Increased knowledge about sharks increases public concern about their conservation

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Abstract

Gaining support for shark conservation has been extremely difficult due to the negative preconceived notions the general public holds toward sharks. In order to achieve public support for conservation initiatives the factors that will change an individual's attitude and behavior toward sharks must first be determined. Using structured questionnaire interviews (n = 186), indices were created that rated an individual's knowledge, attitude, and potential behavior toward sharks and shark conservation. Generally public knowledge levels about sharks were low. However, people with more knowledge pertaining specifically about sharks had potential behaviors more supportive of their conservation. Therefore, it would seem that increases in public knowledge on sharks would help gain support for shark conservation. Males, members of environmental groups, and viewers of shark documentaries and "Shark Week" all showed significantly higher levels of knowledge about sharks. The media (such as "Shark Week") can play a significant role in promoting conservation, but unfortunately media coverage of sharks has been controversial recently with the airing of several non-factual, fake documentaries. To promote shark conservation the media's message has to be unbiased, non-sensationalized, and accurate to ensure people are receiving the information necessary to build strong pro-shark conservation behaviors.

Keywords: Behavior, Conservation, Knowledge, Sharks, Shark Week, Survey

1. Introduction

Shark populations worldwide are declining and nearly one quarter of shark species are considered vulnerable, endangered, or critically endangered by the IUCN [1]. These declines have led to increasing concern over the future status of shark populations worldwide. The survival of these species depends on new science-based legislation establishing more realistic catch quotas and protection for species of concern.

However, many members of the public hold negative preconceived notions about sharks, viewing them as vicious predators, man-eaters or “mindless eating machines” [2,3,4]. These attitudes toward sharks have been identified as one of the greatest impediments to shark conservation efforts [5,6]. The media has played a key role in creating these opinions, and further exacerbates their negative stereotype by providing inaccurate information and melodramatic depictions leading to possible misunderstandings about sharks [2,3,4,7]. Recently it was proposed to discontinue the use of the term “shark attack” in the media and elsewhere, to language that better reflects the different outcomes associated with interactions between sharks and humans [8]. The term “shark attack”, encompasses a myriad of different shark encounters, including those with no physical contact between human and shark occurring [8]. The change in terminology for shark encounters will hopefully reveal the true risk sharks pose to humans in order to alter negative attitudes toward them [2,4,8].

Creating positive attitudes toward sharks and their conservation is critical because attitudes have the ability to guide, influence, direct, shape, or predict an individual's potential behavior toward a species and its conservation [2,7,9]. People demonstrating more positive

attitudes toward a specific animal are less likely to take part in disruptive or harmful behavior toward that animal [7].

Many different variables can affect a person's attitude toward the natural environment or sharks, including age, gender, income, and ethnicity [2,10]. However, the knowledge an individual has about a specific species or environmental issue can strongly influence their attitudes toward it [2]. Increased knowledge about a species or environmental issue has been shown to result in more naturalistic¹, ecologicistic², humanistic³, and moralistic⁴ attitudes, as well as greater interest and awareness in these subjects [2,11]. Positive changes in the public's attitude toward an environmental issue can also lead to major shifts in policy pertaining to it [12].

Due to the combination of negative attitudes toward sharks and the critical need for improved shark conservation efforts, it is imperative to change the public perception of sharks. Therefore, it is important to determine the specific variables (i.e. age, gender, etc.) that shape an individual's attitudes and potential behaviors toward sharks and their conservation if current and future conservation efforts are to be successful [12]. In order to accomplish this task a social survey was used to gauge respondent's knowledge specifically about sharks, attitudes toward sharks, and potential behaviors toward sharks and their conservation (i.e. willingness to donate money, give support for shark conservation legislation). The objective was to address the relative roles that attitudes, knowledge, and varying demographic variables play on potential behaviors

¹ Interest in direct experience with animals and the exploration of nature [2].

² Concern for the environment as a system; for inter-relationships between wildlife species and natural habitats [2].

³ Interest and strong affection for animals, with strong emotional attachment and "love" for them [2].

⁴ Concern for the right and wrong treatment of animals, with strong opposition to exploitation or cruelty toward animals [2].

toward sharks and their conservation. To improve shark conservation and understanding, it is critical to recognize the factors influencing potential public behaviors toward them.

2. Methods

A structured questionnaire was used to obtain general demographic information, knowledge about sharks, attitudes toward sharks, and potential behaviors toward sharks and their conservation from interviewed members of the general public. The survey instrument was distributed in the northern Virginia, Washington DC Metro area from November 2007 to April 2008 at automotive dealerships (n=3) service waiting rooms (a location with a broad cross-section of the public, who are often waiting for considerable periods of time). The survey response rate was high (87.7%; n=186 completed surveys) - there were no incentives for taking the survey; it was completely voluntary. The statistical program StataIC 10 was used for all statistical analyses.

Survey questions were separated *a priori* into four categories: knowledge about sharks, attitudes towards sharks and their conservation, behavior toward sharks and their conservation, and demographics. Demographic questions were treated as individual variables to analyze their impacts on potential behaviors, as well as attitudes and knowledge. For knowledge about sharks, attitudes toward sharks, and potential behaviors towards shark and shark conservation, indices were created using the respective questions from the survey instrument.

The knowledge index (Chronbach's $\alpha^5 = 0.573$) consisted of 23 binary coded questions. Participants on many of the knowledge questions within the survey were also given the option of answering, "I don't know", which was scored the same as an incorrect answer. To

⁵ How well a set of items or variables measures a single uni-dimensional latent construct.

create the knowledge index the responses on these questions were added together to give a total score out of 25 (the index is measured out of 25 because one of the questions used on the index asks which three sharks pose the greatest threat to humans and the participant in the survey received one point for each correct answer). Participant's knowledge about sharks (knowledge index score) was based on the score they received with a higher score indicating more shark knowledge. No respondents scored higher than 15 out of 25.

The attitudinal index was based on five questions, used to judge a participant's attitudes towards sharks and their conservation. The shark attitudinal index proved to be internally unreliable (Chronbach's $\alpha = 0.238$) and therefore was not used in the analyses.

The potential behavior index was derived (Chronbach's $\alpha = 0.814$) from nine questions designed to measure a participant's general behavior towards sharks. These included questions on a respondent's potential willingness to support shark conservation legislation or the donation of money to shark conservation. The sums of the responses to these questions were used to create an index with a scale from zero to nine with higher scores representing the likelihood of more pro-shark behavior (i.e. individuals more willing to support shark conservation).

Due to the attitudinal index proving to be unreliable, it was not possible to test how knowledge about sharks or other demographic factors impact attitudes, as well as, how attitudes toward sharks may then impact potential behaviors toward them. We instead tested if a person's knowledge about sharks could directly impact their potential behavior toward sharks and shark

conservation using a standard multivariate regression analysis. This approach was also used to determine how several different demographic variables (age, gender, education, where they receive information regarding sharks, membership in an environmental group, and whether or not they had viewed the annual week-long US television program “Shark Week” that features shark-based programming) impacted a person’s knowledge about sharks. We also used a one-way analysis of variance (ANOVA) with a Scheffe post-hoc comparison to test how different sources of information about shark (i.e. scientific journals, documentaries, television news) impacted a person’s knowledge about sharks and their concern for shark conservation. An ANOVA was also used to test if a respondent’s belief in the urgency of shark conservation differed between whether they had previously viewed ‘Shark Week’.

3. Results

The surveyed respondents were comprised of 52% males and 48% females with a mean age of 37 years. Nearly half of all respondents indicated they had a college degree (48.57%), while 24%, 20.57%, and 6.86% had high school degrees, masters, or PhD's respectively. A majority of respondents had previously viewed “Shark Week” (58.52%), with males representing 62% of these viewers. Overall, 70% of surveyed males had previously viewed “Shark Week” compared to only 46% of females. The majority of respondents claimed to receive their information about sharks from documentaries (59.76%), while 19.53% obtained it from television news, 6.51% from newspapers, 5.33% from magazines, and only 2.96% from scientific journals. Membership in an environmental group represented 6.18% of respondents.

A respondent's knowledge about sharks significantly predicted their potential behavior toward sharks and their conservation ($F(1,182)= 9.81, p= 0.002, R^2= 0.051$). Higher levels of knowledge about sharks predicted more positive potential behaviors toward shark conservation. However, overall knowledge levels about sharks were low among respondents [Fig. 1].

Figure 1 would go here.

The level of knowledge respondent's had about sharks could significantly be predicted when using the joint predictive power of the variables age, gender, education, where they receive information regarding sharks, whether or not they had viewed the US television program marathon "Shark Week", and membership in an environmental group [Table 1].

Table 1 would go here.

When examining how individual variables impacted shark knowledge, gender significantly predicted a respondent's level of knowledge about sharks, with males demonstrating a higher level of shark knowledge than females. Similarly, members of environmental groups and viewers of "Shark Week" [Fig. 2] both displayed significantly higher levels of knowledge about sharks. Respondents who had previously viewed "Shark Week" were also more likely to

believe shark conservation was either urgent or very urgent (31.2%) than non-viewers (19.6%) ($F(1, 147) = 4.01, p = 0.05$).

Figure 2 would go here.

However, neither age nor education level significantly predicted a respondent's knowledge about sharks. Where respondents received information regarding sharks significantly impacted their levels of knowledge about sharks ($F(5, 163) = 3.62, p = 0.004$) [Fig. 3].

Figure 3 would go here.

However, knowledge about sharks differed significantly only between people receiving shark information from documentaries versus those getting it from movies or other people.

4. Discussion

People with more knowledge about sharks were shown to potentially be more supportive toward sharks and their conservation. Barney [7] found similar results relating to dolphin conservation; where individuals with higher levels of knowledge about dolphins were the less likely to participate in harassing behavior. From this study it appears that knowledge about sharks may be able to directly impact potential behaviors toward their conservation. This means that someone does not necessarily have to have a good perception of sharks to potentially support their conservation. Rather knowledge of sharks and their importance to the marine ecosystem may be enough to garner support for their protection. Therefore, understanding the

variables that affect a person's knowledge about sharks may provide conservationist with insight into what groups to focus on for education programs and on how to further educate the public to possibly receive increased support for conservation measures.

Gender was the strongest predictor of shark knowledge, with men having significantly more knowledge about sharks. This finding is in contradiction with a previous study [2], in which gender was not a significant predictor of knowledge about sharks. Increased shark knowledge in males could possibly be due to differences in where information about sharks is received. Respondents who stated they received information on sharks from documentaries and "Shark Week" had higher shark knowledge, with a majority (61% and 62% respectively) of those respondents being male. Therefore, the difference between shark knowledge in males and females may be due to gender biases in shark documentaries. Many shark documentaries or programs on "Shark Week" appear to generally be marketed toward the male demographic. It should also be noted that the majority of respondents indicating they obtained information about sharks from documentaries had previously viewed "Shark Week", indicating the possibility of respondents believing "Shark Week" programming were documentaries.

The possibility that viewing "Shark Week" (seemingly considered a documentary) directly impacts one's knowledge level about sharks, combined with the popularity of its programming highlights its importance to potential pro-shark conservation behavior. It also demonstrates the need for "Shark Week" to provide accurate and scientifically sound information about the current threats to sharks and their threat to humans. Viewing "Shark Week" also

increased the chance that respondents believed shark conservation was either urgent or very urgent. Insuring that the content within shark related programming ("Shark Week" and other shark related documentaries) is factual, not gender biased, and is non-sensationalized could go a long way in strengthening support for shark conservation.

Generally, a person's knowledge about a subject would grow with age through schooling or life experiences. However, contradictory to previous studies, age and education level had no effect on the knowledge a person had about sharks [2,7]. This could be the result of most people not being exposed to information about sharks through schooling or life experiences and explain why respondents in this study displayed a relatively low level of shark knowledge. Rather individuals must actively choose to obtain information about sharks on their own. Friedrich et al. [13] found that respondents surveyed at an aquarium in the U.K. displayed relatively high levels of knowledge about sharks. However, the individuals surveyed in that study were taking an active interest in the aquatic environment, which could expose them to increased information about sharks biasing the true public knowledge about sharks [13]. When attempting to provide the general public with information about sharks in order to assist with conservation it can be expected that different individuals will both have varying knowledge levels and encounter shark-related information from varying media outlets (news, documentaries, aquaria, etc.). Therefore, developing different types of media to educate the public, and ensuring they provide the correct message will be important.

Sharks are not a common subject matter in everyday life or within most educational systems (i.e. college, high school). This may be the cause of the low knowledge levels about sharks found in this study. News pertaining to sharks does appear on television on occasion. Usually for either a new scientific discovery or the reports of a shark attack. However, such

coverage is still not very common, especially in inland areas. "Shark Week" likely provides the majority of information about sharks received by the public. Unfortunately, media coverage of sharks has been controversial recently with the airing of several non-factual documentaries about fictitious "rogue sharks" and documentaries claiming that the gigantic extinct *Megalodon* still exists. Concern by marine conservationists over the potential for these documentaries to undermine public knowledge about sharks, and the potential to cause "scares" that could be detrimental to shark conservation, led the 3rd International Marine Conservation Congress (14-18 August 2014; the IMCC meetings are the largest academic conferences specifically on marine conservation) to commission a special panel on this very topic.

With so little information about sharks in general, being distributed it seems important that when information does appear that the message be unbiased, non-sensationalized, and accurate to ensure people are receiving the information necessary to build strong pro-shark conservation behaviors.

5. Conclusions

It is now recognized that changing environmental behaviors toward an environmental issue or species is much more complicated than simply educating the public and altering attitudes [14]. There are multiple factors that influence a person's behaviors including: knowledge, attitude, motivation, values, culture, experiences, policies, and community infrastructure [13,14]. However, when attempting to alter behaviors about an environmental issue, increasing public knowledge, compared to these other variables, represents a simple first step in the process. Our study showed that a person's knowledge about sharks has the ability to significantly impact their potential behavior toward shark conservation. Higher levels of knowledge about sharks resulted

in more positive potential behaviors toward them, with respondent's becoming more supportive of protective legislation, the establishment of marine protected areas, and willingness to donate money that would encourage the conservation of sharks. The impact of knowledge on potential behaviors in this study highlights the need to understand the variables contributing to knowledge development and demonstrates that education is a good first step in attempting to alter public behaviors toward sharks. Being male, viewing of shark documentaries or "Shark Week", and having membership in an environmental organization all significantly impacted knowledge of sharks. Shark-related programming could possibly be male biased given the higher percentage of males (70% of total sampled males) compared to females (46% of total sampled females) that had previously viewed "Shark Week". This could explain some of the variance in shark knowledge between genders. The development of programming that is not gender-biased, is accurate in explaining the threats to sharks and their threat to human, and does not sensationalize sharks could be of great importance. Therefore, recent fictitious programming on Discovery Channel's "Shark Week", which depicts large (sometimes extinct) man-eating sharks, and the continued media hype in some cases over shark attacks are of considerable concern. Mediums such as "Shark Week" should be used to raise awareness and understanding of sharks and the threats they currently face.

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Fig. 1. Frequency of varying shark knowledge index scores for respondents. Indicates how much or how little they know about sharks based on questions from the questionnaire. Higher scores indicate more knowledge. Scores are out of a possible 25, but no respondents scored higher than 15. ($n= 184$)

Fig. 2. Respondent's knowledge index scores compared to the percentage of those respondents who had either previously viewed "Shark Week" ("Yes") or who had never viewed "Shark Week" ("No"). ($n= 176$)

Fig. 3. Respondent's knowledge index scores compared to where they received the majority of information about sharks. Each of the knowledge index scores shows the percentage of respondents that received their information about sharks from each of the five sources. ($n= 169$)

Table 1. Results for the standard multivariate regression analysis in which we tested the cumulative predictive power of all the variables on a respondent's knowledge about sharks and determined which variables could individually significantly predict a respondent's knowledge about sharks.

Independent Variable	<i>F</i> -value	<i>p</i> -value	<i>R</i> ²	<i>t</i> -value	<i>p</i> -value
Multivariate regression	<i>F</i> (8, 147)= 4.96*	<0.001*	0.2125*		
Gender				2.36*	0.02*
Age				1.52	0.13
High School Education				0.69	0.489
College Degree				0.75	0.457
Master Degree				0.72	0.471
Viewed Shark Week				2.41*	0.017*
Where Receive Shark Information				2.74*	0.007*
Member of Environmental Group				2.56*	0.011*

* Indicates significance

Figure 1.

Figure 2.

Figure 3.