

Navy Sonar, Cetaceans, and the Supreme Court:
Fairfax County Public Attitudes and Potential Ramifications

A thesis submitted in partial fulfillment of the requirements for the degree of Master of
Science at George Mason University

By

Kylie E. Zirbel
Bachelor's Degree
Le Moyne College, 2007

Director: Peter J. Balint, Professor
Department of Environmental Science and Policy

Spring Semester 2010
George Mason University
Fairfax, VA

Copyright: 2010 Kylie E. Zirbel
All Rights Reserved

ACKNOWLEDGEMENTS

I would like to thank my advisor, Dr. Peter J. Balint, for his continual support throughout my studies at George Mason University, for believing in me, and for taking on a “Z”. I would also like to thank Dr. E.C.M. Parsons and Dr. Larry L. Rockwood for their guidance as my committee members on this project and for teaching awesome classes. Everyone who read over my survey and helped me create the final draft (MCCS and ESP students and faculty especially). Annaliesa, thank you so much for helping me stay on track. DCIP for your motivation and helping me to just finish already. My friends without whom I would have surely gone insane by now or at the very least run away to a far off land. Those of you who were willing to run away to a far off land, thank you for giving me an out in case I needed it. Anyone who persuaded me to have playtime instead of thesis time, my sanity thanks you. My family for their pep talks and for giving me my sense of humor. And finally to everyone who filled out my survey or allowed me to interview them, without you I would not have a project so thank you for participating!

TABLE OF CONTENTS

	Page
List of Tables.....	v
List of Figures.....	vi
List of Abbreviations/Symbols.....	vii
Abstract.....	viii
Chapter 1: Introduction.....	1
Chapter 2: Submarines and Military Sonar.....	6
Chapter 3: Impact of Sonar on Cetaceans.....	9
Chapter 4: Mass Strandings.....	12
Chapter 5: Mitigation.....	16
Chapter 6: Brief Legal Review.....	18
Chapter 7: <i>Winter v. Natural Resources Defense Council</i>	29
Chapter 8: Public Attitudes and Policy Change.....	34
Chapter 9: Methodology.....	36
Chapter 10: Results and Discussion.....	42
Chapter 11: Conclusion.....	71
Appendix I: Survey Instrument.....	74
Appendix II: Interview Questions.....	78
List of References.....	79

LIST OF TABLES

Table	Page
Table 1. Hypotheses concerning demographics variables relationship with how respondents answered question 2.....	38
Table 2. Summary of chi-square tests conducted on the relationship between demographic variables and responses to question 2	44
Table 3. Percents for respondents' political ideology and whether or not they believe the Navy should be exempt from marine mammal protection regulations.....	52
Table 4. Percents for respondents' political party affiliation and whether or not they believe the Navy should be exempt from marine mammal protection regulations	54
Table 5. Percents for respondents' military service and whether or not they believe the Navy should be exempt from marine mammal protection regulations.....	57
Table 6. Important questions to this study on the survey instrument	60
Table 7. Summary of qualifications of experts.....	64

LIST OF FIGURES

Figure	Page
Figure 1. Percentage of respondents by how they replied to question 2: should the Navy be exempt from marine mammal protection regulations in times of peace.....	43
Figure 2. Original percentage of respondents by age bracket before re-code	44
Figure 3. Percentage of respondents by age bracket as used in the Pearson’s chi-square tests	44
Figure 4. Percentage of respondents by level of education before re-code	47
Figure 5. Percentage of respondents by level of education as used in the Pearson’s chi-square tests	47
Figure 6. Percentage of respondents by race/ethnicity	49
Figure 7. Percentage of respondents by political ideology before re-code.....	50
Figure 8. Percentage of respondents by political ideology as used in the Pearson’s chi-square tests	50
Figure 9. Percentage of respondents by political party affiliation before re-code.....	53
Figure 10. Percentage of respondents by political party affiliation as used in the Pearson’s chi-square tests.....	53
Figure 11. Percentage of respondents by military service as used in the Pearson’s chi-square tests	55
Figure 12. Percentage of respondents by environmental group membership as used in the Pearson’s chi-square tests	58
Figure 13. Percentage of respondents by ocean activity participation before re-code ...	59
Figure 14. Percentage of respondents by ocean activity participation as used in the Pearson’s chi-square tests	59
Figure 15. Percentage of respondents by how they responded to question 8: Do you believe Navy sonar impacts marine mammals.....	61
Figure 16. Percentage of respondents by how they responded to question 10: If Navy sonar does impact marine mammals, what should be done	61
Figure 17. Percentage of respondents by how they responded to question 15: How knowledgeable do you consider yourself about the Supreme Court case concerning the Navy and sonar impact on whales (<i>Winter v. NRDC</i>)	63

LIST OF ABBREVIATIONS

APA	Administrative Procedure Act
CEQ	Council on Environmental Quality
CZMA	Coastal Zone Management Act
ESA	Endangered Species Act
EA	Environmental Assessment
EIS	Environmental Impact Statement
FSA	Fur Seal Act
HFAS	High-Frequency Active Sonar
ITP	Incidental Take Permits
LFAS	Low-Frequency Active Sonar
LWAD	Littoral Warfare Advanced Development Program
MFAS	Mid-Frequency Active sonar
MMPA	Marine Mammal Protection Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NATO	North Atlantic Treaty Organization
NEPA	National Environmental Protection Act
NGO	Non-Governmental Organization
NMFS	National Marine Fisheries Service
NMSA	National Marine Sanctuary Act
NOAA	National Oceanic and Atmospheric Administration
NRDC	Natural Resources Defense Council
OSPAR	Convention for the protection of the marine environment of the North-East Atlantic
RIMPAC	Rim of the Pacific
SACLANTCEN	Supreme Allied Commander, Atlantic, Undersea Research Center
SOCAL	Southern California
Sonar	Sound Navigation and Ranging
SONATE	Decision aid tool for use during planning and execution of sonar exercises in Norwegian waters
SURTASS	Surveillance Towed Array Sensor System
<i>Winter v. NRDC</i>	<i>Winter v. Natural Resources Defense Council</i>

ABSTRACT

NAVY SONAR, CETACEANS, AND THE SUPREME COURT: FAIRFAX COUNTY PUBLIC ATTITUDES AND POTENTIAL RAMIFICATIONS

Kylie E. Zirbel, Master of Science

George Mason University, 2010

Thesis Director: Dr. Peter J. Balint

Ocean noise is particularly problematic for marine wildlife in the Northern hemisphere. One source of anthropogenic noise currently impacting cetaceans in particular is military sonar. As a result, environmental NGOs have pursued a series of legal battles to test how much leeway the Navy has concerning exemption from environmental laws. The legal battle made its way to the Supreme Court in the case *Winter v. Natural Resources Defense Council* (NRDC). Ruling of the court suggests that the military is held to different standards when it comes to the implementation of federal environmental law. Public opinion on the impact of navy sonar on cetaceans and current policy has not been sought previously and since public opinion is a key force in the development and implementation of policy it could be a valuable asset to stakeholders to understand. In this thesis, I used chi-square tests to determine which demographic variables were correlated with how respondents felt about Navy exemption. I found that age, level of education, and ocean activity participation did not have a significant relationship with

how respondents felt about Navy exemption. I did find, however, that individuals who were conservative, Republican, and have served in the military were more likely to believe the Navy should be exempt from marine mammal protection regulations. I was unable to test my hypotheses regarding race/ethnicity and environmental group membership due to insufficient data. My study was also designed to investigate the respondents' understanding of sonar and its impact on marine mammals in order to support a more comprehensive study in the future. The results that I obtained were that a majority of my sample believe that Navy sonar impacts marine mammals. A majority of my sample also believe that moderating sonar use would be an appropriate action to take if Navy sonar does impact marine mammals. I also found that a large majority of my sample has never heard about the case *Winter v. NRDC*. I conducted expert interviews to determine the potential ramifications of the Supreme Court case. A few noteworthy points found in the expert interviews include that the case exerts federal power over state power; its legal precedent sets limitations to the use of preliminary injunctions under NEPA; and that it is possible to reconcile national security efforts with environmental protection.

CHAPTER 1: INTRODUCTION

The Marine Mammal Protection Act (MMPA) of 1972 marked the recognition of the need to conserve marine mammal species by the United States government. This act also noted the necessity for further research into potential marine mammal impacts including ocean noise (Richardson et al., 1995). The results of these studies indicate that anthropogenic ocean noise may cause direct harm to marine mammal species. Ocean noise is particularly problematic in the Northern hemisphere (Scott, 2004). One source of anthropogenic noise is military Low Frequency Active sonar (LFAS) and Mid Frequency Active sonar (MFAS) used for the detection of submarines and during exercises. As a result, environmental Non-Governmental Organizations (NGOs) have pursued a series of legal battles to ensure the Navy complies with environmental laws. The legal battle made its way to the Supreme Court in the case *Winter v. Natural Resources Defense Council* and a decision was handed down on November 12th, 2008. The decision of the Supreme Court suggests that the military is held to different standards when it comes to the implementation of federal environmental law (Craig, 2008) outside of exemption occasionally granted due to emergency circumstances warranting extra national security precautions.

The United States needs to maintain balance between protecting valuable environmental resources while still ensuring a high level of national security. While the

court is an effective means to pursue legal action and policy change, alternative avenues of policy change will need to be addressed by the stakeholders, including but not limited to, environmental NGOs in the court cases, scientists and policymakers, if they seek future action to influence the Navy's practices. Public opinion has been shown to be one of the key forces in the development and implementation of policy even though the mechanisms are not entirely understood (Burstein, 2003). As a result, public opinion could be a valuable asset to stakeholders in the sonar debate. Obtaining information about the status of public opinion would allow for better education strategies to increase public knowledge regarding military sonar impact on marine species. Information about public attitudes towards national security, marine conservation, and the impact of sonar on marine mammals is important to evaluating target audiences. I conducted an exploratory survey of Fairfax County public attitudes on this issue which will ultimately aid in creating effective studies in the future by establishing a baseline understanding. I also conducted several expert interviews to try and determine the potential future impact of *Winter v. NRDC* with regards to its political, legal, naval, and environmental ramifications.

The first part of this thesis will briefly address the literature surrounding this issue. While this is an international issue, I have chosen to focus on how this issue has impacted the United States. In the literature review, I will briefly discuss submarines and military sonar. I will then discuss the mass strandings that brought this issue to the attention of stakeholders. Afterwards, I summarize some of the major impacts scientists believe that sonar has on marine mammals. I then briefly discuss a few of the mitigation

measures followed by other nations. This is followed by a summary of the legal battle concerning Navy sonar which includes the policies that were used to file suit as well as the court cases involved which culminate in my discussion of *Winter v. NRDC*.

After the literature review, I discuss the methodology that I used to collect surveys. Within the methodology section, I include my hypotheses concerning how certain demographic factors may have a relationship with the dependent variable of whether or not respondents believe the Navy should be exempt from marine mammal protection regulations in times of peace. The hypotheses that I tested were that younger individuals, more highly educated individuals, liberal individuals, Democrats, individuals who have not served in the military, individuals in environmental groups, and individuals who participate in many ocean activities would all be less likely to favor Navy exemption from marine mammal protection regulations in times of peace. I also tested the hypothesis that there would not be a significant relationship between race/ethnicity and attitudes towards Navy exemption. The other primary purpose of the survey was to obtain descriptive information concerning belief in sonar impact, attitudes towards mitigation measures, and knowledge surrounding the Supreme Court case *Winter v. NRDC*.

The methodology section also provides a summary of how I collected expert interviews to discuss the potential future impact of the Supreme Court case. The major questions that I asked the experts include how the case relates to military, state, and federal power, the potential legal precedence it sets, how the case will impact the Navy in the future, and whether or not the interviewee believes it is possible to reconcile national

security efforts with environmental protection. Following this section is my results and discussion section.

In my results and discussion section, I describe information gained about Fairfax County residents' attitudes towards Navy exemption from marine mammal protection regulations. I used chi-square tests to determine which demographic variables were correlated with how respondents felt about Navy exemption. I found that age, level of education, and ocean activity participation did not have a significant relationship with how respondents felt about Navy exemption. I did find, however, that individuals who were conservative, Republican, and have served in the military were more likely to believe the Navy should be exempt from marine mammal protection regulations. I was unable to test my hypotheses regarding race/ethnicity and environmental group membership due to insufficient data.

My study was also designed to investigate the respondents' understanding of sonar and its impact on marine mammals in order to support a more comprehensive study in the future. The results that I obtained were that a majority of my sample believe that Navy sonar impacts marine mammals. A majority of my sample also believe that moderating sonar use would be an appropriate action to take if Navy sonar does impact marine mammals. I also found that a large majority of my sample has never heard about the case *Winter v. NRDC*.

For the expert interview results, a few noteworthy points found include that this case exerts federal power over state power; its legal precedent sets limitations to the use of preliminary injunctions under NEPA; and that it is possible to reconcile national security

efforts with environmental protection. Following the results and discussion section, I offer a brief conclusion.

CHAPTER 2: SUBMARINES AND MILITARY SONAR

Historically, submarines have had six basic mission capabilities. These are coastal defense, naval attrition, commerce warfare, projection of power ashore, fleet engagement, and assured destruction (Kautenschlager, 1987). Recent technological developments have given submarines additional mission capabilities. The growth of submarine fleets has included increased stealth capacity (Wallace and Meconis, 1995). Sonar (Sound Navigation and Ranging) is used by the United States military to detect enemy submarines and is an effective and delicate technology that must be practiced to effectively promote naval power (Whitt, 1983). This technology was developed in response to new quiet submarines during the Cold War (Scott, 2004). Sonar is classified in two fundamental categories as either passive or active.

Passive sonar is a listening device used so the enemy submarine is unaware of the search effort and the searcher listens for engine noise and other inherent sounds from target objects (Whitt, 1983). In passive sonar, the searcher does not emit a sound. In active sonar, the searcher emits a broadcasted acoustic signal which then reflects off other objects and returns to the submarine through an echo (Whitt, 1983). Any object that is large enough, including enemy submarines, the ocean floor, or marine mammals, will reflect the broadcasted signal and cause it to return to the submarine. Active sonar is used because it allows the submarine to pinpoint the direction and location of other

objects in the ocean; however, the broadcasted signal may also warn enemy submarines of the search effort (Whitt, 1983). As a result, the submariners must determine if active sonar or passive sonar will be more useful to complete mission goals.

There are three major types of active sonar used by the Navy. These are low frequency active sonar (LFAS) (<1 kHz), mid frequency active sonar (MFAS) (between 1 kHz and 10 kHz), and high frequency active sonar (HFAS) (>10 kHz) (National Research Council, 2003). Each frequency of sonar is used for different purposes by the Navy. LFAS is primarily used for general surveillance over large areas and it primarily detects large objects. Outputs are similar to MFAS but the array is wider. One primary example of LFAS used by the Navy is the Surveillance Towed Array Sensor System (SURTASS LFAS) which can propagate over long distances (Hatch and Wright, 2007). LFAS is used less frequently by the U.S. Navy than MFAS and may have more subtle impacts on marine mammals (Hatch and Wright, 2007). MFAS is more effective for the localization and tracking of targets than LFAS. At the lower frequency end of the MFAS spectrum there is an extended range where threats can be identified. At the higher frequency end of the MFAS spectrum the arrays are smaller and output powers can be less, making this ideal for smaller ships to use. HFAS is used for weapons (torpedoes and mines) and for counter-weapons (mine countermeasure systems or anti-torpedo devices) at a range of hundreds of meters to a few kilometers (National Research Council, 2003). HFAS allows for increasingly greater resolution and is typically effective over short distances. Both LFAS and MFAS are cited as a potential source of anthropogenic harm to cetaceans and other marine mammals. For a more comprehensive review of the development of

U.S. military sonar systems as they relate to marine mammal impact refer to (Di Mento, 2006).

CHAPTER 3: IMPACT OF SONAR ON CETACEANS

A multitude of behavioral responses by cetaceans to military sonar exercises have been documented by researchers. Changes in feeding behaviors of blue and fin whales were seen during military sonar activities (Clark and Altman, 2006; Croll et al., 2001). Humpback whales altered their typical reproductive behavior in response to sonar activities (Miller et al, 2000). Avoidance behavior was seen in whales during military MFAS exercises (Maybaum, 1993; Balcomb and Claridge, 2001). Other behavior modifications linked to sonar include shallow water stranding and beaching due to potential disorientation or avoidance of the sonar source. These changes may be linked to modified diving behavior. Various modifications of vocalizations were also documented by researchers.

Modifications to vocalizations by cetaceans varied depending upon the species studied and type of military sonar in the area. Sperm whales, typically a vocal species, were silent during the use of MFAS (Watkins et al., 1993). On the other hand, long-finned pilot whales had a tendency to increase whistling in response to military sonar (Rendell and Gordon, 1999). Humpback whales increased the lengths of their songs during exposure to LFAS presumably to compensate for acoustic interference (Miller et al., 2000; Fistrup et al., 2003). Sounds from beaked whales were reduced or ceased during sonar activities (Cressey, 2008). All of these vocalization modifications were

considered atypical for the species mentioned and could potentially impact breeding, feeding, and social cohesion depending upon which calls are being affected (Weilgart, 2007).

Cetaceans have evolved to exploit deep sea resources and until recently were thought to do so without the risk of decompression sickness or nitrogen necrosis (Jepson et al., 2005). Despite this, decompression-like symptoms have been observed in several species. Beaked whales that stranded in Madeira Island had gross lesions similar to whales found stranded in the Bahamas that may indicate changes in diving behavior (Ketten, 2005). Gas and fat emboli, indicative of decompression-like symptoms, were found in beaked whales that stranded in the Canary Islands in 2002 (Fernandez et al., 2005). The initial assessment determined the absence of pathogens, and inflammatory or neoplastic processes, and the presence of congestion and hemorrhage around the acoustic jaw fat, ears, kidneys, and brain (Fernandez et al., 2005). The cetaceans in the Canary Islands had bubbles and fat emboli in the vessels and parenchyma of their vital organs and this specific problem has been demonstrated in other strandings linked to military sonar (Fernandez et al., 2005). One hypothesis generated by Fernandez and colleagues (2005) was that sonar causes nitrogen bubbles to come out of supersaturated blood directly. The second hypothesis by multiple researchers is that in response to sonar, modifications in diving behavior induced symptoms similar to decompression sickness in humans causing the development of fat emboli and gas bubbles (Fernandez et al., 2004; Fernandez et al., 2005; Cox et al., 2006). Military sonar has been implicated as a potential cause of liver failure associated with compromised dive capabilities in cetaceans

(Jepson et al., 2005). Other physical impacts linked to sonar include hemorrhage in inner ears and cranial spaces, renal capsular hemorrhage, lung hemorrhage, bruising of the larynx and heart lesions (Balcomb and Claridge, 2001).

CHAPTER 4: MASS STRANDINGS

Atypical mass stranding events of various cetacean species, including baleen whales that tend to feed and calve in coastal areas and beaked and sperm whales because they are deep diving (Scott, 2004), provided momentum for studying the impacts of military sonar on cetaceans. Military maneuvers were suggested as a potential cause for a 1985 mass stranding of Cuvier's beaked whales and a Gervais beaked whale in Fuerteventura, Canary Islands which raised attention to the issue (Simmonds and Lopez-Jurado, 1991). Prior to the development of the new generation of sonar, strandings were isolated and typically involved one animal rather than multiple whales stranding at a time (Balcomb and Claridge, 2001). Atypical strandings occur when multiple animals strand at the same time. Consequently, military sonar has been addressed by the marine conservation community as an ocean noise priority.

In 1985, mass strandings of Cuvier's beaked whales (*Ziphius cavirostris*) and a Gervais beaked whale (*Mesoplodon europaeus*) occurred in Fuerteventura, Canary Islands (Simmonds and Lopez-Jurado, 1991). Another stranding occurred along Fuerteventura in 1988 of Cuvier's beaked whales and also of a northern bottle-nosed whale (*Hyperoodon ampullatus*) (Simmonds and Lopez-Jurado, 1991). These strandings were atypical for the area and military maneuvers have been cited as a possible cause due to proximity to whale feeding grounds (Simmonds and Lopez-Jurado, 1991).

In 1996, a mass stranding of 12 Cuvier's beaked whales (*Ziphius cavirostris*) occurred off of the coast of Kyparissiakos, Greece (Frantzis, 1998). This incident occurred around the same time as the North Atlantic Treaty Organization (NATO) exercises involving Shallow Water Acoustic Classification research that used LFAS and MFAS causing the two events to be linked (Frantzis, 1998) especially when considering the impact of low-frequency sounds on deep-diving whales (Watkins et al., 1985; Bowles et al. 1994; Frantzis, 1998). An investigation into the cause of this stranding event was conducted in 1998 by the Supreme Allied Commander, Atlantic, Undersea Research Center (SACLANTCEN) Bioacoustics Panel more conclusively linking the stranding to the military exercises in the region (Buck and Calvert, 2007).

In March of 2000, two minke whales (*Balaenoptera acutorostrata*), one spotted dolphin (*Stenella frontalis*), and fourteen beaked whales (Family *Ziphiidae*) live stranded along the Northwest and Northeast Channels of the Bahamas (Balcomb and Claridge, 2001; Malakoff, 2001). This specific stranding event was highly publicized (Parsons et al., 2008) and significant evidence was gathered to link the strandings to U.S. Naval exercises using MFAS in the area (Balcomb and Claridge, 2001). The stranding in the Bahamas provided further momentum for scientists to study impacts of military sonar on cetaceans.

In May of 2000, there was another stranding event of Cuvier's beaked whales coincident with NATO exercises at Madeira Island (Buck and Calvert, 2007). NATO was conducting its Linked Seas 2000 exercises, and injuries to cetaceans were similar to those seen in the Bahamas (Buck and Calvert, 2007).

In 2002, a NATO exercise, Neo Tapon 2002, was linked to a mass stranding event off the Canary Islands of fourteen beaked whales (Jepson et al., 2003; Scott, 2004). The species that stranded included Cuvier's beaked whales, a Blainville's beaked whale (*Mesoplodon densirostris*), and a Gervais' beaked (Jepson et al., 2003). Necropsies of the whales demonstrated vascular congestion, and microvascular hemorrhages associated with fat emboli consistent with findings in other stranded cetaceans linked to military sonar use (Jepson et al., 2003).

In 2003, 15 harbor porpoises (*Phocoena phocoena*) were found beached after the Navy conducted MFAS exercises near the eastern side of the Strait of Juan de Fuca and the Haro Strait in Washington prompting an in-depth investigation by the National Marine Fisheries Service (NMFS) (Norman et al., 2004). Reports from witnesses described behavioral changes seen in many species of marine mammals during the sonar exercises and these reports prompted an assessment of acoustic trauma as a potential cause of the strandings (Norman et al., 2004). Necropsies of the porpoises did not find evidence of acoustic trauma and no common cause of the strandings could be found (Norman et al., 2004). However, due to difficulty in identifying lesions consistent with acoustic trauma, it was not completely ruled out as a potential cause (Norman et al., 2004).

In 2004, a stranding of beaked whales and short-finned pilot whales occurred off the coast of Taiwan (Wang and yang, 2006). Prior to 2004, there were only two other confirmed records of short-finned pilot whale strandings in Taiwan (Wang and Yang,

2006). A number of naval exercises occurred nearby these strandings and these were cited as a possible contributory factor (Wang and Yang, 2006).

In January of 2005, a multiple species stranding event of pilot whales (*Globicephala macrorhynchus*), minke whale, and dwarf sperm whales (*Kogia sima*) occurred on the coast of North Carolina (Hohn et al., 2006). This stranding event occurred after the military conducted exercises using MFAS; however, the researchers could not determine a definitive link between the strandings and military sonar activity or environmental conditions (Hohn et al., 2006). Despite this, sonar has been cited as one of the possible causes of this stranding.

In February of 2005, another mass stranding occurred off the coast of Taiwan that involved pygmy killer whales (Wang and Yang, 2006). Between July and August 22 of 2005 other strandings occurred off the coast of Taiwan linked to military sonar (Wang and Yang, 2006).

The cases described offer an insight into mass strandings that have, in some way, implicated sonar as a potential cause; however, the list is not exhaustive. The number of strandings has increased international concern from the marine conservation stakeholders about the impact of military sonar on cetaceans and marine ecosystems; yet there is significant resistance from governments to change military policies (Parsons et al., 2008). This resistance to change is likely linked to the necessity for national security and the belief in sonar as a means to promote security.

CHAPTER 5: MITIGATION

The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) reviewed the impacts of anthropogenic noise in cetaceans in 2009 and ultimately came up with necessary steps to introduce mitigation measures. These steps include understanding species that may be present in an area, the sensitivity of present species to the noise source in the area, population density in the area to determine how many individuals will be affected, and risk of the affect (OSPAR, 2009). The basic mitigation principles defined by OSPAR (2009) to reduce anthropogenic noise include limiting overall use, limiting the area of use, and limiting the season of use when possible. OSPAR also recognized that success has been made in mitigating naval sonar impacts internationally.

The Royal Norwegian Navy follows guidelines for use of active sonar in Norwegian water since 2006 and each year a decision aid tool (SONATE) is produced to aid naval planners and commanders (Nordlund and Benders, 2008). The Royal Netherlands Navy also tries to balance operational requirements to promote national security with environmental protection regulations by determining sensitive areas, monitoring populations, restricting sonar activities when marine mammals are present, reducing power, and logging information (OSPAR, 2009). Spain has maintained a moratorium on the use of MFAS and LFAS at less than 50 nautical miles from the

Canary Islands since this is considered a sensitive area after mass strandings occurred (OSPAR, 2009). The Australian system of mitigation involves detecting whales within 4000 yards of sonar activity and either turning sonar systems off, reducing power, or altering course (OSPAR, 2009). Italian naval vessels' mitigation actions involve avoiding steep areas, acoustic trapping situations, and keeping outside of protected areas as well as conducting visual searches for marine mammals within range (OSPAR, 2009). The U.S. has adopted mitigation measures that include visual searches for marine mammals, training during daylight when possible, ensuring conditions support survey capabilities, passive acoustic surveys before and during exercising, and reporting marine mammals that are in danger (OSPAR, 2009).

In response to a request from the U.S. Council on Environmental Quality (CEQ), the National Oceanic and Atmospheric Administration (NOAA) has reviewed and revised its ocean noise policy with the change of administration in 2009. NOAA plans to reinstate comprehensive aerial cetacean surveys to estimate cetacean population density in certain areas and conduct two workshops, one to develop a plan that will estimate a sound budget for the oceans, and a second to learn more about marine mammal "hotspots". NOAA is strongly encouraging the U.S. Navy to be involved in these efforts in order to improve mitigation strategies for military activities involving sonar in order to reduce cetacean impact. The Under Secretary of Commerce for Oceans and Atmosphere, Jane Lubchenco, has also met with the Navy and NRDC to develop an understanding of the issue and conflict between the Navy and environmental NGOs involved (Lubchenco, 2010).

CHAPTER 6: BRIEF LEGAL REVIEW

Despite following certain mitigation measures, U.S. Navy sonar litigation has continued throughout the past decade. Various statutes have been used by environmental organizations in an attempt to halt or modify the Navy's use of MFAS and LFAS, thereby reducing cetacean impact and holding the Navy accountable for environmental damages.

National Environmental Policy Act (NEPA)

The National Environmental Policy Act of 1969 has been used as one of the major environmental statutes in Navy sonar litigation. This statute requires that governmental agencies produce Environmental Impact Statements (EIS) to address the environmental impacts of projects. An EIS must address the environmental impacts of the actions, adverse environmental effects that are unavoidable, alternatives to the action being proposed, enhancement of long term productivity from short term impacts on the environment, and irreversible use of resources involved if the action goes forward (National Environmental Policy Act, 1969). This requirement by NEPA is strictly procedural and does not require the agency to choose the least damaging action as identified by the EIS (Craig, 2009). The Navy is required to follow NEPA (1969) except when emergency circumstances are in effect.

Marine Mammal Protection Act (MMPA)

The Marine Mammal Protection Act of 1972 protects marine mammals by imposing a “moratorium on taking and importing marine mammals and marine mammal products” (Marine Mammal Protection Act, 1972). Exceptions to the moratorium are granted to those who have been issued permits for taking and importing marine mammals for scientific research, and enhancing the survival or recovery of a specific species or stock. (Marine Mammal Protection Act, 1972).

Incidental Take Permits (ITP) are granted under the MMPA by NMFS when activities may result in the incidental take of a small number of marine mammals (Marine Mammal Protection Act, 1972). The Navy sought an ITP from the NMFS for sonar activities in 2002 (Craig, 2009). The Navy had to follow certain regulations including mitigation measures to ensure marine mammals were not subjected to sounds greater than 180dB and extensive monitoring of marine mammals in the area (Craig, 2009). Once litigation began regarding use of Navy sonar off the coast of California, Congress amended the MMPA in 2003 by granting exemption for actions that are considered necessary for national defense and by redefining ‘harassment’ specific to military readiness (Marine Mammal Protection Act, 1972; Craig, 2009). This granted the Navy more freedom to take actions that may injure and disrupt marine mammals (Craig, 2009).

Endangered Species Act (ESA)

The Endangered Species Act of 1973 was enacted to provide for the conservation of threatened and endangered species of fish, wildlife, and plants. It authorizes the

determination of species as threatened or endangered, listing of determined species, designation of critical habitat, prohibition of unauthorized interactions with endangered species, authorization to take land for conservation, and authorization of penalties for violations (Endangered Species Act, 1973). The ESA is careful in that it describes its relationship with the MMPA so that species dually protected will obtain benefits from the most protective provisions within the two acts (Craig, 2009). In 2003, Congress also decided to amend the ESA to include Department of Defense exemption from critical habitat designations; however this is unlikely to be relevant to the Navy sonar issue (Craig, 2009). MFAS training was not found by lower courts to have violated the ESA; however SURTASS LFAS was found to likely violate the ESA by lower courts in California in *NRDC v. Gutierrez* in 2008 (Craig, 2009).

Coastal Zone Management Act (CZMA)

The Coastal Zone Management Act of 1972 has proven to have the most controversial impact with regards to the Navy sonar issue and its impact on marine mammals due to the tension between state and federal rights. The CZMA was used in litigation in both Hawaii and California. The CZMA was enacted due to national interest in effectively managing, protecting and developing coastal zones (Coastal Zone Management Act, 1972). The national policy under the CZMA is to preserve, protect, develop, and restore the coastal zone (Coastal Zone Management Act, 1972). It also encourages states to effectively manage their coastal zones using management programs which are reviewed (Coastal Zone Management Act, 1972). Exemption can be granted to

federal activities by the President and exemption was granted to the Navy by George W. Bush during sonar litigation. This action received attention from the Central District of California questioning the constitutionality of Presidential exemption over states' rights (Craig, 2009).

National Marine Sanctuary Act (NMSA)

The National Marine Sanctuary Act of 1972 was created in order to identify and designate areas of the marine environment with special national significance and then manage these areas to promote conservation. Once areas are designated as sanctuaries, agencies have to consult with the Secretary of Commerce if they engage in activities that impact resources (National Marine Sanctuary Act, 1972). As a result, this act has been used in litigation concerning Navy operations near California and Hawaii because of the marine sanctuaries off the coasts but may prove to have influence in the future along the Atlantic and around Florida (Craig, 2009).

Fur Seal Act (FSA)

The Fur Seal Act of 1966 to prohibit taking, transporting, importing, or possessing, fur seals and sea otters in order to conserve these animals. Exemptions are granted to Indians, Aleuts, and Eskimos living along the North Pacific Ocean (Fur Seal Act, 1966). This is a very short, specific act with a narrow focus. Despite this it has been raised during the Navy sonar litigation and has been unsuccessfully used by plaintiffs (Craig, 2009).

Magnuson-Stevens Fishery Conservation and Management Act (MSA)

The Magnuson-Stevens Fishery Conservation and Management Act of 1976 was passed in order to conserve and manage fishery resources off the coast of the United States, support and encourage implementation and enforcement of international fisheries agreements, and to promote domestic fishing under sound conservation and management principles, the stewardship of fishery resources by Regional Fishery Management Councils, the development of fisheries in a non-wasteful manner, and to protect essential fish habitat under permits and licenses (Magnuson-Stevens Fishery Conservation and Management Act, 1976). The MSA lacks exemptions for national security or defense and consequently the Navy may be found in violation in the future if protected fish are killed (Craig, 2009).

Cases Involving Low-Frequency Active Sonar

LFAS rose to the attention of the scientific community after mass strandings that were temporally and spatially linked to military exercises. The extended propagation of this type of sonar has made scientists believe that its impacts may be more common than is known (Hatch and Wright, 2007). Consequently, this type of sonar has been the focus of several cases brought to the court by environmental groups.

LFAS was used off the west coast of Hawaii between 1997 and 1998 to test its effects on humpback and sperm whales. The Ocean Mammal Institute, an organization that collects data on the impact of human marine activities (specifically ocean noise) on

cetaceans, motioned for a preliminary injunction against the Navy claiming the Navy was not complying with NEPA, the MMPA, and ESA (*Ocean Marine Mammal Institute v. Cohen*, 1998; Craig, 2009). The court denied the plaintiff's motion because irreparable harm was not demonstrated. The case was appealed, and the Court of Appeals affirmed the lower court's ruling and determined the issue was moot because the testing was finished (Craig, 2009).

In 1998, the Navy conducted another phase of testing (phase III) off the coast of Hawaii on the impacts of LFAS on humpback and sperm whales without having gone through NEPA review instigating another lawsuit (*Kanoa Inc. v. Clinton*, 1998). In this lawsuit, NEPA, MMPA, ESA, and the Fur Seal Act were used as grounds to bring a claim to the court by Kanoa Inc., a cruise company concerned with losing revenue (*Kanoa Inc. v. Clinton*, 1998). The plaintiff filed for a temporary restraining order to halt the research and preliminary injunction to create mitigation measures to reduce cetacean impact (*Kanoa Inc. v. Clinton*, 1998). This case was dismissed because the Plaintiff did not meet the constitutional and statutory standing requirements to bring action under the Administrative Procedure Act (APA) (*Kanoa Inc. v. Clinton*, 1998; Craig, 2009).

Phase III testing of LFAS and its impacts on cetaceans off of Kona in Hawaii caused the Hawaiian County Green Party, along with several other NGOs concerned with marine mammal protection, to bring suit against the Navy under NEPA, the MMPA and the ESA (*Hawaiian County Green Party v. Clinton*, 1998). The counts brought against the defendants included illegal irretrievable and irreversible commitments, lack of objectivity in the NEPA process, and failure to properly administer and enforce the law

(Hawaiian County Green Party v. Clinton, 1998). The cessation of testing prior to the case caused it to be moot (Craig, 2009). The Hawaiian County Green Party motioned to re-open the case; however the court determined that the case would not be reopened because the plaintiffs' claims did not warrant it (Craig, 2009).

In 2002, the Navy's use of SURTASS LFAS for training and testing, over a large area in the Pacific with threatened species, was brought to the court by the NRDC (*Natural Resources Defense Council v. Evans, 2002*). The NRDC claimed the Navy was unlawfully issued permits in violation of the MMPA, failed to prepare an adequate EIS as required by NEPA, failed to prepare a supplemental EIS when new information on environmental effects came to light, and failed to prepare an adequate biological opinion under the ESA (*Natural Resources Defense Council v. Evans, 2002*). A narrowly tailored preliminary injunction to halt Navy exercises in sensitive areas was granted in favor of plaintiffs. The court determined that the harassment of up to 12% of all marine mammals violated the MMPA's small numbers limitation, the NMFS impermissibly narrowed the definition of harassment under the MMPA, the NMFS violated NEPA by postponing the designation of off limit areas and by not analyzing alternatives effectively, and that the NMFS violated the ESA by illegally defining adverse modification and by not including proper incidental take statements (Craig, 2009). The court allowed the Navy to train and test SURTASS LFAS in order to complete mission goals; however they were restricted from operating in possibly sensitive marine mammal areas to minimize impact (*Natural Resources Defense Council v. Evans*).

In 2003, the Navy deployed SURTASS LFAS world-wide in response to heightened national security risk thus beginning another legal battle with the case *Cetacean Community v. Bush*. In this case, the “cetacean community” sued President George W. Bush for violations of the ESA, MMPA, and NEPA by the Navy (*Cetacean Community v. Bush*, 2004). The court was asked to decide if cetaceans have standing as legal entities to sue under the ESA, MMPA, NEPA, and the APA (*Cetacean Community v. Bush*, 2004). This case was brought forward to the U.S. District Court of Appeals for the Ninth Circuit and was ultimately thrown out because cetaceans lack statutory standing to sue the Navy under the APA (*Cetacean Community v. Bush*, 2004).

Again in 2008, the Navy’s use of SURTASS LFAS was brought to court by plaintiffs seeking a preliminary injunction since the Navy and NMFS were in violation of the MMPA, NEPA, and ESA (*Natural Resources Defense Council v. Gutierrez*, 2008). The court ordered the continuation of the injunction issued in 2002 following *Natural Resources Defense Council v. Evans*, with a few changes that restrict LFAS use in specific sensitive areas but also provides the Navy greater flexibility to operate in other areas (*Natural Resources Defense Council v. Gutierrez*, 2008). New off limits areas include the Davidson Seamount, the Northwestern Hawaiian Islands Marine National Monument, the Galapagos Islands, the Great Barrier Reef, and the Pelagos (*Natural Resources Defense Council v. Gutierrez*, 2008).

Cases Involving Mid-Frequency Active Sonar (MFAS)

The Navy proposed a MFAS training range off of the coast of North Carolina. In 2005, the NMFS failed to disclose all relevant and unprivileged information relating to the environmental impacts of the proposed MFAS training range causing them to be sued by the NRDC under the Freedom of Information Act (*Natural Resources Defense Council v. National Marine Fisheries Service*, 2006). The NRDC wanted to gain access to documents concerning mass strandings of cetaceans; the court ruled in plaintiffs' favor (Buck and Calvert, 2007).

In 2006, the NRDC took the Navy back to court in response to the Navy's use of MFAS during its Rim of the Pacific war games (RIMPAC exercises) in the case *Natural Resources Defense Council v. Winter*. The case, *NRDC v. Winter* ultimately ended at the Supreme Court as *Winter v. Natural Resources Defense Council* in 2008.

While the case *NRDC v. Winter* was making its way to the Supreme Court, another case was brought forward concerning the Southern California (SOCAL) exercises under the CZMA (*California Coastal Commission v. U.S. Department of the Navy*, 2007). This case was sought to determine whether or not the California Coastal Commission can review defendants' activities involving use of MFAS for consistency with California's coastal zone management program (*California Coastal Commission v. U.S. Department of the Navy*, 2007). This case was stayed pending the resolution of *NRDC v. Winter* (Craig, 2009).

The Navy's use of MFAS in training exercises off the Hawaiian Islands between January 2007 and 2009 received attention from the Ocean Marine Mammal Institute

which filed suit in *Ocean Mammal Institute v. Gates*. Plaintiffs maintained that the Navy was in violation of NEPA, CZMA, NMSA, and the ESA. The district court issued a narrowly tailored preliminary injunction requiring mitigation. The Ocean Marine Mammal Institute was able to demonstrate that the Navy violated NEPA by not allowing public comment, by relying on NMFS's noise thresholds in the EAs, by creating an inadequate alternative analysis, and by failing to prepare an EIS (Craig, 2009). The court also agreed that the Navy violated the CZMA by not adhering to deadlines by relying on its flawed NEPA analysis to issue determinations under the CZMA and likely caused irreparable harm to cetaceans (Craig, 2009). The district court then modified the original preliminary injunction and a few weeks later partially granted the plaintiffs' motion requiring the NMFS and the Navy to complete their records (Craig, 2009).

RIMPAC Exercises

In 2006, the NRDC and other plaintiffs filed an application for an injunction to halt use of MFAS during Naval RIMPAC exercises off the coast of Hawaii, thus beginning a legal battle in the U.S. District Court for the Central District of California for the case *Natural Resources Defense Council v. England* (Buck and Calvert, 2007). Judge Florence-Marie Cooper issued a temporary restraining order blocking the use of military sonar during the RIMPAC exercises (Buck and Calvert, 2007). The Navy and the environmental groups settled so that the RIMPAC exercises could include the use of sonar as long as it wasn't within 25 miles of the Northwestern Hawaiian Islands Marine

National Monument (Buck and Calvert, 2007). Monitoring of marine mammals was also required.

Other Cases

In 2001, the NRDC filed suit against the U.S. Navy over the Navy's use of Littoral Warfare Advanced Development Program (LWAD) (Heisler, 2003). The LWAD program allows for the testing for anti-submarine technology and includes active sonar. The case, *Natural Resources Defense Council v. U.S. Department of the Navy*, sought an injunction against the Navy to limit active sonar testing because the LWAD Program did not comply with the ESA (*Natural Resources Defense Council v. U.S. Department of the Navy*, 2002). The court upheld the Navy's assertion that LWAD did not require review but also held that NEPA and the ESA did apply extraterritorially and that the Navy had a duty to fulfill its responsibilities under those statutes (Craig, 2009).

Two other cases involving active sonar were brought to the court in response to scientific experimentation testing whale-finding high-frequency sonar on gray whales. Specifically, the cases were brought against the NMFS questioning its issuance of the scientific permits. In 2003, the first case was brought forward by the Hawaii County Green Party under the MMPA and ESA (*Hawaii County Green Party v. Evans*, 2003). In 2004, the second case was brought forward by Australians for Animals under NEPA and the MMPA (*Australians for Animals v. Evans*, 2004). It was decided that the NMFS did not violate NEPA or the MMPA and for testing resumed.

CHAPTER 7: *WINTER V. NATURAL RESOURCES DEFENSE COUNCIL*

Initially in 2006, the NRDC filed for a temporary restraining order under the MMPA, NEPA, ESA, and CZMA for the Navy to halt the use of MFAS in the RIMPAC SOCAL exercises thus starting the legal battle *Natural Resources Defense Council v. Winter*. In January of 2007, the Secretary of Defense granted the Navy a 2-year exemption from the MMPA for MFAS activities under the condition that the Navy train lookouts to watch for marine mammals, have at least 5 lookouts on each vessel, report detected marine mammals, reduce active sonar transmission levels when marine mammals were present, shutdown active sonar when marine mammals were within 200 yards of the vessel, and operate active sonar at lowest practicable level (*Winter v. NRDC*, 2008).

In February of 2007, the Navy issued an Environmental Assessment (EA) that claimed the SOCAL exercises would not have a significant impact on the environment and shortly thereafter plaintiffs filed suit again under NEPA, ESA, and the CZMA. The district court issued a blanket preliminary injunction due to the likelihood that the Navy: violated NEPA by (1) failing to prepare an adequate Environmental Impact Statement (EIS); (2) by using inadequate mitigation measures; (3) by not considering alternatives or cumulative impacts in its EA; violated the CZMA by (1) not adopting mitigation

measures deemed necessary by the California Coastal Commission; and (2) likely caused irreparable harm to cetaceans (Craig, 2009).

The Navy filed an emergency appeal and was granted a stay of the injunction to allow for training. The Court of Appeals then vacated the stay of the injunction and remanded the case back to the District Court to issue a more narrowly tailored injunction which required the Navy to follow mitigation measures to reduce impact on cetaceans. These mitigation measures included a 12-mile exclusion zone, using lookouts to monitor for marine mammals, restricting use of helicopter dipping sonar, limiting use of MFAS in geographic choke points, shutting down MFAS when within 2,200 yards of a vessel, and reducing power of MFAS when conditions permit sound to travel further than normal (*Winter v. Natural Resources Defense Council*, 2008). The Navy appealed because it did not feel it could effectively train if it had to shut down MFAS when marine mammals were within 2,200 yards of naval vessels and power down MFAS during surface ducting conditions which cause sound to travel faster than normal (*Winter v. Natural Resources Defense Council*, 2008).

In 2008, President Bush exempted the Navy's use of MFAS from the CZMA and the CEQ provided the Navy with alternative arrangements for complying with NEPA due to emergency circumstances (*Winter v. Natural Resources Defense Council*, 2008). The Navy moved to vacate the District Court's injunction, the District Court refused, and the Court of Appeals affirmed the District Court's refusal (*Winter v. Natural Resources Defense Council*, 2008). The Court of Appeals determined that the two mitigation measures the Navy used as grounds for appeal were reasonable and the preliminary

injunction remain intact (*Winter v. Natural Resources Defense Council*, 2008). The Court of Appeals determined that the Navy's need to train without mitigation measures did not qualify as "emergency circumstances" and then partially stayed two mitigation measures required by the preliminary injunction for 30 days unless the Navy petitioned the Supreme Court (*Natural Resources Defense Council v. Winter*, 2008). The Navy then petitioned for a Writ of Certiorari asking the Supreme Court to review the lower court's decision. The Writ of Certiorari was granted and on October 8th, 2008 the oral arguments took place.

The Supreme Court made its final 5-4 ruling concerning *Winter v. NRDC*, on November 12th, 2008. The majority did not rule on the merits of the case, on the irreparable harm found by the courts below, or on the Administration's attempt to waive Navy compliance with NEPA, but decided that the risk to military training from two of the lower court's mitigation measures outweigh the risk to marine mammals (Craig, 2009). The opinion of the court states that "a plaintiff seeking a preliminary injunction must establish that he is likely to succeed on the merits, that he is likely to suffer irreparable harm in the absence of preliminary relief, that the balance of equities tips in his favor, and that an injunction is in the public interest" (*Winter v. Natural Resources Defense Council*, 2008). The court determined that the possibility of harm is not significant enough to warrant preliminary injunctions and rather irreparable injury must be likely and even if irreparable injury from the Navy's training exercises is demonstrated, this injury is outweighed by the public interest in an effectively trained Navy (*Winter v. Natural Resources Defense Council*, 2008). The Supreme Court

therefore overturned the court's injunction with respect to the two mitigation measures the Navy appealed. The Supreme Court determined that the shutdown zone of 2,200 yards was inappropriate because the lower court based this on the shutdown zone of 2,000 meters used for LFAS so it is inappropriate for MFAS (*Winter v. Natural Resources Defense Council*, 2008). The Supreme Court also claimed that the powering down of MFAS during surface ducting conditions was unacceptable since Diesel-electric submariners are trained to take advantage of surface ducting to avoid detection and adequate training would need to occur during these conditions (*Winter v. Natural Resources Defense Council*, 2008). The Court left the rest of the injunction intact, asserting that the Navy had not challenged the other measures imposed in the injunction (*Winter v. Natural Resources Defense Council*, 2008).

The mitigation measures that remain intact for the Navy to follow after *Winter v. NRDC* include excluding sonar use in a 12-mile zone, using lookouts for marine mammals, restricting use of helicopter dipping sonar, and limiting sonar use in geographic choke points. Consequently, the training exercises conducted by the Navy have been more environmentally friendly than they might have been without the litigation (Schaffner, 2008). The Supreme Court made it clear that when using NEPA in future lawsuits, the likelihood of irreparable harm must be demonstrated for preliminary injunction relief and this may prove to be more difficult in future cases than previously used standards (Eubanks, 2009). Even though the Supreme Court did not provide much guidance regarding NEPA, lower courts were effective in setting precedent suggesting that localized impacts may serve to establish irreparable harm, a detailed EA does not

negate the need for an EIS, and the CEQ cannot override an injunction under NEPA's emergency circumstances provision (Eubanks, 2009). This suggests that preliminary injunctions under NEPA may continue to be successful, particularly in lower courts.

CHAPTER 8: PUBLIC ATTITUDES AND POLICY CHANGE

Research has demonstrated that a change in public opinion may stimulate policy change (Page and Shapiro, 1983). However on many less visible matters the public may have weak opinions or no opinion, reducing its ability to influence policy (Page and Shapiro, 1983). Further research indicates that public opinion affects policy three-quarters of the time and has substantial effect at least one-third of the time (Burnstein, 2003). It was also demonstrated that issue salience has an effect as well as interest taken by organizations (Burnstein, 2003). This suggests that working to change public opinion may be one of the effective avenues for promoting policy change regarding the Navy sonar issue thus warranting study into this matter. Knowledge concerning how much the public knows, and what opinions the public holds may be useful in developing education strategies to improve public knowledge and potential for policy influence.

A poll, conducted in 1996, showed that 85% of the public believe the government needs to do more to protect the ocean (Spruill, 1997). This suggests support for marine conservation practices promoted by the government. Three studies on public attitudes towards threats to marine ecosystems were conducted in Scotland, one in the south-west, one in the north-east, and one on city inhabitants Scotland. The research conducted in south-west and north-east Scotland indicates that respondents had a low level of concern about the impact of military activities on cetaceans (Scott and Parsons, 2004; Zapponi

and Robinson, 2007). Rather, only 9.5% of the survey respondents in south-west Scotland felt that military activities posed a serious threat to cetaceans with a majority believing that it poses a minor threat (Scot and Parsons, 2004). The study conducted on Scottish city inhabitants showed that 16.2% of respondents thought that military activities were a serious threat to cetaceans (Howard and Parsons, 2006). A plurality of the respondents (26.3%) felt that military activities were a minor threat (Howard and Parsons, 2006). These studies were conducted almost a decade ago and provide some insight into Scottish awareness of military sonar impact on cetaceans; however, awareness may be higher now due to publicity on the issue.

There has not been research conducted in the United States about public attitudes towards the impact of the military on cetaceans or about the relationship between this issue and marine conservation policy. Since public opinion may affect policy change, and research into attitudes towards Navy exemption from marine mammal protection regulations, support for sonar impact mitigation measures, belief in sonar impact, and knowledge concerning *Winter v. NRDC* has not been conducted, this will be the focus of my research.

CHAPTER 9: METHODOLOGY

Fairfax County Resident Attitudes

The survey instrument and sampling procedure complied with the guidelines and conditions set forth by the Human Subjects Review Board of George Mason University. I developed the survey instrument used in this study over the course of one year. The first version of the survey was developed for my graduate course in survey research methods. Using this version, I conducted pretests of the survey instrument by distributing it to willing undergraduate students in the Smithsonian-Mason Semester at the Conservation Research Center. I did this to gauge respondent reactions to the wording, order, and form of the questions to test the questionnaire for clarity and participant understanding. I then adapted the survey instrument taking into account comments and concerns that were given during the pretest. Once initial revisions were made, the survey instrument was critiqued by selected faculty members and graduate students at George Mason University in the Environmental Science and Policy Department. After the survey instrument was reviewed for the second time, I constructed a final version of the survey instrument which was distributed to participants. The final version of the survey instrument can be seen in Appendix 1.

Between May 2009 and October of 2009, I distributed the survey throughout Fairfax County at local community events and also at stores that would attract a wide

cross section of the community (e.g. grocery stores, coffee shops). This sampling strategy does not ensure a representative sample and should be viewed as biased.

Nevertheless, it service the purpose for a preliminary study designed to lay the foundation for future research. Individuals present in the sampling area were asked if they would like to participate in the study, and if they agreed they were given a survey. Those who declined were not asked again. No specific individuals were sought for participation and no incentives were provided. Most individuals who declined participation said that they did not have time to participate or were uncomfortable with the topic after glancing quickly at the survey instrument. Many individuals who participated responded favorably to the survey instrument and wished me luck in completing the study. However, there were two individuals who felt that the questions were designed to solicit a certain response or to promote a political agenda. Approximately 30% of the individuals sought for participation agreed to fill out the survey instrument.

Once the collection of the surveys was completed, each survey was coded into PAWS 18 (formerly SPSS) for statistical analysis. To ensure that surveys were coded and entered properly, each survey was coded twice and entered into separate files in PAWS 18. Using the assigned survey numbers, the results for each separate coding were compared to check for conflicts in coding. Any conflicts found during this process were then fixed allowing for the construction of a final dataset. I used this dataset to create descriptive information about responses to questions from the survey instrument.

Question 2 on the survey instrument was the dependent variable for the purposes of the data analysis and hypothesis testing. This question asked respondents to say whether or

not they believe that the Navy should be exempt from marine mammal protection regulations in times of peace; the choices were yes, no, or unsure. Individuals who chose unsure for question 2 were left out of the statistical analysis. I used Pearson’s chi-square tests to determine which demographic variables had a significant relationship with how a respondent answered question 2. The hypotheses that I tested are listed in table 1.

Table 1. Hypotheses concerning demographic variable relationship with how respondents answered question 2.

Variable	Hypothesis
Age Bracket	H ₁ : Individuals categorized in older age brackets will be more likely to favor Navy exemption than individuals in younger age brackets.
Level of Education	H ₂ : Individuals who are more highly educated will be more likely than individuals with less education to believe that the Navy should not be exempt.
Race/Ethnicity	H ₃ : There will be no significant relationship between the race/ethnicity of an individual and whether or not they favor Navy exemption.
Political Ideology	H ₄ : Conservatives are more likely than moderates or liberals to favor Navy exemption.
Political Party Affiliation	H ₅ : Democrats are less likely than Republicans to favor Navy exemption.
Military Service	H ₆ : Individuals who have served or currently serve in the military are more likely to favor Navy exemption than individuals who have not served in the military.
Environmental Group Membership	H ₇ : Individuals who are members of environmental groups are less likely to favor Navy exemption than individuals who are not in environmental groups.
Ocean Activity Participation	H ₈ : Individuals who have participated in fewer ocean activities will be more likely to favor Navy exemption than individuals who have participated in more ocean activities

Respondents were asked a series of questions relating to demographics, marine conservation, national security, the impact of sonar on cetaceans, and the Supreme Court case *Winter v. NRDC*. Demographic questions asked included birth year (Q21), highest level of education (Q23), race/ethnicity (Q22), political ideology (Q19), political party affiliation (Q20), military service (Q24), environmental group membership (Q27) and ocean activity participation (Q3). Age was calculated using the statistical software from ‘year of birth’ and then re-coded into an age bracket categories. Thus ages may be 1 year off for some individuals and these values are approximate.

Questions pertaining to marine conservation were asked to gather information about how respondents felt about marine conservation in general. Respondents were asked how important marine conservation was to them personally (Q4), whether or not they believe the United States should protect marine mammals using laws and regulations (Q5), how effective they think policy has been in protecting marine mammals (Q6), and which policy they believe is the most effective in promoting conservation of marine mammals (Q7). Questions pertaining to national security included ranking several issues to see how national security compared to the environment (Q1), how important national security was to them personally (Q12), how effective they believe the use of Navy sonar is in promoting national security (Q13), and what level of threat they perceive foreign submarines are to U.S. national security (Q14). Questions pertaining to the U.S. Navy and marine mammals include if the respondent believes the U.S. Navy should be exempt from marine mammal protection regulations in times of peace (Q2), does the respondent believe Navy sonar impacts marine mammals (Q9), if Navy sonar does impact marine

mammals what the respondent believes should occur (Q10), and who respondents think is responsible for decisions about the use of Navy sonar (Q11). Questions dealing with the Supreme Court case *Winter v. NRDC* included how knowledgeable an individual considers himself or herself to be about *Winter v. NRDC* (Q15), the impact on marine mammals that the Supreme Court case decision will have (Q16), whether or not the respondent believes the Supreme Court made the correct decision by supporting the Navy (Q17), and what factors affected the Supreme Court's decision making process (Q18).

Expert Interviews

The interview questions and collection procedure were approved by the Human Subjects Review Board of George Mason University prior to conducting interviews. In order to address the potential implications of the Supreme Court case, *Winter v. NRDC*, I conducted interviews with environmental lawyers and marine policy experts (Interview questions available in Appendix 2). Potential interviewees were selected according to their expertise, asked to participate in the study either via email or telephone, and given an informed consent form. Those who agreed to participate were asked the interview questions via telephone. Participation was purely voluntary and names are withheld to preserve the anonymity of the interviewees due to the sensitive nature of the responses in relation to occupation.

These interviews sought to gain insight into the political, legal, naval, and environmental ramifications of the Supreme Court's decision and the possible precedent that it will set. With regards to the political ramifications, interviewees were asked to

speculate about the possible political ramifications of the Supreme Court's decision, the political forces that may have influenced the decision, how the case relates to military, state, and federal power, as well as environmental NGO influence. Interviewees were asked about the legal ramifications and to speculate about the legal precedence of the case, how the decision will impact environmental law, and the possible ramifications for environmental policy. With regards to naval ramifications, the interviewees were asked to speculate how the case will impact the Navy's practices, how the Navy interacts with the marine environment and whether or not they believe it is possible to reconcile national security efforts with environmental protection. Interviewees were also asked about the environmental ramifications of the case more specifically, what the decision means in terms of marine conservation, the overall environmental ramification so the decision, and what the next step for scientists and environmental NGOs should be in the future.

CHAPTER 10: RESULTS AND DISCUSSION

Survey Results and Discussion

A total of 156 surveys, each containing 28 questions, were distributed to Fairfax County residents (age 18+) following the procedure described in the methods section. The respondents were asked to answer questions relating to demographics, marine conservation, national security, the impact of naval sonar on marine life, and the Supreme Court case *Winter v. NRDC*. All questions pertained only to times of peace. The purpose of my study was to determine what factors were correlated with how respondents answered the dependent variable, question 2: should the Navy be exempt from marine mammal protection regulations in times of peace. I also used this study to develop general descriptive data concerning whether respondents believe Navy sonar impacts marine mammals, what should be done if sonar is proven to impact marine mammals, how knowledgeable they consider themselves regarding the court case *Winter v. NRDC*, and whether or not they believe the Supreme Court made the correct decision by supporting the Navy.

Refer to figure 1 for a summary of responses to question 2.

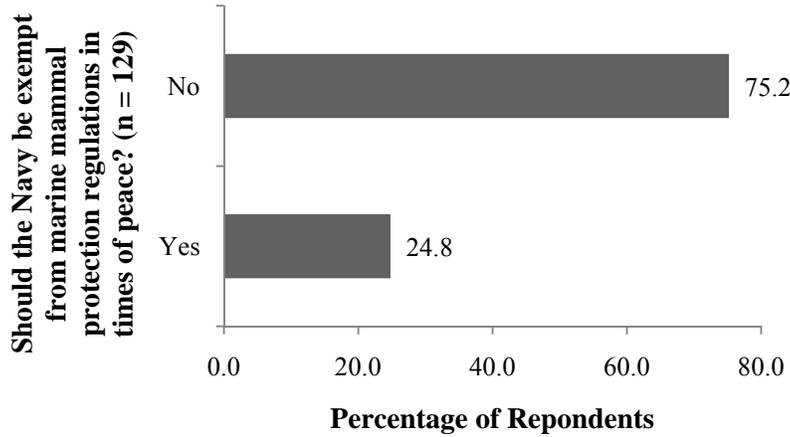


Figure 1. Percentage of respondents by how they replied to question 2: should the Navy be exempt from marine mammal protection regulations in times of peace.

The independent variables that I used in my analysis were age bracket, level of education, race/ethnicity, political ideology, political party affiliation, military service, environmental group membership, and ocean activity participation. Through the statistical software PAWS 18, I conducted Pearson's chi-square tests to test my hypotheses which can be seen in table 1 in the methods section. The results of the Pearson's chi-square tests are summarized in table 2.

Table 2. Summary of chi-square tests conducted on the relationship between demographic variables and responses to question 2.

Q2	Chi-Square Validity	d.f.	N	Test Value	p- value	Significant
Age	Valid	2	124	4.821	0.090	No
Level of Education	Valid	2	129	1.945	0.593	No
Race/Ethnicity	Invalid					
Political Ideology	Valid	2	124	35.091	≈0	Yes
Political Party Affiliation	Valid	2	127	37.469	≈0	Yes
Military Service	Valid	1	129	4.382	0.036	Yes
Environmental Group Membership	Invalid					
Ocean Activity Participation	Valid	1	129	0.495	0.482	No

The first hypothesis that I tested was H_1 : Individuals categorized in older age brackets will be more likely to favor Navy exemption than individuals in younger age brackets. In order to test this hypothesis I had to reduce the number of categories that I originally created to improve expected counts in the contingency table cells. Figure 2 shows the original age bracket categories and Figure 3 shows the reduced age bracket categories used in the statistical analysis.

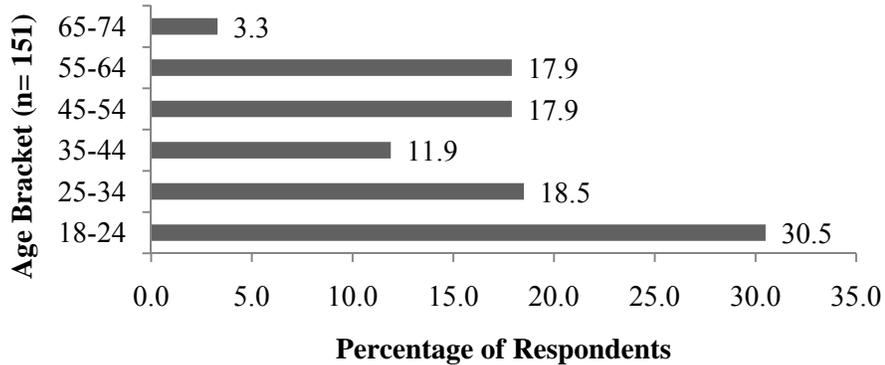


Figure 2. Original percentage of respondents by age bracket before re-code.

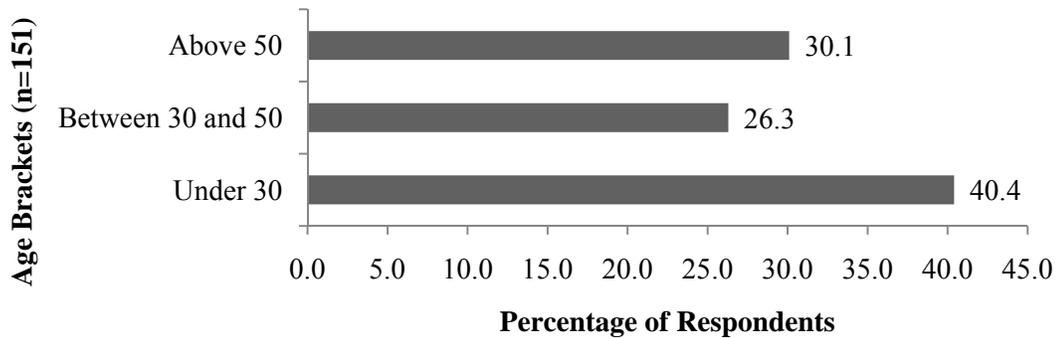


Figure 3. Percentage of respondents by age bracket as used in the Pearson's chi-square tests.

The results of the Pearson's chi-square test, $\chi^2 (df = 2, N = 124) = 4.821$, $p = .090$, indicate that the null hypothesis of no relationship between the age bracket variable and response to question 2 cannot be rejected. As a result, my hypothesis that there is a relationship between these two variables and that older individuals are more likely to favor exemption is not supported. However, at an alpha level of 0.1 this statistic is

significant warranting further research into the correlation between age bracket and attitudes towards Navy exemption. A majority of those under the age of 30, between the ages of 30 and 50, and over the age of 50 favored the Navy not being exempt. However, individuals over 50 were more closely split between favoring Navy exemption and not favoring Navy exemption than younger individuals. In the future increasing the sample size and also increasing the number of age bracket categories may give different results.

The second hypothesis tested was H₂: Individuals who are more highly educated will be more likely than individuals with less education to believe that the Navy should not be exempt. In order to test this variable, I had to reduce the number of categories for highest level of education completed. I did not have any participants who had less than a high school education so this category was dropped. I combined the categories for respondents with a high school diploma, GED, and Associate's degree and coded these as less than a Bachelor's degree. All respondents with a professional degree (JD, MD), a Master's degree, or a PhD were coded together as having more than a Bachelor's degree. The Bachelor's degree category was left alone. Figure 4 shows respondent percentages by the original level of education categories. Figure 5 shows respondent percentages by level of education after categories were collapsed as used in analysis.

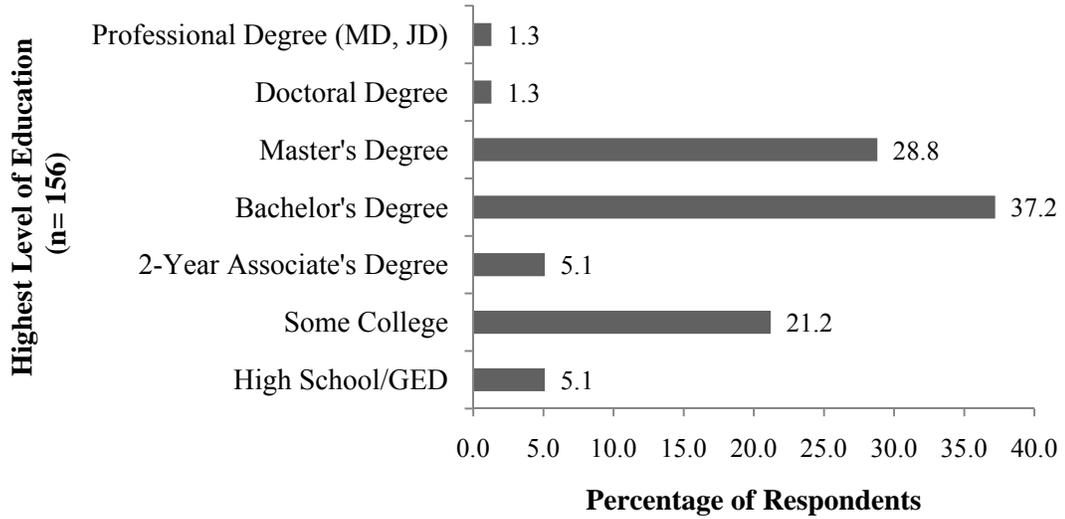


Figure 4. Percentage of respondents by level of education before re-code.

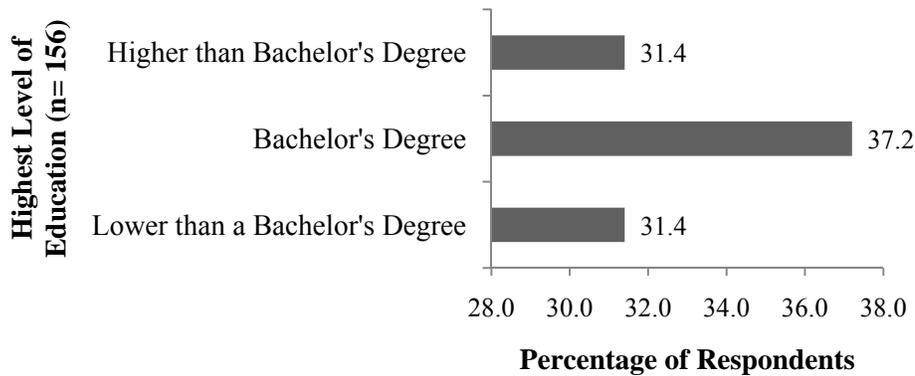


Figure 5. Percentage of respondents by level of education as used in the Pearson's chi-square tests.

The results of the Pearson's chi-square test, $\chi^2(df = 2, N = 129) = 1.945$, $p = .593$, indicate that the null hypothesis of no relationship between the level of education variable and whether or not a respondent felt the Navy should be exempt from marine

mammal protection regulations in times of peace cannot be rejected. As a result, my hypothesis that respondents who are more highly educated will be more likely to say the Navy should not be exempt is not supported, and responses to this question seem to be independent of education level. It may be worthwhile in the future to collect more surveys and keep the original level of education brackets. It also may be valuable to see the field of study of the respondents in the survey since this may be a better variable to use than level of education.

The third hypothesis that I tested was H_3 : There will be no significant relationship between the race/ethnicity of a respondent and whether or not they favor Navy exemption. There is a significant amount of debate concerning race and ethnicity categories in surveys. As a result, I did not feel comfortable collapsing categories in order to increase expected cell counts to meet Cochran's standard for the validity of chi-square tests (Cochran, 1954). As a result, I was unable to test my hypothesis due to insufficient data. In future studies it would be beneficial to allow respondents to write in their race/ethnicity rather than rely upon predetermined categories. Figure 6 shows the percentage of respondents by race/ethnicity.

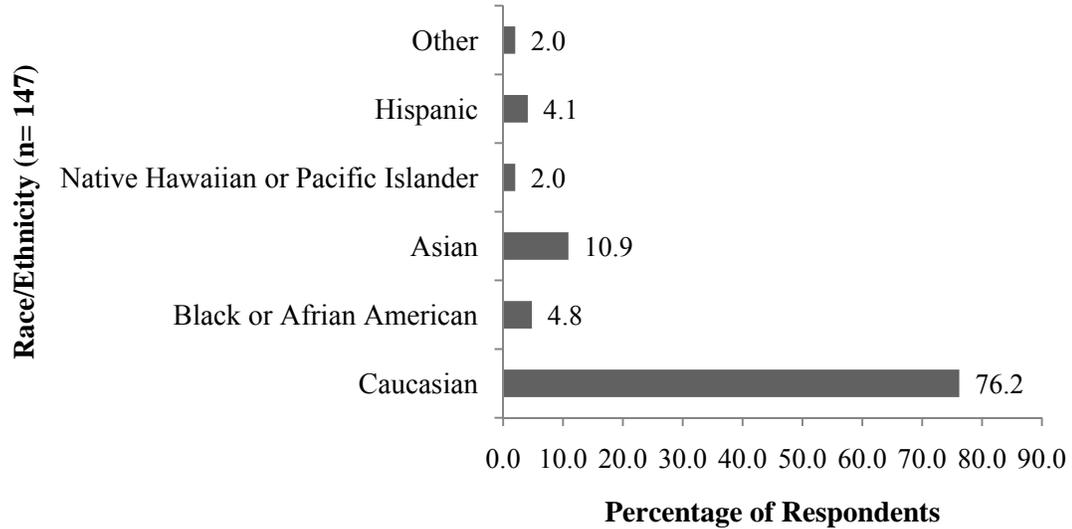


Figure 6. Percentage of respondents by race/ethnicity.

The fourth hypothesis tested was H_4 : conservatives are more likely than moderates or liberals to favor Navy exemption. In order to test this variable, I collapsed the original political ideology categories to increase expected cell counts. Respondents who classified themselves as very conservative and conservative were re-coded as conservatives on the political spectrum. Those who classified themselves as very liberal and liberal were re-coded as liberals on the political spectrum. The moderate category was left as is and those who classified themselves as other were coded as missing. The frequencies for the original political ideology categories can be seen in figure 7 and the collapsed political ideology categories as used in analysis are in figure 8.

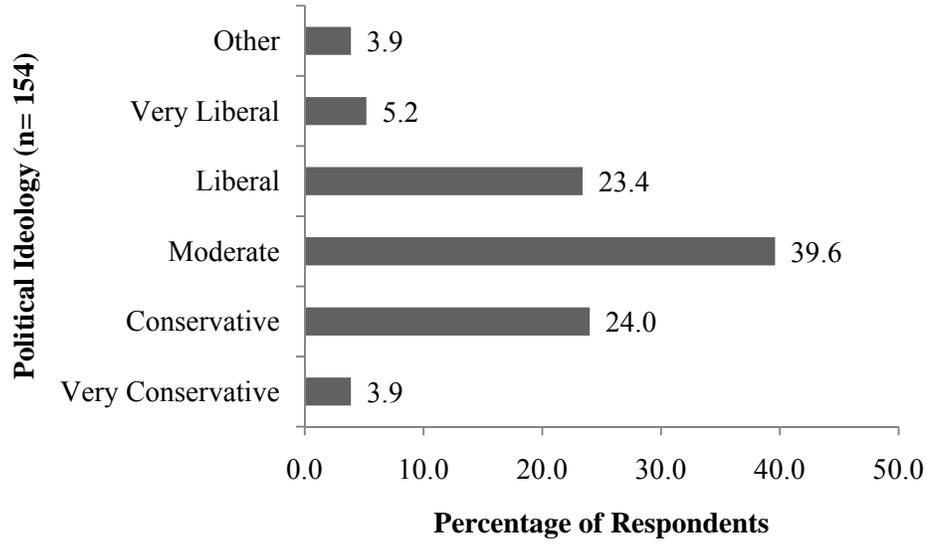


Figure 7. Percentage of respondents by political ideology before re-code.

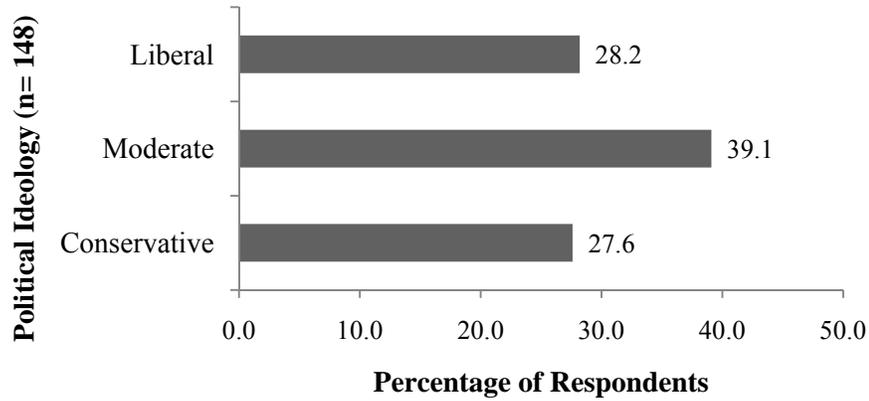


Figure 8. Percentage of respondents by political ideology as used in the Pearson's chi-square tests.

The results of the Pearson's chi-square test, χ^2 (df = 2, N = 124) = 35.091, $p \approx 0$, indicate that the null hypothesis that there is not a relationship between political ideology and how a respondent answered question 2 can be rejected. In order to determine the direction of this relationship, I evaluated the contingency table which can be seen in table 3. The contingency table shows that a majority of moderates (84.0%) and a majority of liberals (97.5%) felt that the Navy should not be exempt from marine mammal protection regulations. On the other hand, a majority of conservatives (58.8%) felt that the Navy should be exempt from marine mammal protection regulations. These results support my hypothesis that conservatives are more likely to favor Navy exemption. It appears that as one moves away from the conservative end of the political spectrum, willingness to grant Navy exemption decreases. This may be due to the different values that conservatives have compared to liberals. It would be valuable for future studies to use a more representative and larger sample and use the original political ideology categories to see if very conservative individuals differ from conservative individuals and if liberal individuals differ from very liberal individuals. It would also be useful to create a political values index and see how this relates to responses to this question.

Table 3. Percents for respondent political ideology and whether or not they believe the Navy should be exempt from marine mammal protection regulations.

Navy Exemption	Political Ideology			Total
	Conservative (n= 34)	Moderate (n= 50)	Liberal (n= 40)	
Yes (n = 29)				
Row	69.0%	27.6%	3.4%	100.0%
Column	58.8%	16.0%	2.5%	
No (n = 95)				
Row	14.7%	44.2%	41.1%	100.0%
Column	41.2%	84.0%	97.5%	
Total	100.0%	100.0%	100.0%	100.0%

The fifth hypothesis that I tested was H₅: Democrats are less likely than Republicans to favor Navy exemption. I also collapsed this category in order to increase expected cell counts. I collapsed the Independent category and other political party category into one which I labeled as Independent. The two party system that the United States primarily operates under justifies this action since none of the other political parties have significant roles in Congress. The Democrat and Republican categories were left in their original form. Respondent frequencies for the original political party affiliation categories are in figure 9 and frequencies for the re-coded political party affiliation categories as used in analysis are in figure 10.

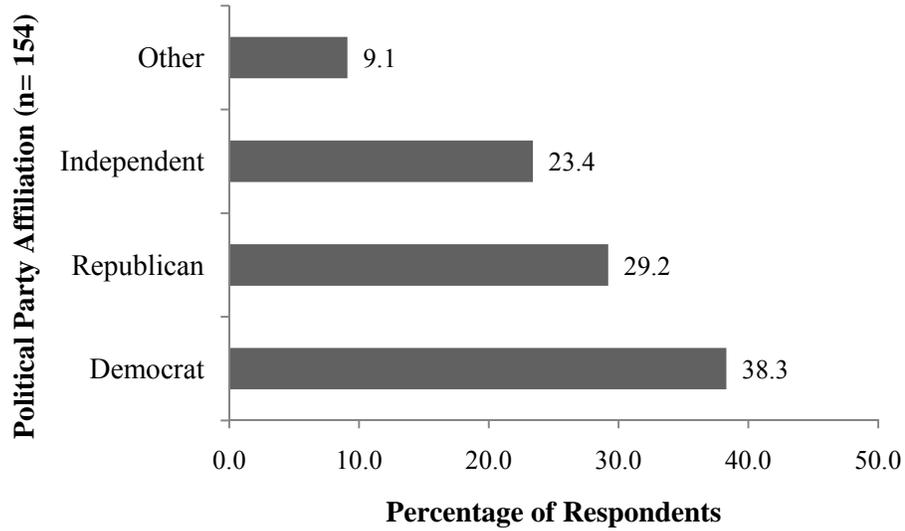


Figure 9. Percentage of respondents by political party affiliation before re-code.

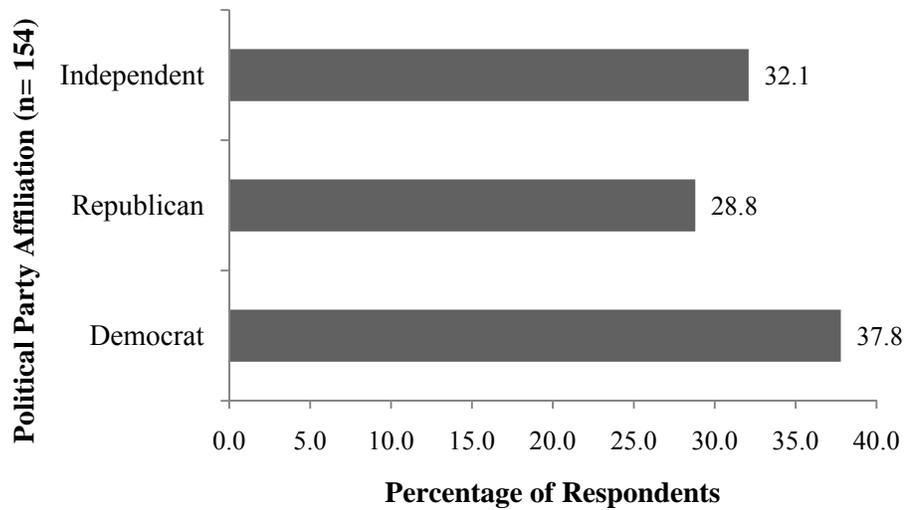


Figure 10. Percentage of respondents by political party affiliation as used in the Pearson's chi-square tests.

The results of the Pearson's chi-square test, χ^2 (df = 2, N = 127) = 37.469, $p \approx 0$, indicate that the null hypothesis that there is no relationship between political party affiliation with whether or not a respondent believes the Navy should be exempt from marine mammal protection regulations can be rejected. There appears to be a significant relationship between these two variables. In order to determine the direction of this relationship, I analyzed the results of the contingency table between these two variables which can be seen in table 4. The contingency table suggests that a majority of Democrats (98%) and Independents (73.8%) felt that the Navy should not be exempt from marine mammal protection regulations in times of peace. On the other hand, a majority of Republicans (57.1%) felt that the Navy should be exempt which supports my hypothesis however there was still a considerable number who did not support exemption. The results of this specific chi-square test are similar to the political ideology results.

Table 4. Percents for respondent political party affiliation and whether or not they believe the Navy should be exempt from marine mammal protection regulations.

Navy Exemption	Political Party Affiliation			Total
	Democrat (n= 50)	Republican (n= 35)	Independent (n= 42)	
Yes (n = 32)				
Row	3.1%	62.5%	34.4%	100.0%
Column	2.0%	57.1%	26.2%	
No (n = 95)				
Row	51.6%	15.8%	32.6%	100.0%
Column	98.0%	42.9%	73.8%	
Total	100.0%	100.0%	100.0%	100.0%

The sixth hypothesis that I tested was H₆: Individuals who have served or currently serve in the military are more likely to favor Navy exemption than individuals who have not served in the military. I did not have to collapse categories to use this variable in my analysis. Respondent frequency by military service can be seen in figure 11.

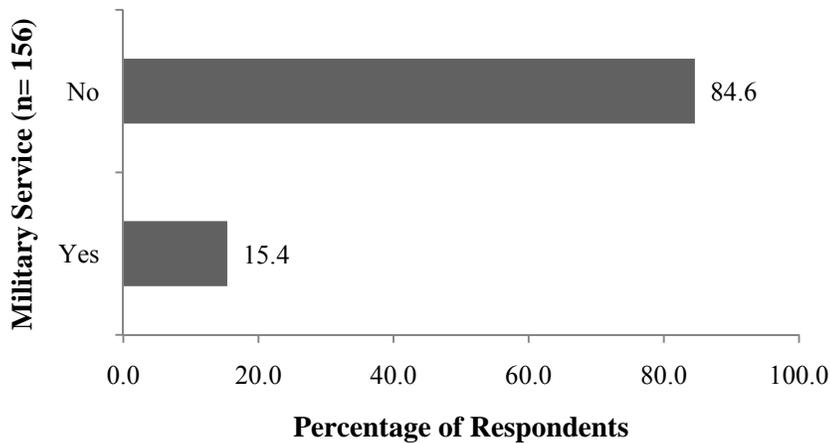


Figure 11. Percentage of respondents by military service as used in the Pearson's chi-square tests.

The results of the Pearson's chi-square test, $\chi^2(df = 1, N = 129) = 4.382$, $p = .036$, indicate that the null hypothesis of no relationship between whether or not a person has served in the military and whether or not they believe the Navy should be exempt from marine mammal protection regulations in times of peace can be rejected. In order to determine the direction of this relation, I analyzed the contingency table which can be seen in table 5. A majority of all respondents whether they served in the military (57.1%)

or if they have not served in the military (78.7%) felt that the Navy should not be exempt from marine mammal protection regulations in times of peace. However, respondents who have served in the military were more likely than those who have not to believe the Navy should be exempt. Military service may allow an individual access to more military information than the public and an increased knowledge concerning what practices are necessary for training purposes. This may cause these individuals to feel that the Navy should be allowed to make its own decisions regarding how it will follow marine mammal protection regulations. It also may be because these individuals have an increased stake in how the military operates since at one point in time they were involved in its operations. Individuals who have not served in the military may be less knowledgeable about military operations and threats. They also may be less comfortable with the Navy making its own decisions regarding marine mammal protection regulations. Future studies should try to determine the possible factors that influence this difference between those who have served and those who have not served.

Table 5. Percents for respondent military service and whether or not they believe the Navy should be exempt from marine mammal protection regulations.

Navy Exemption	Military Service		Total
	Yes (n= 21)	No (n= 108)	
Yes (n = 32)			
Row	28.1%	71.9%	100.0%
Column	42.9%	21.3%	
No (n = 97)			
Row	12.4%	87.6%	100.0%
Column	57.1%	78.7%	
Total	100.0%	100.0%	100.0%

The seventh hypothesis that I tested was H₇: individuals who are members of environmental groups are less likely to favor Navy exemption than individuals who are not in environmental groups. This category could not be collapsed so I left it in its original form when conducting the Pearson’s chi-square test. The respondent frequencies by environmental group membership can be seen in figure 12. Low expected counts in over 20% of the cells on the contingency table violate Cochran’s rule (Cochran, 1954), so the results of the Pearson’s chi-square are invalid and will not be discussed due to insufficient data. Increasing sample size in future studies would help obtain expected counts high enough to determine whether or not my hypothesis is valid.

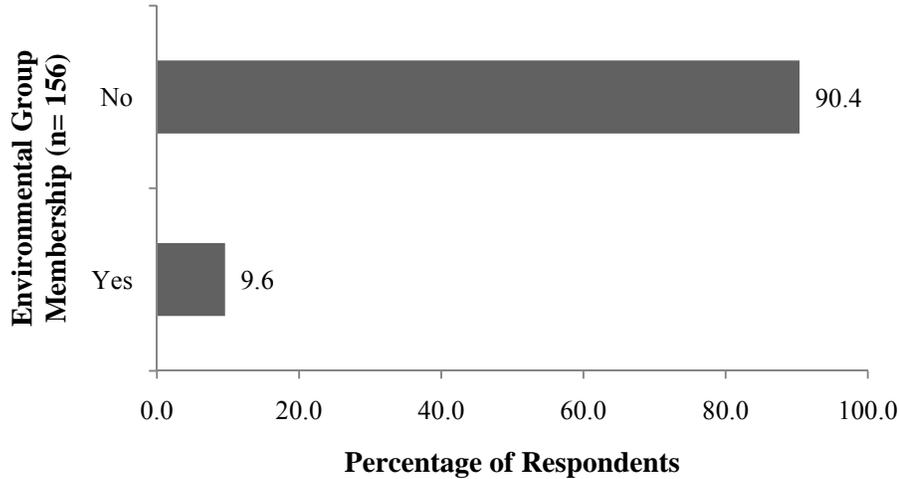


Figure 12. Percentage of respondents by environmental group membership as used in the Pearson’s chi-square tests.

The eighth and final hypothesis that I tested was H_8 : individuals who have participated in fewer ocean activities will be more likely to favor Navy exemption than individuals who have participated in more ocean activities. In order to use the ocean activity participation variable I had to reduce the number of categories. I re-coded this variable so that there were two categories. Individuals who participated in three or fewer ocean activities within the past year were grouped together and individuals who participated in four or more activities within the past year were grouped together for analysis. The original respondent percents by ocean activity participation can be seen in figure 13. Figure 14 shows the respondent percents by ocean activity participation after the categories were collapsed as used in analysis.

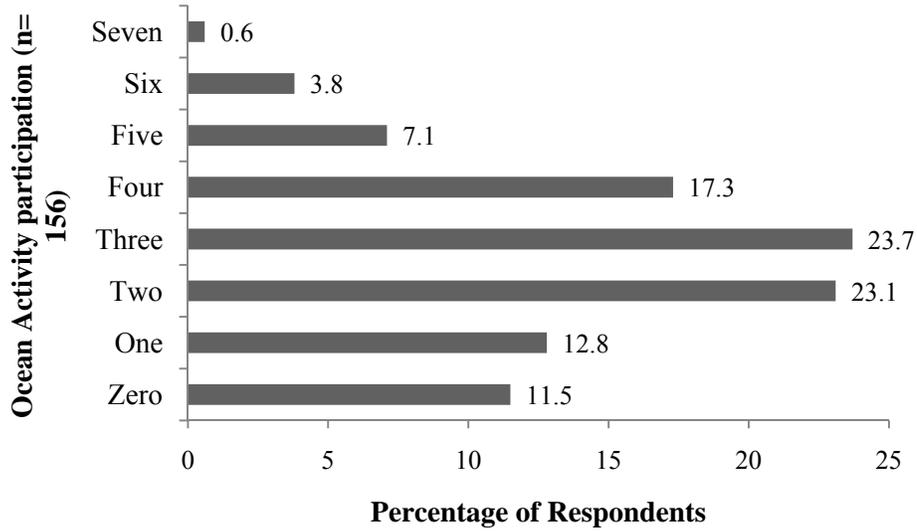


Figure 13. Percentage of respondents by ocean activity participation before re-code.

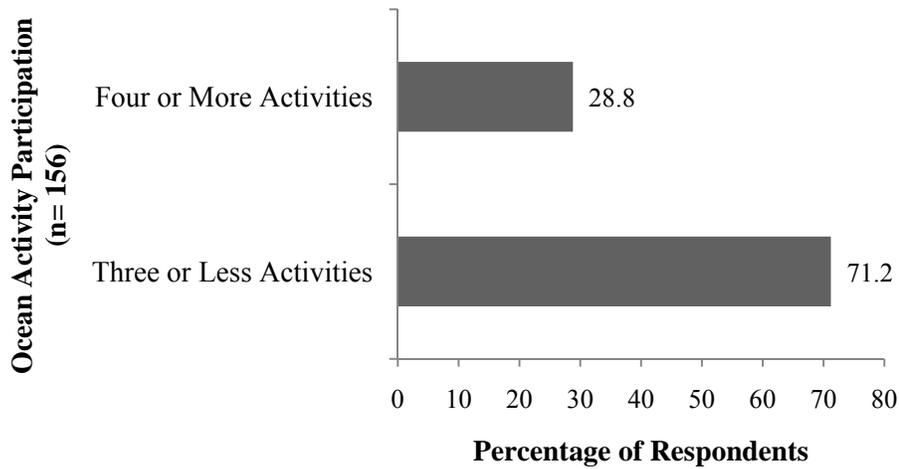


Figure 14. Percentage of respondents by ocean activity participation as used in the Pearson's chi-square tests.

The results of the Pearson's chi-square test, χ^2 (df = 1, N = 129) = 0.495, p = .482, indicate that the null hypothesis of no relationship between ocean activity participation and whether or not a respondent believes the Navy should be exempt from marine mammal protection regulations cannot be rejected. As a result, my hypothesis that respondents who have engaged in more ocean activities would be less likely to believe the Navy should be exempt is not supported. The type of activity, as well as general knowledge concerning marine conservation, would be valuable to understand in future studies.

I also wanted to obtain descriptive data from a few other select questions on the survey that may be of interest. These questions are listed in table 6.

Table 6. Important questions to this study on the survey instrument.

# on Survey	Question
Q8	Do you believe Navy sonar impacts marine mammals?
Q10	If Navy sonar does impact marine mammals, what should be done?
Q15	How knowledgeable do you consider yourself about the Supreme Court case concerning the Navy and sonar impact on whales (<i>Winter v. NRDC</i>)?

Descriptive information about questions 8 and 10 may be useful because they provide general information about whether or not respondents believe Navy sonar impacts marine mammals and what they believe should be done if Navy sonar does impact marine mammals. Figure 15 shows percents for question 8 and figure 16 shows percents for question 10.

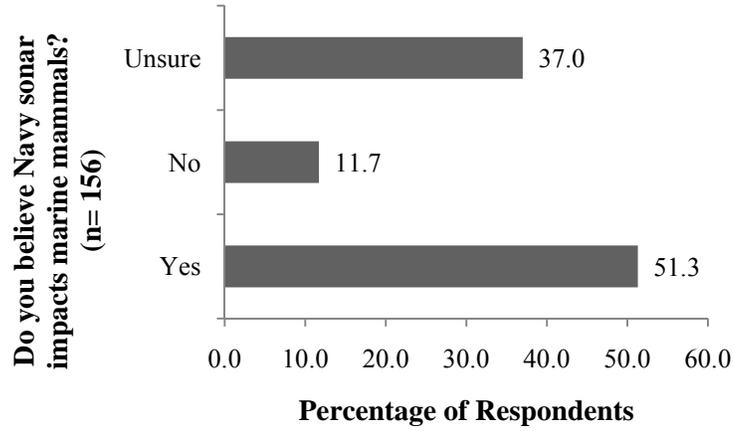


Figure 15. Percentage of respondents by how they responded to question 8: Do you believe Navy sonar impacts marine mammals.

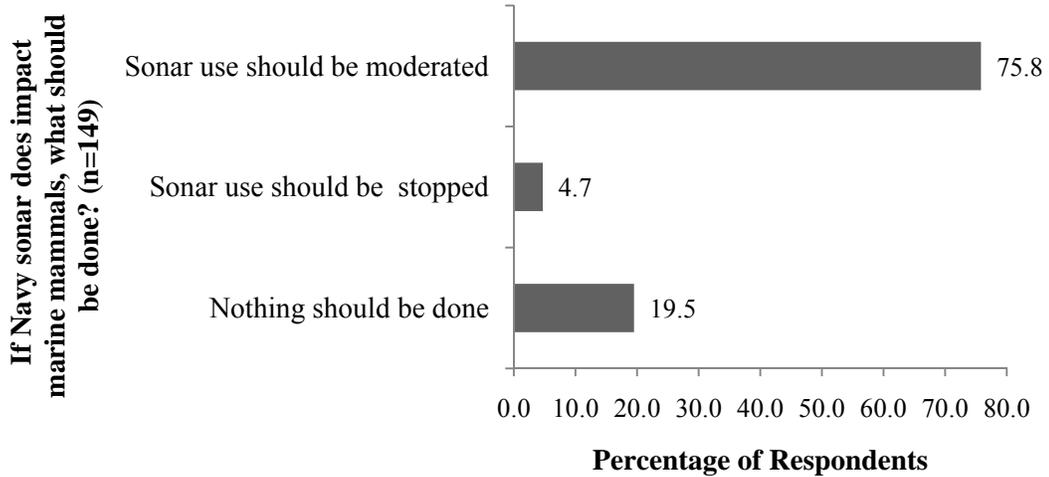


Figure 16. Percentage of respondents by how they responded to question 10: If Navy sonar does impact marine mammals, what should be done.

A majority of respondents (51.3%) believe that Navy sonar does impact marine mammals. However, there were quite a few respondents who were unsure (37.0%). If similar results are obtained using a more representative sample, it would be valuable for stakeholders to obtain information about individuals who are unsure and individuals who do believe Navy sonar impacts marine mammals. Future research should look into where individuals who believe in impact have obtained their information from and what impacts they believe sonar has so stakeholders. It would also be valuable to know how most of the unsure individuals obtain general information in order to try and create strategies for outreach so that they know more about the issue. A majority of respondents also felt that Navy sonar use should be moderated if it impact marine mammals (75.8%). If future research, using more representative sample, finds similar results it would suggest that the public may support mitigation measures to reduce cetacean impact and this information would be very valuable to stakeholders wishing to gain further public support.

Descriptive information about questions 15 is valuable because it provides insight into whether or not the respondents have knowledge about *Winter v. NRDC*. Figure 17 shows percents for question 15.

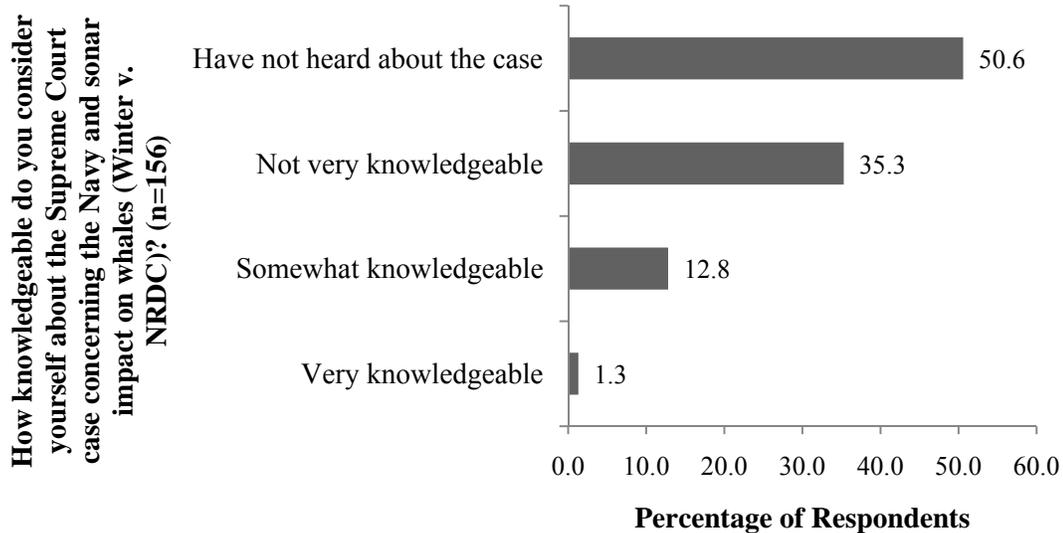


Figure 17. Percentage of respondents by how they responded to question 15: How knowledgeable do you consider yourself about the Supreme Court case concerning the Navy and sonar impact on whales (*Winter v. NRDC*)?

A majority of respondents said that they had not heard about the case *Winter v. NRDC* (50.6%) followed by those who consider themselves not very knowledgeable (35.3%). If similar findings were to be found in a future study, it would suggest that public knowledge about this case is minimal and better dissemination of information would be necessary if stakeholders wish to pursue the public as an avenue for policy change.

Expert Interview Results

A total of 5 experts agreed to be interviewed and provide insight into the potential ramifications of the Supreme Court case *Winter v. NRDC*. Refer to Appendix 2 for the interview questionnaire. The first four questions dealt with general qualifications of the

experts. However, specific information has been left out to protect anonymity of the expert interviewees. The interviewee qualifications have been summarized in table 7 for review.

Table 7: Summary of qualifications of experts

	Job Title	Job Field	Area of Expertise
Expert 1	Associate Attorney	Environmental Law	Public interest environmental litigation
Expert 2	Professor of Law	Environmental Law	Environmental law dealing with water
Expert 3	Senior Scientist, Director	Marine Policy	Environmental statistics and marine policy
Expert 4	Senior Research Specialist	Marine Policy	Economic and marine policy
Expert 5	Program Leader, Protected Resources	Marine Mammal Policy	Marine conservation, cetacean and pinniped biology, surveys and acoustics

Political Ramifications

Questions 5 through 8 on the Interview Questionnaire (Appendix 2) deal with the potential political ramifications of the Supreme Court case. The experts were asked to describe the potential political ramifications of the case. Four out of five experts agreed that the court case will have very little political ramifications in the future. However, some of the ramifications mentioned include the enlargement of presidential authority, prioritizing national security concerns over environmental concerns, and allowing military operations leeway with regards to environmental law compliance. Expert 1 said that he sees presidential authority to prioritize national security over environmental

concerns to be “manipulated much less under the Obama administration than it was under the Bush administrations.” Ultimately, few political ramifications were mentioned by all of the experts.

Experts were asked to consider the political forces that may have influenced the Supreme Court’s decision on the case. The interpretation of the law was suggested by Expert 3 as the major political force influencing the decision. The environmental groups responsible for filing suit were also offered as a major political force; however, not one that necessarily influenced the Supreme Court’s decision. Expert 5 mentioned that the judges voted along party lines indicating that party politics may have influenced the decision. Trying to balance national security interests with environmental protection regulations was the major political force mentioned by three of the experts.

Since military power, state power, and federal power are all significant political factors in the case *Winter v. NRDC*, experts were asked to speculate on how this case will impact the relationship between these forces. Experts gave conflicting opinions regarding military power. Expert 4 said the case will not affect military power in any way and the military will try to minimize the likelihood of future litigation. However, all of the other experts mentioned that the military has been given leeway with regards to environmental regulation compliance ultimately allowing the military grounds to assert dominance. Limitations on checks and balances on military power were noted. Two experts suggested that federal power was exerted over state power.

The political ramifications on environmental NGO influence were an important factor considered by the experts. This question received a wide gamut of responses.

Expert 3 claimed that there was no impact on environmental NGO influence since the case was purely based on interpretation of the law. Expert 1 claimed that NGOs need to more effectively promote the issue in order to gain further public support. Expert 2 believed that the NGOs secured more than most people thought that they would in lower courts and said that “litigation by NGOs has driven a lot of the development of the science regarding active sonar and impact on the oceans” which demonstrates their ability to influence decisions. The case was cited by Expert 5 as a loss for the NGO community.

Legal Ramifications

Questions 9 through 11 on the Interview Questionnaire (Appendix 2) deal with the potential legal ramifications of the Supreme Court case. Experts were asked to predict the legal precedence of the case. According to three experts, this case has a limited impact on legal precedent. Expert 2 said the precedent of the case is narrowly focused on preliminary injunctions and Expert 1 added that it provides limitations on the use of preliminary injunctions when balancing public interests. Expert 2 added that the case is being used to demonstrate that the military, because its primary objective is national security, is special and it is more important than other considerations.

Experts were asked about the impact of the case on environmental law. Four of the experts tended to agree that the case has little impact on environmental law outside of the military; however, the case also confirms the existing precedent that the military does not have to comply with environmental law as stringently as other entities. Expert 1 and Expert 2 mentioned that the case has created more strict standards for using preliminary

injunctions under NEPA so that plaintiffs must establish a high likelihood for irreparable harm rather than previous precedent in which injunctions were granted under the possibility for irreparable harm.

Experts were asked to speculate on the future impact on environmental policies as a whole due to the case. Three experts said that there needs to be recognition by policymakers that the military can successfully challenge environmental policies. As a result, to reduce military challenges, environmental policies need to be crafted in a way that will make it more difficult to accommodate military activity. Expert 2 said that more coherent policy and legal framework needs to be established to deal with military actions that have adverse environmental impacts. With regards to impact on existing policy, experts mentioned procedures tied to NEPA and the MMPA. According to Expert 1, NEPA is very effective, but it is slowly being chipped away at and in order to maintain its integrity in the future, policy needs to be enforced in the way Congress intended it to be when the law was written. It was also suggested that attention needs to be paid more to the permitting process under the MMPA in the future by Expert 4.

Naval Ramifications

Questions 12 through 14 on the Interview Questionnaire deal with the potential naval ramifications of the Supreme Court case. The interviewees were asked to speculate how the court case will impact the Navy's practices. Expert 1 said that the case may not impact the Navy's practices especially since it has difficulty complying with NEPA.

Expert 2, on the other hand, felt that the Navy has learned how to do some of its practices in more environmentally friendly ways due to the litigation but the Supreme Court's decision may end up causing them to take a step back. Three experts agreed that the Navy's time in court has been costly both in money and in time and, as a result, the Navy will try to avoid future cases by mitigating environmental impacts and adhering more closely to policies including NEPA.

Interviewees were asked to discuss how the case may influence the interaction between the military and marine environment. Expert 2 noted that the case sends the message that the Supreme Court will be hesitant to halt any naval practices because of national security interests. Two experts mentioned that only time will show the impacts on the marine environment from naval interactions. Expert 4 said the Navy will continue to use sonar for training out of necessity and hopefully continue to look at ways to minimize impacts on marine mammals. Expert 5 said that we need to remind ourselves that the Navy has come a long way from its old practices and should be given some credit for the changes it has made.

One of the most important questions asked to the experts was whether or not it is possible to reconcile national security efforts with environmental protection. All experts agreed that it is possible to reconcile national security efforts with environmental protection and each gave suggestions as to how this could occur. Expert 4 mentioned the idea of a technological fix to reduce impact by creating other detection strategies for submarines or for marine mammals. Expert 2 said this is not a black and white issue and Expert 3 emphasized that there are competing stakeholders that all need to be taken into

account when decisions based on compromise are made. Expert 1 said that policy is a significant mechanism to balance national security and environmental protection and that current policy needs to be enforced. Expert 2 suggested that Congress take a more proactive approach towards balancing environmental policy with national security policies. The final factor suggested by Expert 5 was by promoting public understanding of environmental issues in general to create more of a sense of value for our natural heritage.

Environmental Ramifications

Questions 15 through 17 on the Interview Questionnaire deal with the potential environmental ramifications of the Supreme Court case. Experts were asked to discuss how the case may impact marine conservation in the future. Four of the five experts agreed that in terms of marine conservation the case will have little impact. Expert 3 said that the case will have a negative impact on marine conservation. Two experts mentioned that individual cetaceans will continue to be negatively impacted due to sonar. Expert 4 called for the need for more research into the impacts of sonar on marine mammals.

The interviewees were also asked about the more general environmental impact of the court case. The results of this question were very similar to those concerning marine conservation. Experts agreed the Navy will continue training and marine mammals will continue to be impacted. It was noted by Expert 4 and Expert 5 that more research still

needs to be done. Expert 1 was concerned about the cascading ecological impacts that could occur due to continual impact which could potentially cause ecosystem collapse.

Experts were asked to speculate what the next step is for scientists and environmental NGOs. Expert 3 and Expert 4 said that more scientific research is needed into the exact impacts of sound and sonar on marine mammals, long term population monitoring and tracking of marine mammals, and more extensive data sharing networks for better research. An important consideration brought up by Expert 4 was that more information is required but this is difficult to obtain without directly exposing marine mammals to these types of sounds which goes against a lot of conservation practices. Experts agreed that environmental NGOs can continue to have influence on policy especially when equipped with more scientific data to bolster further support. Expert 4 suggested that NGOs also continue to meet with scientists to get accurate information on what is known and what still needs to be known to create effective strategies in the future. Expert 5 suggested that NGOs continue to use the courts as an avenue for change and bring attention to procedural violations of the MMPA, ESA, and NEPA. Expert 2 said that public opinion could be an avenue to pressure the Navy to change by requesting new legislation or better implementation of existing policies from Congress.

CHAPTER 11: CONCLUSION

A majority of survey respondents (75.2%) do not believe the Navy should be exempt from marine mammal protection regulations in times of peace. Of survey respondents, people on the conservative end of the political spectrum, Republicans, and those who served in the military were more likely to say that the Navy should be exempt from marine mammal protection regulations in times of peace ($p < .05$). This finding suggests that future studies should include questions that help to distinguish if these demographic factors have a significant relationship with whether or not an individual believes the Navy should be exempt from marine mammal protection regulations using a more representative sample. Understanding which factors influence how people feel regarding Navy exemption is important to stakeholders who wish to gain public support. For example, my study suggests that the Navy has relatively higher support from conservatives, Republicans, and those who have served in the military. If future studies have similar results, it would be beneficial for the Navy to try and recruit support from individuals who do not fall into these categories. On the other hand, environmental NGOs should try and reach out to unsure individuals and those who are conservative, Republican, and have served in the military since these are the people who are more likely to support Navy exemption. All of this would require future study that looks into the reasons why individuals say that the Navy should or shouldn't be exempt. This

includes perceived foreign threat, knowledge of military operations, knowledge of marine mammal impact, etc.

I found that a majority of respondents (51.3%) believe that sonar impacts marine mammals; however I also found most respondents are unsure about how Navy sonar impacts marine mammals. Despite this, a majority of respondents (75.8%) believe that sonar use should be moderated if it does impact marine mammals. If these results represent the general public, it is clear that more information regarding scientific studies needs to be disseminated in a clear and accessible way. Science is often laden with complex procedures and terms which make it difficult for people to understand and it can be very discouraging. When asked how knowledgeable respondents were about the case *Winter v. NRDC*, a majority (50.6%) have not heard about the case. Only a very small percentage of my sample (1.3%) considered themselves very knowledgeable about the case. This suggests that if the results of this study are validated by future studies, the public is highly unaware of this legal battle and an uninformed public does not promote policy change.

The experts were able to provide many intriguing responses to the possible political, legal, environmental, and naval ramifications of the Supreme Court case *Winter v. NRDC*. The political ramifications of the case were considered to be limited other than deference to the military and federal government concerning policy decisions. With regards to the legal ramifications, the case was seen to have narrow implications due to its focus primarily on military operations. However, it may prove to limit future use of preliminary injunctions under NEPA and lead to the requirement of more strict conditions

for proving irreparable harm. NEPA was specifically focused on by a few experts who said that it is an effective piece of legislation when used as intended. With regards to naval ramifications it was suggested that the Navy will likely be more willing to actively engage in mitigation measures to reduce time in the courts. If this proves true, it would be a success for environmental NGOs. Experts felt that marine mammals will continue to be impacted by military sonar in the future. Experts were also asked if it is possible to reconcile national security concerns with environmental protection and all were optimistic. It was suggested that more scientific research into the impact of military sonar and ocean noise in general is absolutely imperative.

Ultimately, it is important to open channels of communication between scientists, environmental NGOs, the military, policy makers, and the public regarding the impact of sonar on cetaceans and its relationship with military preparedness. This should include communication about the case *Winter v. NRDC*. Increasing public knowledge around this issue will allow for the public to become more engaged in the policy process and also future court cases surrounding this issue. As a major source of policy change, the public does have the ability to promote change. Future research should also look into attitudes towards this issue before and after individuals are educated about the issue. This will allow for this conflict to be reduced, the better implementation of existing policy, and the creation of more sound policies in the future.

APPENDIX I

Survey of Fairfax County Resident Attitudes

This survey is being conducted by Dr. Peter Balint and Kylie Zirbel at George Mason University to be used towards the completion of a Master's degree. Dr. Balint may be reached at 703.993.1404 and Kylie may be reached at 585.217.6848 for questions or to report a research-related problem. You may contact the George Mason University Office of Research Subject Protections at 703-993-4121 if you have questions or comments regarding your rights as a participant in the research. Your participation is completely voluntary. There are no direct benefits for participating. All responses are completely confidential and you may stop answering at any point.

For the following questions please check **ONE** response that best indicates your viewpoint unless the question indicates otherwise. Please note that all questions pertain to times of peace.

1. From your point of view, please rank the following in order of importance on a scale from 1 to 6, with 1 being the most important and 6 being the least important:
 - The economy
 - Healthcare
 - National security
 - Education
 - The environment
 - Taxes
2. Should the Navy be exempt from marine mammal protection regulations in times of peace?
 - Yes
 - No
 - Unsure
3. Within the past year have you participated in any of the following ocean activities? (Please check all that apply)
 - Swimming
 - Visiting beaches or the coast
 - Sailing or boating
 - Fishing
 - Surfing / windsurfing
 - Diving / snorkeling
 - Whale watching
 - Other _____ (please specify)
4. How important is conservation of marine mammals to you personally?

- Very important
 - Important
 - Not important
 - Unsure
5. Should the United States protect marine mammals using laws and regulations?
- Yes
 - Not Sure
 - No
6. How effective do you think policy has been in protecting marine mammals?
- Effective
 - Somewhat effective
 - Ineffective
 - Unsure
7. Which policy do you believe is the most effective in promoting conservation of marine mammals?
- Coastal Zone Management Act
 - Marine Mammal Protection Act
 - Endangered Species Act
 - National Environmental Policy Act
 - Nothing has been effective
 - Unsure
8. Do you believe Navy sonar impacts marine mammals?
- No
 - Yes
 - Unsure
9. How does Navy sonar impact marine mammals?
- Is beneficial
 - Causes harm
 - No impact
 - Unsure
10. If Navy sonar does impact marine mammals, what should be done?
- Nothing should be done
 - Sonar use should be completely stopped
 - Sonar use should be moderated
11. Who is responsible for decisions about use of Navy sonar?
- The President
 - Congress
 - The Supreme Court
 - The Navy
 - The public
 - Unsure
12. How important is national security to you personally?
- Very important

- Important
 - Not important
 - Unsure
13. How effective do you think the use of Navy sonar is in promoting national security?
- Effective
 - Somewhat effective
 - Ineffective
 - Unsure
14. What level of threat are foreign submarines to U.S. national security?
- High
 - Moderate
 - Low
 - No threat
 - Unsure
15. How knowledgeable do you consider yourself about the Supreme Court case concerning the Navy and sonar impact on whales (*Winter v. NRDC*)?
- Very knowledgeable
 - Somewhat knowledgeable
 - Not very knowledgeable
 - Have not heard about the case
16. What impact on marine mammals do you believe the Supreme Court decision supporting use of sonar will have?
- Positive impact
 - No impact
 - Negative impact
 - Unsure
17. Do you believe the Supreme Court made the correct decision by supporting the Navy?
- Yes
 - No
 - Unsure
18. What factors do you believe affected the Supreme Court's decision making process? (please select all that apply)
- National security
 - Impact on marine mammals
 - Lower court decisions
 - Scientific opinion
 - Political ideology of Justices
 - Interpretation of the law
19. Politically, would you consider yourself to be:
- Very Conservative
 - Conservative

- Moderate
 - Liberal
 - Very Liberal
 - Other
20. Politically, would you consider yourself to be:
- Democrat
 - Republican
 - Independent
 - Other
21. In what year were you born? _____
22. What race/ethnicity do you consider yourself?
- White
 - Black or African American
 - Asian
 - American Indian or Alaska Native
 - Native Hawaiian or Pacific Islander
 - Other _____
 - Prefer not to answer
23. Which of the following is your highest level of education?
- Less than high school
 - High school / GED
 - Some college
 - 2-Year Associates degree
 - Bachelor's degree
 - Master's degree
 - Doctoral degree
 - Professional degree (MD, JD)
24. Have you served in the military?
- Yes
 - No
25. If yes, what branch? _____
26. If you served, when did you serve? _____
27. Are you a member of an environmental group?
28. If yes, please identify the group. _____

APPENDIX II

Expert Interview Questions:

Initial Questions

1. Job title:
2. Agency:
3. What is your field?
4. What is your area of expertise?

Political Ramifications

5. What are the potential political ramifications of the Supreme Court's decision in *Winter v. NRDC*?
6. What political forces have influenced this decision?
7. What does this case mean in terms of military power, state power, and federal power?
8. What does this case mean in terms of environmental NGO influence?

Legal Ramifications

9. What legal precedence does the case *Winter v. NRDC* set forth?
10. What are the legal ramifications of the Supreme Court's decision and how will this impact environmental law?
11. What are the ramifications in terms of environmental policy and how effective these laws are?

Naval Ramifications

12. How does the case *Winter v. NRDC* impact the Navy's practices?
13. How does this case influence the way the Navy interacts with the marine environment?
14. Is it possible to reconcile national security efforts with environmental protection and what are ways in which this can be done?

Environmental Ramifications

15. What does the case *Winter v. NRDC* mean in terms of marine conservation?
16. What are the environmental ramifications of the decision?
17. What is the next step for scientists and environmental NGOs?

REFERENCES

REFERENCES

- Administrative Procedure Act of 1946, 5 U.S.C. 500 et seq.
- Australians for Animals v. Evans*, 301 F. Supp. 2d 1114 (N.D. Cal., 2004).
- Balcomb, K. and D. Claridge. (2001). A mass stranding of cetaceans caused by naval sonar in the Bahamas. *Bahamas Journal of Science*. 2: 2-12.
- Bowles, A.E., M. Smultea, B. Wursig, P. DeMaster, and D. Plaka. (1994). Abundance of marine mammals exposed to transmissions from Heard Island Feasibility Test. *Journal of the Acoustical Society of America*. 96: 2469-2484.
- Buck, E. and K. Calvert. (2007). Active military sonar and marine mammals: events and references. *Congressional Research Service*. Order Code RL 33133.
- Burstein, P. (2003). The impact of public opinion on public policy: A review and an agenda. *Political Research Quarterly*. 56(1): 29-40.
- Cetacean Community v. Bush*, 386 F. 3d 1206 (D. Haw., 2003), 386 F. 3d 1169 (9th Cir., 2004).
- Clark, C.W. and N.S. Altman. (2006). Acoustic detections of blue whale (*Balaenoptera musculus*) and fin whale (*B. physalus*) sounds during a SURTASS LFA exercise. *Journal of Oceanic Engineering*. 31(1): 120-128.
- Cochran, W.G. (1954). Some methods for strengthening the common χ^2 test. *Biometrics*. 10(4): 417-451.
- Craig, R.K. (2009). Beyond *Winter v. NRDC*: A decade of litigating the Navy's active sonar around the environmental exemptions. *Boston College Environmental Affairs Law Review*. 36: 353-378.
- Croll, D.A., C.W. Clark, J. Calambokidis, W.T. Ellison, and B.R. Tershy. (2001). Effect of anthropogenic low-frequency noise on the foraging ecology of *Balaenoptera* whales. *Animal Conservation*. 4: 13-27.

Coastal Zone Management Act of 1972, 16 U.S.C. 1451-1456.

Convention for the protection of the marine environment of the North-East Atlantic (OSPAR) Commission. (2009). *Overview of the impacts of anthropogenic underwater sound in the marine environment*. (ISBN 978-1-906840-81-5 Publication Number: 441/2009) Retrieved February 1, 2010, from http://www.ospar.org/documents%5Cdbase%5Cpublications%5Cp00441_Noise%20Background%20document.pdf

Cox, T.M., T.J. Ragen, A.J. Read, E. Vos, R.W. Baird, K. Balcomb, J. Barlow, J. Caldwell, T. Cranford, L. Crum, A. D'Amico, G. D'Spain, A. Fernandez, J. Finneran, R. Gentry, W. Gerth, F. Gulland, J. Hildebrand, D. Houser, T. Hullar, P.D. Jepson, D. Ketten, C.D. MacLeod, P. Miller, S. Moore, D.C. Mountain, D. Palka, P. Ponganis, S. Rommel, T. Rowles, B. Taylor, P. Tyack, D. Wartzok, R. Gisiner, J. Mead, and L. Benner. (2006). Understanding the impacts of anthropogenic sound on beaked whales. *Journal of Cetacean Research and Management*. 7(3): 177-187.

Di Mento, J.M. (2006). Beyond the water's edge: United States national security & the ocean environment. (Doctoral dissertation, Fletcher School of Law and Diplomacy, 2006).

Endangered Species Act of 1973, 7 U.S.C. 1531 et seq.

Eubanks, W.S. (2009). Damage done? The status of NEPA after *Winter v. NRDC* and answers to lingering questions left open by the court. *Vermont Law Review*. 33: 649-670.

Fernandez, A. M. Arbelo, P. Castro, A. Espinosa, F. Rodriguez, P. Herraiez, and J.R. Jaber. (2005). Gas and fat embolic syndrome involving a mass stranding of beaked whales (Family Ziphiidae) exposed to anthropogenic sonar signals. *Veterinarian Pathology*. 42: 446-457.

Fur Seal Act of 1966, 16 U.S.C. 1151-1187.

Hatch, L.T. and A.J. Wright. (2007). A brief review of anthropogenic sound in the oceans. *International Journal of Comparative Psychology*. 20: 121-133.

Hawaii County Green Party v. Clinton. 124 F.Supp.2d 1173 (D. Hawai'i, 2000).

Heisler, R. (2003). A whale of a tale: NRDC v. U.S. Navy and the attempt to exempt the exclusive economic zone from the National Environmental Policy Act. *Southwestern Journal of Law and Trade in the Americas*. 10: 125-170.

- Hohn, A.A., D.S. Rotstein, C.A. Harms, and B.L. Southall. (2006). *Report on marine mammal unusual mortality event UMESE0501Sp: Multispecies mass stranding of pilot whales (Globicephala macrorhynchus), minke whale (Balaenoptera acutorostrata), and dwarf sperm whales (Kogia sima) in North Carolina on 15-16 January 2005*. (NOAA Technical Memorandum NMFS-SEFSC-537). Retrieved January 15, 2009, from <http://www.nmfs.noaa.gov/pr/pdfs/health/umese0501sp.pdf>
- Howard, C. and E.C.M. Parsons. (2006). Attitudes of Scottish city inhabitants to cetacean conservation. *Biodiversity and Conservation*. 15: 4335- 4356
- Jepson, P.D., M.Arbelo, R. Deaville, I. A.P. Patterson, P. Castro, J.R. Baker, E. Degollada, H.M. Ross, P. Herráez, A. M. Pocknell, F. Rodríguez, F.E.Howie, A. Espinosa, R. J. Reid, J. R. Jaber, V.Martin, A.A. Cunningham, and A. Fernández. (2003). Gas-bubble lesions in stranded cetaceans: Was sonar responsible for a spate of whale deaths after an Atlantic military exercise?. *Nature*. 425: 575.
- Jepson, P.D., R. Deaville, I.A.P. Patterson, A.M. Pocknell, H.M. Ross, J.R. Baker, F.E. Howie, R.J. Reid, A. Colloff, and A.A. Cunningham. (2005). Acute and chronic gas bubble lesions in cetaceans stranded in the United Kingdom. *Veterinarian Pathology*. 42: 291-305.
- Kanoa Inc., v. Clinton*. 1 F. Supp. 2d 1088 (D. Hawai'i, 1998)
- Lautenschlager, Karl. (1987). The submarine in naval warfare, 1901-2001. *International Security*. 11(3): 94-140.
- Lubchenco, J. (2010) Letter from NOAA Administrator to the U.S. Council on Environmental Quality, Jan 19th, 2010. Retrieved March 31, 2010, from http://www.nmfs.noaa.gov/pr/pdfs/permits/lubchenco_letter.pdf
- Malakoff, D. (2001) A roaring debate over ocean noise. *Science*. 291(5504): 576-578.
- Marine Mammal Protection Act of 1972, 16 U.S.C. 1361 et seq.
- Magnuson-Stevens Fishery Conservation and Management Act of 1976, 16 U.S.C. 1801-1882.
- Maybaum, H. (1993). Responses of the humpback whales to sonar sounds. *Journal of the Acoustical Society of America*. 94(3): 1848-1849.
- Miller, P.J.O., N. Biassoni, A. Samuels, and P.L. Tyack. (2000). Whale songs lengthen in response to sonar. *Nature*. 405: 903.

- National Environmental Policy Act of 1969, 42 U.S.C. 4332-4347.
- National Marine Sanctuaries Act of 1972, 16 U.S.C. 1431 et seq.
- National Research Council, Ocean Studies Board. (2003). *Ocean Noise and Marine Mammals*. Washington D.C.: National Academies Press.
- Natural Resources Defense Council v. Evans*. 232 F. Supp. 2d 1003 (N.D. Cal., 2002), 232 F. Supp. 2d 1129 (N.D. Cal., 2003).
- Natural Resources Defense Council v. Gutierrez*. Civ. Action No. 07-04771, 2008 WL 60852 (N.D. Cal., 2008).
- Natural Resources Defense Council v. U.S. Department of the Navy*. No. CV-01-07781 CAS (RZX), 2002 WL 32095131 (C.D. Cal., 2002).
- Natural Resources Defense Council v. National Marine Fisheries Service*. 409 F. Supp. 2d 379 (S.D. N.Y., 2006).
- Natural Resources Defense Council v. Winter*, No. 8:07-cv-00335-FMC-FMOx, 2007 WL 2481037 (C.D. Cal., 2007), 502 F. 3d 859 (9th Cir. 2007), 508 F. 3d 885 (9th Cir. 2007), 530 F. Supp. 2d 1110 (C.D. Cal., 2008), 513 F. 3d 920 (9th Cir., 2008), 527 F. Supp. 2d 1216 (C.D. Cal, 2008), 516 F. 3d 1103 (9th Cir., 2008), 518 F. 3d 658 (9th Cir., 2008), 518 F. 3d 704 (9th Cir., 2008), No. 07-1239, 2008 WL 859374 (2008), 128 S. Ct, 2964 (2008).
- Nordlund, N. and F. Benders. (2008). *SONATE 3.0- a decision aid system to mitigate the impact of sonar operations in Norwegian water on marine life*. Retrieved January 15, 2009, from <http://rapporter.ffi.no/rapporter/2008/01414.pdf>
- Norman, S.A., S. Raverty, B. McLellan, A. Pabst, D. Ketten, M. Fleetwood, J.K. Gaydos, B. Norberg, L. Barre, T. Cox, B. Hanson and S. Jeffries. (2004). *Multidisciplinary investigation of stranded harbor porpoises (Phocoena phocoena) in Washington State with an assessment of acoustic trauma as a contributory factor (2 May – 2 June 2003)*. (NMFS Tech. Memo. NMFS-NWR-34). Seattle, WA: National Marine Fisheries Service. Retrieved May 20, 2009 from, http://www.nwr.noaa.gov/mmammals/cetaceans/porpoise_final.pdf
- Ocean Mammal Institute v. Cohen*. No. 98-CV-160, 1998 WL 2017631 (D. Hawai'i, 1998), 164 F.3d 631 (9th Circuit)

- Ocean Mammal Institute v. Gates*. 546 F. Supp. 2d 960 (D. Hawai'i, 2008), 2008 WL 2020406 (D. Hawai'i, 2008), 208 WL 2185180 (D. Hawai'i, 2008).
- Parsons, E.C.M., S.J. Dolman, A.J. Wright, N.A. Rose and W.C.G. Burns. (2008). Navy sonar and cetaceans: Just how much does the gun need to smoke before we act? *Marine Pollution Bulletin*. 56: 1248-1257.
- Rendell, L.E. and J.C.D. Gordon. (1999). Vocal response of long-finned pilot whales (*Globicephala melas*) to military sonar in the Ligurian Sea. *Marine Mammal Science*. 15(1): 198-204.
- Richardson, W., C. Greene Jr, C. Malme, and D. Thomson. (1995). *Marine Mammals and Noise*. San Diego: Academic Press.
- Schaffner, A. (2008). National security vs. whales: The Navy and the Natural Resources Defense Counsel battle their way to the Supreme Court. *Sea Grant Law and Policy Journal*. 1(2): 82-96.
- Scott, K. (2004). International regulation of undersea noise. *International and Law Quarterly*. 53(2): 287-324.
- Scott, N.J. and E.C.M. Parsons. (2004). A survey of public awareness of the occurrence and diversity of cetaceans in south-west Scotland. *Marine Biology Annuals*. 84: 1101-1104.
- Simmonds, M.P., and L.F. Lopez-Jurado. (1991). Whales and the military. *Nature*. 351: 448.
- Spruill, V.N. (1997). U.S. public attitudes toward marine environmental issues. *Oceanography*. 10(3): 149-152.
- Wallace, M.D. and C.A. Meconis. (1995). Submarine proliferation and regional conflict. *Journal of Peace Research* 32(1): 79-95.
- Wang, J.Y., S.C. Yang. (2006). Unusual cetacean stranding events of Taiwan in 2004 and 2005. *Journal of Cetacean Research and Management*. 8:283-292.
- Watkins, W.A., K.E. Moore, and P. Tyack. (1985). Sperm whale acoustic behaviors in the southeast Caribbean. *Cetology*. 49: 1-15.
- Watkins, W.A, M. Daher, K.M. Fristrup, T.J. Howald and G. Notarbartolo di Sciara. (1993). Sperm whales tagged with transponders and tracked underwater by sonar. *Marine Mammal Science*. 9(1): 55-67.

Weilgart, L.S. (2007). A brief review of known effects of noise on marine mammals. *International Journal of Comparative Psychology*. 20: 159-168.

Whitt, L. and K. Wilk. (1983). Antisubmarine Warfare: Passive vs. Active Sonar. *The Two-Year College Mathematics Journal*. 14(5): 434-435

Winter v. Natural Resources Defense Council. 129 S. Ct. 365 (2008).

Zapponi, L and K.P Robinson (2007). Social attitudes to marine conservation in NE Scotland: public perceptions and cetaceans in the Moray Firth. (As presented at the 21st Annual Conference of the European Cetacean Society. San Sebastian, Spain. April 22-25, 2007). Retrieved March 15, 2010, from http://www.crru.org.uk/cust_images/pdfs/zapponi_robinson_ECS2007.pdf

CURRICULUM VITAE

Kylie E. Zirbel received her B.S. in Biology with Integral Honors from Le Moyne College in 2007.