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The Conservation Project: An Exploration of Multimedia in Ocean Conservation

Ilaria Bardini

University of Maine - Main, ilaria.bardini@maine.edu

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THE CONSERVATION PROJECT
AN EXPLORATION OF MULTIMEDIA IN OCEAN CONSERVATION

by

Ilaria Bardini

A Thesis Submitted in Partial Fulfillment
of the Requirements for a Degree with Honors
(Marine Science)

The Honors College

University of Maine

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Advisory Committee:

Michael Grillo, Associate Professor of Art, Advisor

Ian Bricknell, Professor of Aquaculture

Ellie Markovitch, Lecturer in the school of Communication and Journalism

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ABSTRACT

The Conservation Project ties in many elements of multimedia and its possible applications in marine conservation. The purpose of this thesis was to develop new skills in videography, photography, podcast production, and website development through which to deepen my understanding of the multimedia as a tool in science. Through the development of a website

DEDICATION

Dedicated to Lisa Hutchings for her constant support, infectious enthusiasm, and showing me that there is still space to be silly in science. Thank you for creating the space for my love for the ocean to flourish.

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A wholehearted thank you to everyone who helped and supported me through this project. This would not have been possible without the conservationists and biologists who agreed to be interviewed, on camera, and extensively answered all my questions. Thank you to Dr. Daniel Gibson at WPI for engaging in many questions regarding horseshoe crab neurology and touring me through saltmarshes looking for baby horseshoe crabs. Thank you for Dr. Brenda Boleyn for allowing me to interview her about horseshoe crab conservation. Thank you to Dr. Deborah Tobin from UAA for helping me with the beluga whale eDNA research project. Thank you, Dr. Olga Von Ziegesar for hosting my Winged Whale Research Internship for which I did a lot of marine conservation work.

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Lastly, thank you to my family who have always encouraged me to pursue my love for marine science and the ocean. I would not be here for you pushing me to be my absolute best.

FOREWORD

Do we ever leave a self behind?

I often ponder this question, marveling at how horseshoe crabs can molt a version of themselves away. As I move from one part of life to another; graduating college, going on to grad school, or moving from Maine to Alaska, I hope that I leave aspects of myself whenever I once was. What's hard to control is which parts are left, which little shadows in the corners of the campus buildings I used to walk will stick in between the books in Fogler Library or linger on the flower petals in Littlefield Garden. How can we leave places physically while maintaining a sense of connection? My wish is for this creative thesis, "The Conservation Project", to be one silhouette I leave at the University of Maine. It culminates the passions that have been intensified or gained through my undergraduate regarding marine conservation, tracing my experiences and pursuit of my passions through a creative lens. This disquisition will outline and discuss the trials, tribulations, and success of exploring the use of multimedia in marine conservation.

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INTRODUCTION

The use of multimedia in the world of marine conservation has become an increasingly powerful tool. It can shift perceptions and create emotional connections across diverse audiences.

Many of the pieces of media that have been the most influential to how I understand myself and interact with the world around me, are ones I was exposed to at a younger age and then later, during my undergraduate, reconnected with again. *Sonic Sea* is one such example. It was a documentary that had a profound impact on the solidification of my decision to pursue a career in marine conservation and policy. It instilled a deeply rooted intent to protect the ocean that had, in many ways, acted as my first natural science classroom.

The award-winning documentary spoke beautifully and passionately to the extent of noise pollution in today's oceans, illustrating the devastating impacts on the large marine mammals that inhabit the water column. I remember my 15-year-old self with the strongest sense of embarrassment of the damage humans have done to our natural spaces. I had previously been completely unaware that noise pollution existed and the ways in which it has hastening even the most strong and intelligent cetaceans to extinction. I left that theater with a pit in my stomach and a newfound determination to help protect the oceans and the animals that live there.

I decided to focus my undergraduate capstone and thesis on marine conservation, specifically investigating the way in which I engage with and create media as a marine scientist and artist in the format of a website. Many of the projects I engaged in including videography, photography, and podcasts were a kind of medias I had very little or no

previous experience in before beginning this project. This created the space and time I needed to embrace the idea of imperfections and the new. ‘The Conservation Project’ is a documentation of my experience creating these different kinds of media, the trials and tribulations of each, the things I learned as a scientist and artist, and the diversity if people I met and connected with throughout the process.

I decided to focus on two subjects for the project: Atlantic horseshoe crabs (*Limulus polyphemus*) and cetaceans, primarily beluga whales (*Delphinapterus leucas*).

DISQUISITION

BACKGROUND

Limulus polyphemus

I bent down to examine the forlorn puddle that had managed to form in all its grimy glory in the middle of a positively concave road, almost as if it was purposefully defying the laws of gravity. A gentle movement caught my eye. In the midst of that body of fresh rainwater were marine organisms that dreadfully required salinity and had since before the breaking of Pangea. It was time for my marine science enthused self to jump into action. I scooped up mud and tiny horseshoe crabs with the fervency only ten-year-old rescuing bedraggled arthropods could have. The tops of the surrounding phragmites swayed, taunting me as I desperately searched for an ocean amidst all that marsh. Finally, once knee deep in peat, past the usefulness of my bogs, I found an oasis of nutrient dense salt water. Just as they had shown themselves, my armored friends disappeared into the silt.

My obsession with *Limulus polyphemus*, Atlantic horseshoe crabs, at such a young age translated into an interest in their hidden role in our society and their conservation. Horseshoe crabs (HSC) are a clear example that nature plays an irreplaceable role in our lives. HSC blood is readily used in the biomedical industry for the testing of injectables, including the COVID-19 vaccine. Other anthropogenic uses of horseshoe crabs include their role as bait in the eel and conch fisheries which has led to a decrease in HSC populations. This has adversely impacted the health of migrating shorebirds including red knots (*Calidris canutus*) who rely on HSC eggs that are buried

along the sandy beaches of Delaware Bay. Feeding on these nutrient rich eggs fuels the last leg of the migration of these birds from the southernmost tip of South America, Tierra del Fuego to the Arctic. Due to anthropogenic activities, HSC populations and, consequently, HSC egg density has drastically decreased, greatly impacting the health of red knots as well a myriad of other coastal marine organisms and the ecosystem.

My thesis began with the plan to focus solely on HSC conservation through the medium of film which began in January of 2023. This morphed into an interest to explore more than just one method of scientific communication for this specific subject matter of HSC conservation, leading to the development of a podcast, supplemental educational resources such as science-based coloring pages, and a short documentary which will be finished in the Fall of 2024.

Delphinapterus leucas

I first heard about the Cook Inlet belugas when I came to Homer, Alaska for a program in Conservation Ecology. There are five distinct populations in Alaska, the Cook Inlet being the most endangered with only 331 individuals remaining as per most recent counts from the National Oceanic and Atmospheric Administration (NOAA). I was so interested in the conservation of this threatened populations of belugas that I decided to focus on a conservation project which tied in multimedia as well as researching the use of environmental DNA, eDNA. eDNA is the biological material I specifically researched the way in which eDNA can be used to detect the presence of beluga whales in the Kenai River in Kenai, AK, where the Cook Inlet beluga population often frequents. I spent the semester collecting water samples, filtering those samples, and preparing for genetic analysis. The hope is that the results from the genetic analysis can be paired with

observational data to help offer insights for future management decisions and conservation efforts regarding this specific populations as well as others. I volunteered with NOAA's Alaska Beluga Monitoring Program to conduct two-hour monitoring sessions on the Kenai River. During these sessions, in addition to taking photographs for individual beluga ID and collecting data regarding numbers and behaviors, I conducted several interviews with long-term volunteers. These interviews were used to create a podcast highlighting the Cook Inlet beluga population and the work that is being done to protect them.

Winged Whale Research. For the last several months, I had the opportunity to work as an intern for Winged Whale Research (WWR) which is a non-profit that specialized in cetacean research in Prince William Sound and surrounding waters under a federal NOAA permit. My work with them was primary focused on multimedia and outreach in order to promote awareness for boat strikes in Kachemak Bay in Homer, Alaska. I spoke with fishermen, Homer locals, and hosted a film forum to test out different strategies for varied audiences regarding whale conservation.

PROJECT STATEMENT OF PURPOSE

The purpose of this creative thesis was to explore how we can use multimedia in ocean conservation through the development of a website and project called The Conservation Project. I wanted to create a digital space for myself, and others interested in protecting our oceans. This project was meant to allow me to further develop and engage in new scientific communication multimedia, techniques and styles that I had not little to no previous experience in with the intention to document both experience in a way that could inspire others to do the same.

LITERATURE/MEDIA REVIEW

The Overview

This creative thesis was greatly inspired by the different medias I have been exposed to throughout my life, especially during my undergraduate. For this project I wanted to dive into why certain podcasts, books, photographs, and films about natural spaces impacted my attitude towards protecting the ocean. What made them successful? Which techniques were used to inspire diverse audiences? These were questions I investigated before diving into creating my own forms of media and developing a website. In addition to drawing inspiration from media I stumbled upon or read in my Honors Civilizations courses, I also did significant research on literature regarding *Limulus polyphemus* biology, ecology, and anthropogenic uses. This literature review will dive into a literature review of horseshoe crabs and a media review.

Horseshoe Crab Literature Review

There are four extant species of horseshoe crabs (HSC), Limulidae, around the world (FWS). The American horseshoe crab, *Limulus polyphemus*, is the only species of horseshoe crab that lives from the eastern continental shelf of North America to the Gulf of Mexico (Sekiguchi et al., 2009). The three other species inhabit the waters of India, China, and Japan (Vestbo et al., 2018). The three other species are *Carcinoscorpius rotundicauda*, otherwise known as the mangrove horseshoe crab, *Tachypleus gigas*, otherwise known as the Indo-Pacific horseshoe crab, and the *Tachypleus tridentatus*, also known as the Chinese horseshoe crab (Akbar et al., 2018).

HSC have remained almost completely evolutionary unchanged for over 200 million years with fossil records dating back to 450 million years ago (Smith et al., 2016).

Historically used commercially in the eel and conch fishing industry as bait, they have also been used in the biomedical industry due the unique properties and capabilities of their blood. In addition, HSC are vitally important to migrating shore bird populations (Niles et al., 2009).

Due to their anthropogenic uses in combination with environmental stressors, HSCs populations are declining. By determining the myriad of anthropogenic impacts on the four current horseshoe crab species, scientists are identifying ways to address, preserve, and rehabilitate horseshoe crab populations in Asia, the Gulf of Maine, and the Gulf of Mexico.

There is a strong ecological relationship between horseshoe crabs and migrating shorebirds (DNRSC). An example is of *L. polyphemus* which has the largest population in Delaware Bay (DNRSC). When horseshoe crabs lay their eggs in May and June, adults migrate onshore and lay their eggs in the sand, at the same time uncovering existing HSC nests which are eaten by shorebirds (DNRSC). One shorebird of particular scientific interest is the red knot, *Calidris canutus rufa*, which congregates along the beaches of Delaware bay on the Northward migration to replenish their fat supply (Niles et al., 2009). Due to horseshoe crab egg historical harvest for the minnow and eel bait industry and then later for the conch industry, researchers found that peak counts of red knots between 2003 and 2009 were 66% less than compared to previous counts between 1998 and 2002 (Niles et al., 2009). Red knots are not the only shorebirds that rely on HSC eggs. Similar research on migrating sandpipers in Delaware Bay show that their populations are also negatively impacted by the decline in HSC egg availability (Mizrahi et al., 2009). According to research done in New Jersey through the New Jersey Audubon

Society, egg density counts dramatically decreased from the 1990's to the early 2000's (Mizrahi et al., 2009). Average counts in the early 1990's was about 40,000 eggs m⁻² (Niles et al., 2007) to about 3,000-4,000 m⁻² in 2007 (Kalasz et al., 2007). This dramatic decrease is likely linked to the harvesting of Horseshoe crabs for the commercial bait industry (Mizrahi et al., 2009). Other possible variables include temperature, salinity, moisture, and oxygen which greatly impact HSC egg development (Smith et al., 2017). The negative impacts these declines are having on migratory shorebirds is evident. The long-term implications this may have on ecosystem dynamics is widely unknown, raising questions regarding how ecological relationships within coastal and estuarine environments may change in relation to HSC abundance (Bottom, 2009).

During the 1990's, there was a dramatic increase in the demand for Horseshoe crab harvesting for bait in order to accommodate the expanding whelk and American eel, *Anguilla rostrata*, fisheries (Mizrahi et al., 2009). Because both these industries targeted mostly female horseshoe crabs with an average of 2 million crabs landed annually in the early 2000's, this led to a dramatic decrease in HSC egg availability (ASMFC 2004).

Horseshoe crabs are used readily in the biomedical industry for a variety of applications due to the nature of their blood (van Holde and Miller, 1995). Their blood, blue in coloration due to the presence of the copper-based pigment hemocyanin (MDNR), runs through their open circulatory system. Due to the presence of granular amebocytes, HSC have been able to survive for over 450 million years because of their "innate immunity" (Krisfalusi-Gannon et al., 2019). When these amebocytes encounter certain endotoxins or BDG, a polysaccharide found in the cell walls of most fungi, an immune response occurs that consists of clotting and neutralizing the detected pathogens to

prevent infection (Krisfalusi-Gannon et al., 2019). This test is known as *Limulus* Amebocyte Lysate, or LAL (Novitsky, 2009). Similar tests exist for several of the other species of HSC in Asia but under different names. This visible reaction to endotoxins has increased the demand for HSC blood within the biomedical industry for testing drug and medical device safety (Novitsky, 2009). Live horseshoe crabs are collected and go through a biomedical bleeding process for blood collection where an individual can lose up to 30% of their blood (Hurton, 2004). The research by Hurton looked at potential harm of bleeding including stressors such as handling, changes in temperature, air exposure, blood loss, and overall trauma instead of identifying a mortality rate. Current data from 2020 from the Atlantic States Marine Fisheries Commission estimates that short-term bleeding-induced mortality was about 15%, accounting for roughly 78,750 HSC deaths annually (ASMFC, 2020). These deaths are not insignificant. There is a push to create and approve a synthetic substitute for LAL and other HSC blood required testing which may help stable HSC populations (Maloney et al., 2018).

The implementation of official HSC conservation efforts in the United States is fairly recent. In 2005, scientists and conservationists created a committee and hosted the first International Symposium on the Science and Conservation of Horseshoe Crabs (ISSCHC). A few years earlier in 1995, the Ecological Research and Development Group (ERDG) was formed to promote conservation of the world's four species of HSC (Gauvry, 2009). With an emphasis on community-based conservation, the ERDG created The Horseshoe Crab Conservation Network which has classroom and educational tools and a variety of information on their website, the premise of which is to spark interest and fascination of HSC to promote conservation efforts (Gauvry, 2009).

Horseshoe crabs in Asian countries are harder to manage because specific details regarding the extent of their range is still unknown (World Conservation Monitoring Centre, 1996). Asian countries are noticing much greater shifts in HSC populations with their three species than with *Limulus* in the United States. Researchers in Taiwan proposed to establish several protected areas specifically for HSC, with fishing of these arthropods banned for a period of five years (Chen et al., 2004). Education has been pushed heavily within Taiwan and Japan as well including symposiums, workshops, television programs, and implementation of HSC related conservation material within school curriculums (Chen et al., 2004). These greatly increased overall public awareness and positive attitudes towards HSC within the community (Chen et al., 2004).

Beluga Whale Literature Review. The extent of the impacts of climate change are vastly unknown and many terrestrial and marine organisms are struggling due to the stressors of their altered environments. The critically endangered Cook Inlet beluga whale, *Delphinapterus leucas*, is one such example. Anthropogenic activities such as commercial fishing, noise and chemical pollution, and energy development is greatly impacting the health and distribution of beluga populations (NOAA). Climate change is also causing erratic and unpredictable extreme weather events which has additional ramifications on marine ecosystems. These changes and disruptions lead to altered foraging behavior, migratory shifts, and population depletions which can have drastic impacts across trophic levels. Traditionally, belugas have been the subject for subsistence harvesting by Alaska Natives which is currently being monitored to aid in conservation and management efforts (NOAA). Many indigenous communities have decided to pause subsistence harvesting of belugas in order to help revitalize the populations.

There are five distinct populations of Beluga whales in Alaska. The Cook Inlet Beluga population, the subject of this research, is on the endangered species list. As per recent counts, there are about 331 individuals left in this specific population (NOAA). This number was determined through aerial surveys conducted by NOAA fisheries.

As technology advances, new methods of accurately and effectively using innovations in the world of conservation biology and ecology are developed. One such tool is environmental DNA, eDNA. This is the organic material shed by organisms into their aquatic and terrestrial surroundings. This aids in the assessment and understanding of species distribution and biodiversity research (Ficetola et al., 2008). Instead of having to observe organisms in their natural habitat, eDNA allows for a less invasive method of detection and identification (Foote et al., 2012).

CREATIVE PROCESS

Planning Process and Project Description

I began the project by researching the pre-existing literature on horseshoe crab biology, ecology, and role in the biomedical industry. While combing through papers, I came across researchers who had done extensive work on these subjects that lived with New England and reached out to them, hoping for a response. I began this process in January of 2023, not getting very many responses. I was finally put in contact with Dr. Daniel Gibson from WPI who has done extensive research on horseshoe crab neurology and was willing to have several Zoom interviews with me between the months of May and July. In August, I was able to drive to Cape Cod, Massachusetts where he took me on a marsh walk to collect in field footage of juvenile horseshoe crabs. I also was put in contact with Dr. Brenda Boleyn, a marine biologist and one of the board of directors for the Horseshoe Crab Conservation Association. I drove to her house and conducted an interview with her about her conservation work and the history of horseshoe crab conservation in New England. These meetings took an extensive amount of planning. Coordination was key and as someone who had never conducted interviews of this fashion before, I kept a checklist of everything I needed for each interview: printed out release forms that I had designed and written myself, printed individualized interview questions, charged camera batteries, two tripods (one for my phone and one for my Canon Mark II), water, snacks, and a positive attitude.

For the podcasts, content and flow were the two things I planned out the most. This came in the form of creating a script as my comfortability talking into a microphone and hearing my own voice is something I am working on. I first recorded my content,

went through to edit and piece together using Podcastle and then marked where I wanted specific sound effects, what I wanted them to add to the overall podcast, and how I would try to create them. For some, I used pre-made ones from an Adobe subscription I have.

The coloring pages were planned based on what information I thought would be most interesting to listeners and/or what I wanted listeners to focus on when listening to the corresponding podcast. For each coloring page, I would draw a rough sketch to conceptualize the general composition I wanted, then decide the style, and finally created several different renditions of the same coloring page before picking the one I felt fit best.

Hosting the film forum was not very difficult for me as it was something I have experience with in the past. In high school, began a film forum I called “EcoFlix” where I would show an ocean or environmentally geared documentary and host a discussion after. This was to engage fellow students at my school as well as create a space to share my love of marine science with my community. Picking the film was also relatively easy as I wanted something many different audiences could be drawn to and that inspired action. I planned well in advance when and where I wanted to host the forum, making sure to make flyers and advertise well in advance. I made sure to get rights for the film before showing it.

I decided to display my creative work for the Conservation Project on website which I designed using Squarespace. This was a website I have been working on for over a year and a half. I created it originally for a multimedia and journalism class. In the summer of 2023, it morphed into a digital portfolio of my academic work and research interests. I have a Photo Library which is dedicated to wildlife and landscape photography. Over the last year, I have been developing my skills and techniques in

photography and videography which was a driving factor when planning this creative thesis project. When I decided to explore the world of multimedia more deeply as part of my thesis, I began thinking about ways I could display my work and document the journey. Within the Conservation Project page on my website, there is an “About” page which acts as an introduction to the project. Each specific topic has its own page with accompanying media. The page titled *Limulus polyphemus* gives an overview of Atlantic horseshoe crab, HSC, ecological history and anthropogenic uses which is followed by a place to listen to the HSC podcast through Soundcloud and then links to PDF versions of my Engagement Tool coloring pages. For the cetacean conservation aspect of the project, I have two topic pages: one for *Delphinapterus leucas* and Winged Whale Research (WWR). The *D. leucas* page gives an overview of the current status of the Cook Inlet beluga whale population in Alaska and then describes how eDNA is being used as a tool with potential conservation applications. If you scroll further down, there is a link to a few resources for more information and a link to download a PDF of an Engagement Tool coloring page. I then have a link to a PDF version of a scientific poster I made regarding my research with the Cook Inlet belugas. I was lucky to be able to give a presentation regarding this work and the potential conservation applications of eDNA. I then have a Blog section where each post takes the reader through the step by step of how eDNA samples are collected and what happens to them back in the lab. These blogs have pictures as well as a video that helps explain the steps. For this project, I interviewed several members of the Alaska Beluga Monitoring Project (AKBMP) who have been working for several years to collect data regarding the Cook Inlet belugas along the Kenai River. I plan to finish this podcast by July of 2024. I was able to join AKBMP for a few

monitoring sessions. I helped with keep track of the number of individual belugas that swam through the mouth of the Kenai River and observed behaviors. I also aided in taking photos of individual belugas within the pod for photo identification. The third subject was Winged Whale Research (WWR) which is a non-profit that focuses on cetacean research in the Kachemak Bay. I was fortunate to be able to work with them and focus on multimedia and outreach regarding marine mammal conservation in Alaska. For the first two months of my work, I focused on human-animal interactions and attitudes towards marine mammal among the Homer community. An important aspect of WWR is data regarding whale sightings and photos for individual whale identification. This is partly done through citizen science and non-science audiences. This means that spreading awareness regarding the importance of reporting and documenting whale sightings regardless of experience level is vitally important, especially in the high boat traffic and whale populated waters of the Kachemak Bay. In order to help with this, I would walk up and down the 4.5-mile-long Homer Spit with a clipboard of flyers detailing several marine mammal research projects being done through the University of Alaska, Anchorage. While on these walks along the Homer spit, I spoke to fisherman, businesses, and families. This was a great way to gauge the level of interest in marine mammal conservation efforts and general attitudes towards marine mammals. These flyers have a basic description and a QR code leading to a form to fill out in the event of a whale sighting. This form has a place to upload photos which are uploaded to Happy Whale. Happy Whale uses AI to identify individual whales and track them throughout the years. I spent some time exploring Happy Whale and uploading negatives that were taken from WWR researchers from the 1990's.

I created a two-page newsletter for WWR which illustrated the Spring 2024 interns and ways to get involved. I wanted to increase community engagement so with the support of WWR, I hosted a film forum at the Kenai Peninsula College which was open to the entire Homer community. The film hosted was *Sonic Sea* which is about noise pollution in the ocean and the ways in which it is impacted whale populations. I picked this film because of the high quality of the audio-visual elements as well as the successful story telling. I hosted a short discussion after the film, offering ways for community members to be involved with cetacean conservation. It was a successful event attended by several NOAA representatives. The flyer for this event is posted on the website.

The last page dedicated to my thesis project is a contact page for questions which gets sent directly to my email.

Trials and Tribulations

I began this project with a lofty goal; to create a 45-minute documentary about *Limulus polyphemus*, Atlantic horseshoe crab (HSC) biology, ecology, role in the biomedical industry, and conservation history. Human relationships to and in nature is a topic I have always found intriguing and by interviewing conservationists and researchers, I wanted to include that human element while also taking a deep dive into the complicated science regarding HSC biology and use in the biomedical industry. As is the case for most lofty goals, many elements of the projects had to be tweaked. This resulted in a decision to switch to an exploration of several different kinds of media in order to be able to use the video and audio materials I spent several months gathering. The short documentary portion of the project is currently in progress with plans to be finished in the

Fall of 2024. However, some of the audio from the footage was used for portions of podcasts or the information from interviews were used to supplement audio projects. Podcasts were the most difficult because of the usage and creation of sound effects. Timing and style were incredibly difficult to figure out as they often felt awkward or misplaced. In fact, when it came to most of these projects, it was the *feeling* that mattered the most and that I took the most care to be attentive to.

For the beluga eDNA project, the primary aspect of my work that I was looking forward to was the process of documenting the process of genetic analysis. I was planning to have this be a significant portion of my thesis as I was going to take videos of the process of conducting genetic analysis. In April of 2024, I drove up to Anchorage to work in the genetic analysis lab. When I arrived, I found out that all of the kits were missing solutions that were needed to conduct the analysis, so I was unable to analyze my samples and collect video footage as planned. I am hoping to complete analysis in July 2024. I am continuing the beluga eDNA work the summer of 2024!

CREATIVE WORK

To see all creative work for The Conservation Project, please go to the Website at
ruby-saffron-ssy5.squarespace.com/about

REFLECTION

Throughout the process of creating my creative thesis, I learned to embrace imperfection and the chaotic nature of the world. By fully engaging with different multimedia, I was able to more fully understand the benefits and limitations of the use of digital media in the world of conservation. Therefore, I made efforts to not only create podcasts, engagement tools, flyers, and posters, but to also present them to my community.

This leads into one of my primary struggles throughout the process; reticence. Although many of the projects I was working on were extremely exciting, I often found myself shying away from talking about them or putting them out for other people to see. Although I had, wholeheartedly, jumped into a new world of multimedia where I knew I would be practicing techniques that I had very little experience in, I was unforgiving of myself and the quality of the work I was creating. This hesitance to display my work, not out of fear of feedback and constructive criticism, but was from a deeply ingrained perfectionism. I did not want anyone else's eyes or ears to be exposed to that which I had not deemed "good enough". This was, of course, silly. The entire premise of this project was to embrace the realistic and imperfect nature of the world we live in, openly defying the idea that for something to be relevant it must be flawless.

The world of marine conservation from a regulation and management standpoint is also far from perfect. It is through the failures that scientists have learned what works best for struggling populations. The earth, being extremely dynamic which is intensified by anthropogenic activity, is incredibly difficult to predict. There are so many moving parts and factors to consider that finding just one, or even five, solutions to a problem is

sometimes not the answer. When creating this project, this was an aspect that stuck with me; if there is not one solution then there is not one way to present the problems and to inspire action.

But how can you appropriately react when the people who you are talking to do not agree with or care about what you're saying? This goes into the question of audience, another aspect of this project I struggled with. When walking along the spit for WWR, I came across several people who greatly disliked the presence of marine mammals throughout the Homer harbor. It is thought that sea otters are the reason to certain crab species along the coast. This is, in fact, not true but the intense ferocity in which people believe this is incredible and attempting to steer this misconception is difficult. How can change attitudes? From the work I have done the last year, I believe it's about framing. In one scenario, the sea otters ate all the crabs. In another, it's the crab fishermen who overfished. How can we address this issue without assigning blame? I am, honestly, not exactly sure. Otherwise, I mostly conserved with people who held the same interests as I throughout this process and I really wish that I had had the opportunity to be challenged in that way. I am sure it will happen eventually as I plan to continue this project!

To continue the topic of audience, I was able to present several of my projects to the community. The first of which was the horseshoe crab podcast and test out of the engagement tools. For me, podcasts work best if I am multitasking, doing the dishes, drawing, or on a walk. I find that it allows me to be in a more relaxed space and engage with the podcast. Because of this, I wanted to create a creative outlet to be used in conjunction with the podcast. In early April of 2024, I presented the podcast at the Kenai Peninsula College. I had about 20 people there who listened to the podcast while working

with the engagement tools. I hosted a short discussion after for feedback regarding the experience and was able to tweak a few elements of both the podcast and the coloring page. This was one of the most rewarding experiences as I was able to jump two hurdles: presenting and perfectionism.

Over the course of this process, I found myself becoming much more comfortable with the interviewing process. When planning the documentary, I meticulously created interview questions, finding it hard to stray away from the safety of the words written on the page. When interviewing volunteers from AKBMP, I had no preplanned questions at all. I simply had a conversation that was free from the worry of not asking the right questions. However, it is important to note that the HSC documentary interviews were video whereas the AKBMP interviews were solely audio. I have found that for my subjects to be comfortable, I also should be and feel comfortable. Although I am nowhere near perfect, I have certainly become much more comfortable in front of a microphone and found that I am much more natural in an audio-dominated settings, such as podcasts, than I am in front of a camera.

When presenting my research regarding my work with beluga eDNA detection, I found that the process of giving presentations allowed me to more deeply understand what I was talking about. When I participated in the research symposium in April of 2024, I spoke to myriad of people across different backgrounds. This allowed me to dig deeper in terms of my own understanding of the topic as to be able to explain it in multiple different ways. Another way in which I came across this was when I volunteered with AKBMP while interviewing them. I was able to engage in the activities of the people I interviewed which gave me an entirely different perspective regarding how I

wanted to present the work they were doing when creating the podcast. This was the case as well when I went to the salt marsh with Dr. Gibson in the summer of 2023 to look for juvenile horseshoe crabs. For most of that day, I camera was hardly on. Instead, I was bending down, putting my hands in the sand, watching the horseshoe crabs with my own eyes, and truly observing with their movements.

Thinking back to what I would change about the project, I wish I had focused far more on audience. Although it was my plan, I decided to try a myriad of different kinds of multimedia for several different audiences. Looking back on my work to date, I am certainly proud of it, but I think I could have narrowed down exactly who this was aimed at. Picking one specific audience would have allowed me to dive much deeper into teaching techniques, specific styles to use, kinds of language, and the most impactful ways to push the story I am trying to tell. Thinking to the podcasts and short documentary I am planning to finish within the next year, I would like to focus on young adults who are interested in getting involved in wildlife conservation and multimedia. At that age, I would have greatly benefited from resources and guides to not only getting involved and learning about issues, but to be actively creating. This increases a sense of belonging, empowerment, and community. This last aspect of community is what I would like to further emphasis and foster in continuing this project. I would like to push the website further to be across several other media platforms that are more readily accessible and visible to users. By opening a forum for others within the website, a community can truly flourish where there is space for many voices to conserve, ask questions, relay their own experiences. Although my audience focus will change to become more streamlined, it will allow for many voices within that specific audience to be amplified.

I would also like to begin focusing on audio. During the process of this creative thesis, I truly fell in love with podcast creation. I became far more comfortable in front of a microphone and the process of creating sound effects was one that I enjoyed and want to spend more time on. I found that having a more conversational tonality was much more powerful than my pre-written scripts and I would like to begin having more than my own voice on podcasts. I have learned many things about myself throughout this process of changing plans and creation and I am so grateful to have been able to find my voice through the chaos.

BIBLIOGRAPHY

- Beng, K. & Cortlett, R.T. (2020). Applications of Environmental DNA (eDNA) in Ecology and Conservation: Opportunities, Challenges and Prospects. *Biodiversity and Conservation* 29: 2089-2121. <https://doi.org/10.1007/s10531-020-01980-0>
- Castellote, M., Gill, V.A., Garner C., Gilstad A., Hou, B., Brewer, A., & Knoth, J. 2023. Using Passive Acoustics to Identify a Winter Foraging Refugia and Quiet Space for an Endangered Beluga Population in Alaska. Anchorage: US Department of the Interior, Bureau of Ocean Energy Management. 55p. Report No.: OCS Study BOEM 2023-074. Contract No.: M20PG00005.
- Ficetola, G. F., Miaud, C., Pompanon, F., & Taberlet, P. (2008). Species Detection Using Environmental DNA from Water Samples. *Biology Letters*, 4(4): 423–425. <https://doi.org/10.1098/rsbl.2008.0118>
- Foote, A., Thomsen, P., Sveegaard, S., Wahlberg, M., Kieglast, J., Kyhn, L., Salling, A., Galatius, A., Orlando, L., Thomas, P., & Gilbert, P. (2012). *Investigating the Potential Use of Environmental DNA (eDNA) for Genetic Monitoring of Marine Mammals*. PLoS ONE 7(8): e41781. <https://doi.org/10.1371/journal.pone.0041781>
- Harper, L., Handley, L., Carpenter, A., Ghazali, M., Muri, C., Macgregor, C., Logan, T., Law, A., Breithaupt, T., Read, D., McDevitt, A., & Hänfling, B. (2019). Environmental DNA (eDNA) metabarcoding of pond water as a tool to survey conservation and management priority mammals. *Biol Conserv*, 238: 108225. <https://doi.org/10.1016/j.biocon.2019.108225>
- Kumar, S.V., Castellote, M., & Gill V. (2024). The Urban Beluga: Acoustic Monitoring in the Kenai and Kasilof Rivers, Alaska. Anchorage: US Department of the Interior, Bureau of Ocean Energy Management. 64p. Report No.: OCS Study BOEM 2024-002.
- Lyet, A., Pellissier, L., Valentini, A., Dejean, T., Hehmeyer, A., & Naidoo, R. (2021). eDNA Sampled from Stream Networks Correlates with Camera Trap Detection Rates of Terrestrial Mammals. *Sci Reports*, 11(1): 11362. <https://doi.org/10.1038/s41598-021-90598-5>
- Meulenbroek, P., Hein, T., Friedrich, T., Valentini, A., Erős, T., Schabuss, M., Zornig, H., Lenhardt, M., Pekarik, L., Jean, P., Dejean, T., & Pont, D. (2022). Detecting the Near Extinct Needles in a Haystack Via eDNA Metabarcoding From Water Samples. *Biodiversity Conservation* 31: 2817–2832. <https://doi.org/10.1007/s10531-022-02459-w>

- Akbar, John., Nelson, B.R., et al. "A review on fisheries and conservation status of Asian horseshoe crabs." *Biodiversity and Conservation*, vol 27, September 2018, p3373-3598. <https://doi.org/10.1007/s10531-018-1633-8>
- Berkson, Jim., Shuster, Carl. "The Horseshoe Crab: The Battle for a True Multiple-use Resource." *Fisheries Magazine*, Vol 24, no 11, p6-10. [https://doi.org/10.1577/1548-8446\(1999\)024<0006:THCTBF>2.0.CO;2](https://doi.org/10.1577/1548-8446(1999)024<0006:THCTBF>2.0.CO;2)
- Botton, Mark. "The Ecological Importance of Horseshoe Crabs in Estuarine and Coastal Communities: A Review and Speculative Summary." *Biology and Conservation of Horseshoe Crabs*, 2009, p45-63. Springer, https://doi.org/10.1007/978-0-387-89959-6_3
- Centre, W. C. M. 1996. *The IUCN Red List of Threatened Species*. IUCN Red List of Threatened Species. <https://www.iucnredlist.org/species/21308/9266907>
- Chen, Chang-Po., Yeh, Hsin-Ye., et al. "Conservation of the horseshoe crab at Kinmen, Taiwan: strategies and practices." *Biodiversity and Conservation*, September 2004, Vol 13, p1889-1904. <https://doi.org/10.1023/B:BIOC.0000035868.11083.84>
- Gauvry, Glenn. "Community Building: An Integrated Approach to Horseshoe Crab Conservation." *Biology and Conservation of Horseshoe Crabs*, May 2009, p605-612. https://doi.org/10.1007/978-0-387-89959-6_40
- Homepage - Atlantic States Marine Fisheries Commission, www.asmfc.org/uploads/file/janFeb07.pdf
- Krisfalusi-Gannon, Jordan., Waleed, Ali. "The Role of Horseshoe Crabs in the Biomedical Industry and Recent Trends Impacting Species Sustainability." *Font. Mar. Sci*, Vol 5, June 2018. <https://doi.org/10.3389/fmars.2018.00185>
- Maloney, Tom., Phelan, Ryan., et al. "Saving the horseshoe crab: A synthetic alternative to horseshoe crab blood for endotoxin detection." *PLoS Biology*, vol 16, October 2018, p10. <https://doi.org/10.1371/journal.pbio.2006607>
- Maryland Department of Natural Resources, dnr.maryland.gov/ccs/Pages/horseshoecrab-medical.aspx#:~:text=Why%20is%20the%20Horseshoe%20Crab,based%20respiratory%20pigment%20called%20hemocyanin
- Niles, Lawrence., Bart, Jonathan., et al. "Effects of Horseshoe Crab Harvest in Delaware Bay on Red Knots: Are Harvest Restrictions Working?" *BioScience*, vol 59, February 2009, p153-164. <https://doi.org/10.1525/bio.2009.59.2.8>
- Novitsky, Thomas. "Biomedical Applications of Limulus Amebocyte Lysate." *Biology and Conservation of Horseshoe Crabs*, January 2009, p315-329. https://doi.org/10.1007/978-0-387-89959-6_20

Smith, David., Brockmann, Jane., et al. "Conservation status of the American horseshoe crab, (*Limulus polyphemus*): a regional assessment." Rev Fish Biol Fisheries, vol. 27, December 2016, p 135-175. <https://doi.org/10.1007/s11160-016-9461-y>

Smith., David., Newhard, Joshua., et al "The Long-Term Effect of Bleeding for Limulus Amebocyte Lysate on Annual Survival and Recapture of Tagged Horseshoe Crabs." Front. Mar. Sci., vol 7, December 2020,. <https://doi.org/10.3389/fmars.2020.607668>

van Holde, K. E., and Miller, K. I. "Hemocyanins." Adv. Protein Chem. 47, 1995, p1–81. [https://doi: 10.1016/S0065-3233\(08\)60545-8](https://doi:10.1016/S0065-3233(08)60545-8)

"Facts." Florida Fish And Wildlife Conservation Commission, myfwc.com/research/saltwater/crustaceans/horseshoe-crabs/facts/#:~:text=Anyone%20who%20has%20had%20an,also%20used%20in%20several%20fisheries.

Shelley, Mary. *Frankenstein*. Broadview Press, 2012.

AUTHOR'S BIOGRAPHY

Ilaria Rose Bardini was born in Salem, Massachusetts on May 22nd, 2001. Her love for marine science began at a very young age and intensified when she began volunteering with the Joppa Flats, Massachusetts Audubon Society. She comes from a very creative background, being a watercolor artist, classical and jazz musician, additionally engaging in creative writing and poetry. She started playing cello at the age of five which continued through her college career. In 2020, Ilaria started her undergraduate at the University of Maine, majoring in Marine Science with a minor in Journalism. At UMaine, she was involved with the University Orchestra, Green Team, Divest UMaine, president of the Maine Peace Action Committee, and engaged in other political and environmental activism endeavors. She worked for Maine EPSCoR as a student writer, was a math tutor, and was an Honors Civilizations Assistant. In addition to her creative pursuits, Ilaria's primary passions are in scientific research. In the Summer of 2023, Ilaria conducted research under Dr. Jeffrey Runge regarding the size and lipid content of *Calanus finmarchicus*, a tiny marine copepod which serves as the primary food source of the critically endangered North Atlantic right whale. In the Spring of 2024, Ilaria moved to Homer, Alaska to finish her undergraduate degree, focusing on Conservation Ecology. Ilaria intends to continue her passion for scientific research and will be attending graduate school for Marine Biology at the Moss Landing Marine Labs through San José State University.