Received: 17 JAN 2025 | Accepted: 18 JUN 2025 | Published Online: 27 JUN 2025
Recoletos Multidisciplinary Research Journal Vol. 13 no. 1 (June 2025)
DOI: https://doi.org/10.32871/rmrj2513.01.09

Orginal Article

Abundance and Characteristics of Microplastic in the Selected Coastal Area of Pangasugan, Baybay City, Leyte, Philippines

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Abstract

Background: *Microplastics (MPs) less than 5 mm in size were detected in marine water, which is promoting growing research interest beyond the marine environment into soil, freshwater, and drinking water. This study investigated the presence and characteristics of MPs in water samples from Visayas State University beach, Pangasugan, Leyte.*
Methods: *Samples (n=20) were collected from 20 sites based on spatial variation. MPs were isolated via density extraction and filtration, identified under a microscope, and analyzed chemically using FTIR.*
Results: *The average contamination level was 132.5 items/L. MPs were categorized by shape, color, size, and polymer type, with fibers (62%) being most prevalent, followed by fragments and pellets (9.4%). Black (24.5%) was the most common color. Identified polymers included ABS (acrylonitrile butadiene styrene), EVA (ethylene vinyl acetate), PA (polyamide), and PET (polyethylene terephthalate).*
Conclusion: *Given the direct exposure of aquatic ecosystems to this contamination, further studies are recommended to assess health risks, offering crucial baseline data for future research.*

Keywords
spatial variation, FTIR, beach region, Leyte, Philippines

INTRODUCTION

Since its initial discovery in 1972 as an aquatic pollutant in the marine environment, microplastics (MPs) have gained international attention due to their possible negative impacts on human health and ecology (Carpenter & Smith, 1972; Crew et al., 2020). According to current studies, the most urgent ecological and environmental issue is MPs contamination. Numerous studies addressing the contamination caused by MPs have increased significantly since 2014. Numerous investigations have demonstrated that MPs are present and migrate through a range of aquatic habitats (Yu et al., 2016; Zhang et al., 2017), rivers (Andrady, 2017), and freshwater lakes (Sighicelli et al., 2018). Because MPs pollution impacts human health, there is increasing worry about it (Bagheri et al., 2021; Rashid et al., 2021). The marine environment was the primary focus of early studies on the temporal and spatial distributions of MPs in environmental matrices (water, soil/sediment, etc.). According to another study on marine MPs, 90% of the plastic debris in the world's oceans comes from terrestrial sources, with an estimated 150 million tonnes of plastic debris present (Al Helal et al., 2025; Zhang et al., 2019). Rivers are thought to play a significant role in moving different types of plastic waste from the land to the ocean (Baldwin et al., 2016; Shen et al., 2020). Consequently, a more accurate calculation of the amount of marine MPs pollution is made possible by a better understanding of the amount of MPs input from rivers to the ocean, which also helps to improve our understanding of the origins and pathways of marine MPs pollution. This is because a significant portion of the plastics produced, 40 percent of the plastics demand in Europe, are utilized in single-use items like packaging. Millions of tons of plastic debris (4.8 to 12.7 MT in 2010 alone) are thought to have found their way into the marine environment, even though some plastic garbage is appropriately managed (by recycling or burning) (Jambeck et al., 2015). Due to their rapid dispersal and endurance, which allow them to be readily spread by wind and currents, they can often travel hundreds of km. Since the middle of the 20th century, microplastics (MPs) have raised concerns. Previously, MPs have been found in the water column, near-shore sediments, and deep-water sediments, among other marine environments worldwide. Numerous affluent countries and corporations have already demonstrated their dedication to stopping the production of MPs and conducting research on them.

The Philippines is located in Southeast Asia (SEA), which is divided by the South China Sea and the Philippine Sea. The archipelago, which consists of over 7000 islands with a combined area of over 300.000 km2, has the longest coastline in the world, spanning over 36.000 km. The largest island in the country, Luzon, is located in the north, Mindanao is in the south, and the Visayas group of islands is in the middle. The Philippines confronts the Pacific Ocean and is located in an area of the Pacific Ring of Fire, making it vulnerable to frequent natural catastrophes and hazards. Catastrophic typhoons often originate in the Philippines as well. The Philippines is susceptible to earthquakes, tsunamis, floods, typhoons, and storm surges (Gurenko & Leste, 2004). One of the primary causes of the spread of plastic waste from one location to another is typhoons and flooding. This is the highest frequency of typhoon events, globally with about 20 approaching or making landfall annually (Al Helal et al., 2025; Otieno et al., 2004). On the other hand, not much is known about MPs in Philippine beach sand and marine habitats. Numerous studies have evaluated the amount of MPs in maritime sediment in Europe and other continents, which is essential for evaluating the environmental impact of MPs. In terms of unmanaged plastic trash production estimates in 2010, the Philippines was third out of 192 nations. However, there aren't many studies on microplastic (MPs) consumption in the Philippines. The North, Caribbean, Mediterranean, and China Seas were the sites of most investigations on MPs in aquatic species. Accordingly, MPs occurrences in various marine settings have been thoroughly investigated, whereas freshwater ecosystems have gotten far less attention. Despite a study that found the Philippines to be the third-largest contributor of plastic waste in the world's oceans in 2010 and that the country mismanaged 1.01 million tons of plastic waste in 2016 (Law et al., 2020), there is very little monitoring of the MPs contamination in the country. Within the last 5 years, studies on MPs contamination in the Philippines have been published which reported the occurrence of MPs in surface water (Argota et al., 2019; Espiritu et al., 2023; Lumongsod & Tanchuling, 2019), marine sediments (Al Helal et al., 2025; Bucol et al., 2020; Kalnasa et al., 2019), and marine biota such as fishes (Paler et al., 2019), mussels (Argamino & Janairo, 2016) and oysters. However, Galarpe (2020), mentioned that there is a need for more MPs and MPs research in the country to develop and support appropriate plastic regulation policies.

Few studies have examined MPs on Leyte Island even though numerous published papers in the Philippines have examined microplastics on fish, surface sands and sediments, rivers, and marine waters (Cabansag et al., 2021; Limbago et al., 2021; Tanchuling & Osorio, 2020). Among the provisioning services that Cancabato Bay offers to the fishing communities are bivalves, which are thought to be the most likely source of MPs from seafood to humans because they are eaten whole (Aguirre et al., 2024; Lusher et al., 2017). The study's findings demonstrated that Perna viridis and Venerupis species contain microplastics gathered at Cancabato Bay, with more MPs found in the latter. The bivalves include three kinds of MPs: fiber, fragment, and film. The FTIR investigation, which reveals polyamide fibers as the most prevalent polymer in the bivalves, supports this. Another study shows that MPs contamination in surface water and sediment samples of Baybay City, Leyte, is higher than in previous studies (Al Helal et al., 2025). This study analyzes the microplastic (MPs) abundance and their characteristics within the Visayas State University beach area, Pangasugan, Leyte. This study also seeks to assess MPs in this area and their abundance, characteristics, and distribution to maintain marine ecosystems and diversity. The main aims of this study were to assess the MPs from the water samples of Visayas State University beach area, Pangasugan, Leyte, Philippines. Secondly, the researchers will evaluate the characteristics of the MPs in the collected sample. Finally, it analyses the distribution of MPs based on abundance, color, shape, and size. Sampling locations were along the shoreline of the VSU beach area, and sampling time was in the dry season of May 2024.

METHODS

Description of the Study Area

The beach area of Visayas State University in Pangasugan, Baybay, Leyte, Philippines, served as the study's site. (Figure 1) Over the past few years, several Philippine national and international organizations have been investigating the presence of MPs in various locations throughout the country.

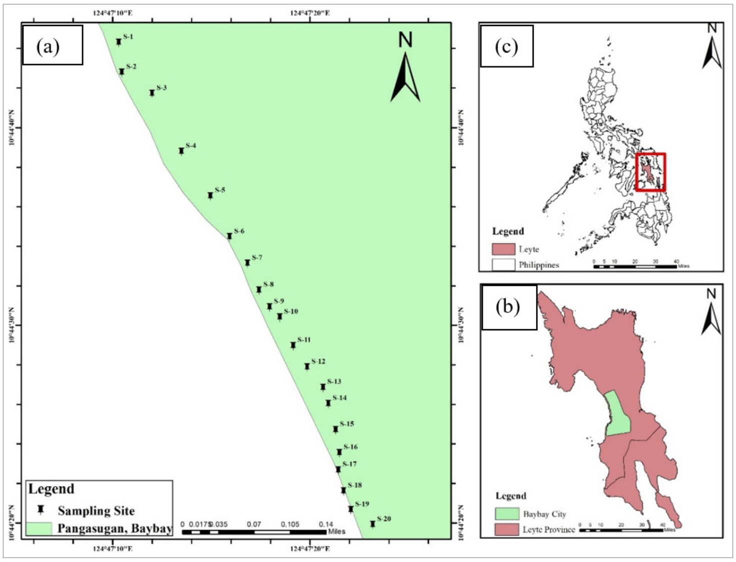

Figure 1. *Map of the Study Area*
(a) Shows sampling site along the shoreline of VSU beach area, Pangasugan, Baybay city, Leyte, Philippines; (b) Map of the Leyte Island with Baybay City highlighted; (c) Map of the Philippines with Leyte highlighted.

One of the top universities in the Visayas Islands for science, technology, and environmental preservation is Visayas State University. It is situated at the base of Mount Pangasugan, one of the Philippines' few surviving rainforests. Visayas State University's main campus is in Pangasugan, 34 kilometers south of Ormoc City and 8 kilometers north of Baybay City in Leyte. The coordinates of this location are 10°44'43"N 124°47'41"E. The campus spans 1,099.4 hectares, from the Camotes Sea shore to Mount Pangasugan's summit. This seashore is sometimes referred to as VSU Lower Beach or Visayas State University Beach. This beach is roughly 1.8 kilometers long. However, the Pangasugan region in the southwest of the Philippines was selected for this study, which was the first to analyze MPs. One of the reasons this study was chosen is that it focuses on crowded and popular areas with tourists, where plastic consumption is typically higher.

Sample Collection

Manually random sampling process was used to collect water samples weighing 500 ml. Completely Randomize Design (CRD) was followed for collecting samples. Water samples from the top 5-10 cm layer as suggested by (Al Helal et al., 2025; Chinfak et al., 2021; Hossain et al., 2023) were collected from each sampling point. Water samples of 500 ml were collected using a bucket. A bucket for surface water sampling is also used by (Su et al., 2016). To avoid contamination, all the samples were stored in a plastic container. There were 20 sampling sites within the study area and three samples were collected to represent one composite sample per site. So, there were a total 60 samples, which represent 20 composite samples. The overall sample number for analysis was 20 composite samples.

Sample Preparation

After collecting and processing the samples, they were transferred to the Soil Research Testing and Plant Analysis Laboratory (SRTPAL), Department of Soil Science, Visayas State University for sample preparation. Water from the sampling container was poured into the stacked stainless sieves with mesh sizes of 2-mm (No. 8), 1-mm (No. 18), 500-µm (No. 35), 250-µm (No. 60), 125-µm (No. 120), and 75-µm (No. 200). Particles that are greater than 5 mm that was retained from the 2.36-mm sieve was discarded. The used sieves were thoroughly rinsed with distilled water and left to dry for an hour. The retained particles in each sieve were transferred to their respective glass containers using steel tweezers and a brush. After the collection, the researchers prepared the sample for laboratory and further analysis.

Density Extraction

Using the theory of the differences in specific densities of water (1.2 g cm-3) and plastics (0.1-1.7 g cm-3) allows for the extraction of microplastics (MPs) from water (Alomar et al., 2016; Chubarenko et al., 2016). Less dense MPs float away from the denser, sinking sediment elements because salt solutions have densities greater than most MPs (0.9-1.5 g cm-3) (Quinn et al., 2017). For this study, the researchers used NaCl for density separation as it is highly available and cheap. In the beginning, prepare a solution of NaCl with a density of 1.2 g cm-3 added 35.5 gm of NaCl into 100 mL distilled water. Utilizing the weighing method, the density was calculated. Then, 20 ml of the prepared samples was placed in a beaker along with 40 mL of the NaCl solution. The solution was energetically shaken for 2 min, and the water sample was left to settle for 24 hrs (Abidli et al., 2017).

Filtration

As the natural filtration process would take too long to complete the procedure, a separating funnel was used for filtering floating MPs particles through to eliminate any impurities; the solution was filtered by (Whatman Grade 42, 2.5 µm) filter paper. Then, the filter papers were placed into the petri dish to avoid contamination from the surroundings and the sample was transferred to the Central Analytical Service Laboratory (CASL) laboratory, Visayas State University, Baybay City, Leyte, for Identification of MPs using a stereo microscope.

Microplastics Identification and Basic Characterization

Microplastics (MPs) were categorized by size, shape, and color for each sample using a stereo microscope. A study by Zhang et al. (2018) and Al Helal et al. (2025) discussed the visual categorization of MPs. The MP's investigation was carried out using a dissecting microscope (AmScope-Trinocular Stereo Microscope; SM-2TZ-LED-10M) at 4X, 10X, and 40X magnifications. Forcep was used to remove identifiable MPs from the filter and transfer them to the tared 4 mL vial in order to prevent the misidentification of MPs (Cole et al., 2011; Masura et al., 2022; Ogunola & Palanisami, 2016) and used the following criteria to find MPs in the filters (Hidalgo et al., 2012). According to Ryan et al. (2009), MPs was divided into six types based on their shapes: fragments, fibers, lines, foams, flakes and pellets. Colors were categorized by visual identification. MPs size was categorized as Tiny >1.5mm, Medium 1.5-3mm, and Large >3mm. During observation, the researchers took MPs picture using a DSLR (Canon EOS 4000D) camera. After image collection, MPs size was measured using ImageJ size measuring software (version 1.53e, produced by the National Institutes of Health, USA (Alam et al., 2023).

Chemical Composition Analysis

After the physical identification of MPs, all samples were transferred to the Department of Pure and Applied Chemistry, Visayas State University, Baybay City, Leyte, Philippines, after undergoing basic characterization. The type of polymer was ascertained using FTIR (Fourier transform infrared spectroscopy) (Nicolet 6700) diamond-equipped FTIR ATR spectrometer. MPs particles underwent polymeric analysis, and the test was at a resolution of 4000–500 cm−1. Following the spectrum recording, it was matched with a known polymeric data library. Between 60 and 96 percent of the spectrum matches were found. It was analyzed with Open Specy (Cowger et al., 2020), an open-source spectral classification program.

Quality Assurance (QAs) and Quality Control (QCs)

The QA and QC checks stated below were carried out in the current research. Samplers and latex gloves were initially used to prevent sample contamination throughout the collection procedure. Open containers were covered with aluminum foil and kept in a fume hood while no tests were going on, and non-plastic objects were utilized throughout the experiment and washed with distilled water. Thirdly, before usage, a Whatman grade 42 filter paper (Whatman UK) was used, and distilled water and NaCl solution were utilized in the samples for sample processing and analysis. The blank samples utilized in the blank tests that were used to correct the outcomes of the laboratory analysis also contained no MPs.

Statistical Analysis

Both manually and with the aid of computers, all the data were evaluated by the researchers. The researchers also used Microsoft Excel (2016) to conduct the statistical analysis, and bar diagrams and pie charts were used as graphical data representations. The statistical variables of the marine water MPs items, including maximum, minimum, mean, standard deviation, and variance, were analyzed using descriptive statistical techniques. This study examined the degree of relationship between two factors using SPSS. Principle Component Analysis (PCA) was carried out to simplify the complexity in high-dimensional data and understand the trends and patterns among various variables for this used IBM SPSS Statistics software version 19.0.2.

RESULTS AND DISCUSSION

Abundances of Microplastics in VSU Beach Area Water

A total of 53 MPs were identified in 20 different samples from VSU beach area. The researchers found MPs in high concentration in most samples, and abundances ranged from 50 to 250 per liter of water (Table 1).

Table 1. *The abundance and shape of microplastics that was detected in different Seawater worldwide (items/L)*

Location	Total abundance	Percentage (%)			Reference
		Fragment	Fiber	Film	
VSU beach, Pangasugan, Leyte, Philippines	132.5 items/L	9.43	62.27	_	This study
The North Yellow Sea	37.1 items/L	–	39.1±22.3	58.1±24.9	Zhu et al., 2018
Western Mediterranean Sea	100.78 particle/L	–	–	–	Alomar et al., 2016
Bohai Sea, China	31.1 pieces/L	9.0	83.7	1.1	Dai et al., 2018
Bohai and Yellow Sea	72 items/L	2.55	93.88	1.53	Zhou et al., 2018
Eastern water of Java Sea	206.04 particle/L	54.34±6.39	41.45±4.59	4.21±3.90	Yona et al., 2019
Beijiang River	178 items/L	–	–	–	Wang et al., 2017

MPs have an average abundance of 132.5 Items per liter of water. Sample S-13 had the highest MP abundance, at 250 items per liter of water. MPs were identified in the lowest abundance in samples S-3, S-7, S-12, and S-17, which were 50 items per 1 liter of water. The amount of MPs found in different samples varies considerably (Figure 2). The result shows that the bulk of MPs was detected in sample S-13, accounting for 9% of all samples. Sample S-3, S-7, S-12, and S-17, with a percentage of 2%, contains the least amount. A study conducted in India (Selvam et al., 2021) found that 58% of the MPs were transparent in the groundwater sample and regarded as the most abundant type (7.8-19.9 particles/L). The average number of MPs in the groundwater samples was 38 ± 8 Items/l.

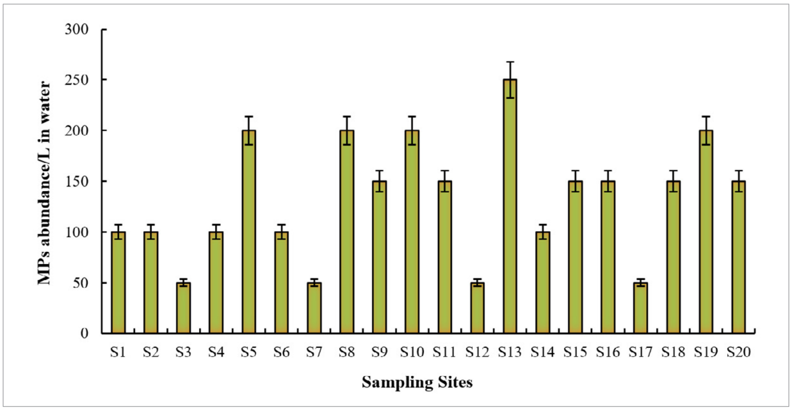

Figure 2. *Abundance (item/L) of MPs in the VSU beach area water samples*

Size of MPs in the VSU Beach area

MPs' size is another important factor in understanding MPs' occurrence. In this study, we identified three types of size which were Tiny (<1.5mm), Medium (1.5-3mm), and Large (>3mm). In the samples of all sampling sites we found Tiny (<1.5mm), Medium (1.5-3mm), and Large (>3mm) all size of MPs. In the water sample, the proportion of Medium MPs was higher. A total of 17 (31.3%) items of large MPs were found in the water sample, and 13 (25.7%) items of tiny MPs were found in the sample. The researchers also found that 23 (43%) medium-size categories dominate the water sample.

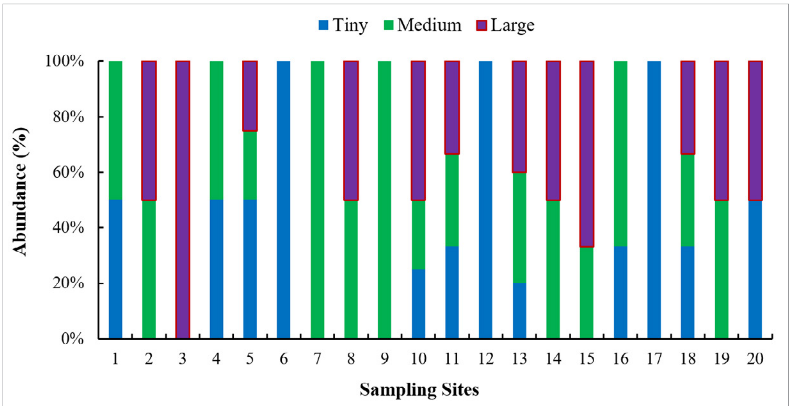

Figure 3. *Abundance (%) of MPs in each sample is based on Size*

Shape of MPs in VSU beach

The MPs were divided into six categories: Fragment, Lines, Fiber, Foam, Flakes and Pellet (Barboza et al., 2019). Not all varieties (shapes) of MPs are quantified in every sample. Fiber and lines are the two most common types of MPs that can be found almost everywhere in the sample. Fragment, foam, and pellets were in short supply in some areas.

Fibers were the most abundant among the different shapes in all studied samples. The average number of fibers was 1.65 per 20 ml or 82.5 per liter of water samples. A minimum number of fibers was found in samples S-17 which was 0 and S-3 where the number of fibers was 1 per 20 ml sample, and the maximum number of fibers found in samples S-19 the number of fibers was 4 per 20 ml or 200 per liter of water sample. The average number of fragments and pellets per liter of marine water was 12.5 in 20 ml per marine water sample, and the total number of foams was 3. The least number was revealed to be foams and flakes. A total of 53 MPs were quantified from 20 samples (20 ml per sample). The results depicted that 62.27% of fibers, 7.5% of lines, foam, and flakes (5.67%) and fragment and pellet (9.43%) were found.

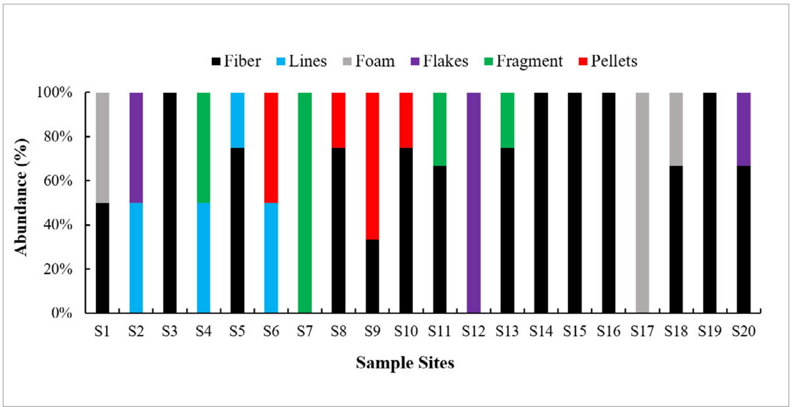

Figure 4. *Abundance (%) of MPs in each sample based on Shape*

Colors of Microplastics in VSU beach area water

Multiple colors of MPs particles were identified from the water samples of the study area. Based on different colors, according to Peng et al. (2017) MPs were divided into six categories: Blue, black, transparent, white, red, deep yellow, and light yellow were categorized in the green category; deep green and light green were counted in the black category. The transparent category is considered the individual category of colorless particles. In this study, the recorded number of color types was a total of seven, which is found in the samples. Here, it is followed by abundance order: Black >Blue>White>Red>Transparent>Green>Violet.

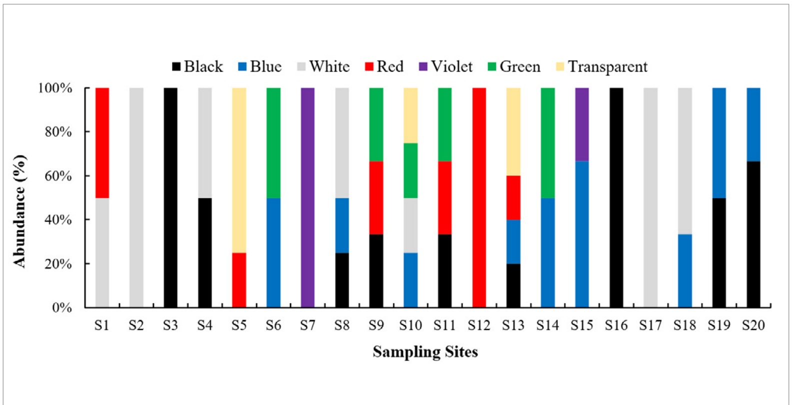

Figure 5. *Abundance (%) of MPs in each sample based on Color*

In research by Kosuth et al. (2018), the particles detected in about 159 drinking water samples were classified as multicolored (128 particles/L), Black (98 particles/L), Clear (42 particles/L), Purple (21 particles/L), and the most prominent color Blue (215 particles/L) and the descending order is- Blue>Multicolored>Black>Clear>Purple. This study found that black was the most abundant color. The second abundant color was blue, and the lowest number of MPs was detected as violet. In total, 53 MPs were detected in 20 different samples, 20 ml per sample of water, where the most abundant color was black, found at 24.5%. Researchers found that other colors like blue (20.75%), red (11.32%), transparent (11.32%), white (18.87%), green (9.43%), and violet (3.77%) respectively. Similarly, Panno et al. (2019) collected 17 groundwater samples during the investigation that contained MPs (65%) that were blue and/or clear, whereas the other common colors were red (15%) and gray (13%).

Polymer type of MPs in VSU beach

Some plastic polymers, such as ABS (acrylonitrile butadiene styrene), EVA (ethylene vinyl acetate), PA (polyamide), and PET (polyethylene terephthalate) have been found in surface water samples of the VSU beach, Pangasugan, Baybay City, Leyte. All MPs from 20 sampling sites were observed for polymeric analysis; in the water samples, the most abundant polymer found was PA which were 18 (35.4%). PET was the second largest polymer for water samples, 9 (18.3%) items, and ABS was the lowest concentration for of this study. A total of 4 (7.6%) items of ABS in water were recorded. EVA polymer found in water samples was 7 (12.8%) items. Figure 6 shows the polymer type identified by FTIR analysis. However, unplanned tourism, marine pollution, the discharge of residential and industrial trash, and illegally constructed buildings pose a major threat to the coastal ecology of the shoreline. For example, resin polymers and pellets come from accidental ship leaks or industrial effluent. PET and PA are widely utilized and produced in significant quantities worldwide. The primary means of transportation for MPs from both land-based and marine sources are winds and ocean currents (Kane et al., 2020; Law et al., 2010). Because of their low specific densities, which allow them to float on the water's surface and travel considerable distances via winds and ocean currents, PET and PA have a wide distribution, even on remote islands. Rain, flooding, and storm events are recognized as the primary drivers of MP transport and contamination in estuarine, coastal, and marine habitats (Hurley et al., 2018; Hitchcock, 2020; Veerasingam et al., 2016). Another significant factor in the movement of microplastics from the ocean to the land is storm surge (Lo et al., 2020; Ockelford et al., 2020). MPs are transported from offshore to the beach by tropical cyclones, and the storm surges that accompany them, in addition to facilitating coastal movement and adjustment.

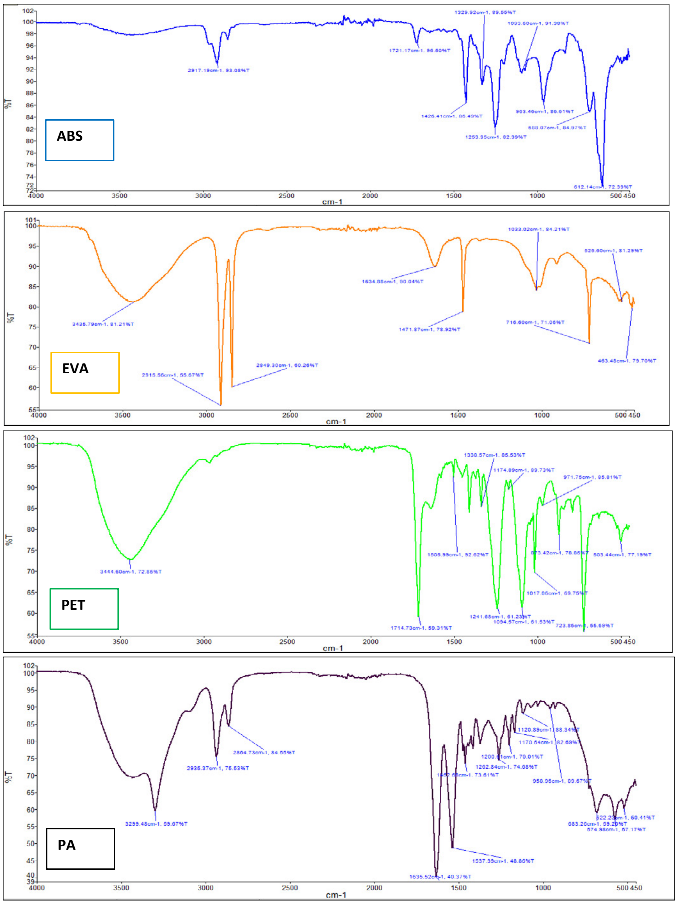

Figure 6. *Polymer type of MPs in VSU beach area identified by FTIR analysis*
ABS (acrylonitrile butadiene styrene); EVA (ethylene vinyl acetate); PET (polyethylene terephthalate); PA (polyamide)

Some Photographs of founded MPs in the Sample

Figure 7 shows MPs' different sizes, shapes and colors in the water sample of VSU beach area Pangasugan, Baybay City, Leyte.

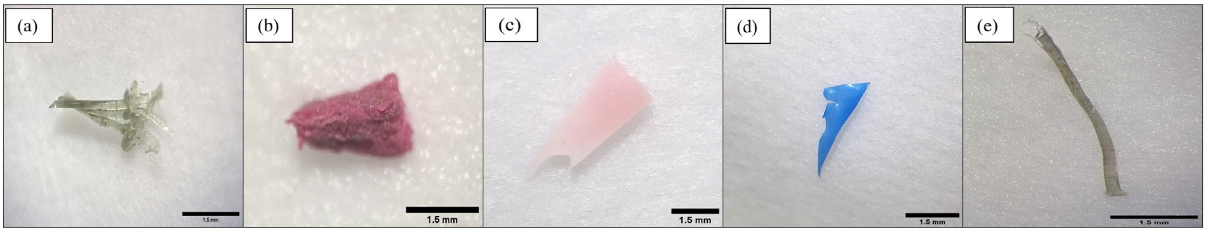

Figure 7. *Different shapes and colors of MPs were found in the Sample*
(a) transparent flakes; (b) Pink Flakes; (c) pink fragment; (d) blue fragment; (e) White line

PCA test result for the samples

A PCA was done on the water samples obtained from 20 sites in this investigation, which were analyzed for various parameters. The aim was to identify the relationships between the different variables, simplify the complexity in high-dimensional data, and understand the trends and patterns among various variables. Three components are shown in Figure 8a in the rotated component plot, which are significant variables after extraction by PCA test. Also, the scree plot shows the significant variation among the components. The scree plot (Figure 8b) shows the analysis's distinctive roots (eigenvalues), and the component plot shows the distribution of variables in the PCA's rotated space. Table 2. Showing component matrix for the water sample. PCA extracted a total of 7 components for the significance considered by this test values of more than 0.4 for the first component, MPs No, Fiber, Large, Medium, and Blue were significant; for the second component, Tiny and Red were most significant, and for the third component Violet and Red were most significant. Rescaled Distance Cluster Combine showed the different relationships among the variables, which are hierarchically connected. The dendrogram linked the relation among the variables (Figure 9).

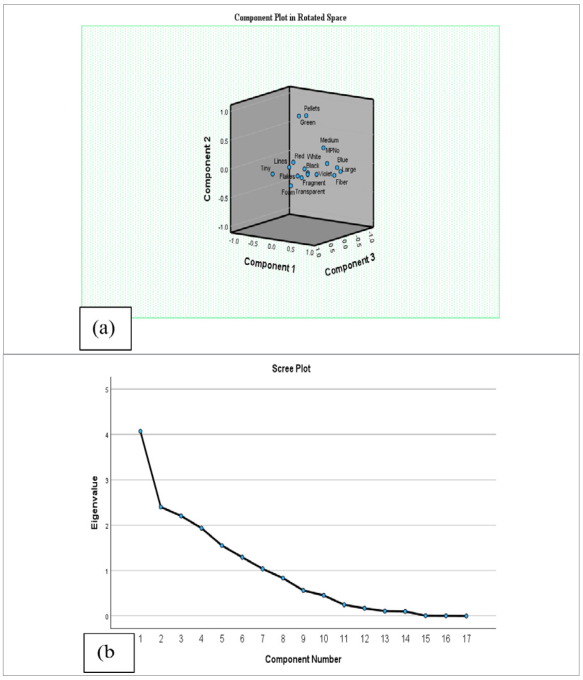

Figure 8. *(a) Component plot in rotated Space; (b) Scree plot from PCA test*

Table 2. *Component matrix for the PCA test. The values more than 0.5 are bolded as significant factors*

	Component						
	1	**2**	**3**	**4**	**5**	**6**	**7**
MP No.	**.931**	.184	.033	.137	.086	.051	.130
Fiber	**.921**	-.045	-.091	.192	-.045	-.009	-.147
Large	**.796**	-.293	-.164	.247	.133	-.238	.226
Medium	**.639**	.047	.028	-.399	.088	**.593**	.128
Blue	**.631**	-.424	-.267	.090	.133	-.408	-.143
Tiny	-.112	**.649**	.281	.379	.049	-.275	-.228
Red	.095	**.624**	**.597**	.034	-.022	.196	.179
Transparent	**.525**	.379	**.542**	.398	.162	-.094	.205
Black	**.606**	-.006	-.155	-.097	-.720	.362	-.269
Flakes	-.334	-.012	-.177	.220	-.537	-.219	**.609**

a. 7 components extracted

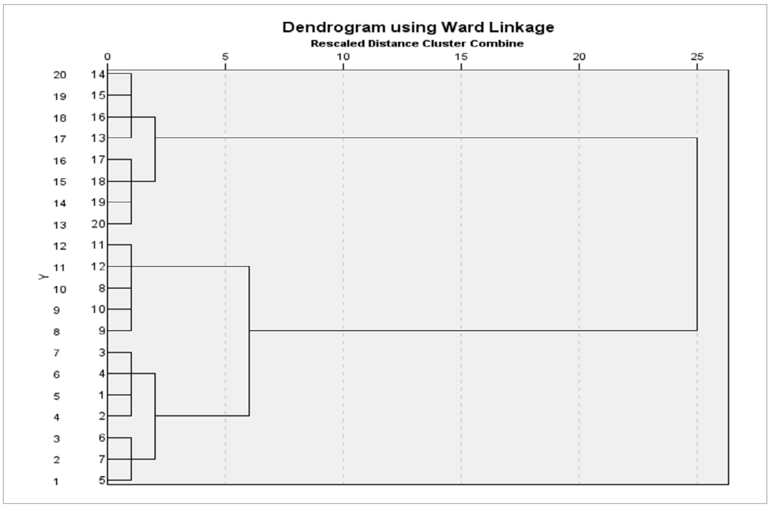

Figure 9. *Dendrogram for cluster combine. Showing the linkage among hierarchical group variables.*

The study has several limitations. Due to time constraints, only a few samples were analyzed. There is a possibility that microplastics might be lost at any point during the process.

CONCLUSION

This study shows that Microplastics (MPs) are present in the VSU beach area. There was a substantial variation in the number of MPs in water in various places due to the impact of widespread human activities. The results also indicate that each water sample includes MPs. MPs abundances per liter of water ranged from 50 to 250. The most common types of MPs were black and blue and at least slightly transparent and violet-colored fibers and foam. MPs contamination has become a significant issue due to the growth of the plastics sector, poor recycling rates, insufficient product designs that do not consider the post-consumer stage of the product, inadequate recovery technologies, and a lack of rules supporting a circular plastics economy. A sizable portion of plastic is lost to the environment when more is produced than is collected and consumed. In addition to impacting the environment, ecology, and biodiversity, MPs can affect social and economic aspects social and economic aspects. Unlike many developing countries, this study area's research on MPs has not yet begun. This work may be helpful for future research on MPs in the Visayas State University, Pangasugan, Leyte, Philippines. Fibers and lines-shaped MPs were the most prevalent in the marine water samples. A wide range of colors, particularly blue and red, were abundant. This study revealed that more than 62% of plastics detected in marine water sources are fibers, and 9.4% were pellet and fragments. This small-scale investigation will serve as a baseline for future extensive environmental and human health risk evaluations. The findings also suggest that MPs found in marine water sources are crucial in the context of MPs pollution, highlighting the need for further research.

Author Contributions

A. S. Al Helal: Conceptualization, methodology, writing – original draft preparation, formal analysis; **A. B. Siddique:** Visualization, investigation, writing-review & editing; **M. Howlader:** Data curation, visualization, formal analysis; **M. Dador:** Data curation, Visualization, writing-review & editing; **V. Asio:** Conceptualization, visualization, Methodology, Supervision.

Funding

This research received no external funding.

Ethical Approval

Not applicable

Competing interest

The authors declare no conflicts of interest.

Data Availability

All relevant data are included in the paper or its supplementary information.

Declaration of Artificial Intelligence Use

The authors declare that no artificial intelligence (AI) tools were used to prepare this paper. All content is the result of the authors' work and original writing.

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How to cite this article:
Al Helal, A. S., Siddique, A. B., Howlader, M., Dador, M., & Asio, V. (2025). Abundance and Characteristics of Microplastic in the Selected Coastal Area of Pangasugan, Baybay City, Leyte, Philippines. Recoletos Multidisciplinary Research Journal 13(1), 107-119. https://doi.org/10.32871/rmrj2513.01.09