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**Public Opinion and Knowledge of Marine Biodiversity in a Coastal
Community – Horry County, South Carolina**

By

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Marine Science

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Abstract

There is very little research that explores the public attitude toward marine biodiversity loss as an environmental issue. This study aims to provide insight into the disparities in marine conservation education in order to better provide meaningful education opportunities for coastal communities. The data for this research was collected using a series of semi-structured interviews that were conducted as focus groups of participants from Horry County, South Carolina. Residents from North Myrtle Beach, Myrtle Beach, Loris, and Bucksport were recruited to three focus groups based on their geographical residency. Horry County retirees and students attending Coastal Carolina University were also recruited to two additional focus groups for a total of 5 groups. The results revealed several themes that highlighted general opinions and knowledge levels of the participants. Knowledge of both marine biodiversity as a general topic, as well as its causes and effects, was limited throughout each of the groups. The participants also expressed opinions that attributed the importance of marine biodiversity to its visual beauty. Opinions about the relative importance of economic development and marine biodiversity conservation differed across the groups. Although the consequences of under communication and ineffective education were apparent, the study was enlightening in presenting the possible improvement of scientific communication through relationship building and conversational education.

1. Introduction

As a part of the North Atlantic Coastal Plain (NACP), the coast of the southeastern United States is recognized as biologically diverse (Noss et al. 2015). The biological richness of states like North and South Carolina, Georgia, and Florida has been presumed, yet undocumented in studies that explore the ecological importance of habitats in the NACP. In South Carolina specifically, coastal and marine biodiversity is not well studied; there is a need for more comprehensive research and education on the topic. There is a lack of up to date literature that explicitly lists or describes the flora and fauna of the area and their relative abundance or overall population health. Biodiversity, or biological diversity, is defined at all levels of ecosystem dynamics, including macro and microorganisms, fauna, and flora (Hunter & Brehm 2003).

In general, there are several myths and misconceptions about the conservation of marine biodiversity. According to Noss et al. (2015), common misconceptions include the belief that the NACP is geologically young and therefore incapable of being a habitat for a rich biota, and the assumption that the geographical homogeneity of the area cannot support diverse ecosystems. The myths include the widely accepted idea that the hardwood forests of the NACP are naturally occurring, when they are essentially a response to habitat loss that occurred in the early 17th century. Another myth is the claim that the fires that occurred in the area before European invasion were anthropogenic, and therefore habitat destroying, when they were likely lightning ignited and maintained the present vegetation (Noss et al. 2015). These misconceptions, myths, and biases surrounding biodiversity have kept scientists from recognizing the NACP as a whole as a biological hotspot (Noss et al. 2015). The perception of biodiversity as a priority has also been hindered by the common perception that natural environments are uninteresting or

unappealing (Askins 2001). Consequently, many coastal states have allowed large population growth at the expense on the area's biological variety, including South Carolina. The increase in human impact directly and indirectly affects estuarine and marine habitats (Gedan et al. 2009). Activities such as pollution, expansion of impervious surfaces and non-forested areas, and shoreline alteration contribute heavily to habitat destruction and biodiversity loss in coastal areas (Noe et al. 2014). Coastal biodiversity loss can partially be attributed to anthropogenic climate change events such as sea level rise and the consequential increase in flooding (Allen & Lendemer 2016).

There is a need for research that covers public knowledge of environmental issues and processes such as climate change and biodiversity loss. The literature concerning biodiversity and public opinion and knowledge is largely focused on forest and woodland habitats (Askins 2001, Hunter & Brehm 2003). Groups and individuals considered as part of the natural science community, as well as those who are not considered as such, have limited knowledge concerning marine biodiversity loss. In the case of the scientific community, there are very few research initiatives that accurately and significantly gather biodiversity data. In the case of those who the scientific community aims to educate, there is a lack of communication and meaningful education (Fischer & Young 2007, Ressurreição et al. 2012). One area that is experiencing that lack of meaningful education is the South Carolina coastline. Places like Horry County, South Carolina are very diverse, and have residents from all education, racial, and socioeconomic backgrounds. The opportunity and interest for self-education, however, is largely limited to people whose monetary and travel resources restricting. I personally know residents of Horry County that have lived in the area for over a decade and have not seen the ocean despite its

proximity. In contrast, other people have daily access to the beach and are targeted extensively for ocean conservation outreach.

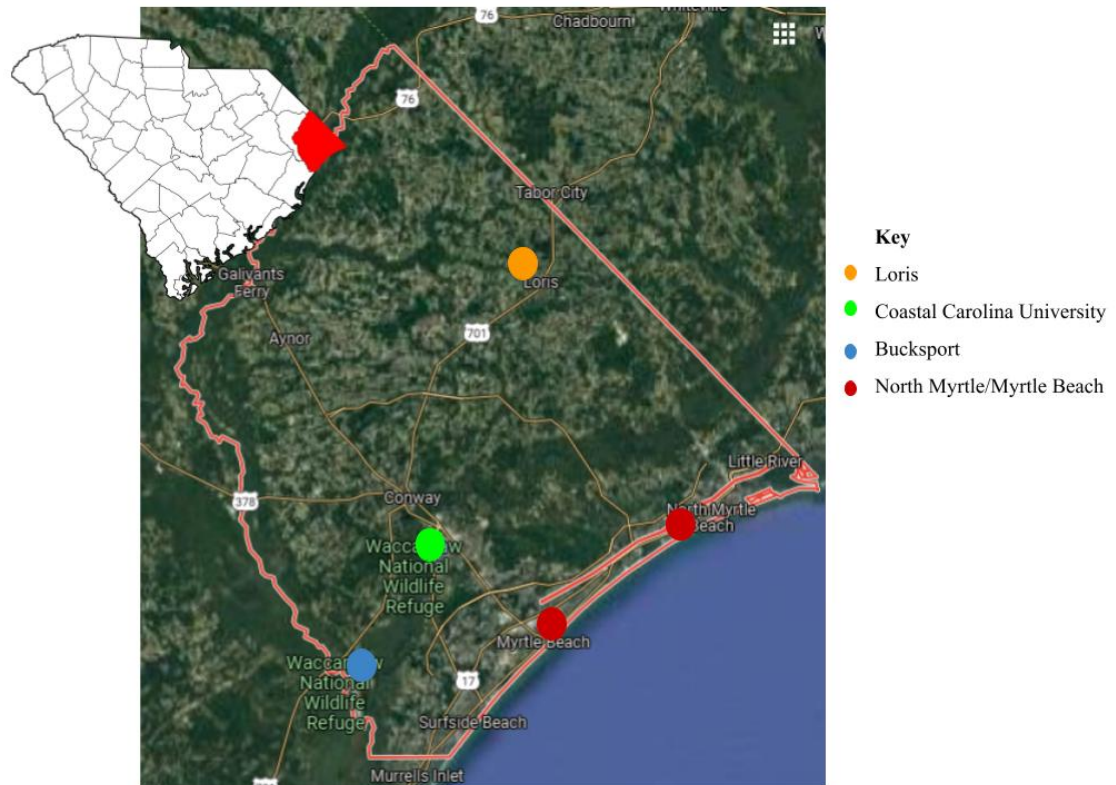
The goal of this research is to gain a better understanding of the public's knowledge and opinions about marine biodiversity loss in Horry County, SC. I came upon the research topic as a result of my own observations for three years as a student at Coastal Carolina University. I have worked at resorts along the Grand Strand area, as well as visited elementary schools, nursing homes, and churches in areas in the county that are further inland. In getting to know people around the county, I have become accustomed to explaining my interest in marine science and being immediately questioned. The most common inquiry being: "what does that mean?" Many people have a limited understanding of science, technology, engineering and math (STEM) fields of study, but being unaware of our own impacts on our environment as humans can be detrimental. This research has the potential to spark conversations about ecological conservation in households that have not previously been taught of its importance. The first step to meaningful education is finding out what people already know and care about. This and other research of its kind are opportunities to tailor ocean education to its audience. This research can also benefit environmental policy by providing insight to the public.

2. Methods

2.1 Study Area

Horry County, South Carolina is the northernmost county along the state's coastline. South Carolina is in the southeastern United States, and shares borders with the coastal states of North Carolina and Georgia. For this study, research was conducted with participants from several geographical regions in the county including Loris, Bucksport, Myrtle Beach, and North

Myrtle Beach as is shown by Map 1. Given their proximity and similarities in cultural makeup, the cities of Myrtle Beach and North Myrtle Beach were studied together.



Map 1. Google Earth Satellite photo of Horry County, South Carolina outlined in red, with study areas marked.

Myrtle Beach and North Myrtle Beach are neighboring cities in the Grand Strand region of Horry County. The Grand Strand is a 60-mile stretch of land and beaches that has been heavily developed into suburban communities and tourist centers. There are several shopping and restaurant districts, theme parks, and event centers that attract people locally and worldwide. The Myrtle Beach and North Myrtle Beach area has a population that is over 80% white, with a median household income over \$52,000, and over 30% of residents having completed a bachelor's degree or higher (U.S. Census Bureau, 2019). This area was chosen for research

because the residents in the area are likely to represent the more affluent and formally educated citizens in the county.

Bucksport, South Carolina is situated near the southern border of Horry County. It is a rural port along the Atlantic Intracoastal Waterway, where Bucksport meets with the Waccamaw River. Although Bucksport is an unincorporated area in the county, it is a very distinct area. The community of fewer than 800 residents is more than 85% Black and has a mean household income of just under \$42,000. Only 7% of the Bucksport population has a bachelor's degree or higher (U.S. Census Bureau, 2019). Bucksport is a small community where most people know each other, and it was chosen for this research because the residents could represent the rural, lower income population in the county.

Loris, South Carolina is located about 20 miles inland on the far north border of Horry County. Loris is a growing town with just under 3,000 residents. Although it is in Horry County, it is relatively distant from the coast and has more forested natural areas than places resembling coastal habitats. The area is about 70% white, with about 10% of residents earning at least a bachelor's degree and a mean household income of about \$49,000 (U.S. Census Bureau, 2019). This area was chosen as a geographic area of research because the coastal habitats discussed in the study are not as easily accessible to Loris residents as other areas in the county. The difference in proximity was determined to be a possible factor in differing opinions and observed knowledge of Horry County residents.

The college student and retiree groups were added to the study to gain an understanding of the opinions and knowledge of two major demographics that may be unique to Horry County. The student group was derived from students at Coastal Carolina University in Conway, South Carolina. Many of the students are permanent residents from more inland areas of South

Carolina or from other states. Their perspective was added to the study to gain the insight of young people who are temporarily residing in a coastal community. The retiree group was recruited for similar reasons, given that Horry County is a popular retirement destination. Their group was added to gain an understanding of the opinions and knowledge of retired residents, who may have been living in the area for varying amounts of time.

2.2 Participant Recruitment and Selection

Participants for this study were recruited through social media platforms (ex. Facebook, Instagram) and community outreach. There were five sets of recruitment materials to cater to the separate focus groups. One set of recruitment flyers were specific to students on the campus of Coastal Carolina University and were widely distributed on social media platforms and bulletin boards throughout the campus. The second set was specific to retirees who were either full or part-time residents of Horry County. This set was distributed as another flyer in Facebook Groups as well as retirement communities. The final three sets of recruitment flyers were general recruitment messages that called for adult residents of Bucksport, Loris, and either Myrtle or North Myrtle Beach. These flyers were posted on several community media platforms specific to each geographic area.

Once residents showed their interest in participating in the study, they were contacted with dates and times for each of the interviews. Once their availability was confirmed, each participant was sent an informed consent form as well as a pre-interview survey. A total of 27 people participated in the study. The demographic make-up of each group is outlined in Table 1.

<i>Group</i>	<i>Number of Participants</i>	<i>Mean Age</i>	<i>Highest Level of Education</i>	<i>Estimated Yearly Income</i>	<i>Racial/ Ethnic Background</i>	<i>Gender</i>
<i>CCU Students</i>	10	23	Bachelor's	\$0-99,999	White – 10% Black – 80% Asian/Pacific Islander – 10%	Male – 100%
<i>Retirees</i>	3	56	Bachelor's	\$0-74,999	White – 33% Black – 67%	Male – 67% Female – 33%
<i>Loris Residents</i>	4	28	Master's	\$50,000-74,000	Black – 50% Asian/Pacific Islander – 50%	Male – 50% Female – 50%
<i>Bucksport Residents</i>	5	33	Bachelor's	\$25,000-99,999	Black – 100%	Male – 60% Female – 40%
<i>N. Myrtle/ Myrtle Beach Residents</i>	5	37	Professional/ Doctoral	\$10,000-99,999	Black – 80% Asian/Pacific Islander – 20% Hispanic/ Latino – 20%	Male – 60% Female – 40%

Table 1. Demographic information gathered prior to each focus group interview from an electronic survey distributed via email to confirmed participants.

2.3 Interview Process

The pre-interview survey was meant to give insight into the demographic makeup of the participants in each group. The questions in the survey included:

1. First name (open response)
2. Last initial (open response)
3. Age (open response)

4. Gender (male, female, transgender, nonbinary, other, prefer not to answer)
5. Race (Select all that apply: White, African American or Black, Asian or Pacific Islander, Indigenous)
6. Ethnicity (Not Hispanic/Latino, Hispanic/Latino)
7. Education level (Some high school, high school diploma or GED, some college, associate's degree, bachelor's degree, master's degree, professional/doctoral degree, none of the above)
8. Employment (yes/no)
 - a. If yes: full time vs part-time (select one), estimated yearly household income (\$0 - \$9,999; \$10,000 - \$24,999; \$25,000 - \$49,999; \$50,000 - \$74,999; \$75,000 - \$99,999; \$100,000 - \$149,999; \$150,000+)
 - b. If no: retired (yes/no), student (yes/no)

A total of five focus groups were conducted over the course of two weeks during October 2021. A series of semi-structured interviews were conducted via Zoom, a live video connection software that allowed the interviews to be recorded. Participants were asked non-dichotomous questions with the intention of facilitating conversation on the subject of marine biodiversity loss in the Horry County coastal community. The questions prepared for the discussion were:

1. Define the terms "biodiversity" or "biological diversity".
2. What comes to mind when you hear these words?
3. Where have you learned about biodiversity, if at all?
4. To your knowledge, what is the state of marine (marsh, beach, ocean, etc.) biodiversity in Horry County?

5. What do you think are the causes and effects of marine biodiversity loss in the area?
6. Do you think marine biodiversity is important for coastal communities? Why or Why not?
7. Which is more important, preserving biodiversity or economic development? Why?

Any additional questions were asked to supplement the more concise and direct answers that participants gave. To build a more comprehensive data set, the researcher used comments from the participants during the interviews to further investigate the personal opinions and knowledge of the participants. At times, questions were rephrased if there was confusion or limited response to a particular question.

2.4 Analysis

The interviews were recorded and audio files were transcribed using Trint, a third-party software that uses artificial intelligence to transcribe audio. It is a paid subscription service that allowed each of the interviews to be transcribed, edited, and saved as documents. The transcriptions were used to compare and analyze the content of the discussion from each group as data. The data were open coded before coming up with themes that aligned with the purpose and major outcomes of the study. Those themes were centralized to personal connection to marine life, reasoning for importance of marine biodiversity, how climate change and biodiversity are related, and the relationship of marine biodiversity to the local economy.

The data were then analyzed to find specific moments in each discussion that could support the themes. Each group was compared to find similar trends in knowledge and opinions based on the participants' answers to the prepared questions, as well as follow-up questions and comments made throughout the conversation. The questions the participants asked were also

considered when analyzing the data for trends that showed changes in participant attitudes over time.

3. Results/Discussion

3.1 Personal disconnection to marine ecosystems led to a limited understanding of the topic.

When asked about their personal connection to marine ecosystems, many residents that were from Bucksport and Loris had trouble coming up with a positive memory or activity that they enjoyed at a beach or on the ocean.

“We’ve been in school and we’re just trying to work with what we learned and what is in the general world and all that.” – Zach, Loris Resident¹

Similarly, Bucksport resident, Aaron, mentioned that their knowledge of the ocean only comes from middle and elementary school. In contrast, Mike and Rebecca from the student group were able to connect personally to the beach because they visit it in a tourist capacity for activities, like sun-tanning, swimming, and beach walks, and Travis, Amanda, Diane and Brenda of the Grand Strand residents’ group listed their favorite beach activities as being snorkeling, swimming, fishing, and surfing.

Even still, the common personal disconnection from Horry County marine habitats came in the form of answering questions as if they were attempting to provide an answer that used scientific vocabulary.

¹ Pseudonyms are used to protect the identities of participants.

“Biodiversity is the study of various diversities of life including plants animals and microorganisms.” – Brenda, North Myrtle/Myrtle Beach Resident

“[T]he measure of variation at the genetic species and ecosystem level.” – Grace, Bucksport Resident

Participants in each group had trouble articulating or recalling a memory or personal connection that illustrated a positive relationship with marine ecosystems in the area. Some participants had backgrounds in natural science (horticulture, biology, etc.), but in general most participants did not. Consequently, there were widespread opinions on what a conversation about biodiversity would consist of.

“A variety of living things.” - Nicole, Horry County Retiree

“Just our interaction with the other life forms.” - Nick, Bucksport Resident

“We’ll probably be getting more into the specifics of what that variety is, you know, all of the different plant species and in their dependencies, on... each other.” - Dave, Horry County Retiree

These responses were expected, especially the varying degrees of knowledge being mostly related to background exposure in academic and professional settings. It is unlikely that any residents or students were inclined to perform self-study on marine biodiversity or related topics, so I was not surprised to observe their limited formal knowledge.

3.2 Most participants valued marine biodiversity for practical reasons, while others mentioned their value being tied to more abstract ideas such as beauty and the sanctity of life.

One of the questions that received fairly unanimous answers across all groups was that of whether or not marine biodiversity is important to marine ecosystems. All participants agreed that conserving marine biodiversity is important, and many agreed that it was important for reasons such as food resources, eco-tourism, and environmental stability.

“I think it's important because it has commercial benefits for example through tourists.”

- Grace, Bucksport Resident

“Yes, it is important. This is because most of the coastal communities have their culture based on either marine environment, climate... their traditions ... and culture, which includes their choice of foods and their dressings or even economical activities like fishing like is part of their life.” - Chad, Loris Resident

There were three participants, in three separate focus groups, that noted their opinion had less practical reasoning. Two participants mentioned that they valued the marine biodiversity in Horry County and other coastal communities because it supports the maintenance of the coastlines' beauty. Their connection to the marine ecosystems is one of one personal enjoyment, so simply seeing how beautiful nature can be is enough to preserve it.

“The marine cycle is dependent on each element, so the undergrowth vegetation promotes ocean beauty. This is important to the beauty of the nature. So, it’s yes, it is important.” - Rebecca, CCU Student

“Biodiversity brings ambience to the environment in general.” - Amanda, North Myrtle/Myrtle Beach Resident

The other opinion was very succinct and directly cited the importance of biodiversity being connected to the importance and sanctity of all life.

“If you think about it, life at very basic levels is important, so yeah, we do have the general appreciation for life” - Ralph, Loris Resident

This approach to justifying the importance of marine biodiversity was interesting, and even unexpected. Because of my background in marine science, I am drawn to the practical importance of ecological systems. Contrary to my personal values and opinions, abstract and intangible benefits of healthy ecosystems are valued by the participants just as much as the tangible ones. The natural beauty of marine habitats is likely highly valued in tourist areas. Being that Amanda is a Myrtle/North Myrtle Beach resident, it is possible that she opted to live in the area partially for its beauty. The same could be said of Rebecca, who may have chosen to attend Coastal Carolina University because the area on and around campus is visually pleasing. If either one of the aforementioned possibilities is true, then the importance of marine biodiversity for the sake of natural beauty is a reasonable opinion.

3.3 The relationship between climate change and marine biodiversity loss was inaccurately considered to be directly causal.

When the conversation topic migrated to the causes and effects of marine biodiversity loss, there were several answers that immediately included climate change as a related topic. Human activity was mentioned as a cause as well, but that comment was not specific enough to determine whether or not the participant was knowledgeable about the exact relationship.

“Impacts are many due to loss of biodiversity and are quite visible, talking of destabilization of the general ecosystems that can regulate the climate effects and natural calamities such as floods and so many more.” - Nick, Bucksport Resident

“If overexploitation is done then there will be nature imbalance. [Nature imbalance] can lead to change in the atmospheric temperature.” - Travis, CCU Student

In the scientific community, climate change and biodiversity loss are considered to be separate issues. The umbrella term of “climate change” encompasses several processes that include anthropogenic environmental destruction and natural cycles that occur on the geologic timescale (Hillebrand et al. 2018). When addressing climate change in the same context as marine biodiversity loss, it is important to consider the difference between the kinds of climate change, and their specific effects. Anthropogenic climate change processes that can lead to marine biodiversity loss include sea surface temperature rising, eutrophication, and ocean acidification (Hillebrand et al. 2018).

Climatic events, like the floods that Nick brought up, can be mitigated by plant life on coasts. However, natural disasters are more regulated by chemical and physical abiotic processes, rather than biodiversity (Lewis et al. 2017). “Imbalance” and “destabilization” having an effect on the climate is not considered a main effect of marine biodiversity loss, but climate change tends to be the main talking point for most people that are concerned about environmental protection. Because of the popularity of the term and topic, I was not surprised that climate change was brought into the conversation so readily.

3.4 There were varying opinions in debating the relative importance of economic growth and biodiversity conservation.

Ecologists and other natural scientists place paramount importance on conservation over economic growth (Fischer & Young 2007, Ressurreição et al. 2012). However, some of the participants felt as if economic growth was equally important, or in some cases more important than conservation for various reasons.

“They have both advantages and disadvantages... I think we really need to try find the balance in between...Because we need to be economically stable as well...and at the same time we need to have the plants there to maintain aesthetics... Economics allow us help maintain the biodiversity money to pay researchers to show us where the problems are and to correct any thing we can.” - Jim, Horry Country Retiree

“I think economic development is more important since it can sustain biodiversity.” - Jill, Loris Resident

I was surprised to learn that so many participants valued economic growth over biodiversity. Jill's point about supporting biodiversity was insightful, though. I also appreciated Jim's point of view in deeming the two topics as equally important. Much of the research done that contributed to ecological conservation is publicly funded, therefore dependent on economic prosperity. In that respect, the two are mutually important.

The mutual importance, however, likely depends on either an understanding or an assumption that every person is doing what they can to conserve natural habitats outside of economic development. I would be able to justify and even back the opinion that economic development and marine biodiversity conservation are equally dependent if ecosystem destruction and restoration were equally realizable. Once a tree is cut down, or a coastal wetland is drained, that cannot be undone. Ecosystems are the culmination of the entire geologic history of the Earth, and though the Earth would not take eons to heal its wounds naturally, it is counterintuitive to destroy a habitat under the pretense of increasing funding to protect said habitat.

Additionally, economic development and all kinds of nature conservation are publicly viewed as opposites. In reality, there are systems of government and economics that support both economic growth and ecosystem preservation. The traditional Western idea that modernity and progress are tied to destructive processes is likely the same idea that kept participants like Jim and Jill from prioritizing marine biodiversity over economic development. With proper, targeted, and meaningful education in ways that the public is respondent to, there is reason to believe that those Western ideals cannot be challenged or changed.

3.5 The interview process gave participants a space to inquire and learn about their specific interests in marine science.

Once I had concluded my formal interviewing process, the participants in some groups were interested in my research or the marine science field in general. I was asked about my plans for the future as well as how I plan to use this research.

*“Is this what are what are you looking to do with your education when your degree?
How are you looking to get yourself involved into this?” – Jim, Horry County Retiree*

In explaining my goals for myself and this study, I could tell that my words were not falling on deaf ears. Although they were not well-versed in marine science, I was able to communicate with them using terms and topics we had discussed earlier to explain my answers. The participants that asked the questions were the same participants that were more active overall during the discussion. Still, the conversations following my initial answers were well-received by all of the participants.

The participants asked in more than one group about what invasive species were impacting the South Carolina coastline and coastal waters. This specific curiosity and interest for their community were also notable because it showed a gained or better-articulated concern for the habitat they directly impact.

“What method can be used to curb the effect of invasive species?” – Amanda, North Myrtle/Myrtle Beach Resident.

*“What are some of the invasive species that lead to Marine biodiversity loss?” –
Madison, Bucksport Resident*

Another question that was presented at the conclusion of one interview was about the ways in which they, as individuals, could contribute to marine conservation efforts locally and on a global scale.

“Could we... discuss on some of the ways to preserve biodiversity?” – Bill, CCU Student

This was also encouraging, considering community engagement is severely lacking in Horry County and coastal communities around the world.

It is likely that the conversational nature of the interviews allowed the participants to see me as less of a lecturer, and more of a resource. Once the participants were comfortable with me, they understood that I was willing to listen just as much as I wanted to get my message across. After establishing a relationship built on that mutual respect, the participants were more responsive and receptive to the information and the topics addressed during the course of the study. Often, scientific communication is terse and fairly one-sided. This study turned out to be an example of what science communication could look like.

4. Conclusion & Recommendations

Although this study was not representative of Horry County residents, or even the demographics and areas studied, there are some conclusions that can still be considered. The first being that wherever a lack of marine biodiversity education is present, a useful first step to

providing that missing communication is finding out what and where information needs to be distributed. Based on the audience, it may be impactful to incorporate the more abstract and aesthetic benefits of natural landscapes in conversations about marine biodiversity loss prevention and marine habitat protection. Second, the participants were concerned with marine biodiversity loss, yet they were also miseducated on the subject. The dissemination of correct information in a concise manner is vital to the preservation of marine biodiversity, especially in coastal communities where human impact is growing. Lastly, this study was specific to a coastal community with suburban and tourist areas. Similar research in a more urban area, or other countries with different politics, cultures, and natural habitats may present different results. Further research that includes a wider range of participants and study areas may be a comprehensive way to address the educational gaps that are present in communicating topics like marine biodiversity loss in coastal communities.

Overall, the study revealed many of the opinions and the general knowledge of residents in Horry County, South Carolina. My surprise was not in how much the residents did or did not know about the topic, but, in some cases, I did not expect to learn of the opinions and reasoning of some participants. This research was beneficial to the participants, as was evident by their willingness to ask for information on invasive species and conservation methods after their interviews concluded. It was refreshing to answer something about my field of study that was not “what does that mean?” As I previously mentioned, that has been my experience for several years now. The participants, who had initially been unable or unwilling to articulate a positive connection to the areas coastal and marine habitats, were curious about their impact and followed up on topics that may have been introduced but not expanded on. I was happy to answer the questions and hoped that the participants used their new information to start the conversation on

marine biodiversity in their individual households and communities. The results of this study were encouraging, and I implore the scientific community to contribute marine conservation resources to developing more effective methods for distributing relevant information.

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