MICROPLASTIC CONTAMINATION IN GIANT TIGER PRAWNS (*Penaeus monodon*) IN SELECTED AQUACULTURE PONDS IN BONIFACIO, MISAMIS OCCIDENTAL

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ABSTRACT

Microplastics have been recognized as emerging environmental pollutants that pose risks to aquatic organisms and may threaten human health through the consumption of contaminated seafood. This study determined the presence and levels of microplastic contamination in giant tiger prawns (*Penaeus monodon*) collected from selected aquaculture ponds in Barangay Migpange, Bonifacio, Misamis Occidental. A descriptive research design was employed, wherein 30 prawns were collected from three sampling sites and subjected to gastrointestinal tract dissection under sterile conditions. Tissue digestion was performed with 10% potassium hydroxide (KOH), followed by density separation with a saturated sodium chloride (NaCl) solution. The resulting filtrates were examined under an Olympus CX23 microscope, and suspected microplastics were identified by their physical characteristics and verified with a hot-needle test. Descriptive statistics, including total count, mean, and frequency distribution, were utilized to analyze the data. Microplastics were detected in prawns from all sampling sites. Microplastics were detected at all sampling sites and consisted of fibers and rubber fragments in blue, red, green, and black colors. Site 1 showed the highest contamination with seven particles (mean = 0.70 MPs per prawn), whereas Sites 2 and 3 each contained two particles (mean = 0.20 MPs per prawn). These findings confirmed microplastic contamination in local aquaculture systems and demonstrated variations in contamination levels among the sampled ponds.

Keywords: ***aquaculture, food safety, microplastics, Penaeus monodon, pollution***

DEDICATION

This manuscript is lovingly dedicated to our families and parents, whose unwavering support, sacrifices, encouragement, and prayers have been our constant source of strength throughout this journey. Their belief in our abilities inspired us to persevere through every challenge and milestone.

We also dedicate this work to our advisers and mentors, Shaira Alaina U. Guiaman and Nelfa D. Canini, for their invaluable guidance, patience, expertise, and dedication in helping us complete this study. Their wisdom and encouragement greatly contributed to the success of this research.

To our friends and classmates, thank you for the shared experiences, motivation, cooperation, and support that made this academic journey meaningful and memorable.

Above all, we dedicate this work to God for granting us wisdom, strength, knowledge, and perseverance to overcome difficulties and complete this study.

Ria, Jocelyn, and Prince

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INTRODUCTION

Background of the Study

Plastic usage increases year by year, and the growing trend is projected to continue. Plastics are the primary materials for packaging and construction applications because of their lightweight and easy-to-handle properties. The environment faces an elevated risk of pollution from both discarded disposable plastic packaging and personal protective equipment (Huang et al., 2022). As of 2017, only 9% of the 9 billion tons of plastic ever produced had been recycled, leaving large amounts of plastic to contaminate the environment and resulting in significant negative health and economic impacts (Nikiema & Asiedu, 2022). Of this plastic waste, 20% is estimated to leak into ocean environments. When these plastics are broken down into particles or fragments in the environment by processes such as physical, thermal, oxidative, or photodegradation, they can become microplastics (MPs), which refers to plastic waste sized between 1 µm and 5 mm (Tee-hor et al., 2024). They are small, spread easily in the environment, making them difficult to collect and eliminate.

In 2025, with the current rate of global plastic consumption, the mass of marine plastics is estimated to triple from 50 million tons (MT) in 2015 to 150 MT (Maddison et al., 2023). Microplastics have been detected in remote marine environments. The extent of plastic pollution in the marine environment has been documented in an international study, which reports that the Philippines is the leading source of plastic pollution in the oceans globally, dumping an average of 3.30 kilograms per person per year (Ahearn, 2023). As a result, many aquatic organisms have been affected, including commercially significant species such as prawns.

Prawns, particularly giant tiger prawns, belong to the most recognized crustaceans from the *Penaeidae* family for their high economic value and importance in aquaculture. They are widely distributed across tropical and subtropical regions, especially in the Indo-Pacific, and include numerous species that are intensively cultivated due to strong market demand (Aguirre-Pabon et al., 2026). Giant tiger prawns (*Penaeus monodon*) are indigenous to the Philippines. They can be grown in freshwater, brackish water, and marine water throughout northern Luzon to parts of Mindanao (Macusi et al., 2022). The giant tiger prawn (*P. monodon*) is selected as the study organism because of its wide distribution, commercial importance, and established use as a bioindicator of aquatic pollution of microplastics and heavy metals (Davies, Dienye, & Victor, 2025; Ren et al., 2025).

According to a study by Tahiluddin et al. (2025), giant tiger prawns (*P. monodon*) are one of the main cultured aquatic organisms in the Philippines, together with seaweeds (primarily *Eucheuma* and *Kappaphycus*), tilapia (*Oreochromis spp.*), milkfish (*Chanos chanos*), and shellfishes (*Crassostrea, Perna,* and *Modiolus spp*.). Prawns can be contaminated with microplastics either from the water they inhabit or through the food they consume. In general, ingestion is considered the primary route by which aquatic organisms such as fish, shellfish, and shrimp absorb MPs. In one instance, these MPs are said to be stored and accumulate in the digestive or intestinal tract after ingestion and are finally removed (Reunura & Prommi, 2022). Prawns' overall health may be compromised by this accumulation, resulting in slower growth and poor feeding efficiency (Palmer & Herat, 2021). The dangers mentioned above are of greater importance in aquaculture, where prawns are raised for human consumption, and thus their health has a direct impact on both farmers and consumers.

The aquatic sector encompasses the wild capture and cultured production of aquatic animals from marine and freshwater environments, including tiger prawns, a significant source of protein and micronutrients in the Philippines (Cabral et al., 2023). Aquaculture ponds are available in the coastal areas in the municipality of Bonifacio, Misamis Occidental. Thus, it is a suitable location for assessing microplastic presence in giant tiger prawns. Researchers are publishing more and more papers on microplastics in various organisms. However, there is still very little research on the effects of microplastics on pond organisms in Bonifacio, a major fishing and aquaculture area of the province.

Objectives of the Study

This study's main goal was to determine the occurrence of microplastic contamination in giant tiger prawns collected from selected aquaculture ponds in Bonifacio. Specifically, this study aimed to:

1. Determine the presence of microplastics in *P. monodon* collected from selected aquaculture ponds in Bonifacio, Misamis Occidental using potassium hydroxide (KOH) digestion, sodium chloride (NaCl) density separation, and microscopic identification;
2. Describe the morphometric characteristics and microplastic contamination levels of *P. monodon* collected from the three sampling sites; and
3. Identify potential factors contributing to microplastic contamination in giant tiger prawns in aquaculture.

Scope and Delimitations

This research primarily focused on detecting and quantifying microplastics in prawns collected from selected aquaculture ponds in Bonifacio, Misamis Occidental. The analysis involved laboratory procedures for dissecting and examining microplastic particles from the gastrointestinal tracts of prawns. The findings provided initial data that could be useful for local aquaculture and environmental monitoring. However, the study did not focus on the chemical characteristics of microplastics or their toxicological effects on prawns and humans. Furthermore, the study was limited to giant tiger prawns, and other aquatic species were not included. The research was also confined to selected fish farming areas in Bonifacio, Misamis Occidental; therefore, the results could not be generalized to other locations or water bodies outside the study area.

Significance of the Study

This study addressed existing gaps by exploring microplastic contamination in cultured prawns in Bonifacio, Misamis Occidental. While previous studies in the Philippines had documented microplastics in other aquaculture species such as milkfish, this study provided more specific and locally relevant data. Additionally, this study provided baseline data on microplastic contamination in local aquaculture systems by measuring microplastic contamination levels. Such data could be used in subsequent monitoring, management, and mitigation of microplastic contamination in aquaculture.

MATERIALS AND METHODS

Research Design

This study used a descriptive design to assess the extent of microplastic contamination in giant tiger prawns (*P. monodon*) collected from three aquaculture ponds in Bonifacio, Misamis Occidental. Aquaculture provided a practical environment for studying microplastic exposure due to its controlled conditions. The regulated feed and water quality enabled clearer, more consistent observation of ingestion patterns. Therefore, this was considered the best method for this region.

The study collected prawn samples from three different aquaculture sites. It then used laboratory procedures to isolate, identify, and classify microplastics. Particles were characterized by type and color to assess the abundance of contamination. These areas also underwent comparative analysis to determine whether differences existed among the three aquaculture ponds in environmental and anthropogenic exposures.

Research Setting

The study was conducted in three selected aquaculture ponds in Barangay Migpange, Bonifacio, Misamis Occidental, Philippines, as shown in Figure 1. These sites were selected based on accessibility, availability of the giant tiger prawn (*P. monodon*), and their role as significant sources of giant tiger prawns within the municipality.

The study covered three selected aquaculture ponds in Barangay Migpange, Bonifacio, Misamis Occidental. These sites were situated in areas where aquaculture had become a major source of livelihood, with giant tiger prawn (*P. monodon*) production making a significant contribution to both local consumption and trade.

As for the location, the sites were close to lowland areas with readily accessible water sources, making them suitable for aquaculture operations. Site 1 (8°01'33.01"N 123°39'17.00" E) is located in a residential area adjacent to households, where domestic activities may have contributed to environmental inputs. Site 2 (8°01'25.51"N 123°39'22.33" E) is situated near a barangay road in a semi-accessible aquaculture area with no nearby residential structures, indicating moderate and indirect human exposure. Site 3 (8°01'11.71"N 123°39'27.15" E) is located near a coastal boulevard with adjacent recreational spaces and small commercial establishments such as food stalls, reflecting intermittent human activity.

These three sites were preferred over other prawn-abundant areas in Bonifacio because of their accessibility and availability. The sites were not far and could be easily reached and managed logistically for sample collection, transport, and coordination with local stakeholders. These sites were major producers of giant tiger prawns and provided samples without interruption during the study period.

These areas were also among the top suppliers of giant tiger prawns in Bonifacio; therefore, they reflected the municipality's aquaculture practices and served as ideal locations to assess microplastic contamination in a community-relevant context.

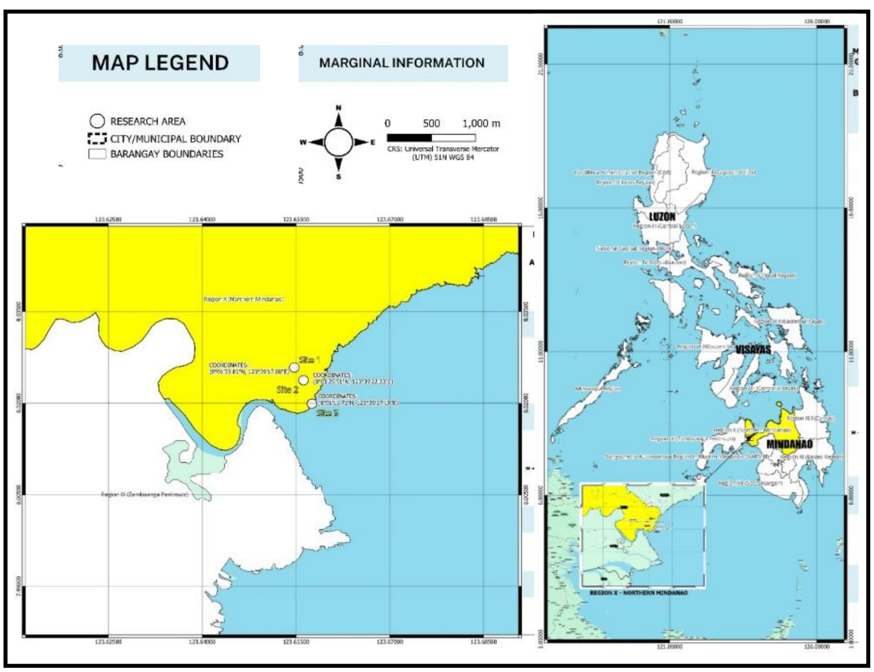

Figure 1. Map of the three collection sites

Data Gathering Procedure

Collection of Giant tiger prawn

Giant tiger prawns (*P. monodon*) were harvested from fishponds in the selected sites. Prawns of different sizes and weights were collected from each site to ensure representative sampling.

Fresh specimens of giant tiger prawns were obtained directly from stockholders of the three local aquaculture ponds in Bonifacio. To properly represent the population while maintaining ethical and logistical feasibility, ten prawns from each sampling site were collected. Similar studies examining microplastic contamination in freshwater crustaceans had used comparable sample sizes per location to detect significant differences across sites. One notable example was the study conducted by Tongnunui et al. (2022), which examined *Macrobrachium lanchesteri* using 10 individuals per site to achieve statistically valid results.

The collected prawns were stored in a cold icebox, wrapped in aluminum foil, and transported to the Natural Science Laboratory at Misamis University, where microplastics were identified and analyzed. To maintain specimen integrity, reduce microbial activity, and prevent degradation that could compromise accuracy, the samples were stored at −18 °C until analysis (Tanner, 2023).

Collection of prawn parts to be analyzed

The frozen specimens were thawed in a metal tray and rinsed twice using distilled water. For each prawn, biometric data such as total length, carapace length, and body weight were recorded prior to dissection. Each prawn was carefully dissected under sterile conditions to isolate the gastrointestinal tract, which was considered the primary site of microplastic accumulation. Tissue samples were weighed and transferred into glass beakers for digestion (Reunura & Prommi, 2022).

Laboratory Analysis

Extraction and Detection of Microplastics

To minimize secondary contamination, strict laboratory controls were implemented. Instruments used were made of glass or stainless steel, and the work area was thoroughly cleaned prior to analysis. Researchers wore 100% cotton lab coats, nitrile gloves, and hair coverings, and sample handling was conducted in a clean bench to prevent airborne contamination (Li et al., 2022).

For each prawn, the gastrointestinal tract was isolated through sterile dissection. Tissue portions were weighed and placed into glass beakers for digestion. Pooling of gastric samples was performed at each sampling site to obtain a representative contamination profile for each pond, a practice also used in composite sampling techniques in microplastic environments. Standard operating procedures for microplastic sampling state that representative sampling and composite environmental samples are used to evaluate contamination (Thornton Hampton et al., 2025). The pooling technique was also applied to other microplastic samples, such as in a study of mussels (*Mytilus galloprovincialis*), where pooled samples were formed from soft tissue collected at each sampling point to create composite samples (Rubini et al., 2025).

According to a study by Hermsen et al. (2018), the use of incubators is ill-advised because some microplastic particles deform or clump together. Aside from that, the digestion procedure developed by Foekema et al. (2013) was recommended for digesting organic matter compared with the other six existing methods (including enzymatic, alkaline, and acidic digestion). Foekema et al. (2013) developed the original digestion protocol, which involves leaving samples in 10% KOH solution at room temperature for two to three weeks. To align with room-temperature digestion protocols reported in previous studies, this study adapted Kühn et al. (2016) with several modifications. In the original study, the samples were placed in approximately 20 mL of 1 M KOH solution, digested at room temperature (18-21°C) for two days, rinsed through a 0. 3 mm sieve, and air-dried for six days. However, in this study, samples were digested using 50 mL of 10% KOH, with samples covered with aluminum foil and left at room temperature for 12 hours following the modified procedures by Jitkaew et al. (2023). After digestion, saturated NaCl solution was added to separate microplastics from remaining materials. The combination of 10% KOH and saturated NaCl for digestion and density separation is also consistent with the study by Tongnunui et al. (2022).

The supernatant was collected after settling and filtered through glass fiber filters (GF/F, pore size 0.45 µm). Filters were placed in covered glass Petri dishes and dried in a fume hood at room temperature to avoid contamination prior to microscopic examination (Rubini et al., 2025). Drying the samples at room temperature was chosen to keep the method as simple as possible, especially when incubators are unavailable (Kühn et al., 2016).

Microplastics identification

Microplastic identification was performed using an Olympus CX23 microscope at 4x magnification (Yu et al., 2023). Particles were characterized based on type (fibers, fragments, films, and beads) and color. Classification followed the standardized criteria from Markley et al. (2024). Particles were assessed based on their physical characteristics, including shape, color, texture, uniformity, and absence of biological cellular structures. Microplastics were categorized into fibers, fragments, films, and beads. Fibers were identified as elongated thread-like particles with consistent thickness; fragments as irregularly shaped broken plastic pieces; films as thin, flexible, sheet-like particles; and beads as rounded or spherical particles. Color was also recorded as an additional classification characteristic. To further verify their plastic nature, suspected particles were subjected to a hot needle test, in which particles that melted, curled, or deformed upon contact were confirmed to be plastic.

Statistical Analysis

Data obtained from laboratory analysis were organized and recorded systematically in datasheets for statistical evaluation. Microplastic particles extracted from pooled gastrointestinal samples were quantified and classified according to type, color, and form.

To summarize contamination levels, descriptive statistics such as total counts, mean microplastic count per prawn, minimum and maximum values, and frequency distributions were employed. These methods are commonly used in microplastic studies to provide baseline contamination data (Li et al., 2022; Rani et al., 2023).

Due to pooling of samples per site, individual variability among prawns could not be determined. Therefore, inferential statistical methods such as one-way ANOVA were not performed because they assume independence among observations. Instead, a comparative descriptive approach was used to examine differences among the three sites, consistent with similar environmental studies (Rubini et al., 2025).

All statistical computations and data visualization were performed using Minitab 2018 Statistical Software, facilitating clear presentation of trends and differences (López-Martínez et al., 2024).

Ethical Consideration

This study adhered to ethical research guidelines, emphasizing environmental responsibility and integrity. Only the required number of prawns was collected and handled carefully to prevent unnecessary harm. Although no human subjects were involved, the research was conducted with honesty, transparency, and accountability. Results were presented accurately, and all sources were properly acknowledged.

RESULTS AND DISCUSSION

Presence of Microplastics in Giant Tiger Prawns

Microplastics were detected in the gastrointestinal tract of giant tiger prawns (*P. monodon*) collected from all selected aquaculture ponds in Bonifacio, Misamis Occidental. Following digestion of organic matter using potassium hydroxide (KOH) and density separation with sodium chloride (NaCl) of the pooled specimens, microscopic examination revealed the presence of different microplastic types, including fibers (red, green, and blue) and rubber fragments (black) (Figure 2).

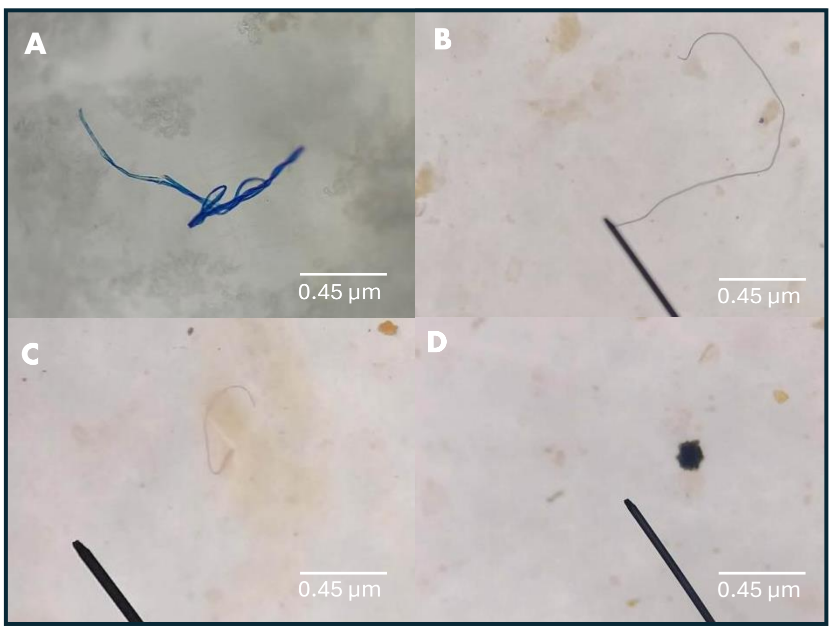

Figure 2. Microscopic identification of microplastics in giant tiger prawns using an Olympus CX23 Microscope (*A,* blue fiber; *B,* green fiber; *C,* red fiber; *D,* black rubber)

The presence of microplastics across all sampling locations indicates that prawns in aquaculture systems can ingest them. This suggests that microplastics are present in the ponds and are already available for ingestion by aquatic species. As the prawns engage in benthic feeding that involves ingestion of sediments, the ingestion of microplastics must likely be due to accumulation of these particles in the sediments (Reunura & Prommi, 2022).

This might be due to the property of microplastics that enables them to remain in the aquatic environment and become incorporated into sediment, where benthic organisms can easily ingest them. Fibers are the most common type of microplastic found and are typically present in household wastewater, artificial textiles, and fishery products. At the same time, rubber particles come from terrestrial sources such as tires (Li et al., 2022). Our findings are consistent with Hossain et al. (2020), who showed that fiber MPs are predominant in *P. monodon.* Aside from that, fibers also constitute the most abundant type of MP pollution in waters worldwide (Walkinshaw et al., 2020).

This means that the aquaculture systems are not immune to contamination but are affected by surrounding human activities. The presence of microplastics in prawns raises questions about food security, given that humans consume prawns. This implies that there can be a link between human beings and microplastics transfer through these organisms.

Morphometric Characteristics and Microplastic Contamination Levels of Penaeus monodon Across Sampling Sites

Prawn morphometric measurements varied between the 3 sampling sites (Table 1). Site 3 showed higher body weights and carapace lengths than those collected from Site 1 and Site 2; meanwhile, those collected from Site 1 were generally smaller. This implies that Site 3 offers a better environment for growth, for instance, good quality of water, abundant supply of food, and low competition level; on the contrary, Site 1 might be subject to factors which can negatively affect growth. This agrees with the finding by Khasani et al. (2023) that growth performance and body development of prawns, such as *Macrobrachium rosenbergii*, are highly dependent on the environment and resources, food supply, and the presence of stressors. Their study revealed that negative impacts, such as food scarcity or environmental stress, would significantly reduce the growth rate and body size of prawns. Nonetheless, despite differences in body size, gut weight was comparable across all three sites, indicating that microplastic intake is not dependent on gut size (Tongnunui et al., 2022).

Table 1. The information on carapace length, total length, stomach weight, and body weight.

		Measure size							
	Site	**Carapace length (cm)**		**Total length (cm)**		**Stomach weight (mg)**		**Body weight (g)**	
Penaeus monodon (n=30)		min	max	min	max	min	max	min	max
	1	45	53	133	165	53.85	54.02	23	35
	2	45	60	160	260	53.94	55.81	29	78
	3	49	76	160	256	53.99	54.76	39	110

The findings suggest that environmental factors have a greater influence on microplastic accumulation than biological differences among prawns. Naidu et al. (2024) reported varying levels of microplastics in shrimp from different pond systems, which were associated with contamination levels in pond water and sediments, as well as external inputs. Therefore, the high contamination observed at Site 1 was more likely attributable to external sources than to differences among individual prawns, highlighting the importance of site-specific conditions in determining contamination levels in aquaculture systems. Similarly, Patel et al. (2025) found that differences in microplastic abundance in *Metapenaeus kutchensis* among stations were related to varying levels of environmental pollution in the water and sediments rather than to the prawns' biological characteristics.

From a descriptive statistical perspective on microplastic contamination in the samples (Table 2), observable differences in the number and types of microplastics found across the three locations were evident. Site 1 was where more microplastics were found (7 particles; mean = 0.70 MPs per prawn), and a variety in color and type was the highest. Sites 2 and 3 had much lower and more stable levels of microplastic contamination (2 particles per site; mean = 0.20 MPs per prawn), with blue fiber-type microplastics predominating in samples from those sites. Additionally, in this study, blue, red, green, and black colored microplastics were observed. According to Wang et al. (2025), the distribution of microplastic colors is influenced by pollution sources and environmental conditions.

Table 2. Descriptive summary of microplastic contamination per site.

Site	No. of Prawns (n)	Microplastic					
		No. of MP's	**Color**	**Type**	**Total No. of MPs**	**Mean MPs per prawn**	**Frequency of MPs**
1	10	3	Black	Rubber	7	0.70	7 occurrences
		2	Red	Fiber			
		1	Green	Fiber			
		1	Blue	Fiber			
2	10	2	Blue	Fiber	2	0.20	2 occurrences
3	10	2	Blue	Fiber	2	0.20	2 occurrences

MPs, microplastics

These findings suggest that, compared with the other sites, Site 1 is exposed to higher levels and different types of microplastic pollution. The presence of various microplastic types suggests multiple sources of contamination, including household garbage, aquaculture products, and other environmental contaminants. This is consistent with the findings of Jia et al. (2024), who found that feed addition, farming systems, and upstream anthropogenic processes all affected the composition and abundance of microplastics in freshwater aquaculture ponds. As a result, the level and composition of microplastics at the sites varied due to anthropogenic activities and local environments. The consistent presence of blue fiber at Sites 2 and 3 suggests that textile fibers contribute to the pollution. Nan et al. (2020) also reported that the most filamentous MPs are blue fibers, which is also consistent with our results.

The most accessible site was Site 1, making it more prone to microplastic contamination from improper waste disposal. The presence of microplastics introduced through runoff and wastewater discharge is consistent with the findings of Hossain et al. (2020), which emphasized that environmental factors have a greater influence on microplastic contamination than biological factors.

The inference drawn from these findings is that the level of microplastic pollution in aquaculture settings depends on the environment and on human activity in these areas. It is therefore crucial to undertake environmental monitoring and management in aquaculture settings, as higher levels of pollution affect organism health and food safety. This is due to the consumption of microplastic pollutants in aquatic environments by marine and cultured organisms, and their accumulation in these organisms' tissues. The consumption and retention are supported by Palmer & Herat (2021), who report that microplastics occurring in water and sediment are regularly ingested by aquatic animals, and that ecotoxicological impacts range from physiological stress and inhibited growth to tissue damage. Additionally, Campanale et al. (2020) observed that microplastics and their additives pose potential human health risks, as ingestion can occur through contaminated fish products and can have harmful long-term effects.

Factors contributing to microplastic contamination

The differences in microplastic contamination in the aquaculture ponds in the study can be explained by human activities and natural factors. Contamination was highest at site 1 (Figure 3) probably because human settlements surround it. The plastics may enter the ponds through domestic wastewater, improper waste disposal, and surface runoff from nearby houses, where they eventually degrade into microplastics. Similar findings were reported by Mak et al. (2020), who found that ponds near residential areas had higher microplastic levels due to household wastewater and the decomposition of plastic materials. Boyle and Örmeci (2020) also found that areas with higher human activity tend to have higher levels of microplastic pollution.

Figure 3. Human settlements around Site 1 (8°01'33.01"N 123°39'17.00"E)

When the three sites were compared, there were fewer types of microplastic particles at Sites 2 and 3 than at Site 1, indicating they had been affected by fewer direct pollution sources. The results are consistent with the findings of Xiong et al. (2021), who reported that poor waste management and nearby human activities were the primary causes of microplastic presence in the ponds. In the study, microplastic abundance at Site 2 was significantly lower than at Site 1. This could be due to the lower number of residential houses around Site 2 (Figure 4), indicating less household plastic waste, sewage leaks, and tire-related particles (Xiong et al., 2021). Site 3 (Figure 5) was located near a coastal road, but also had relatively low contamination. The result is consistent with Chen et al. (2021), who suggested that high movement and management of waste, and environmental conditions, can help reduce the amount of microplastics, even in areas where human activities are present. Hossain et al. (2023) also found that ponds with low or no household activity tend to have fewer or no microplastics.

Figure 4. Little to no number of human settlements around Site 2 (8°01'25.51"N 123°39'22.33"E)

Figure 5. Coastal Road near Site 3 (8°01'11.71"N 123°39'27.15"E)

Additionally, significant amounts of blue fiber microplastics were observed across all sites, particularly at Sites 2 and 3. This suggests not all pollution is from people nearby; some may be from the air or from fiber-based sources, such as clothing or nets. Ryan et al. (2025) stated that atmospheric pollutants can transport microfibers to areas with minimal human activity, which is consistent with the observations that fibers may come from both air and small local sources. Miao et al. (2023) also stated that the constant exposure of the aquatic environments to direct sunlight, heat, and physical forces might result in the degradation of larger plastic items, including fishing gear, pond structures, and other plastic items. Overall, the results obtained prove that the microplastic contamination in aquaculture systems is not only distance-dependent but also affected by other factors such as the intensity of land use, management measures, and environmental conditions.

CONCLUSION AND RECOMMENDATIONS

The study's findings revealed the presence of microplastics in the gastrointestinal tract of *Penaeus monodon* taken from all selected aquaculture ponds in Bonifacio, Misamis Occidental. Fibers were the most prevalent type seen, with rubber particles found in other samples. Differences in microplastic levels were also observed between sample sites, with Site 1 showing the highest average number of microplastics per prawn compared to Sites 2 and 3. Overall, the findings show that microplastic contamination exists in local aquaculture systems and that cultured giant tiger prawns may contribute to the flow of microplastics down the aquatic food chain.

Given the outcomes of the current research, it is suggested that stricter policies concerning waste management in local government units and among aquaculture facilities need to be imposed in order to prevent plastic waste from being introduced into aquatic environments. Monitoring of microplastics contamination in the species reared in aquaculture ponds should become regular as well in order to guarantee food safety for consumers. Additionally, future studies are encouraged to expand the scope by including other aquatic species, conducting polymer identification and chemical characterization of microplastics using Fourier-transform infrared (FTIR) spectroscopy, and assessing their potential toxicological effects on both aquatic organisms and human consumers to provide a more comprehensive understanding of the risks associated with microplastic contamination.

DECLARATION OF THE USE OF AI TOOLS

The researchers would like to acknowledge the use of ChatGPT (https://chatgpt.com/) and Perplexity AI (https://www.perplexity.ai/) as supplementary tools during the development of this study entitled "Microplastic Contamination in Giant Tiger Prawns (*Penaeus monodon*) Cultured in Selected Aquaculture Ponds of Bonifacio, Misamis Occidental."

These AI tools were utilized to assist in brainstorming research ideas, generating and organizing concepts, paraphrasing selected portions of the manuscript for improved clarity and coherence, and identifying related studies and literature relevant to microplastic contamination in aquatic organisms.

The following prompts were used:

- "Generate research ideas related to microplastic contamination in giant tiger prawns *(Penaeus monodon)*."
- "Provide related studies on microplastic contamination in marine organisms and aquaculture species."
- "Paraphrase sentences to improve clarity, coherence, and academic writing style."
- "Suggest ways to organize research findings, discussions, implications, and recommendations."
- "Identify research gaps and future research directions related to microplastic contamination in aquaculture."

The outputs generated by these AI tools served only as supplementary assistance and starting references in the preparation of the manuscript. All information, analyses, interpretations, and conclusions presented in this study were critically reviewed, verified, revised, and approved by the researchers. The researchers take full responsibility for the accuracy, originality, and academic integrity of the final manuscript and ensured that all cited sources were properly acknowledged.

‘

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APPENDIX A

Informed Consent Form

MISAMIS UNVERSITY
Ozamiz City
Department of Student Affairs & Services

MU-DSAS-006/02June2023

PARENT'S CONSENT

COLLEGE OF MEDICAL TECHNOLOGY
Sponsoring Group/Organization

I am allowing my son/daughter/ward, Ria C. Araite, to join the Sample collection (*activity*) to be held on January - February 2024 at Tangub City under the supervision of Ms. Shaira U. Guiaman (*Adviser/Faculty*).

I understand that Misamis University exercises the necessary safety precautions in this activity.

In consideration of the benefits to be derived from the above activity, I expressly waive any and all claims against the administration or any member of the faculty and staff of the Misamis University on account of any unforeseen accident or injury that my son/daughter/ward might incur in connection with the aforementioned activity.

Raymundo P. Araite
Signature over printed name of
Parent/Guardian

01-19-2024
Date

Ria Araite
Signature over printed name of
Student

01-19-2024
Date

Important: This form shall be submitted to the DSAS Office at least two (2) days before the conduct of the activity.

SUBSCRIBED AND SWORN to before me, this ____ day of ______ at ____________, Philippines, that the herein affiant personally came and appeared with his/her ____________, as evidence of his/her personal identity.

Doc. No. 217
Page No. 44
Book No. 17
Series of 2024

ATTY. REY P. SINAG, RMT
Notarial Commission No. 2025-18
Notary Public for Ozamiz City and Clarin
City Hall Drive, Bernad Subdivision, Aguada, Ozamiz City
PTR No. 6007751; 01/05/2026; Ozamiz City
IBP O.R. No. 575165; 12/29/2025; Pasig City
Attorney's Roll No. 70643
MCLE Compliance No. VIII-0014127; Valid until 04/14/2028

Notary Public
Until ____________
PTR No. ____________
IBP No. ____________
TIN No. ____________
Roll No. ____________

(For DSAS Personnel only)

Attested by:

RODEL L. BALDADO, MHist, MAEd
OIC, Department of Student Affairs & Services

Date: 01-21-24

APPENDIX A Cont'd

MISAMIS UNVERSITY
Ozamiz City
Department of Student Affairs & Services

MU-DSAS-006/02June2023

PARENT'S CONSENT

COLLEGE OF MEDICAL TECHNOLOGY
Sponsoring Group/Organization

I am allowing my son/daughter/ward, PRINCE ONE A. TALA, to join the SAMPLE COLLECTION (*activity*) to be held on JANUARY - FEBRUARY 2026 at TANGUB CITY under the supervision of MS. SHAIRA MAINA U. GUIAMAN (*Adviser/Faculty*).

I understand that Misamis University exercises the necessary safety precautions in this activity.

In consideration of the benefits to be derived from the above activity, I expressly waive any and all claims against the administration or any member of the faculty and staff of the Misamis University on account of any unforeseen accident or injury that my son/daughter/ward might incur in connection with the aforementioned activity.

MELINDO D. TALA
Signature over printed name of
Parent/Guardian

01-18-26
Date

PRINCE ONE A. TALA
Signature over printed name of
Student

01-18-26
Date

Important*: *This form shall be submitted to the DSAS Office at least two (2) days before the conduct of the activity.

SUBSCRIBED AND SWORN to before me, this ____ day of ________ at ______________, Philippines, that the herein affiant personally came and appeared with his/her ____________, as evidence of his/her personal identity.

Doc. No. 218
Page No. 44
Book No. 17
Series of 20 26

ATTY. REY D. BINAG, RMT
Notarial Commission No. 2025-18
Notary Public for Ozamiz City and Clarin
City Hall Drive, Bernad Subdivision, Aguada, Ozamiz City
PTR No. 6007751; 01/05/2026; Ozamiz City
IBP O.R. No. 575165; 12/29/2025; Pasig City
Attorney's Roll No. 70648
MCLE Compliance No. VIII-0014127; Valid until 04/14/2028

____
Notary Public
Until ______________
PTR No. ______________
IBP No. ______________
TIN No. ______________
Roll No. ______________

(*For DSAS Personnel only*)

Attested by:

RODEL L. BALDADO, MHist, MAEd
OIC, Department of Student Affairs & Services

Date: 01-21-26

APPENDIX A Cont'd

MISAMIS UNVERSITY
Ozamiz City
Department of Student Affairs & Services

MU-DSAS-006/02June2023

PARENT'S CONSENT

College of Medical Technology
Sponsoring Group/Organization

I am allowing my son/daughter/ward, Jocelyn H. Padillo, to join the conduct of sample collection on Research *(activity)* to be held on January to April 2024 at Misamis University under the supervision of Mr. Shaira Alaina U. Guiaman *(Adviser/Faculty)*.

I understand that Misamis University exercises the necessary safety precautions in this activity.

In consideration of the benefits to be derived from the above activity, I expressly waive any and all claims against the administration or any member of the faculty and staff of the Misamis University on account of any unforeseen accident or injury that my son/daughter/ward might incur in connection with the aforementioned activity.

Julieto M. Padillo
Signature over printed name of
Parent/Guardian

Jan. 20, 2024
Date

JOCELYN H PADILLO
Signature over printed name of
Student

Jan. 20, 2024
Date

Important: This form shall be submitted to the DSAS Office at least two (2) days before the conduct of the activity.

SUBSCRIBED AND SWORN to before me, this 20 day of JAN 2026 at Ozamiz City, Philippines, that the herein affiant personally came and appeared with his/her ____________, as evidence of his/her personal identity.

Doc. No. 286
Page No. 58
Book No. 10
Series of 20 24

ATTY. REY ... BIHAG, RMT
Notarial Commission No. 2025-18
Notary Public for Ozamiz City and Clarin
City Hall Drive, Bernad Subdivision, Aguada, Ozamiz City
PTR No. 6007751; 01/05/2026; Ozamiz City
IBP O.R. No. 576165; 12/23/2025; Pasig City
Attorney's Roll No. 70648
MCLE Compliance No. VIII-0014127; Valid until 04/14/2028

Notary Public
Until ____________
PTR No. ____________
IBP No. ____________
TIN No. ____________
Roll No. ____________

(For DSAS Personnel only)

Attested by:

RODEL L. BALDADO, MHist, MAEd
OIC, Department of Student Affairs & Services

Date: ____________

APPENDIX B

Approved Letter of Consent

Misamis University

Ozamiz City

MISAMIS UNIVERSITY RESEARCH CENTER

CERTIFIED: ISO 21001: 2018 Educational Organizations Management System by DNV
ACCREDITED: Philippine Association of Colleges and Universities Commission on Accreditation (PACUCOA)

MU-RC-042/13 November 2024

Thesis/Research Data Gathering Approval Form

Date: 01 - 15 - 26

Name of Authors: ARCITE, RIA C.; TALA, PRINCE ONE A.; PADILLO, JOCELYN H.
College/Department: COLLEGE OF MEDICAL TECHNOLOGY
Research Title: Microplastic contamination in freshwater prawns (Macrobrachium rosenbergii) from selected aquacultured ponds in Tangub City.

Data Gathering Procedure:

a. Type of Research: *(Kindly check)*

- [ ] Quantitative
- [x] Qualitative
- [ ] Experimental
- [ ] Approved Research Title & Problem/Objectives
- [ ] Approved Data Gathering Procedure
- [ ] Approved Data Gathering Instrument/Data Sheets

b. Respondents/Participants/Subject/Samples to be Collected: Freshwater prawns

c. Procedure:

- [ ] Survey
- [ ] Interview
- [ ] Experimentation
- [x] Laboratory Testing

d. Place of Implementation/Study Area: TANGUB CITY

If to be conducted outside the school campus, indicate the nature of transportation to be used:

- [x] Own private vehicle
- [ ] public utility vehicle
- [ ] rental
- [ ] Others, please indicate ____________

e. Date/s of Implementation/Sampling: JANUARY – FEBRUARY, 2026

Attachments:

- [ ] Approved Letter of Consent from the designated authority in the area/place were the study is to be conducted
- [ ] Signed Parents' Consent

SUBSCRIBED AND SWORN TO before me this ____ in the City of Ozamis, Philippines.

The thesis proposal mentioned above is hereby recommended for the commencement of data gathering implementation.

ATTY. REY B. BINAG, RMT
Notarial Commission No. 2025-18
Notary Public for Ozamiz City and Clarin
City Hall Drive, Bernad Subdivision, Aguada, Ozamiz City
PTR No. 6007751, 01/05/2026; Ozamiz City
IBP O.R. No. 576165; 12/29/2025; Pasig City
Attorney's Roll No. 70648
MCLE Compliance No. VIII-0014127; Valid until 04/14/2028

Recommended by:

Doc. No. 216
Page No. 94
Book No. 14
Series of 2026

MG. GHOVER ALANA V. GUIAMAN
Thesis/Research Adviser

NELFA D. CANINI, PhD
Thesis/Research Instructor

Approved by:

EVANGELINE H. GENEDO, RMT, MATMRS
College Dean

APPENDIX B Cont'd

Misamis University
Ozamiz City
COLLEGE OF MEDICAL TECHNOLOGY

CERTIFIED: ISO 21001: 2018 Educational Organizations Management System by DNV
ACCREDITED: Philippine Association of Colleges and Universities Commission on Accreditation (PACUCOA)

Date: January 15, 2026

DR. HAYDEE D. VILLANUEVA
Dean, College of Arts and Sciences
Misamis University

Subject: *Request for Permission to Use Laboratory Equipment, Rooms, and Reagents for Research Data Gathering*

Dear Dean Villanueva,

We, the undersigned undergraduate researchers from the College of Medical Technology, respectfully seek permission from your good office to **use selected laboratory equipment, laboratory rooms, and reagents located at the Natural Sciences Building** under the College of Arts and Sciences. This request is in line with our ongoing research data gathering for our research paper entitled:

"Microplastic contamination in freshwater prawns (*Machrobrachium rosenbergii*) from selected aquaculture ponds in Tangub City."

The experimental procedures of our study are scheduled to be conducted from **February to April 2026**. The facilities and resources available at the National Science Building are essential for the successful completion of specific laboratory components of our research.

We give our full assurance that all laboratory work will be carried out **in accordance with university rules and regulations**, under proper supervision, and with utmost care for laboratory safety, cleanliness, and responsible use of equipment and reagents. We likewise commit to restoring all facilities to their proper condition after use.

Furthermore, all information and data obtained will be utilized **exclusively for academic research purposes**, and due acknowledgment will be given to the College of Arts and Sciences and the National Science Building in all research outputs.

We humbly request your approval and support for this academic endeavor. Your favorable response will greatly aid us in completing our research requirements.

Thank you very much for your time and kind consideration.

APPENDIX B Cont'd

Misamis University

Ozamiz City

COLLEGE OF MEDICAL TECHNOLOGY

CERTIFIED: ISO 21001: 2018 Educational Organizations Management System by DNV
ACCREDITED: Philippine Association of Colleges and Universities Commission on Accreditation (PACUCOA)

Respectfully yours,

PRINCE ONE A. TALA
Researcher
BS-Medtech Year 3

RIA C. ARCITE
Researcher
BS-Medtech Year 3

Noted by:

MS. SHAIRA ALAINA U. GUIAMAN
Research Adviser

ARJADE O. ALCABAZA, RChT
Laboratory In-Charge

Recommending Approval:

DR. NELFA D. CANINI
Chairperson, Department of Natural Sciences

Approved by:

DR. HAYDEE D. VILLANUEVA
Dean, College of Arts and Sciences

APPENDIX C

Raw morphometric data from sampled giant tiger prawns from the three aquaculture sites in Bonifacio, Misamis Occidental.

Site 1

Sample	Whole length	Carapace length	Whole weight	Gut weight
S1.1	165cm	51cm	28g	53.9017mg
S1.2	151cm	49cm	27g	53.8904mg
S1.3	133cm	49cm	27g	53.8987mg
S1.4	144cm	51cm	32g	53.9353mg
S1.5	150cm	50cm	28g	53.8904mg
S1.6	151cm	49cm	32g	53.9328mg
S1.7	140cm	50cm	32g	53.9051mg
S1.8	153cm	53cm	33g	53.9611mg
S1.9	153cm	50cm	35g	54.0239mg
S1.10	145cm	45cm	23g	53.8576mg

APPENDIX C Cont'd

Site 2

Sample	Whole length	Carapace length	Whole weight	Gut weight
S2.1	210cm	55cm	54g	54.1990mg
S2.2	210cm	50cm	48g	54.1636mg
S2.3	175cm	45cm	29g	53.9407mg
S2.4	220cm	55cm	61g	54.5169mg
S2.5	250cm	60cm	72g	54.5853mg
S2.6	260cm	60cm	78g	55.8112mg
S2.7	180cm	45cm	32g	53.9564mg
S2.8	220cm	55cm	54g	54.1906mg
S2.9	170cm	45cm	34g	53.9600mg
S2.10	160cm	45cm	42g	53.9926mg

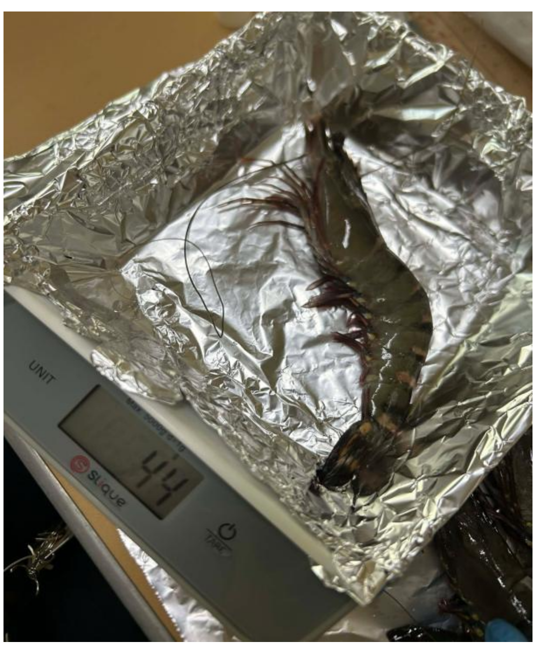
APPENDIX C Cont'd

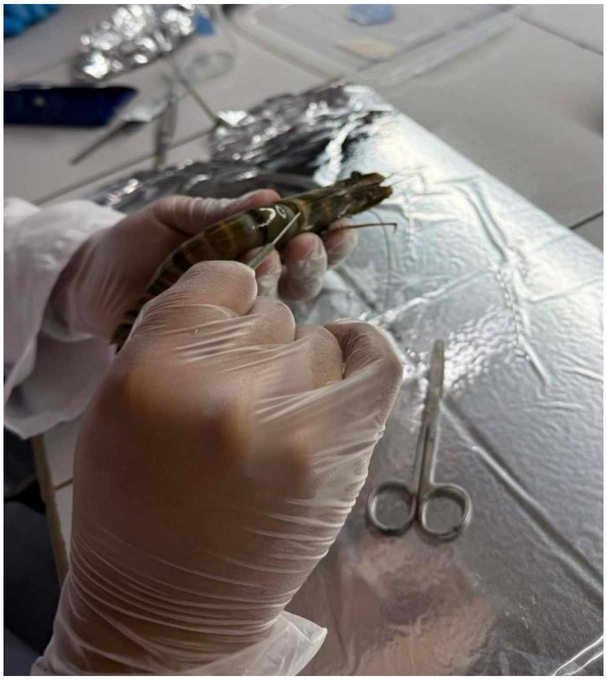
Site 3

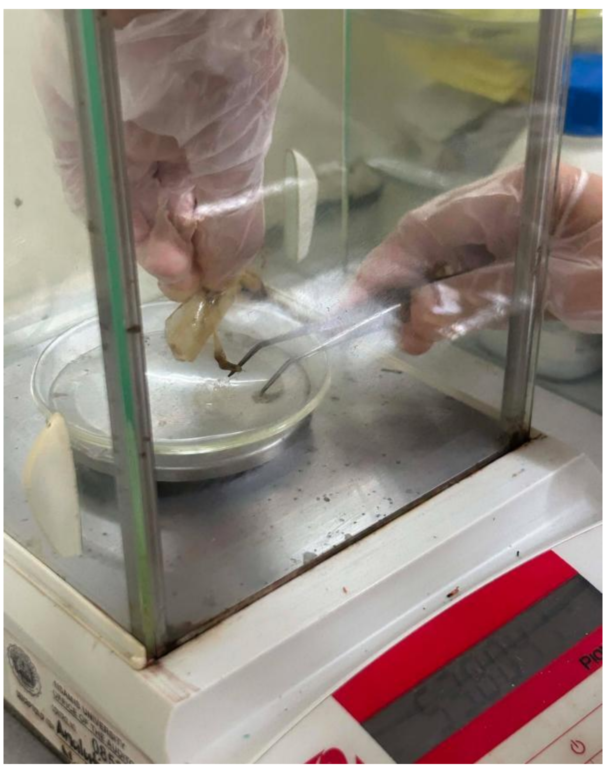
Sample	Whole length	Carapace length	Whole weight	Gut weight
S3.1	200cm	59cm	53g	54.1984mg
S3.2	189cm	53cm	43g	54.0736mg
S3.3	160cm	76cm	46g	54.0736mg
S3.4	218cm	62cm	68g	54.7235mg
S3.5	256cm	74cm	110g	54.7643mg
S3.6	178cm	49cm	47g	54.1011mg
S3.7	175cm	49cm	39g	53.9970mg
S3.8	189cm	49cm	52g	54.1611mg
S3.9	163cm	53cm	47g	54.0987mg
S3.10	187cm	53cm	42g	54.0305mg

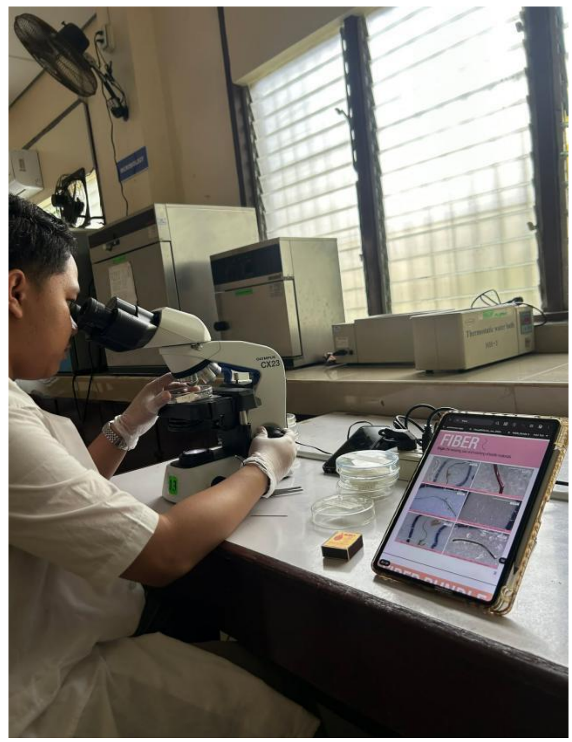
APPENDIX D

Documentation





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APPENDIX E

Grammarly Results

Report: MICROPLASTIC CONTAMINATION IN GIANT TIGER PRAWNS (Penaeus monodon) IN SELECTED AQUAC...

MICROPLASTIC CONTAMINATION IN GIANT TIGER PRAWNS (Penaeus monodon) IN SELECTED AQUACULTURE PONDS IN BONIFACIO, MISAMIS OCCIDENTAL

by Misamis University

General metrics

39,733	5,655	463	22 min 37 sec	43 min 30 sec
characters	words	sentences	reading time	speaking time

Score

99

This text scores better than 99% of all texts checked by Grammarly

Writing Issues

18	2	16
Issues left	Critical	Advanced

Plagiarism

This text hasn't been checked for plagiarism

APPENDIX E Cont'd

Turnitin Results

turnitin Page 2 of 39 - Integrity Overview Submission ID trn:oid:::28447:144068973

24% Overall Similarity

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76 Not Cited or Quoted 15%
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12% Internet sources
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1 Integrity Flag for Review

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