounting for the conflict with fishermen over shellfish resources, which may be the message for an anti-poaching campaign. Sending this message runs the risk of enhancing wildlife management attitudes among lay people. Thus, message contents need to be chosen carefully in order to avoid unintended outcomes. Many practitioners likely recognize this broad risk already, but we hope that our study provides a concrete example and evidence of how particular unintended messages can shape attitudes. In conclusion, our study provides empirical evidence to show that messages presenting ecological benefits of endangered species, human–wildlife conflicts, and physiological facts of endangered species can change short-term attitudes.

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