DAVAO RESEARCH JOURNAL
https://davaoresearchjournal.ph

ORIGINAL RESEARCH ARTICLE

First Evidence of Microplastic Ingestion in Commercially Consumed Marine Gastropods (*Conomurex luhuanus* and *Canarium* spp.) from Davao Gulf

Ma. Kristine D. Limosnero[1]*, Ana P. Ocenar[2]

[1]*Faculty of Doña Carmen Denia National High School – SHS Department, Toril, Davao City, Philippines,*
Ma. Kristine D. Limosnero: https://orcid.org/0009-0006-9899-9829
[2]*Faculty of the Department of Natural Sciences, College of Arts and Sciences, University of Southeastern Philippines, Bo. Obrero, Davao City, Philippines,*
Ana P. Ocenar: https://orcid.org/0000-0001-9634-4905

*Corresponding author: *mkdslimosnero1989@gmail.com*

A B S T R A C T

This study assessed the presence of microplastics (MPs) in the tissues of commercially consumed marine gastropods from the Davao Gulf. A total of 180 individuals were examined. One MP was detected in *Conomurex luhuanus* ("Liswe") and one in *Canarium* spp. ("Aninikad") from Davao del Sur, while two MPs were detected in *C. luhuanus* from Davao Occidental. The particles were classified into three categories: fibers, films, and fragments, with sizes ranging from 0.8 to 2.0 mm. Of the four MPs identified, three were blue. Microplastic density was 0.07 particles per individual in both *C. luhuanus* and *Canarium* spp. from Davao del Sur, and 0.13 particles per individual in *C. luhuanus* from Davao Occidental. FTIR spectroscopy confirmed polyethylene terephthalate (PET), polyvinyl chloride (PVC), and polypropylene (PP) as the predominant polymers. These findings provide preliminary evidence of microplastic contamination in marine gastropods from the Davao Gulf, highlighting potential ecological impacts and raising concerns about food safety, while also underscoring the need for improved plastic waste management and monitoring of seafood resources in the region.

Keywords: *Contamination, Davao Gulf, Fourier Transform Infrared, Microplastics, Marine Gastropods*

Submitted: 10 Jul 2025
Revised: 12 Aug 2025
Accepted: 29 Sep 2025
Published: 03 Dec 2025

OPEN ACCESS

How to cite: Limosnero, M. K. D., and Ocenar, A. P. (2025). First Evidence of Microplastic Ingestion in Commercially Consumed Marine Gastropods (*Conomurex luhuanus* and *Canarium* spp.) from Davao Gulf. *Davao Research Journal,* 16 (4), 15-22. https://doi.org/10.59120/drj.v16i4.463

INTRODUCTION

Plastic pollution has become a pressing global environmental concern due to the extensive use of synthetic polymers in various industries, including packaging, agriculture, and the medical field. These sectors generate substantial volumes of plastic waste that fragment into smaller particles, eventually entering aquatic environments where they persist and interact with marine organisms (Millet et al., 2018; Thushari and Senevirathna, 2020). In the Philippines, plastic contamination has been documented at multiple scales. Abreo et al. (2016) reported the ingestion of plastic debris by green turtles (*Chelonia mydas*) in the Davao Gulf, highlighting the risks of macroplastic pollution to marine megafauna. More recent studies have focused on microplastics (MPs), such as those found in rabbitfish and sediments in Negros Oriental (Bucol et al., 2020) and in mangrove sediments of Butuan Bay, Mindanao (Navarro et al., 2022). In the Davao Gulf itself, Bersaldo et al. (2024) provided the first evidence of potential MP ingestion in the yellow-striped goatfish *Upeneus vittatus* caught in Malita, Davao Occidental, further demonstrating the vulnerability of commercially important finfish to MP contamination. Together, these findings highlight the widespread presence of plastic pollution in Philippine coastal ecosystems.

Globally, microplastic ingestion has been documented in a wide range of finfish species, reflecting their widespread distribution and trophic interactions. Studies in the Mediterranean, for example, reported MPs in commercially important species such as European anchovy (*Engraulis encrasicolus*) and sardine (*Sardina pilchardus*), with fibers being the dominant type (Renzi et al., 2019). Similar findings have been reported in Southeast Asia, where Rahmatsyah et al. (2024) documented microplastic contamination in four crucial commercial fish species from the east coast of North Sumatera Province, Indonesia. In China, high MP loads were detected in both freshwater and marine finfish, including mullets and groupers, indicating exposure through both dietary intake and waterborne uptake (Zhang et al., 2021). Gastropods, while less studied than finfish, are increasingly recognized as valuable bioindicators of sediment-associated microplastic contamination because of their benthic feeding strategies. In India, marine gastropods such as *Babylonia spirata* and *Hemifusus pugilinus* were found to ingest MPs dominated by fragments and films (Nikhil et al., 2024). Similar findings in Europe and the Middle

East suggest that gastropods accumulate MPs primarily through ingestion of detritus and biofilm-coated sediments (Curren et al., 2024). Despite this global attention, information from Southeast Asia remains limited, with most Philippine studies focusing on fish and bivalves rather than gastropods. This knowledge gap is significant given the high reliance on gastropods for local food security.

The food safety implications of microplastic contamination in seafood have become a central concern in recent years. Microplastics are not only physical pollutants but also potential chemical vectors, as they adsorb and transport persistent organic pollutants (POPs), heavy metals, and plastic additives such as phthalates and bisphenols (Jiang et al., 2020; Ziani et al., 2023). These contaminants can bioaccumulate and biomagnify along the food chain, raising concerns about chronic human exposure through the consumption of seafood. Bivalves have been widely studied in this regard, as they are consumed whole and thus directly transfer MPs to humans. In Europe, for example, Van Cauwenberghe and Janssen (2014) estimated that European shellfish consumers could ingest up to 11,000 MPs annually. Finfish, although usually eviscerated before consumption, may still contribute to exposure when smaller particles translocate into muscle tissues (Barboza et al., 2018). Gastropods present a comparable, if not greater, risk because they are also consumed whole in many regions, including the Philippines.

The ecological and food safety implications of microplastic ingestion are particularly concerning in regions with a high dependence on coastal resources. In Southeastern Mindanao, several gastropod species, including *Canarium* spp. ("Aninikad"), They are harvested as commercially essential resources that contribute to food security and livelihoods (Maynawang and Macusi, 2023). Similar reliance on mollusks has been reported for other coastal communities in the region, such as the exploitation of mangrove clams (*Anodontia philippiana*) in Baganga, Davao Oriental (Bersaldo et al., 2022). Because mollusk meat is consumed as edible soft tissue, there is potential for MPs to enter the human diet, particularly when compared with species that are routinely eviscerated before consumption. Despite their ecological and economic importance, little is known about microplastic contamination in gastropods from the Davao Gulf. This key fishing ground supports local food security and coastal livelihoods — even global reviews highlight the paucity of data from Southeast Asia (Curren et al., 2024).

This study, therefore, investigated the occurrence and characteristics of MPs in commercially consumed marine gastropods from the Davao Gulf. Specifically, it aimed to (1) confirm the presence of MPs in edible tissues, (2) characterize their size, shape, and color, (3) quantify the density of particles per individual, and (4) identify polymer types using Fourier Transform Infrared (FTIR) spectroscopy. Beyond laboratory analysis, the findings are expected to provide baseline data for food safety assessments, inform plastic waste management and fisheries policies, and support broader efforts to sustain marine biodiversity and coastal livelihoods in the region.

MATERIALS AND METHODS

Description of the study area

Four coastal sampling sites were selected across the Davao Gulf, specifically in Brgy. Calubihan, Banaybanay, Davao Oriental (6°58'46.1"N, 125°58'47.7"E); Babak, Island Garden City of Samal, Davao del Norte (7°08'32.2"N, 125°41'03.6"E); Brgy. Bato, Sta. Cruz, Davao del Sur (6°47'38.8"N, 125°23'32.1"E); and Colagsing, Brgy. Tanglad, Sta. Maria, Davao Occidental (6°37'02.1"N, 125°25'29.5"E). These sites were chosen to represent fishing communities and tourism areas with differing anthropogenic activities along the Gulf.

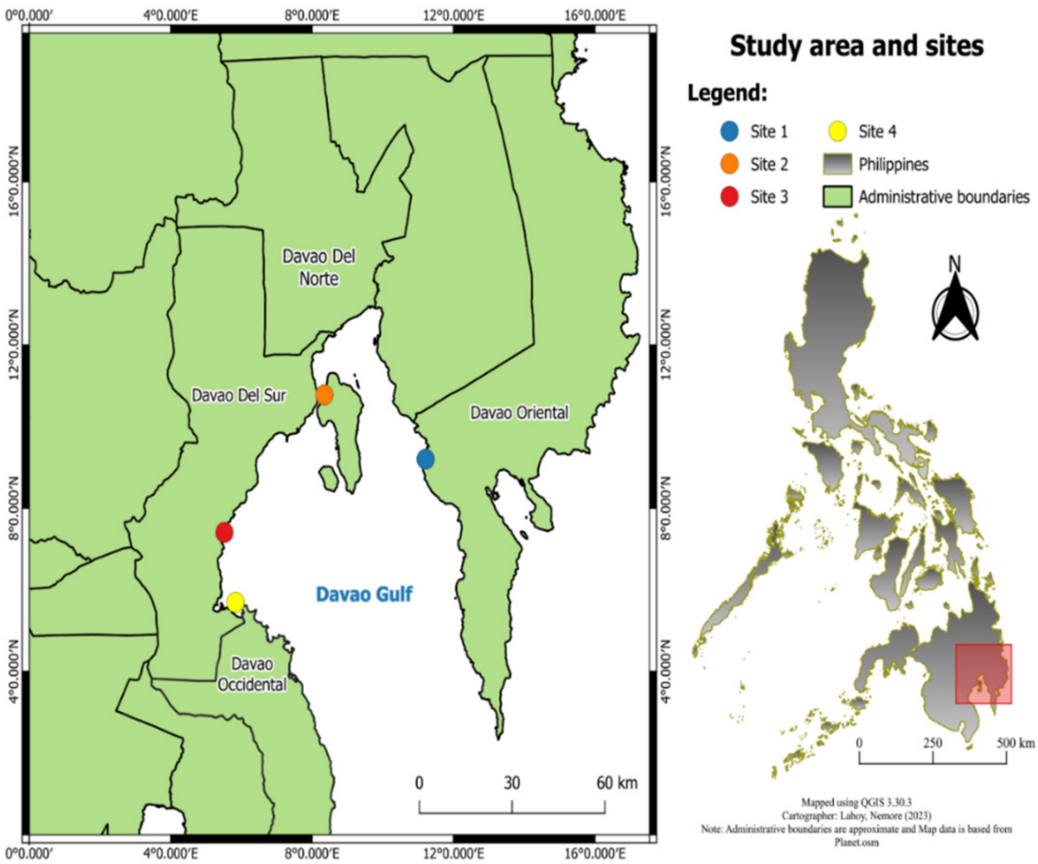

Figure 1. Map showing the location of the four sampling sites within Davao Gulf.

The coastline of Barangay Calubihan, Banaybanay, Davao Oriental, has relatively fewer settlements, with the gathering of gastropods and other invertebrates as the primary livelihood. Much of the coastal land is privately owned, limiting access to large groups of beachgoers and reducing direct waste inputs. In contrast, the Babak, Island Garden City of Samal, Davao del Norte site is located along a developed resort area where tourism is the primary source of livelihood. Despite increased human activity, regular monitoring by the Department of Environment and Natural Resources (DENR) ensures compliance with waste management protocols, thereby helping to maintain the cleanliness of shorelines.

The Barangay Bato, Sta. Cruz, Davao del Sur site is characterized by dense coastal settlements where domestic waste is often disposed of directly along the shoreline. Visible solid waste inputs, including plastics, indicate weaker compliance with local waste management regulations. Meanwhile, the Colagsing, Barangay Tanglad, Sta. Maria, Davao Occidental site supports both coastal settlements and active fisheries. Discarded fishing gear, including nets, nylon lines, and blue plastic drums used as aquaculture floats, is often left exposed along the shore, where it fragments due to photodegradation and contributes to localized plastic pollution. Notably, some drums remain in use, but their continuous exposure to sunlight makes them prone to gradual breakdown into microplastics over time.

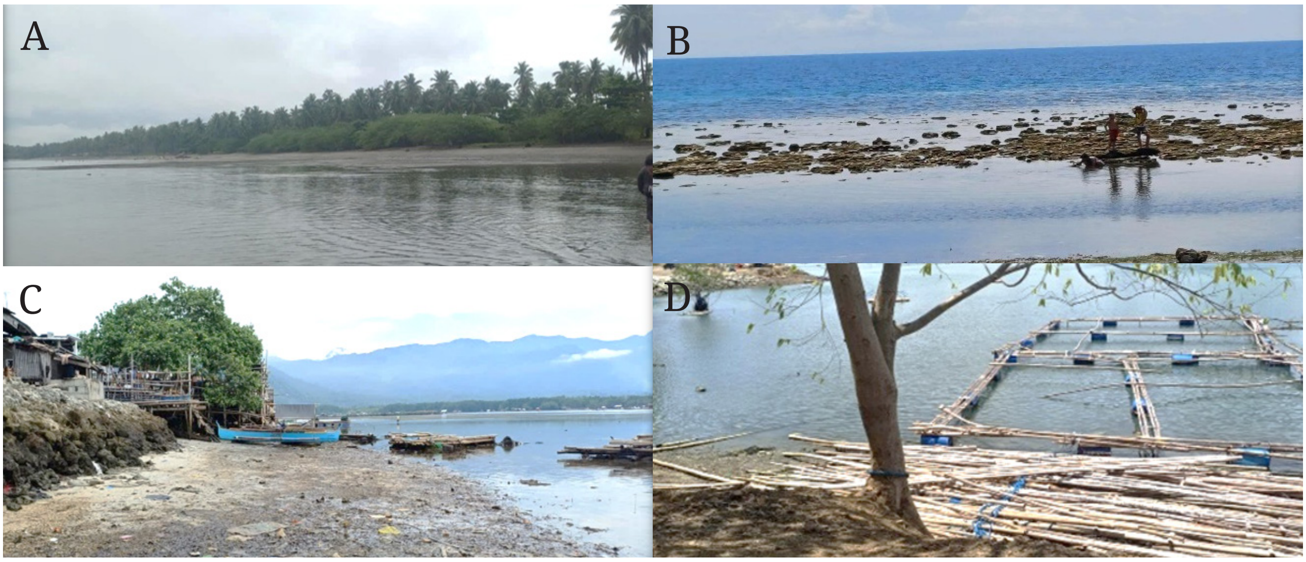

Figure 2. Sampling sites in the Davao Gulf: (A) Brgy. Calubihan, Banaybanay, Davao Oriental; (B) Babak, Island Garden City of Samal, Davao del Norte; (C) Brgy. Bato, Sta. Cruz, Davao del Sur; (D) Colagsing, Brgy. Tanglad, Sta. Maria, Davao Occidental

Sampling scheme and species selection

Five gastropod species were included in the study: *Conomurex luhuanus* ("Liswe"), *Canarium* spp. ("Aninikad"), *Lambis millepeda* ("Saang"), *Chicoreus brunneus* ("Buta-buta"), and *Angaria delphinus* ("Bawkot") (Figure 3). At each site in Davao Oriental, Davao del Norte, Davao del Sur, and Davao Occidental, three species were collected, with species composition varying according to their availability in the gleaning grounds. For each species at each site, five individuals were collected in triplicate, yielding a total of 180 individuals across all sites. Specimens were purchased directly from local gleaners to minimize external contamination during collection and transport.

Figure 3. Commercially Consumed Marine Gastropods Collected: (A) *Conomurexluhuanus* ('Liswe'), (B) *Canarium* spp. ('Aninikad'), (C) *Lambis millepeda* ('Saang'), (D) *Angaria Delphinus* ('Bawkot'), (E) *Chicoreus brunneus* ('Buta-buta').

Laboratory processing and quality control

Specimens were rinsed with filtered distilled water, wrapped in aluminum foil, and stored at −20 °C until processing. Tissue digestion and preliminary analysis were conducted at the Biology Laboratory of the University of Southeastern Philippines. Afterwards, polymer identification was performed using FTIR spectroscopy at the Technology Transfer and Business Development Office of the University of the Philippines – Mindanao. The procedures were adapted from established protocols for microplastic analysis in marine organisms (Navarro et al., 2022; Onda et al., 2023).

To minimize contamination, only non-plastic materials (such as glassware and foil) were used. Solutions were pre-filtered through 0.45 µm filters, and work surfaces were cleaned with lint-free tissue. Airborne contamination was monitored by exposing Petri dishes with dampened filter paper. Laboratory staff wore clean cotton clothing and used lint rollers before entering the work area. Positive controls spiked with microplastics and procedural blanks were processed in triplicate. Recovery rates ranged from 80% to 100%, and no particles were observed in the blanks, confirming procedural integrity.

Microplastic extraction and identification

Frozen tissues were thawed and extracted from shells, then digested with 10% KOH at a 3:1 solution-to-tissue ratio for 48–72h at 40°C, following procedures outlined in Navarro et al. (2022) and the Marine Science Institute's handbook on quantifying marine plastics (Onda et al., 2023). Highly viscous digests were treated with a saturated NaCl solution before being vacuum-filtered through 20 µm ashless filter paper. Filters were dried at 60°C and inspected under a microscope (40× magnification). Suspected particles were confirmed using needle tests, photographed, and categorized by shape, size, and color. Polymer types were identified using FTIR spectroscopy and matched against reference spectral libraries.

Data analysis

Descriptive statistics were applied to evaluate the occurrence, characteristics, and density of microplastics (MPs) across sites and species. MP density (particles per individual) was calculated by dividing the number of confirmed particles by the total number of individuals examined for each species at each site. Particle attributes, including size, shape, color, and polymer composition, were summarized to identify dominant traits. Polymer types identified through FTIR spectroscopy were verified against reference spectral libraries to ensure accuracy and reliability. All analyses focused on descriptive metrics due to the limited number of particles recovered.

RESULTS

Determination of microplastics

A total of 180 gastropod individuals were examined across four sites, representing five species in total (Figure 3). Species composition varied by site, with three species collected per location depending on availability. Four microplastic (MP) particles were confirmed in two species, *Conomurex luhuanus* and *Canarium* spp. No MPs were detected in *Lambis millepeda, Chicoreus brunneus,* and *Angaria delphinus.*

Table 1. Microplastic occurrence and characteristics in gastropods from the Davao Gulf.

Site	Species	No. individuals examined	No. MPs detected	Density (particles/ indivduals)	Polymer(s) detected	Particle types
Davao Oriental	*Chicoreus brunneus* (Buta-buta)	15	0	0	—	—
	Angaria delphinus (Bawkot)	15	0	0	—	—
	Canarium spp. (Aninikad)	15	0	0	—	—
Davao del Norte	*Conomurex luhuanus* (Liswe)	15	0	0	—	—
	Lambis millepeda (Saang)	15	0	0	—	—
	Canarium spp. (Aninikad)	15	0	0	—	—
Davao del Sur	*Conomurex luhuanus* (Liswe)	15	1	0.067	PVC	film
	Lambis millepeda (Saang)	15	0	0	—	—
	Canarium spp. (Aninikad)	15	1	0.067	PET	fragment
	Conomurex luhuanus (Liswe)	15	2	0.133	PP, PET	fragment, fiber
Davao Occidental	*Chicoreus brunneus* (Buta-buta)	15	0	0	—	—
	Canarium spp. (Aninikad)	15	0	0	—	—

Table 1 presents the occurrence of MPs across species and sites. All individuals from Davao Oriental (*C. brunneus, A. delphinus, Canarium* spp.) and Davao del Norte (*C. luhuanus, L. millepeda, Canarium* spp.) were negative. In Davao del Sur, *Conomurex luhuanus* ingested a film of polyvinyl chloride (PVC) while *Canarium* spp. Contained one fragment of polyethylene terephthalate (PET). In Davao Occidental, fragments and fibers of polypropylene and PET were detected in *C. luhuanus.*

Overall, *C. luhuanus* accounted for 75% (3 of 4) of the MPs recovered, suggesting higher susceptibility to ingestion than co-occurring gastropods. Fragments were the dominant morphologies, and blue was the predominant color (3 of 4 MPs, 75%). The polymers detected—PET, PVC, and PP—are commonly associated with food packaging, household products, and fishing gear, indicating both land-based and fisheries-related sources of contamination in the Davao Gulf.

Characterization and polymer classification

Having established the occurrence of MPs across sites and species, the ingested particles were further characterized in terms of size, shape, color, and polymer composition (Table 2). Table 2 presents the characteristics of the four confirmed MPs. Particle sizes ranged from 0.8 to 2.0 mm, with fragments and fibers predominating. Blue was the most common color, while polymers included polyethylene terephthalate (PET), polyvinyl chloride (PVC), and polypropylene (PP). PET was found in both *C. luhuanus* and *Canarium* spp., whereas PVC and PP were detected only in *C. luhuanus*. These patterns suggest multiple input sources, with packaging materials likely contributing PET and PVC, and fisheries-related activities contributing PP.

Table 2. Characteristics of Microplastics Ingested by Commercially Consumed Marine Gastropods in the Davao Gulf.

Site	Species	MP size	MP shape	MP color	Polymer classification
Davao Del Sur	*Canarium* spp. (Aninikad)	1.2 mm	Fragment	Blue	Polyethylene terephthalate (PET)
	Conomurex luhuanus (Liswe)	2.0 mm	Film	White	Polyvinylchloride (PVC)
Davao Occidental	*Conomurex luhuanus* (Liswe)	0.8 mm	Fragment	Blue	Polypropylene (PP)
		1.0 mm	Fiber	Blue	Polyethylene terephthalate (PET)

Microscopic visualization of microplastics

Representative images of the recovered MPs are presented in Figure 2. The panels illustrate the diversity of particle morphologies and colors identified in gastropod tissues. Panels A and B show a blue fragment from *Canarium* spp. and a white PVC film from *C. luhuanus* collected in Davao del Sur, respectively. Panels C and D display MPs from *C. luhuanus* in Davao Occidental, including a blue PP fragment and a blue PET fiber. Each image was captured under 40× magnification with a 1 mm scale bar, highlighting particle size and structural detail. Together, these images provide visual confirmation of the MPs characterized in this study.

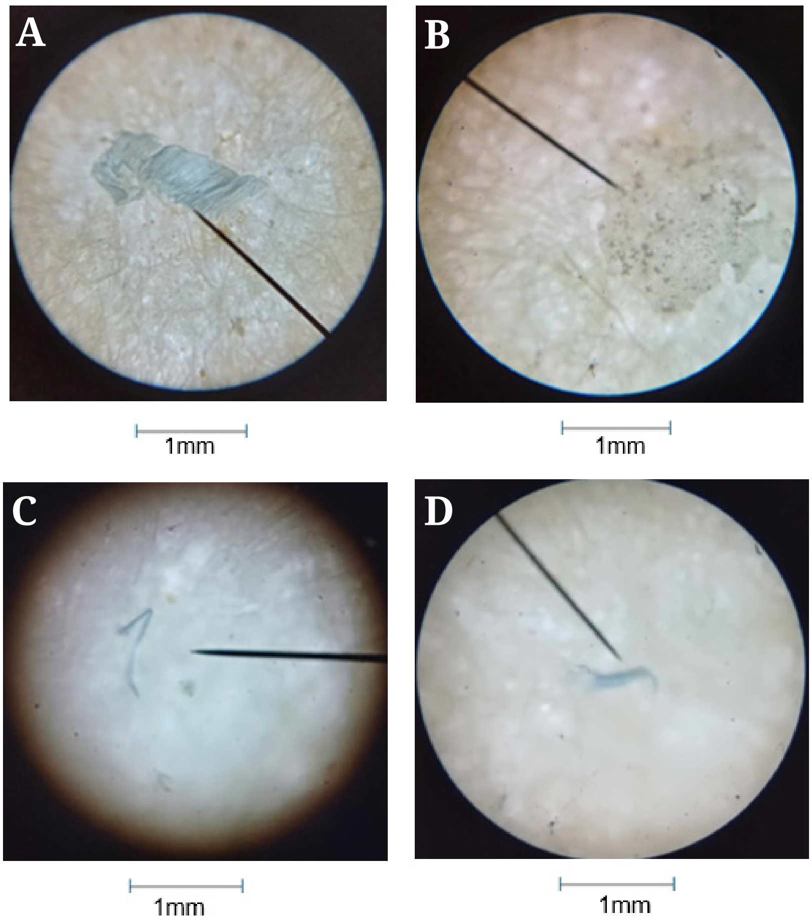

Figure 2. Microplastics extracted: (A) *Canarium* spp., (B) *Conomurex luhuanus* of Davao Del Sur, (C and D) *Conomurex luhuanus* of Davao Occidental.

Density of the confirmed microplastics

The density of MPs per individual is summarized in Table 3. In Davao del Sur, both *Canarium* spp. and *C. luhuanus* showed densities of 0.07 particles per individual. The highest density was observed in C. luhuanus from Davao Occidental, at 0.133 particles per individual.

Table 3. Microplastic Density from Two Collection Sites in Davao Gulf.

Site	Species	Microplastics	Total No. of Individuals	Density
Davao Del Sur	*Canarium* spp. (Aninikad)	1	15	0.07
	Conomurex luhuanus (Liswe)	1	15	0.07
Davao Occidental	*Conomurex luhuanus* (Liswe)	2	15	0.13

Note: Density is expressed in particles per individual

DISCUSSION

This study confirms the ingestion of microplastics (MPs) by commercially consumed marine gastropods in the Davao Gulf, although concentrations were relatively low compared to reports from other regions. Similar findings were observed in bivalves from the Davao Region (*Mytilus smaragdinus*, *Gari togata*, and *Cerastoderma edule*), where fiber-type MPs were detected at low concentrations (Geyrozaga, 2023). In contrast, higher contamination levels have been reported in other parts of the Philippines, such as fish and bivalves in Cebu Island (Abiñon et al., 2020), Bacoor Bay (Bilugan et al., 2021), Zamboanga City (Mejos et al., 2023), Butuan Bay (Similatan et al., 2023), and Pujada Bay, Davao Oriental (Lahoy and Antonio, 2025). These variations suggest that local anthropogenic activities and environmental conditions have a strong influence on MP contamination.

The absence of MPs in gastropods from Calubihan, Banaybanay, Davao Oriental, and Bato, Sta. Cruz, Davao del Norte, may reflect localized differences in waste management practices. These areas are known for their involvement in aquaculture and ecotourism activities, where establishments are subject to Environmental Compliance Certificate (ECC) requirements that include provisions for solid waste management (DENR, 2017). Cleaner shorelines and stricter environmental compliance could explain the lack of detectable MPs in these sites. In contrast, higher contamination in Davao del Sur and Davao Occidental likely reflects the influence of denser coastal settlements and inadequate solid waste management. Improper disposal and runoff may contribute to localized contamination hotspots, consistent with global findings that link MPs to human activities and poor waste management (Wibowo et al., 2019; Verzosa et al., 2024).

Species-specific differences were also evident. Both *Conomurex luhuanus* (Liswe) and *Canarium* spp. (Aninikad) ingested MPs, reflecting their benthic feeding strategies that expose them to contaminated sediments. Gastropods are particularly vulnerable due to their feeding ecology, which increases their contact with sediment-associated plastics (Hussain et al., 2024; Nikhil et al., 2024). Similar trends have been observed in other mollusks and benthic organisms, where feeding style influenced the degree of MP ingestion (De-la-Torre et al., 2020; Porter et al., 2023).

The characteristics of ingested MPs provide further insights. Blue fragments were the most abundant, aligning with patterns observed in other Philippine studies, such as Butuan Bay (Navarro et al., 2024) and Cebu City (Abiñon et al., 2020). Fragments likely originate from larger degraded plastics, consistent with the prevalence of polyethylene terephthalate (PET), which is widely used in packaging and persists in marine habitats (Olubusoye et al., 2024; Zhong et al., 2018). The predominance of high-density polymers such as PE and PVC, which tend to settle on the seafloor, further supports the likelihood of sediment-mediated exposure among benthic gastropods (Gago et al., 2019).

Although the densities observed in this study were low (≤0.133 particles per individual), the presence of MPs in food species is a potential concern for food safety and public health. The detection of MPs in *C. luhuanus* and *Canarium* spp. has direct implications for consumption, as these gastropods are widely harvested and sold in coastal communities of Southeastern Mindanao. Local gleaners collect these species daily and sell them in wet markets, often in volumes reaching several kilograms per week during peak gleaning seasons (Maynawang and Macusi, 2023). Because the edible portion is consumed whole, any ingested MPs may be directly transferred to humans. While the MP densities observed in this study were minimal, chronic consumption could contribute to long-term exposure. Public awareness of proper washing and purging before cooking may help reduce contamination; however, because MPs can be embedded in tissues, community-based waste reduction and improved plastic management remain more effective long-term solutions.

Overall, the findings highlight localized contamination in specific areas of the Davao Gulf, likely due to waste management practices and coastal settlement density. While current levels in gastropods appear minimal, the progressive fragmentation of larger plastics into MPs may increase future contamination risks. Strengthening community-based waste management, promoting circular economy initiatives, and enforcing existing policies are essential steps. At the same time, integrating microplastic monitoring into seafood safety assessments would provide a science-based foundation for protecting marine biodiversity, safeguarding public health, and sustaining the livelihoods of coastal communities dependent on the Davao Gulf.

CONCLUSION

This study provides the first evidence of microplastic (MP) ingestion in commercially consumed marine gastropods from the Davao Gulf. MPs were detected in *Conomurex luhuanus* (Liswe) and *Canarium* spp. ("Aninikad"), particularly in samples from Davao del Sur and Davao Occidental, while other co-occurring gastropods remained negative. The recovered particles were mainly fragments and fibers, with blue as the predominant color, and polymers identified as polyethylene terephthalate (PET), polyvinyl chloride (PVC), and polypropylene (PP). Although the recorded densities were relatively low (≤0.133 particles per individual), their presence in edible gastropods raises essential concerns for food safety and the health of the marine ecosystem.

As a preliminary assessment, these findings underscore the need for broader spatiotemporal monitoring, encompassing more sites, seasons, and larger sample sizes to enhance statistical confidence. The application of advanced polymer identification techniques, such as Raman spectroscopy, would also improve accuracy and comparability with global datasets.

Beyond methodological refinement, the study underscores the importance of integrating MP monitoring into fisheries management and coastal governance. Gastropods like *C. luhuanus* and *Canarium* spp. are widely harvested and consumed in coastal Mindanao, and their contamination—even at low levels—highlights the potential for chronic human exposure. Incorporating microplastic risk assessments into seafood safety protocols, alongside enhanced waste management systems and stricter enforcement of single-use plastic regulations, would provide a science-based foundation for protecting marine biodiversity, safeguarding public health, and ensuring the sustainability of livelihoods dependent on the Davao Gulf. The study recommends expanding the monitoring of microplastics in gastropods and other seafood species across additional sites and seasons in the Davao Gulf to establish long-term baselines. Integrate microplastic surveillance into existing fisheries management and seafood safety programs to inform policy and consumer protection efforts. Promote proper handling and disposal of fishing gear and aquaculture materials (e.g., nets, nylon lines, plastic drums) to minimize fisheries-related plastic inputs. Raise public awareness about the safe preparation and consumption of gastropods, highlighting the potential risks associated with whole-tissue ingestion. Support policy enforcement and innovation, including restrictions on single-use plastics and initiatives advancing circular economy practices in coastal communities.

ACKNOWLEDGEMENTS

The authors would like to express sincere gratitude to the Plastic Research Intensive Methods Training Mindanao 2023 (PRIMe-TP), led by Dr. Deo Florence L. Onda of the University of the Philippines – Marine Science Institute, for providing valuable training and guidance that greatly contributed to the conduct of this study. Appreciation is also extended to the College of Arts and Sciences of the University of Southeastern Philippines for granting access to its laboratory facilities and for the expertise and support generously shared by its faculty members.

FUNDING SOURCE

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

AUTHOR CONTRIBUTIONS

M.K.D.L.: Conceptualization, Resources, Fieldwork, Laboratory Analysis, and Writing – Original Draft. A.P.O.: Conceptualization, Writing – Review and Editing, Validation, and Guidance.

DECLARATION

Informed consent statement

Permission letters from the barangay study sites provided a letter of consent for conducting the interview in ther business.

Conflict of interest

The authors declare that they have no known financial, personal, or professional conflicts of interest that could have influenced the outcomes, interpretation, or presentation of this research.

REFERENCES

Abiñon, B. S. F., Camporedondo, B. S., Mercadal, E. M. B., Olegario, K. M. R., Palapar, E. M. H., Ypil, C. W. R., and Garces, J. J. C. (2020). Abundance And Characteristics Of Microplastics In Commercially Sold Fishes From Cebu Island, Philippines. *International Journal of Aquatic Biology*, 8(6), 424-433.

Abreo, N. A. S., Macusi, E. D., Blatchley, D. D., and Cuenca, G. C. (2016). Ingestion of marine plastic debris by green turtle (Chelonia mydas) in Davao Gulf, Mindanao, Philippines. *Philippine Journal of Science*, 145(1), 17-23.

Barboza, L. G. A., Vethaak, A. D., Lavorante, B. R., Lundebye, A. K., and Guilhermino, L. (2018). Marine Microplastic Debris: An Emerging Issue for Food Security, Food Safety and Human Health. Marine pollution bulletin, 133, 336-348.

Bersaldo, M. J., Lacuna, M. D., and Macusi, E. D. (2022). Status of mangrove clam (Anodontia philippiana Reeve, 1850) in Baganga, Davao Oriental, Philippines. ABAH Bioflux, 14(2), 55-66.

Bersaldo, M. J. I., G Lacuna, M. L. D., S Orbita, M. L., Tampus, A. D., Avenido, P. M., and Macusi, E. D. (2024). First Evidence of Potential Microplastic Ingestion of Yellow Striped Goat Fish Upeneus vitattus (Forsskal, 1775) Caught in Malita, Davao Occidental, Philippines. ILMU KELAUTAN: *Indonesian Journal of Marine Sciences*, 29(1).

Bilugan, Q. M., Limbago, J. S., and Gutierrez, R. L. (2021). Detection And Quantification Of Microplastics From Cultured Green Mussel Perna Viridis In Bacoor Bay, Cavite, Philippines. *Sustinere: Journal of Environment and Sustainability*, 5(2), 90-102.

Bucol, L. A., Romano, E. F., Cabcaban, S. M., Siplon, L. M. D., Madrid, G. C., Bucol, A. A., and Polidoro, B. (2020). Microplastics in marine sediments and rabbitfish (Siganus fuscescens) from selected coastal areas of Negros Oriental, Philippines. Marine Pollution Bulletin, 150, 110685.

Curren, E., Yu, D. C. Y., and Leong, S. C. Y. (2024). From the Seafloor to the Surface: A Global Review of Gastropods as Bioindicators of Marine Microplastics. Water, Air, and Soil Pollution, 235(1), 45.

Dawson, A. L., Santana, M. F., Miller, M. E., and Kroon, F. J. (2021). Relevance And Reliability Of Evidence For Microplastic Contamination In Seafood: A Critical Review Using Australian Consumption Patterns As A Case Study. Environmental Pollution, 276, 116684.

De-la-Torre, G. E., Apaza-Vargas, D. M., and Santillán, L. (2020). Microplastic Ingestion And Feeding Ecology In Three Intertidal Mollusk Species From Lima, Peru. Revista de Biología Marina y Oceanografía, 55(2), 167-171.

Department of Environment and Natural Resources (2003). DENR Administrative Order No. 2003-30: Implementing Rules and Regulations for the Philippine Environmental Impact Statement (EIS) System. Environmental Management Bureau. content/uploads/2016/06/DAO-2003-30.pdf

Frias, J. P., and Nash, R. (2019). Microplastics: Finding A Consensus On The Definition. Marine Pollution Bulletin, 138, 145-147.

Gago, J.; Filgueiras, A.; Pedrotti, M.L.; Caetano, M.; Frias, J. (. 2019). Standardised Protocol for Monitoring Microplastics in Seawater. Available online: https://repository.oceanbestpractices.org/handle/11329/1077 (accessed on 29 October 2023).

Geyrozaga, J. I. (2023). Microplastics in Bivalves From Selected Coastal Environments and Public Markets in Davao Region, Philippines (Unpublished Master's thesis). University of Southeastern Philippines.

Gigault, J., Halle, A. t., Baudrimont, M., Pascal, P-Y, Gauffre, F., Phi, T-L., Hadri, H. E., Grassl, B., Reynaud, S. (2018) Current Opinion: What Is A Nanoplastic? Environmental Pollution 235, pp 1030-1034. https://doi.org/10.1016/j.envpol.2018.01.024

Hussain, M., Blache, D., and Maloney, S. K. (2024). Impact of Microplastics on the Physiology of Benthos. In Microplastic Pollution (pp. 363-372). Singapore: Springer Nature Singapore.

Jiang, B., Kauffman, A. E., Li, L., McFee, W., Cai, B., Weinstein, J., and Xiao, S. (2020). Health Impacts of Environmental Contamination of Micro-and Nanoplastics: A Review. Environmental Health and Preventive Medicine, 25, 1-15.

Lahoy, N. M., and Antonio, E. S. (2025). Microplastic Occurrence in the Gastrointestinal Tract of Rabbitfish (Siganus canaliculatus) in Pujada Bay, Philippines. *Davao Research Journal,* 16(2), 49-61.

Maynawang, I. S., and Macusi, E. D. (2023). Catch Assessment Of Commercially Important Gastropods In Guang-Guang, Mati City, Davao Oriental, Philippines. Academia Biology, 1(1).

Mejos, J. S., Cotamora, G. D., Vidal, P. M., Baguio-Gonzales, A., Tito, O. D., and Alejos, M. S. (2023). Microplastic Abundance And Characteristics In Rabbitfish Siganus Guttatus And Parrot-fish Scarus Ghobban From The Local Market Of Zamboanga City, Philippines. *Uttar Pradesh Journal Of Zoology*, 44(15), 89-96.

Millet, H., Vangheluwe, P., Block, C., Sevenster, A., Garcia, L., and Antonopoulos, R. (2018). The Nature Of Plastics And Their Societal Usage. Plastics And The Environment, 2018, 1-20.

Navarro, C. K. P., Arcadio, C. G. L. A., Similatan, K. M., Inocente, S. A. T., Banda, M. H. T., Capangpangan, R. Y., ... and Bacosa, H. P. (2022). Unraveling microplastic pollution in mangrove sediments of Butuan Bay, Philippines. Sustainability, 14(21), 14469.

Navarro, C. K. P., Arcadio, C. G. L. A., Capangpangan, R. Y., and Bacosa, H. P. (2024) Evidence Of Microplastic Uptake By Mud Clam (Polymesoda Erosa) In The Mangrove Sediments Of Butuan Bay, Mindanao, Philippines. Mindanao, Philippines.

Nikhil, V. G., Amritha, G. G., Ranjeet, K., and Varghese, G. K. (2024). Distribution of Microplastics in Seafloor Sediments and Their Differential Assimilation in Nearshore Benthic Molluscs Along The South-west Coast of India. Environmental Pollution, 344, 123350.

Olubusoye, B. S., Cizdziel, J. V., Wontor, K., Heinen, E., Grandberry, T., Bennett, E. R., and Moore, M. T. (2024). Removal of microplastics from agricultural runoff using biochar: a column feasibility study. Frontiers in Environmental Science, 12, 1388606.

Onda, D. F. L., Gomez, N. C., Purganan, D. J. E., Bitalac, J. M. S., Balboa, K. J. N., Bonita, J. D. P., Ignacio, P. S. P., Alindayu, R. C., Licnachan, L. O. C., Luzadas, R. L., Galang, J. M. M. (2023). Handbook for Quantifying Plastics in the Marine Environment [Unpublished Manuscript]. Microbial Oceanography Laboratory, Marine Science Institute, University of the Philippines Diliman.

Porter, A., Godbold, J. A., Lewis, C. N., Savage, G., Solan, M., and Galloway, T. S. (2023). Microplastic Burden in Marine Benthic Invertebrates Depends on Species Traits and Feeding Ecology Within Biogeographical Provinces. Nature Communications, 14(1), 8023.

Rahmatsyah, R., Syarifuddin, S., Juliani, R., Azzahra, A. F., Rahmeida, S., and Batubara, A. S. (2024). Microplastic contamination of four important commercial fish in east coast of North Sumatera Province, Indonesia. Phil J Fish, 31(2), 2023-0056.

Renzi, M., Specchiulli, A., Blašković, A., Manzo, C., Mancinelli, G., and Cilenti, L. (2019). Marine Litter in Stomach Content of Small Pelagic Fishes from the Adriatic Sea: Sardines (*Sardina pilchardus*) and Anchovies (*Engraulis encrasicolus*). Environmental Science and Pollution Research, 26(3), 2771-2781.

Similatan, K. M., Arcadio, C. G. L. A., Navarro, C. K. P., Capangpangan, R. Y., and Bacosa, H. P. (2023). Microplastic Ingestion By Adult Milkfish Chanos Chanos (Forsskål, 1775) In Aquaculture System: The Case Of Butuan Bay, Philippines. Marine Pollution Bulletin, 194, 115409.

Thushari, G. G. N., and Senevirathna, J. D. M. (2020). Plastic Pollution In The Marine Environment. Heliyon, 6(8).

Van Cauwenberghe, L., and Janssen, C. R. (2014). Microplastics in Bivalves Cultured for Human Consumption. Environmental pollution, 193, 65-70.

Van Cauwenberghe, L., Devriese, L., Galgani, F., Robbens, J., Janssen, C.R. (2015) Microplastics In Sediments: A Review Of Techniques, Occurrence And Effects. Marine Environmental Research 111:5-17. Https://Doi.Org/10.1016/J.Marenvres.2015.06.007

Verzosa, R. C., Katipunan, F. J. M., Lumangyao, J. G. B., and Antonio, E. S. (2024). Solid waste management awareness and practices in coastal communities. *Davao Research Journal,* 15(3), 60-77.

Wibowo, Y. G., A. T. Maryani, D. Rosanti, D. Rosarina (2019). Microplastic in Marine Environment and Its Impact. Sainmatika: Jurnal Ilmiah Matematika dan Ilmu Pengetahuan Alam. 16(1). DOI 10.31851/sainmatika.v16i1.2884 https://jurnal.univpgri-palembang.ac.id/index.php/sainmatika

Zhong, X., Zhao, X., Qian, Y., and Zou, Y. (2018). Polyethylene Plastic Production Process. Insight-Material Science, 1(1), 104-104.

Zhang, F., Xu, J., Zhu, L., Peng, G., Jabeen, K., Wang, X., and Li, D. (2021). Seasonal distributions of microplastics and estimation of the microplastic load ingested by wild caught fish in the East China Sea. *Journal of hazardous materials,* 419, 126456.

Ziani, K., Ioniță-Mîndrican, C. B., Mititelu, M., Neacșu, S. M., Negrei, C., Moroșan, E., ... and Preda, O. T. (2023). Microplastics: A Real Global Threat for Environment and Food Safety: A State of the Art Review. Nutrients, 15(3), 617.