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Innovative Solutions to Environmental Challenges: Exploring Fishermen's Perspectives on Technology-driven Conservation Efforts in Noveleta, Cavite

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Abstract

This phenomenological study explores the viewpoints of fishermen in Noveleta, Cavite, on technology-based conservation initiatives and their effects on local marine ecosystems and fishing methods. Using purposive sampling, seven participants offered valuable insights into the present condition of marine life, the implementation of cutting-edge solutions, and the impact of these technologies on their means of living. The study revealed several themes: The challenges of modern fishing conditions, including stricter laws, and the consequences of environmental changes, such as pollution and habitat damage. Fishermen also discussed

how government rules impacted them and how new technologies like GPS and fish finders brought new challenges even as productivity rose. Furthermore, the discussion underscored significant concerns such as the necessity for efficient marine conservation, the impact of infrastructure developments on local communities compared to traditional practices, and the economic viability amidst shifting circumstances. This study highlights the complex connection between policy, technology, and traditional fishing methods, highlighting the importance of inclusive and sustainable approaches to conservation.

Keywords: Conservation, Fishermen, Innovation, Cavite

Introduction

Anthropogenic stressors continue to increase due to the demands for food, energy, and transportation. As a result of this increased harmful human activities towards the marine environment, the ocean is currently facing enormous stress. These stresses and pressures have resulted in pollution and a decline in biodiversity (Winther *et al.*, 2020). Humanity also heavily depends on the marine ecosystem and its inhabitants. Häder and colleagues (2020) ^[14] estimate that more than 71% of the earth's surface is made up of oceans, coral reefs, and coastal environments. Diverse marine life present in these environments is necessary for human survival.

The management of the global carbon and oxygen cycles, the production of food and energy, and the support of human well-being are some of the services that marine ecosystems provide (Ward *et al.*, 2022). These services are among the important services that marine ecosystems provide to humans that are needed for the survivability of people.

Moreover, the services that marine biodiversity provides are essential components in attaining sustainable progress in the economy. According to Kyriazi *et al.* (2023), marine ecosystems can be regarded as an economic sector that provides an ongoing supply of environmental services and actively supports the development of methods that can promote economic progress. In addition, marine biodiversity plays a crucial role in supporting important businesses like commercial fisheries and coastal tourism. These industries are significant contributors to the global economy, providing income and employment opportunities for many people (Islam *et al.*, 2022; Manzolli *et al.*, 2024).

The location of the study will be conducted in the municipality of Noveleta, located in the northwestern part of the province of Cavite. Since Noveleta is a coastline-bounded municipality, the marine ecosystem has a significant impact on determining its current state of local development and growth.

Marine ecosystems provide important and essential resources to humans. However, the health and functionality of aquatic ecosystems' physical and biological components determines their capacity to provide services for human well-being (Rees *et al.*, 2020).

Furthermore, human-induced pollution and climate-related factors are negatively affecting health and life in the marine ecosystem. According to Zaghoul *et al.* (2020) pollution is the substances or energy liable for causing several adverse impacts

degrading the health of the aquatic environment, harming biota, damaging structures, or interfering with the authentic uses of the environment.

In addition, marine biodiversity, or the variety of life found in the oceans, is alarmingly disappearing worldwide, driven by the anthropogenic stressors, which are degrading marine ecosystem function (Ward *et al.*, 2022). Moreover, our current state of the environment's temperature is currently the leading factor determining marine biodiversity. Hence, climate change is fundamentally changing the diversity of life in the oceans on a global scale and will continue to do so into the future. (Worm & Lotze, 2021).

Moreover, climate change is seen as a major driver in marine ecosystems since climate change affects their resilience, functionality, and related ecosystem services (Gissi *et al.*, 2021) ^[13]. At the same time, human activities, including plastic pollution, negatively impact the health and quality of the marine ecosystem. Over 8 million tons of mostly single-use plastics enter the marine environment each year from different industries in the world (Häder *et al.*, 2020) ^[14]. The impacts of human activities, along with the effects of climate change, continue to increase and threaten life in the marine environment (O'Hara *et al.*, 2021).

Moreover, the aquatic ecosystems of the globe are quickly reaching hazardous conditions due to factors such as climate change, fast emission of greenhouse gases, and human activities. (Priya *et al.*, 2023). Another study by Xiao *et al.* (2022) shows that coral reefs globally are degrading significantly due to various factors, these factors include natural catastrophes and anthropogenic disturbances. At the same time, the ability of the associated services that marine ecosystems provide is also being reduced.

The evidence from previous research studies suggests that these environmental factors need to be examined in more detail to contribute additional knowledge in formulating a hypothesis that will help mitigate the increasing effects of human related activities that negatively impact and disrupt the functionality of marine ecosystems.

Therefore, the aim of this study is to gather valuable insights from the perspectives of the fishermen in Noveleta, Cavite, regarding the use of technology-driven conservation efforts to address environmental challenges in marine ecosystems. With the objective of contributing to the development of effective strategies for the conservation of marine ecosystems through the acquisition of additional knowledge.

Objectives of the Study

This study aims to gain knowledge and insights from the fishermen regarding their experiences with the technology-driven conservation efforts made in Noveleta, Cavite. Specifically, this research study aims to (1) determine the current status of the marine ecosystem in Noveleta, Cavite; (2) identify the present innovative solutions in Noveleta, Cavite; (3) determine how technology-driven conservation efforts affect fishermen.

Materials and Methods

Phenomenology is the type used for the conducted qualitative study. According to Tenny *et al.* (2022), qualitative research offers a deeper exploration and comprehension of real-life issues. Unlike quantitative research, which relies on numerical data and experimental treatments, qualitative research delves into the reasons and

mechanisms behind phenomena. It focuses on understanding people's experiences, thoughts, and perspectives, rather than solely relying on numerical analysis.

Phenomenology is a method of research that tries to understand what things are like by studying how people see and feel about them. It's about describing the main idea of something by studying it from the viewpoint of those who've lived through it. Phenomenological research looks at how people experience things and believes that the true nature of something comes from how people perceive it. Phenomenological researchers observe and examine what people think, feel, and perceive about the subject they're studying. In phenomenological research, only the perspectives of the people who have directly experienced the phenomenon matter. The beliefs and opinions of the researcher regarding the subject should not matter. Phenomenological research design is particularly helpful for exploring the thoughts, emotions, and experiences of the audience in depth (Manen, 2021) ^[21].

Through this qualitative research with a phenomenological approach, researchers can uncover the lived experiences of fishermen in many ways, such as their perceptions, beliefs, and feelings towards the adoption and impact of technology-driven conservation efforts in Noveleta, Cavite towards their fishing practices.

This study used a face-to-face interview used to assess fishermen. Collecting data is a crucial step in conducting research. It involves gathering information to explore the research problem effectively. According to Mazhar, Syeda Ayeman, *et al.* (2021) the value of data collection is that it's impossible to carry out research without the specific information needed. The purpose of this interview is to gather in-depth information about marine ecosystems and experiences of the local fishermen in about their perspectives on technology driven conservation efforts in Noveleta Cavite. What are interviews? Interviews are a qualitative research method used to collect primary data by asking one or more people about their opinions, experiences or perspectives on a particular topic or subject matter. There are three main types of interviews are structured, unstructured, and semi-structured. Interviews can be conducted face-to-face, over the phone, through video conferencing, and can be done in different forms such as focus groups or one-on-one. Interviews are personal, interactive, qualitative, in-depth, and contextual.

During the month of March, the researchers of this phenomenological study plan to conduct an One-on-one with the fishermen in Noveleta Cavite. The first step is to formulate the question statements regarding the study which is done also in March. After the researchers made the questions, the second step is the researchers made a formal letter to ask permission to conduct this study by writing formally to the fishermen of Noveleta Cavite. The questionnaire is composed of questions that the researchers formed from the related research and studies. The researcher made sure that the set of questions are enough to provide sufficient data needed in the study. Third step: Contact the respondents to set an exact date to ensure that the set date of the respondent and researchers are in their free time. Fourth step after the interview the researchers transcribe the data that they got in the respondents.

The target population for this qualitative research is the fishermen who have experience or are engaged in technology-driven conservation efforts in Noveleta, Cavite.

The fishermen in Noveleta, Cavite, will be the target population since they are within the researchers' reach.

There will be a sample of seven (7) selected participants from the target population. The selected participants will be the fishermen who have the knowledge and experience regarding the technology-driven conservation efforts, for their knowledge and experiences are essential in ensuring that the information gathered is more likely to be appropriate and helpful for the current study. Furthermore, their experiences and knowledge will contribute additional information regarding the technology-driven conservation efforts. Thus, greatly helping the current research. The chosen participants will have the following characteristics and attributes: Must have engaged or experiences with the technological driven conservation efforts, must be at least the legal age eighteen (18) years old; to ensure the participants are able to provide consent and will be participating responsibly, the years of experience in fishing must be at least one (1) to two (2) years in the field; to ensure the chosen participant contains useful knowledge regarding fishing, must have been engaged with fishing activities the last 7 years from 2017 until 2024; this is to ensure that the participant possesses the knowledge regarding the current status of marine ecosystem. This set of criteria was to ensure that the selected sample will more likely possess the knowledge and insights that will be beneficial to the current study.

The researchers employed a non-sampling technique; specifically, a purposive sampling procedure was used to select the participants from the population in this study. This strategy was employed to ensure that the chosen participants possessed a higher probability of possessing the pertinent and valuable information that would be advantageous to this investigation.

Researchers employ the qualitative research method of thematic analysis to carefully and systematically examine and understand data. Thematic analysis is an analytical process that employs an organized and sequential approach to the interpretation of research findings. It offers brief descriptions and analysis of the themes found in the data set and aids in the development of conceptual models by researchers, (Caulfield, 2023).

Thematic analysis is one particular method used to investigate qualitative data. Thematic analysis is an effective technique for discovering people's views, ideas, knowledge, experiences, or values when examining a collection of qualitative data, such as interview transcripts, social media profiles, or survey findings (Kiger & Varpio, 2020) [18]. The data that will be gathered will be subjected to coding and thematic analysis to provide further empirical support to the research. The process will be broken down into six steps: Reading the transcripts to become familiar with the data. This means reading and re-reading the data, taking notes, and beginning to identify patterns and ideas that emerge. This step is crucial for setting the foundation for the subsequent analysis. Next, generating codes through line-by-line open coding. Coding involves systematically working through the data to identify features that are pertinent to the research question. These features are then coded, with the codes acting as labels that categorize the data into meaningful groups, they will be broken down into short open codes into sub-themes. And then, revising, reviewing, and refining themes. Once the themes have been reviewed and refined, the next step is to define and name

them, naming and defining three major themes and related sub-themes. This involves developing a detailed analysis of each theme, identifying the essence of what each theme is about, and determining what aspect of the data each theme captures. And finally organizing themes to represent participants' perspectives within defined themes while also writing up the analysis, weaving together the data extracted to tell the experiences of participants and the gathered data.

Results and Discussion

This section presents the results, discussion, and interpretations of the current research study data gathered from fishermen's experiences regarding the technological-driven conservation efforts in Noveleta, Cavite, which were analyzed through the use of thematic analysis by the researchers.

Theme 1: Government Policies and Their Effects

This theme aims to analyze and evaluate the impact of government policies on marine fishing and the challenges that arise from these policies based on fishermen's perceptions and experiences. Examining the current state of government regulations and their effects may promote a marine environment conducive to the growth of productivity and livelihoods for fishermen, minimize the risks associated with ineffective policy implementations, and enhance the interaction between policy-makers and the fishing communities they impact. This knowledge can be utilized to develop strategies to address these challenges and optimize policy effectiveness.

Changes in Fishing Regulations: Changes to regulations can have significant impacts on both the marine environment and fishermen. Well-informed and adequately enforced rules can result in favorable outcomes, such as mitigating adverse effects on the aquatic ecosystem (Masyhadi, 2024) [22]. Nevertheless, formulating and implementing legislation without considering the viewpoints and apprehensions of fishermen and other stakeholders might lead to detrimental consequences (Keyzer *et al.*, 2020) [17]. There have been changes in laws and regulations throughout the years that have affected fishermen. The government has made new additions and introductions for fishing, Arnel explains that,

“Ang panghuli ng isda ay marami nang bawal para nang sasakyan. *May mga coding area na. May mga kulay-kulay na bangka*”

This statement displays that new laws have been implemented by the government, such as restrictions based on the size of nets, color-coded boats, areas, and restricted fishing zones. Implementing these laws is necessary to combat illegal activities and mitigate harmful human activities to the marine environment. Furthermore, implementing color-coded areas and boat laws can significantly impact fishermen and their fishing productivity. Color-coded areas can be a visual aid to designate specific zones for fishing activities, helping fishermen navigate and operate within designated boundaries effectively (Wong & Yong, 2020). In addition, Arnel explains that laws were a lot looser back then. He explained that,

“*Noong araw, kahit anong suklat ng lambat mo, kahit anong lugar, pwede kang mangisda. Ngayon, may mga area na bawal ka na mangisda.*”

Arnel discusses the changes in fishing regulations and practices over time, emphasizing the heightened restrictions designed to promote conservation and sustainable fishing practices. Inadequate rules in the fishing industry can result in major consequences for both the marine ecosystem and the fishing business. Insufficient implementation or weak regulations can result in excessive fishing, damage of habitats, and pollution, leading to the depletion of fish populations and the deterioration of marine ecosystems (Massaquoi & Roberts, 2021). However, even though these regulations are necessary, they still adversely affect the fishermen. Color-coded areas can adversely impact fishermen by contributing to sudden declines or long-term collapses in fish production and affecting livelihoods (Tidd *et al.*, 2023).

In addition to this, Arnel added that the current state of fishing has become difficult to catch fish due to laws. He stated,

“Ang panghuli ng isda ay marami nang bawal paranang sasakyan”

Some laws obstruct the fishing activities of the fishermen and can dictate how the current fishing conditions will be affected. Implementations of laws such as the Marine Protected Area (MPA) can result in a decline in fish catches and an escalation in expenses and fees for fishermen, thereby affecting their means of subsistence through restricted access to fishing areas and diminished productivity (Derdabi & Aksissou, 2021)^[7]. Furthermore, based on Arvin, the government continues to affect the current fishing condition in this study by constructing breakwaters that will close out the fishing entrance in their area. Arvin added that,

“Kung isasara nasyon wala na dikana makakapangisda”

This statement implies that the government's actions have negatively impacted fishermen's fishing conditions by constructing a breakwater that will close the entrance of boats to the waters. Furthermore, there are also areas where fishermen are prohibited from fishing, and the fishermen know this regulation is implemented and will avoid this area. Abner explained,

“Alam namin kung saan namin iaarya yung bangka namin na wala kaming mapeperwisong mga corals.”

This emphasizes the awareness and responsible practices of the fishermen, highlighting their commitment to avoiding damage to coral reefs and respecting the implemented government laws to ensure that the health of the marine environment is being taken care of. Furthermore, Jonel added that,

“Pag lumampas ang gps mo at ibang bayan kana makikita mo yan bawal dito kasi mga taga tanza lang dito aatras ka kung matapang ka e pasok ka pag nahuli ka bayad ka, ay kaya ganun ang mangyayari.”

This implies a warning about entering a restricted area, and fishermen are informed about the consequences of proceeding towards these areas.

Government Operations: Governments in the marine environment play a crucial role in promoting the health of the marine environment and ensuring that the marine ecosystem stays healthy. Governments implement regulations that restrict excessive fishing, manage pollution, and protect crucial habitats, ensuring the sustainable existence of marine resources in the long run (Shen *et al.*, 2023).

This study revealed that these regulations, with the assistance of the government, have benefits. For instance, the Coast Guard is available within the maritime sector to assist and respond to any issues fishermen may face at sea, Rodolfo explained that,

“Kaya meron tayong maritime may cost guard oras na magkaroon ng problema ang mga mangingisda sakanila lalapit.”

The Coast Guard's responsibilities include enforcing maritime laws and assisting fishermen in trouble. As Rodolfo explained, there is a maritime sector with a Coast Guard so that fishermen can turn to them when they encounter problems. This statement underscores the Coast Guard's role as a first responder in maritime emergencies and the benefits of the government regulations being upheld. It also displays the interaction with the Coast Guard and maritime services with fishermen. Furthermore, enhancing the governance and communication techniques within Marine Protected Areas (MPAs) could promote better collaboration between authorities and fishermen, resulting in the pursuit of common conservation objectives and heightened satisfaction among participants (Muñoz *et al.*, 2022)^[25].

Theme 2: Economic Survival in Changing Conditions

This theme aims to analyze and evaluate the current challenges and strategies based on the experience of the participants related to economic Survival in Changing Conditions. Understanding their challenges can pave the way to determine how they have been resilient and adapted to economic changes. This theme also aims to develop more effective plans and solutions to meet the challenges they face. This theme seeks to identify effective strategies to better understand how fishermen continue to sustain their livelihoods despite economic fluctuations and evolving conditions in the fishing sector that affect them.

Economic Aspects: Economic aspects refers to activities and decisions that affect the economy. It is related to production, distribution, and use of wealth and resources of a society (D'Agaro *et al.*, 2022)^[5]. In the context of fishing, the economic aspect contains topics related to the income of fishermen, fish prices, market demand, cost-benefit analysis that describes the state and behavior of an economy. Danilo stated that,

“Dyan nagkaroon kami ng tulong noong nag ano dyan ng san miguel nagkaroon kami ng ayuda yan yung mga mangingisda dapat meron kang id yung fisher folk ay katulad yan tapos na yung ayuda wala na”

In Danilo's statement, he shows the importance of financial aid from San Miguel Corporation as compensation for the inconveniences of dredging activities. This also indicates the

positive impact of financial aid on their livelihood. However, this was still followed by his statement indicating concern over the loss of support after the end of financial assistance from the company.

Despite Danilo's concern, Abner gave a statement regarding the important role of having keen observation on fishing in their daily work at sea. According to Abner,

"Mata mata lang talaga tingin kami sa malayo kapag meron yung napansin ayon inaaryahan namin 'yon,"

Abner emphasized in his statement the importance of keen observation in guiding the decisions and actions of fishermen in their daily work at sea to maintain their livelihood. This idea is further supported by Anbleyth (2020)^[1]. In addition, Jonel stated that,

"Maganda naman ang pangingsda pag seasonal pero pag bagyuhan wala tapos yan tigil ang pangingsda, month of may dapat tigil na yan pero dahil sa naiipon na yung ano sumusobra, yan ang mahirap sa mangingsda, pagkatapos ng bagyuhan tigil kana."

In Jonel's statement, he expressed the extreme difficulty caused by the need to find an alternative source of income due to the lack of sufficient income from fishing. He also said that the income from fishing during the seasonal season is good but the disturbance caused by the typhoon gives an additional problem which is also the reason for the cessation of fishing. By the month of May, fishing should be temporarily stopped, but due to the accumulated demand, some of the fishermen still continue. Because of the cessation of this, many of the fishermen are forced to find other ways to maintain their livelihood despite the challenges they are facing. Furthermore, Rodolfo added that,

"Pero di ko inaalís talaga yung pangingsda kasi jaan talaga ako jaan 'yan yung binuhay ako sa pamilya ko"

In Rodolfo's statement, his steadfastness as a fisherman can be seen despite the trials and problems they face, he still does not want to leave fishing, because it is the primary source of livelihood for him and his family. Moreover, Danilo added that the fishing was better then compared to now. Danilo stated that,

"Maganda noong araw dahil malinis pa tsaka maraming nahuhuling isda, di naman minsan ay nakakahuli kaso mo di katulad noong araw magkalat ka lang jan ng pain marami kanang mahuhuli"

This statement shows Danilo reminiscing about the time when the fishing was good because the surroundings were clean, and there were many fish that could be caught. His statement suggests that nowadays, it is not easy to catch fish due to pollution or other reasons. The statement emphasizes the impact of human activities on natural resources. This also indicates Danilo's longing for the simplicity and abundance of the past compared to the current situation. Furthermore, Abner added that the breakwater for those fishermen with boats is an obstruction. He explained that

"Sa aming may mga bangka pwerwisyo sa'min 'yang break water kasi tulad dito himbis na ibubulusok mo

nalang dyan eh pupunta ka pa don sa puwang para dalhin eh sa bigat ng bangka na 'yan... para sa'ming may mga bangka parang ano 'yan parang hadlang sa'min 'yan. Pero para sa may mga walang bangka pabor 'yan"

In Abner's statement, he expressed the perversion of the breakwater for their fishermen with boats because they find it difficult to pass through it especially if they are carrying heavy loads. Abner also stated that for those who did not have boats it was a useful one. His statement shows that it is important to first know and understand the views of each group of fishermen on these kinds of things.

Theme 3: Infrastructure Development vs. Traditional Practices

Infrastructure Impact: Business investment, which is the money companies put into growing their operations, is essential for long-term economic growth. In many developed countries, it hasn't been strong in the past ten years, mainly because of ups and downs in demand. However, various permanent factors and policies also influence how much businesses invest (Egert, 2021). In relation to this study, building breakwaters helps fishermen by making the sea safer for them to work in. So, when governments invest in such infrastructure, it helps fishermen who might struggle with rough seas or bad weather. Rodolfo states that,

"Ayan maganda 'yang break water kasi dati sa'min nung wala niyan kapag malakas ang bagyo inaabot kami ng alon."

Breakwaters offer protection from strong waves, but others think otherwise. Arvin states that,

"'Yang break water na 'yan... ayun mahihirapan kami magtaas lalo na malalaki alon."

Some of the fisherman's are having a trouble with the break water in such ways as struggling to do their job the way they did it in the past when there was no breakwater. On the other hand, there are breakwater challenges that deeply affect boat owners but benefit non-boaters. Abner states that,

"Sa aming may mga bangka pwerwisyo sa'min 'yang break water kasi tulad dito himbis na ibubulusok mo nalang dyan eh pupunta ka pa don sa puwang para dalhin eh sa bigat ng bangka na 'yan... para sa'ming may mga bangka parang ano 'yan parang hadlang sa'min 'yan. Pero para sa may mga walang bangka pabor 'yan."

Going back to Arvin's statement, he said that he's against about the breakwater since it will just make his work harder to do or more like a barrier for him to do what's easy. In relation to Abner's statement, he also doesn't want the built breakwater since it will just makes his work really hard but this is beneficial for the non boaters since they don't have to suffer the way other fisherman's who own a boat. It's like they don't have to struggle the way boat owners do because of the built break water. However, there are still fishermen who is fine in the built break water but in a condition. Arvin states that,

“Basta wag lang nila tangalin yung butas ayos na kami.”

According to Arvin's statement, as long as they don't remove the remaining way for them to exit so that they can catch a fish, it's fine with them. Which means, once they paved the only way for them to enter, they will no longer accept the built break water for the reason that it will might affect their fishing lifestyle. If this happen, the fisherman's boat will no longer be a use.

“Yan kasi temporary lang ‘yan nakabukas eh para lang may madaanan mga bangka eh pero kapag ayan talaga sinara na wala na... di na namin mapapakinabangan yung mga bangka.”

Temporary breakwater opening impacts boat usage. Not only this might be a reason for them to finally stop fishing but the family that the fisherman's are being fed might suffer from food scarcity if the fisherman livelihood is dependent on fishing. Abner states that,

“Mas gugustuhin ko pang bayaran nila ako sa bangka ko kesa sa masira lang pagdating ng bagyo na di mo na mapakinabangan.”

He prefer compensation over storm damage for boats because the money that the government will give to Abner and to the other fisherman's who has a boat will be used to start a business and let it grow. But some of the fisherman's don't have any other choice but to just accept government authority in breakwater closure. Abner states that,

“Yung sa'min wala na kaming magagawa kung talagang isasarado kasi ano na ‘yan... gobyerno ang maging ano mo dyan eh...”

The fisherman clearly state that they can't do anything but to just agree since it's the government that's talking and they don't have a power to do so. On top of all that, fisherman's is still trying to somehow help the sea to be preserved despite the illegal activities of their fellow fishermen by securing boats responsibly to avoid disturbing corals. Abner states that,

“Alam namin kung saan namin iaarya yung bangka namin na wala kaming mapeperwisyonang mga corals.”

They are being careful about where they should anchor their boat so they can avoid hurting the coral reefs just shows how small knowledge about the ocean is good for the environment and helps keep marine ecosystems healthy which shows a good start to conserve our ocean.

Going back to the 'break water', the interviewers got curious about like what's the plan of the government once the break water is finally closed since it's just temporary.

“balita ko jan sa break water ay gagawing kalsada papuntang costal.” Abner said.

Turning a breakwater into a coastal road might disturb marine habitats. This could cause problems for the marine environment and could completely stop the fisherman's to catch a fish.

Theme 4: Impact of Environmental Changes

Environmental Impact due to Human Activities: Human activities have had a wide range of detrimental impacts on the natural environment, including species extinction, habitat destruction, and climate change (Donkor, 2023) ^[9]. There are many human activities that deeply affect the condition of the marine ecosystem.

“Wala na ang dagat sobrang... polluted hindi katulad ng mga siguro mga past 1970s, 70s, napaka ganda ng dagat.”

Arnel's statement shows how marine life in the past is much better than nowadays. People back then might be very respectful when it comes to treating their sea better. Unlike today's generation, the respect of everyone to the marine ecosystem is gradually disappearing. Rodolfo states that,

“Sa dami na ng lumalabas na nangingisda at mga ilegal na pangangisda- nauubos na ang ating mga isda.”

Fish depletion will be the result of illegal fishing. That's why the more people do illegal fishing, the more our fishes will gradually disappear. It's very crucial for the fisherman's to know their limits... unless nothing will be left for the future generations. Except for the fishes, the underwater explosions also damage the coral reefs making the fishes escape the place and for the fisherman's to struggle the next day. Rodolfo states that,

“Pinasabog nila yung ilalim ng tubig kaya pati yung mga corals kapag tinamaan noon eh masisira.”

The use of underwater explosives is concerning as it leads to irreversible damage to coral reefs, affecting marine ecosystems and livelihoods depending on them.

Illegal fishing is not the only human activity that post a negative impact towards the marine ecosystem. There's also an impact of dredging in fish habitats. Abner states that

“Siguro mga nabulabog yung isda dahil sa dredging kasi syempre buhangin ‘yon makapal ‘yon eh makakalkal ang ano non eh ano... yun simula non wala na tumumal na yung ano ng isda.”

In this case, there's a big chance that there will be no future for marine ecosystems if people will continuously do these types of things that the people do that is slowly destroying marine life.

Also, environmental impact mentions dredging that's affecting the fishing. Jonnel states that,

“Habang tinutuloy nyo na yung dredging mas malaking tyansa yung marine ano mauubos yan siguro meron pang isda pero noong last 3 years di mo na kailangang lumayo dahil dyan lang may mahuhuli ka na eh.”

Jonnel expresses concern regarding the ongoing dredging activities and their potential significant impact on the marine environment. He suggests that the continuation of dredging increases the likelihood of decreasing marine resources, particularly fish. Additionally, he notes a noticeable

decrease in the need to venture far from the dredged area to catch fish over the past three years, implying a decline in fish stocks attributable to the dredging activities.

Moreover, the disruption are caused by the transportation of sand to the coastal areas. Abner states that,

“Siguro mga nabulabog yung isda dahil sa dredging kasi syempre buhangin ‘yon makapal ‘yon eh makakalkal ang ano non eh ano... yun simula non wala na tumumal na yung ano ng isda.”

Abner is implying that the disturbance to the fish might be due to dredging activities, which stir up the thick sand, disrupting the fish habitat. As a result, there's been a decrease in fish population since then. This shows how dredging and similar human activities can harm the environment, underscoring the importance of thinking carefully about them to avoid hurting marine ecosystems. In addition, environmental disruption drove fish away. Rodolfo states that,

“Kaya pag dredging niyang ganon ang pumalit na... edi nakuha na yung lupa ang pumalit ngayon doon sa nahukay niya burak na sa kwan putik na. Kaya... ang isda sa'tin lumayo na.”

Furthermore, after noticing this, it's important to think about how dredging affects the environment and find ways to reduce its harm on marine life and nature. Also, more research is needed to understand the long-term effects and help make better decisions about coastal development and using resources.

Also, fishing has been really challenging due to the hot weather. Abner states that,

“Walang mahuli ngayon eh... tag tag hirap ang mga taga rito sa'min sa lugar at mainit ngayon... walang mahuling isda eh.”

This indicates that because of the hot weather, people are having a hard time catching fish. It shows how weather conditions can affect fishing and people's ability to make a living from it.

Environmental Degradation: This have become one of the biggest worries worldwide in the 21st century. The worsening of these issues is causing more concern because it affects many different parts of a country, like its economy, society, and the environment (Lee et. al., 2024) [20]. The biggest problems for marine ecosystems are overfishing and pollution. Overfishing happens when fish are caught too quickly, harming their populations and the balance of the ecosystem. Pollution, like plastic and chemicals, also hurts marine life and habitats, causing lasting damage to the oceans. These issues are serious and affect both marine life and the people who rely on it.

“Tapon na naman dyan yung mga laundry, yung mga... Eh, ang laundry, may mga chemical yan. Magiging dumping site nalang ‘yan. Severance water line”

Based on Abner's statement,, it might be appropriate to consider implementing proper waste management practices

for laundry facilities to minimize the environmental impact of chemical discharge. Additionally, raising awareness among residents about the importance of proper waste disposal and the potential consequences of chemical pollution could help mitigate environmental harm in the area.

Theme 5: Marine Conservation Efforts

Strategies and Impact: To better address twenty-first-century challenges, research institutions often develop and publish research impact strategies, but as a tool, impact strategies are poorly understood (Reed et al., 2022). For instance, researchers could develop impact strategies focused on advocating for bans on harmful fishing methods, regulating fishing activities, and promoting the creation of artificial coral reefs to mitigate the deterioration of the ocean environment. By implementing effective impact strategies, researchers can work towards meaningful change and address the urgent need for action in protecting the oceans.

“Mas maganda talaga mangisda dati di tulad ngayon ang dami nang basura at pollution.”

Arvin states that fishing was much better before than it is now. Nowadays, there's a lot of garbage and pollution in the water, which makes it harder to fish. This pollution messes up the fishing spots and makes it tough for fish to live there in peace.

Therefore, Arnel states the possible reason why fishes in their place is gradually decreasing.

“Siguro mga nabulabog yung isda dahil sa dredging kasi syempre buhangin ‘yon makapal ‘yaon eh makakalkal ang ano non eh ano... yun simula non wala na tumumal na yung ano ng isda.”

He also explains that the disturbance caused by dredging, which involves digging up sand or sediment from the sea floor, might have disrupted the habitat of the fish. This disturbance could have led to a decline in the fish population over time. Rodolfo similarly states that,

“Kaya pag dredging niyang ganon ang pumalit na... edi nakuha na yung lupa ang pumalit ngayon doon sa nahukay niya burak na sa kwan putik na. Kaya... ang isda sa'tin lumayo na.”

He says that when dredging occurs, the seabed is disturbed, and instead of water, it becomes filled with mud and dirt. This change in the environment causes the fish to move away from that area.

Besides dredging, explosives are the one of common way to easily catch a fish and because of these actions, the marine ecosystem are most likely affected.

“Pinasabog nila yung ilalim ng tubig kaya pati yung mga corals kapag tinamaan noon eh masisira.”

Rodolfo said that other fisherman's used explosives underwater, causing damage even to the corals when they were hit by the explosions.

On the other hand, Rodolfo states the possible solution to prevent our fishes disappear little by little.

“Eh bawalan natin yung mga illegal na pangingisda. Katulad nalang ng dynamite fishing. Number one 'yan kasi yung similya ng isda ay napapatay na niyan.”

Rodolfo's statement shows how crucial it is to stop people from using harmful methods to catch fish, like dynamite fishing. This technique is super destructive because it involves setting off explosives underwater, which wrecks coral reefs and kills so many fish, including the little ones that haven't even had a chance to grow up yet. By putting a ban on these harmful practices, we're not just protecting the ocean and its creatures, but also ensuring there will be enough fish for generations to come. He also states the one of the most problems that the ocean faced by some fishermen that other fishermen made too.

As a solution for the marine problems, Jonnel states that,

“May magagawa tayo kailangan ng issue kay gov. kay mayor wala pa yan e dapat yan sa governor, congressman hanggang sa kataas taasan ang mamamayagpag jan.”

He says that we should take an action about a problem, and it's not just up to the mayor to fix it. Jonnel also thinks that we should talk to the highest people like the governor or even members of congress to get things done. It's like saying, "Let's go straight to the top to sort this out."

However, there are other issues that some fishermen are mostly faced because of the act of their co-fishermen who become so unpleasant and offensive in terms of going from one place to another where many fishermen are used to go fishing too. Jonnel says that,

“Tapos pupunta lang ibang bayan huhulihin lang nila dapat through to government para atleast pag inayos ng bfar.”

Jonnel said that some people from different towns come to catch fish. Instead of letting them do it freely, they suggest that the government should regulate them. This way, the Bureau of Fisheries and Aquatic Resources (BFAR) can step in and manage things better. It's like asking for rules to be followed so that fishing is fair for everyone.

Conversely, in terms of taking care of the marine ecosystem, Jonnel states that,

“Wala ka namang magagawa jan eh siguro mag ano sila ng hatchery parang coral na ano parang bahay ng isda yung artificial yung parang coral reefs gagawa ka, gobyerno ang gagawa dapat.”

Jonnel thinks that everyone can't do anything about the situation but they suggest that maybe the government should make artificial coral reefs to help, because they think it's the government's job to handle this kind of thing.

Theme 6: Challenges in Modern Fishing

This theme aims to analyze and evaluate the current state and the arising difficulties from modern fishing based on the perceptions and experiences of the participants. Analyzing the current state of modern fishing and the challenges that arise from this may cultivate a fishing environment beneficial to the growth of fishing productivity and fishing livelihood, reduce the lower risk of low catch, and improve

the interplay between fishermen and the marine environment through knowledge that can be utilized to create strategies aimed to address these challenges.

Modern fishing faces numerous challenges due to technological advancements, global demand for seafood, and sustainable marine resource management. Issues include overfishing, bycatch, habitat destruction, climate change, and effective fisheries management (Andersen *et al.*, 2024)^[2]. Addressing these issues is crucial for sustainable fishing practices, biodiversity preservation, and livelihoods. Globalization's influence on fishing has exacerbated fish stock depletion, particularly in coastal regions traditionally fished by indigenous communities (Prapti *et al.*, 2021).

Fishing Conditions: Fishing Conditions explores the factors that significantly influence fishing activity and the availability of fish in the region, highlighting seasonal changes and guidelines (Finnis & Reid-Musson, 2022)^[11]. This study explores the challenges that fishermen face in their livelihood amidst changing fishing conditions and explores the potential benefits of investing in infrastructure. Abner stated that,

“Mayron ngang yung tinatawag na lawlaw yung lawlaw yung ginagawang tuyo minsan may lumalabas talaga 'yan sa buwan minsan may buwan na wala siya”

Abner added to her statement that they would have a hard time catching fish from February to April. Because it is also the northeast monsoon season. He said,

“Sa buwan din katulad nitong buwan ng amihan yung pag pasok ng February hanggang April talagang sadyang mahina talaga ang isda kasi amihan eh.”

As highlighted in Abner's statements, one of the major issues faced by fishermen is that there are specific months when fish are abundant, while in other months, they are scarce or in short supply.

Moreover, Arnel added that the sea is getting tighter because of the laws and the current fishing state. Arnel stated that,

“Ang dagat po natin medyo sumisikip na.”

This statement suggests that our seas are facing increasing pressures. This can be interpreted in several ways. It points to a growing presence of activities such as fishing, shipping, and pollution, which physically crowd marine environments. Furthermore, Arnel added that the fishing productivity has decreased and has resulted in some challenging circumstances for fishermen. He explained that,

“Medyo mahina na ang hulihan”

This implies that fishing productivity in the current state of the marine ecosystem has gotten weaker, leading to a reduction in fish catch. The changes highlighted that inadequate fishing productivity and poor pricing for selling raw fish can lead to insufficient income for fishermen, hence impacting their capacity to fulfill their daily requirements. Diminished fishing yields might result in economic difficulties for fishing communities (Tan *et al.*, 2021).

In addition to this, Arnel added that the current fishing conditions have become difficult to catch due to laws. He stated,

“Ang panghuli ng isda ay marami nang bawal paranang sasakyan”

Some laws obstruct the fishing activities of the fishermen and can dictate how the current fishing conditions will be affected. Implementations of laws such as the Marine Protected Area (MPA) can result in a decline in fish catches and an escalation in expenses and fees for fishermen, thereby affecting their means of subsistence through restricted access to fishing areas and diminished productivity (Derdabi & Aksissou (2021) [7]. Furthermore, based on Arvin, the government continues to affect the current fishing condition in this study through the construction of breakwaters in their area. Arvin added that,

“Kung isasara nasyon wala na dikana makakapangisda”

This statement implies that the government's actions have negatively impacted fishermen's fishing conditions. This is regarded as a normal circumstance despite the reduced fish productivity fishermen encounter. Abner explained that,

“Sila yung may mga ganitong walang mahuli ano na yan normal samin yan.”

Abner stated that no catch is regarded as a normal occurrence. Fish catches are often reduced by difficulties that fishermen run against. Fish bait shortages, poor weather, and disputes influencing fishing spots are just a few of the causes of these issues. Fish populations are further being depleted by overfishing and unsustainable fishing techniques brought on by disagreements among fishermen (Daris *et al.*, 2022) [6].

Consequently, as a result of these activities that negatively impact fishing productivity, this had led negative effects on fishermen as well. Reduced fish catches profoundly and diversely negatively affect fishing lives and livelihoods. The declining fish catch results in financial instability and suffering for millions of fisherman worldwide, gravely jeopardizing their livelihoods (Tikadar *et al.*, 2021). Furthermore, Abner stated that,

“Kung meron silang mahuli edi salamat pero kung walang mahuli eh wala. Uuwi silang luhaan. Pang ulam lang talaga pero pang benta wala”

Based on the statement, when fishermen have few catches of fish, it would leave a negative effect on them emotionally and on their livelihood and the catches would be enough for them to eat but not enough to sell.

Theme 7: Community Response and Adaptation

Community and Culture: Fishing not only supports the livelihoods of fishermen but also contributes to the local economy through the sale and trade of fish. Additionally, fishing is often a traditional and cultural practice that is passed down through generations, strengthening family ties and preserving cultural heritage. Rodolfo said that

“Sila yung may mga ganitong walang mahuli ano na ‘yan normal na sa’min ‘yan”

Normalizing that it's fine when no fish are caught Catching no fish is a a natural occurring circumstances. The world's small-scale fisheries support livelihoods by providing both income and subsistence food to avoid poverty and nothing to eat. This safety net function is highly relevant for marginalized households and local economies coping with the effects of a changing climate. Yet, characterizing and quantifying the livelihood safety net role of small-scale fisheries has been elusive and often ambiguous in the literature. The lack of information also contributes to inattention from policymakers (Viridin *et al.*, 2023).

Long time fishing in a long time helps identify types of fish. Long-time fishing experience can indeed help individuals identify more fish. Over time, experienced anglers become familiar with the different species of fish, their characteristics, and their habitats. They learn to recognize the behavior, size, shape, and color patterns of various fish species. Sir Rodolfo said that

“Sa tagal ko nang mangingisda biro mo alam ko na kung anong klaseng isda yung nagalaw”

This knowledge and experience enable them to identify different fish species more accurately and quickly. Additionally, experienced fishermen often develop a keen eye for subtle differences in fish appearance, such as fin shape, scale patterns, or body markings, which further aids in fish identification.

Fishermen's organization: Fisherman organizations do exist. Fishermen organizations are formed to represent the interests and concerns of fishermen within a particular region or industry. These organizations play a crucial role in advocating for the rights and welfare of fishermen, promoting sustainable fishing practices, and addressing issues related to the fishing industry. sir abner said that

“Meron tayong samahan ng mga mangingisda na organisasyon”.

Fishermen organizations often work closely with government agencies, environmental groups, and other stakeholders to develop policies and regulations that ensure the long-term viability of fisheries and protect the marine ecosystem. They may also provide support and resources to their members, such as programs, increase market opportunities, and assistance in regulatory requirements.

Different treatments when traveling for fishing, depending on various factors such as the destination, regulations, and the purpose of the trip. Some areas may have designated marine protected areas or conservation zones where fishing is restricted or prohibited. Traveling to these areas for fishing may require special permits or authorization, and strict adherence to conservation measures is necessary to preserve the ecosystem and fish populations (Kriegl *et al.*, 2021) [19]. Marine protected areas (MPA) are designated parts of the ocean that restrict human activities to a certain degree. MPAs are established around the world using a wide range of legislative instruments and thus come in various forms and shapes. Furthermore, Rodolfo stated,

“Kapag dumayo kami doon sa ibang lugar hinuhuli kami pero kapag sila ang dumayo eh di namin sila pinapansin kasi pareparehas lang naman kami ng ginagawa eh... hindi naman kami yung may ari ng dagat para pagbawalan sila eh”

It's important to research and familiarize yourself with the specific regulations and requirements of your fishing destination to ensure compliance and a smooth fishing experience. Consulting with local fishing authorities, charter operators, or fellow anglers can provide valuable insights and guidance for a successful fishing trip.

Bad weather alerts prompt immediate action from local authorities. When bad weather alerts are issued, local authorities often take immediate action, especially in areas where fishing is a significant activity. The safety and well-being of fishermen and other individuals at sea are of utmost importance, and prompt action is necessary to mitigate potential risks and ensure their protection. Rodolfo said that

“Oo ay hindi pero pag mas umaano yung panahon mas tumitindi yung ramdam mo kasi nga mas umaano yung taon mas malaki yung alon”

Local authorities, such as coast guards, maritime agencies, or emergency management agencies, closely monitor weather conditions and receive updates from meteorological services. When severe weather conditions, such as storms, hurricanes, or strong winds, are forecasted or detected, they issue alerts and warnings to the public, including fishermen.

Theme 8: Adoption and Impact of Fishing Technologies

The purpose of this theme is to explore and understand the technologies used in fishing and their effects on the fishing environment, and the communities that rely on fishing for their daily living jobs. Furthermore, it aims to look into how the adoption of new fishing technologies has influenced fishing practices, sustainability, and overall impact on the marine ecosystem.

Fish Finder Technology: Fish finders are electronic devices used by fishermen to locate and identify fish underwater. They work by emitting sonar signals into the water (Yasim *et al.*, 2021). The fish finder then analyzes the returned signals and displays them on the screen, allowing the user to see the location and the type of the fish.

This study find that the ability of fish finder is to detect and locate fish underwater. It also examines how fish finder technology improves fishing efficiency and productivity. It explores the effect of fish finders on the locals of noveleta Cavite in some of the fishing areas. Sir Jonnel said that,

“Napaka simple lang kasi gamitin ng fish finder kasi iseset mo lang sa kulay sa lalim tapos yun lang madedetect mona yung mga isda kung anong uri at kung gaano karami ang makikita mo sa fish finder”.

Sir Jonnel claims that fish finder are very easy and simple to use among fishermans.it also bring that these has a positive effect on perspective on fishermans.

Fish finder are very simple to use for the fishermens because you just set something to the fish finder and that's all you can detect the fish, you can know what kind of fish and how many you can see in the fish finder. According to Gautama *et al.* (2023)^[12] a Fish finder is a detection tool that makes it

easier for fishermen to know the location of the fish crowd. In addition to the previous statement, several fishermen have also mentioned that the cost of the item in question was quite high. They expressed their concern about the expensive price tag associated with it. This suggests that the item may not be easily affordable for everyone in the fishing community. Sir arvin said that

“Ang fish finder nasa mahigit 20k ganun”

Sir arvin claims that the value of fish finder is 20k but the estimated value of fish finder in the phillipines now is 13 thousand. According to Smith *et al.*, (2024) that the equipment is commonly deployed at a wide range of water depths and greatly expands our capacity to remotely monitor aquatic ecosystems.

In Noveleta, Cavite, the fishermen face a technological disadvantage compared to other regions due to limited financial resources. This lack of funds prevents them from acquiring essential equipment like GPS devices, which are crucial for modern fishing practices. As a result, the fishermen in Noveleta rely on traditional methods and techniques, highlighting the challenges they face in adapting to the advancements in technology. Sir Jonnel said,

“Kung gusto nyo mas advance na technology punta kayo ng bayan ng tanza. kase dyan may mga radar kana may gps kana at kung ano ano pang mga gamit”

Sir Jonnel statement claims that there are more advanced technology apart from fish finder. In our region, fishing technology may be less advanced compared to others. This is because we have such as limited access to modern equipment, lack of infrastructure, or traditional fishing practices that have been passed down through other fishermans. As a result, our region may rely on simpler techniques like hand nets, traditional fishing boats, or basic fishing tools.

Leaving that aside here in noveleta cavite there are limited technological upgrade occur in various reasons, like limited access to resources and funding can hinder technological upgrades. Sir Jonnel also said,

“Sa tanza kayo makakakita non ang may mas malaking information about sa technology sa pangingsida sakin yung alam ko lang is yung fish finder yun lang”.

Sir Jonnel statement claim that Noveleta cavite have limited technological advancement in Technology that is developed for or adopted by the recreational fisheries sector (e.g., anglers and the recreational fishing industry) has led to rapid and dramatic changes in how recreational anglers interact with fisheries resources. According to Cooke *et al.* (2021)^[4] said that From improvements in finding and catching fish to emulating their natural prey and accessing previously inaccessible waters, to anglers sharing their exploits with others, technology is completely changing all aspects of recreational fishing.

Other than that, there is an equipment that can track if you are going to hit a rock underneath the ocean that is called sonar. The high frequency Adaptive Resolution Imaging Sonar (ARIS) is widely used for underwater object detection and imaging. Our study investigated the suitability of ARIS

3000 for the species identification of North-East Atlantic marine species using experimental aquarium studies, field surveys and multi investigator assessments. Aquaria results showed that 82 % of species were detected by observers, of which five were identified correctly identified consistently (Jones *et al.*, 2021)^[16]. Sir Jonnel also said that

“Sonar yung para syang radar, yung fish finder kasi halos isda lang ang pwede mong iano yung sa sonar makikita mo yung lupa o bato kung tinatamaan ka”.

Sonar technology has significantly transformed the fishing industry by enabling fishermen to effectively locate and track fish beneath the water's surface. This information allows fishermen to make informed decisions about where to cast their nets or drop their lines, increasing the efficiency and productivity of their fishing. Sonar technology has proven to be an invaluable tool for fishermen, enabling them to navigate and explore the depths of the ocean with greater precision and accuracy.

The utilization of GPS technology plays a crucial role in determining fishing limits and ensuring compliance with territorial boundaries. Sir Jonnel said that

“May gps sila kase mayroon territory kung tawagin, bawat bayan mayroon territory sa bawat dagat pag lumampas ka jan huhulihin ka ng coast guard kumbaga sa kalsada out of line ka kaya kailangan naka gps ka”.

This statement of sir Jonnel he said that there are territorial boundaries in each city or regional places like tanza, cavite city, and many more. GPS technology allows fishermen to accurately determine their location at sea, enabling them to stay within the designated fishing limits set by authorities by using GPS devices, fishermen can track their positions in real-time and ensure they are operating within the permitted fishing zones. In addition sir Jonnel also said that

“Pag lumampas ang gps mo at ibang bayan kana makikita mo yan bawal dito kasi mga taga tanza lang dito aatras ka kung matapang ka e pasok kapag nahuli ka bayad ka, ay kaya ganun ang mangyayari”.

The statement includes that if a fisherman's GPS device indicates that they have crossed into a different town's fishing territory, they may encounter consequences such as being warned or fined by the coast guard. That fishermen from a specific town, Tanza, have a reputation for being territorial and enforcing fishing boundaries. The statement implies that if a fisherman is brave enough, they may continue fishing in the restricted area, but if caught, they will have to pay a penalty.

Fishermen in Noveleta, Cavite, rely on fish finders as a valuable tool to detect and locate schools of fish in the water they navigate. The fish finder's sonar technology allows them to effectively scan the underwater environment and Sir Abner said that

“Nakakatulong din minsan kasi kung aarya ka himbis na wala kang mahuli may mahuhuli ka kahit kaunti”

Sir Abner, like many other fishermen, recognizes the value of using a fish finder to enhance his fishing. Fish finders are

electronic devices used by fishermen to locate and identify fish underwater. They work by emitting sonar signals into the water. The fish finder then analyzes the returned signals and displays them on the screen, allowing the user to see the location and the type of the fish (Yasim *et al.*, 2021).

Beside that, fishermen in noveleta are lacking of fishing technological knowledge among the fishermen may result in a lack of awareness about modern fishing technologies and equipment. This can be a problem in tier ability to take advantage of advances tools that can improve their fishing efficiency. Sir Jonnel said that,

“Sa tanza kayo makakakita non ang may mas malaking information about sa technology sa pangingsida sa kin yung alam ko lang is yung fish finder yun lang”.

So, the statement of sir Jonnel is that tanza has more information about technology in fishing because the fishermen in noveleta the only thing is using is fish finder. Without technological knowledge fisherman may struggle to adapt a new fishing techniques or practices that rely on advance technologies.

Fishermen in noveleta Cavite lack access to advanced fishing technologies. Insufficient access to modern fishing equipments and tools can be a hinder to fisherman's ability to efficiently locate and catch fish without advance technologies such as fish finders sonar systems. Fishermans may rely on traditional methods that are less effective in identifying a fish.

“About naman sa mga technology sa pangingsida, hindi to katulad ng tanza sila ang mas hightech sa mga technology sa pangingsida kasi sila yung mga malalaki yung bangka sila yung luma laot papuntang west philippine sea”

This statement said that we lack access to advanced fishing technologies and tanza has more advance because they are more civilized and they have funds money that they can use to buy equipments like gps, fish finder, or sonar system. Fisherman Illegal Fishing Utilizing Fish Finder Technology some fishermans they are using illegal type of fishing like dynamite fishing. Arvin said that

“Meron yung mga dibote na mga bomba mga pandra dinamita hinahagis nila sa dagat”

This statement said that fish finders are utilized in illegal fishing because fish finders utilize sonar technology to detect underwater objects including fish and because of that fisherman just dropping dynamite in a school of fish that fish finder detects. Dynamite fishing is One damaging fishing method that uses explosives to stun or kill schools of fish is dynamite fishing, also known as bomb fishing or blast fishing (Banerjee *et al.*, 2023)^[3].

Theme 9: Impacts of Fishing Technology

Fish finder can be a life saver when fisherman have barely caught fish. Fish finder are very simple to use for the fishermens because you just set something to the fish finder and that's all you can detect the fish, you can know what kind of fish and how many you can see in the fish finder. Fish finder is a detection tool that makes it easier for

fishermen to know the location of the fish crowd (Gautama *et al.*, 2023)^[12].

“Nakakatulong din minsan kasi kung aarya ka himbis na wala kang mahuli may mahuhuli ka kahit kaunti”

These findings support sir abner claims that fish finder are very easy and simple to use among fishermans.it also bring that these has a positive effect on perspective on fishermans. Advance technology of fishing it has proven that it is more efficient than traditional fishing techniques.The use of advance technology such as fish finder allows to locate fishes with greater precision and accuracy (Siswandi, 2024). Modern fisheries has proven to be able to be more effective, sustainable and provides economic benefits for fishing communities (Siswandi, 2024). Arvin said that

“Mata mata lang talaga tingin kami sa malayo kapag meron yung napansin ayon inaaryahan namin ‘yon”.

This statement of Arvin says that they are only looking in their eyes in distance finding fish and throwing his net to catch fish.these techniques is ineffective that may result in lower catch fish rates and inefficient use of resources.

Conclusion

The marine ecosystem of Noveleta, Cavite is facing several issues due to human activity and environmental changes. Among these issues include overfishing, pollution, climate change, loss of species, and habitat degradation. The diminishing numbers of fish, the destruction of coral reefs caused by underwater explosives and dredging and illicit fishing are all obvious signs of the negative consequences of these activities. Human activities need to be well balanced in order to tackle these issues and protect the marine ecosystems. It is advisable to enact laws that promote the building of artificial coral reefs, outlaw destructive fishing methods, and control the fishing sector. Moreover, reducing damaging fishing techniques is necessary to protect the ocean and its inhabitants as well as to guarantee a consistent supply of fish for next generations.

In conclusion, the local fisherman in Noveleta have devised some innovative strategies to maintain the company under constantly shifting circumstances. Financial support from organizations such as San Miguel Corporation is seen to be necessary to assist fisherman in overcoming the difficulties brought on by dredging activities. Building breakwaters is also underway, despite concerns about its potential impact on fishing activities and possible disturbance of maritime habitats.Technology-driven conservation programs could either help or hurt fisherman. Even when the intentions of these programs are to prevent environmental damage and promote sustainable fishing techniques, they can upend traditional fishing practices and livelihoods. Fisherman must be included in decision-making and alternative livelihoods must be promoted if conservation initiatives are to be effective and beneficial for the marine ecology as well as the fishing community.

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