Hosted by

Characterization of Microplastics Residue in Water and Biota of Majidun Estuarine, Lagos Nigeria

Rasheed Yemi Oladunjoye[*,a], Abduljeleel Jimoh Adeyemi[a], Precious Tiwaloluwa Shokoya[a], Oyebamiji Oladeni Fafioye[a], Rasheedat Oluwakemi Kuku[b], Raheem Adekunle Asiru[c], Mistura Temitope Adeleke[a] and Oladunni Nimota Adekunle[a]

[a]Department of Zoology and Environmental Biology, Olabisi Onabanjo University, Ago – Iwoye, Nigeria

[b]Department of Science and Technical Education, Olabisi Onabanjo University, Ago – Iwoye, Nigeria

[c]Department of Biological Sciences, Federal University Gusau, Zamfara State, Nigeria

*Corresponding Author; P. O. Box 47, Ago-Iwoye, Ogun State, Nigeria.

oladunjoye.rasheed@oouagoiwoye.edu.ng; +2348058109160; ORCID: 0000-0002-3374-791

DOI 10.53974/unza.jabs.8.3.1334

ABSTRACT

This study assessed the phenotypic Microplastic contamination is a critical environmental issue impacting aquatic ecosystems worldwide. Due to their environmental persistence, microplastics degrade water quality, threaten aquatic *biota*, and pose potential health risks to humans through water/sea food consumption. Despite the global significance of this problem, no documented studies have assessed microplastic pollution in the *Majidun* River, Ikorodu, Lagos State, Nigeria. This study investigated the occurrence of microplastics in surface water and commercially available aquatic species in *Majidun* River, Ikorodu, Lagos State, Nigeria. Water samples were collected using amber bottles and analyzed for microplastic occurrence using Fourier-transform infrared spectroscopy (FTIR), while fish, Kribia kribensis, Chrysichthyes *filamentous*, *Galeoides decadactylus*, Clarias *lazera*, *Carranx hippos* and *Monodactylus seba*e) and crustacean species (Callinectes pallidus), were dissected to extract and analyze gastro-intestinal contents for microplastic contamination. The result revealed Neoprene occurrence (5.9 ± 0.02) as predominant microplastic that significantly exceeded Ethylene Propylene (1.0 ± 0.03) across the River. In the *biota*, eight microplastic polymers were identified: *Polyacrylamide*, *Polyaramid*, *Nylon*, *Polybutylene terephthalate*, *polyvinyl alcohol*, *Ethylene propylene*, *Polyurethane*, *and Neoprene.* Microplastic occurrence was highest in *Monodactylus* sebae (23%), followed by *Galeoides decadactylus* (19%), *Clarias lazera* (19%), and *Carranx hippos* (18%). The lowest occurrences were recorded in Kribia kribensis, *Chrysichthyes filamentous*, and *Callinectes pallidus* (7% each). This study provides the first evidence of significant microplastic contamination in the *Majidun* River, highlighting the need for policies to mitigate microplastic pollution and raise awareness of its impacts on water quality, aquatic life, and human health.

KEYWORDS: *FTIR, Majidun, Microplastics, Pollution, Polymers*

INTRODUCTION

Plastics, encompassing a wide array of materials that are either synthetic or naturally occurring, can be molded when soft and retain a fixed shape when hardened, giving them versatility across various applications (Ezcurra and Bisogno, 2022). As polymers composed of repeating monomeric units, plastics have become integral to modern life due to their durability, low production cost, and ease of fabrication, making them essential for items such as food containers, medical supplies, and packaging (Andrady and Neal, 2009; Coleman, 2017; Borra and Dutta, 2019). Since the mid-20th century, global plastic production has surged, now reaching approximately 300 million tons annually, and it is expected to double by 2030 (Gourmelon, 2015). This rapid increase in production has exacerbated the issue of plastic pollution, with an estimated 10% of plastic waste entering the oceans each year, largely via rivers and other land-based sources (Vadera and Khan, 2021).

The environmental persistence of plastics, resulting from their resistance to degradation, has become a serious environmental concern. Plastics take thousands of years to decompose under natural conditions, yet exposure to environmental factors such as sunlight, ultraviolet radiation, moisture, and wave action breaks them down gradually into microplastics (MPs), defined as particles less than 5 mm in diameter (Costa et al., 2018; Ouyang et al., 2021). While plastics at intact form pose pollution issues, the threat intensifies when they degrade into MPs, which have been documented in aquatic environment, impacting ecosystems and human health alike (Adeogun et al., 2020; Akarsu et al., 2020; Attah et al., 2023).

Approximately, 700 aquatic species, including fish, penguins and sea turtles, are now recognized to be at risk of microplastics, either through ingestion or exposure to toxic additives embedded in these particles (Akarsu et al., 2020). Many MPs carry hazardous organic pollutants such as *polybrominated diphenyl* ethers (PBDEs) that are absorbed from surrounding waters or incorporated during manufacturing. These pollutants are known to accumulate in aquatic organisms, triggering oxidative stress, *cytotoxicity*, *neurotoxicity*, *hepatotoxicity*, and other adverse effects that threaten species health and biodiversity (Gore et al., 2017). Furthermore, MPs devoid of chemical additives, while not chemically harmful, pose physical risks; and cause blockages in the digestive tracts of marine organisms, leading to malnutrition, physical injury, or even death (Udayakumar et al., 2021).

Various studies have identified *polyethylene, polyethylene terephthalate, polypropylene, polystyrene*, and *polyvinyl chloride* as the most prevalent microplastic polymers found in surface waters, sediments, and fish (Adeogun et al., 2020; Ogbomida et al., 2023; Attah et al., 2023). In Nigeria, fish plays a crucial role in the diet as a primary and affordable source of animal protein, especially for those in rural and coastal communities (Alfred et al., 2020; Gomna and Rana, 2007). According to the Food and Agriculture Organization (FAO), fish provides approximately 40% of the total animal protein intake for Nigerians (Abdulraheem et al., 2016), underscoring its importance in the national diet. However, exposure of fish to MPs has been associated with oxidative stress, which can disrupt cellular functions and trigger inflammation (Marn et al., 2020) which could potentially threaten human as may cause harm when consumed.

Despite researches on plastic pollution, specific studies on microplastics remain limited in some regions, particularly in Nigeria, where plastic waste production ranks ninth globally. The country generates approximately 2.5 million tons of plastic waste annually, with less than 12% recycled, leaving vast quantities uncollected or improperly managed (Babayemi et al., 2018; Obiezu et al., 2019; Dumbili et al., 2020). Majidun River Ikorodu, Lagos State, is one such example of a heavily plastic pollution waterway where previous studies have documented high levels of heavy metals and other contaminants (Oladunjoye, 2022).

Microplastic pollution has become a significant threat to aquatic ecosystems, with potential to disrupt ecosystem and in-turn have adverse effects on human health. Several studies have documented the occurrence of microplastics in water, sediments and fish in Nigeria aquatic bodies (Adeogun et al., 2020; Olarinmoye et al., 2020; Attah et al., 2023; Yahaya et al., 2024). However, no microplastics assessment has been conducted on Majidun River despite its susceptibility to pollution from industrial and domestic sources and its socio-economic purposes (Ayejuyo et al., 2003; Oladunjoye et al., 2022) which make the study to be the first report to document its occurrence and abundance in water and aquatic *biota*.

The study aims to address this gap by conducting an in-depth characterization of microplastics in both surface water and commercially available fish species of Majidun River, Lagos Nigeria. Through this investigation, we seek to contribute to the understanding of microplastic pollution in Nigerian water bodies, assess the potential risks to aquatic organisms, and provide a foundation for environmental management and policy development regarding plastic wastes in the country.

MATERIALS AND METHODS

Site Description

This study was carried out in Majidun River, Ikorodu, Lagos State, Nigeria. Majidun River is located on latitude 6°36′N 3°30′E and longitude 6.600°N 3.500°E (Figure 1). Also, it is known as Majidun Ilaje creek because the major inhabitants are mainly from Ilaje, Ondo State with the time zone of Lagos/Africa (Ayejuyo et al., 2003). Majidun is located in Ikorodu, which is a city and one of the Local Government Areas in Lagos State, located along Lagos Lagoon that share boundary with Ogun State. Majidun River is frequently subjected to the dumping of refuse and industrial effluents, as well as various other waste materials. Despite its pollution the river remains a critical resource for the local community, serving agricultural, recreational, transportation and occasional domestic water needs.

Sample Collection

Water samples were taken at 1m from the shore of the river (Olarinmoye et al., 2020). Two water samples (one per sampling location) were taken at 100 meters apart with a pre-cleaned 250mls amber bottle (a non-plastic container to prevent microplastic contamination) directly below the water surface. Fish samples for MPs analysis were obtained using gill and hand nets. The samples comprised of six fish species (*Kribia kribensis*, *Chrysichthys filamentous*, *Galeoides decadactylus*, *Clarias lazera*, *Carranx hippos*, *and* Monodactylus sebae) and one *crustacean* species *(Callinectes pallidus)*. The fish species were placed on ice and transported to the laboratory following the method described by Adeogun et al. (2020).

Microplastics Extraction, Quantification and Detection

Water

Approximately 100 ml of the water sample was passed through a 500 µm mesh. Then, 10 ml of nitric acid was added, and the mixture was agitated for about 4 hours at 50°C to remove organic matter. The samples were subsequently filtered using Whatman filter paper (WHA1001090; Merck, Germany). The filter paper containing the residue was air-dried and prepared for microplastic analysis using Fourier-transform infrared spectroscopy (FTIR) as documented in Riaz et al. (2018) and Attah et al. (2023) findings.

Fish

One (1g) of the fine milled fish sample was taken into digestion flask, 5ml of conc. Nitric acid was added and the mixture was place on (hot plate) for about 25mins until the brown fumes started forming and the fume changes gradually to whitish which shows that the samples have been completely digested. The digested samples were allowed to cool and later made up to 20ml mark with purified water, the mixture was filtered through a micro glass filter or clean filter paper and the residue on the filter paper, allow to dry under dry air and kept under air tight in order to prevent contamination. The microplastic polymers are determined by FTIR using the methods described by Talari et al. (2016) and Ogbomida et al. (2023) reports.

Data Analysis

Data obtained were statistically analys using the IBM Statistical Package (SPSS) version 20.0 (IBM Corp, 2011). Mean amount of microplastic in the water samples was compared using the Independent sample T-test. Also, the amount of each microplastic component present in the fish samples was compared using One-way Analysis of Variance (ANOVA). Mean values were separated using Student-Newman-Keuls and results presented as Mean±Standard deviation. Probability value (p – value) less than 0.05 was considered to be statistically significant.

RESULTS

Microplastics in Majidun Water

A total of Eight (8) microplastics polymers were detected in water and fish samples which include *Poly acryl amide, Poly aramid, Nylon, Poly butylene terephthalate, Poly vinyl alcohol, Ethylene propylene, Poly urethan*e and *Neoprene*. Neoprene emerged as the predominant microplastic in the water samples from the Majidun River, with the occurrence significantly exceeding those of Ethylene Propylene across all sampling points. Neoprene was the only component detected in the water sample collected from Point A of the Majidun River, with a concentration of 1 microplastic particle (Figure 2). In contrast, Point B exhibited a significantly higher concentration of Neoprene, with 6 particles, and also contained *Ethylene Propylene* ($p < 0.05$).

Composition of Microplastics in Fish Samples

All the seven aquatic *biota* (6 fin fish species and 1 shell fish species) revealed 100% prevalence of microplastics in their body (Figure 3). The percentage occurrence of microplastics was highest in *Monodactylus sebae* (23%), followed by *Galeoides decadactylus* (19%), *Clarias lazera* (19%), and *Carranx hippos* (18%). Table 1 presents the quantification of microplastics in the fish species of Majidun River, Lagos Nigeria. The composition of microplastic types varied significantly among the species. *Clarias lazera* exhibited highest number of microplastic components, with 3.00±0.20 (PA), 1.00±0.10 Nylon, 1.00±0.20 (PBT), 4.00±0.40 Neoprene, and 2.00±0.30 (PU). This was followed by *Galeoides decadactylus*, with 3.00±0.10 (PAA), 3.00±0.50 (PA), 4.00±0.30 Nylon, and 1.00±0.05 (PBT). *Monodactylus sebae* contained 3.00±0.40 (PAA), 3.00±0.20 (PA), 6.00±0.30 Nylon, and 1.00±0.09 (PBT). Nylon was the most abundant component in *Galeoides decadactylus* and *Monodactylus sebae*. Additionally, Neoprene was the most prevalent in *Clarias lazera* (4.00±0.40) and *Carranx hippos* (6.00±0.50). Notably, only Polyvinyl Alcohol (PVA) was detected in *Chrysichthys filamentous* (4.00±0.40).

DISCUSSION

Neoprene was the most prevalent polymer identified in *Majidun* River water which account for six (6) out of seven (7) detected microplastic polymers (85.71%), while *Ethylene Propylene* constituted one (1) polymer (14.28%). The dominance of Neoprene polymers aligns with the findings of Buyukunal et al. (2023) in Istanbul, Turkey, where both *Ethylene Propylene* and Neoprene were among the predominant polymers detected in aquatic environments. However, the finding was in contrasts with studies conducted in Nigeria water bodies; Ogbomida et al. (2023) identified *Polyethylene Terephthalate, Polyvinyl Chloride, Polystyrene,* and Polyethylene in the Ikpobi River, Edo State. Similarly, Attah et al. (2023) documented *Polyethylene, Acrylic Fiber, Polypropylene,* and *Polystyrene* in the New Calabar River, Rivers State. Yahaya et al. (2024) also reported *Polyethylene*, *Polypropylene, Polyamide,* and Polystyrene in the Badagry Lagoon, Lagos State. Significant higher Neoprene concentration at point B might be as a result of close proximity to human activities.

However, in Majidun aquatic biota, eight (8) microplastic polymers *(Poly acryl amide, Poly aramid, Nylon, Poly butylene terephthalate, Poly vinyl alcohol, Ethylene propylene, Poly urethane* and *Neoprene* identified were similar with remarkable differences in polymer composition. Notably, Parvin et al. (2021) examined freshwater fish from Bangladesh and identified High-Density Polyethylene (HDPE), Polypropylene-Polyethylene Copolymer, and *Ethylene Vinyl Acetate* as the dominant plastic polymers. Similarly, Bessa et al. (2018) found that *polyethylene, polypropylene, rayon, polyester, polyacrylonitrile,* and nylon were the primary polymers in commercial fish species from an estuarine environment in Mediterranean Sea. *Polyethylene Terephthalate (PET), Polyvinyl Chloride (PVC), Polystyrene, Polyethylene,* and *Polypropylene microplastic polymer* variation documented in *Clarias gariepinus* and *Oreochromis niloticus* of Ikpobi River, Edo State, Nigeria reported in different water bodies and fish species may reflect regional differences in anthropogenic activities, polymer usage patterns, environmental conditions, and local plastic waste inputs (Ogbomida et al., 2023). Additionally, for the *biota*, the observed differences could also be influenced by their feeding habits and ecological interactions, emphasizing the need for localized assessments of microplastic pollution in both surface water and aquatic organisms.

Remarkably, only 1 microplastic sample was recorded at a single point, which may be attributed to its proximity to less industrialized or less densely populated areas. This reduced anthropogenic activity, such as improper disposal of synthetic materials or effluents, likely results in lower concentrations of microplastics. Additionally, hydrodynamic condition factors such as water flow patterns, wind driven waves and sedimentation may contribute to the dispersion of microplastics, potentially preventing their accumulation at the point. The dominance of Neoprene in the samples could be due to its widespread use in various industries, including manufacturing, automotive, and consumer goods, where it is commonly found in products like wetsuits, gaskets, and seals. Material's durability and resistance to degradation may also contribute to its persistence in the environment, leading to higher concentrations in aquatic ecosystems (Connell et al., 2020; Marn et al., 2020).

In this study, microplastics were detected in all fish species which is consistent with Attah et al. (2023), who reported a 100% prevalence of MPs in twelve (12) samples of *Pseudotolithus elongatus* from the New Calabar River and Bonny River, Rivers State, Nigeria. Contrarily, Parvin et al. (2021) observed 73.3% prevalence of MPs in freshwater fish from Bangladesh, while Adeogun et al. (2020) recorded 69.7% prevalence in eight different commercial fish species from Eleyele Lake, Oyo State, Nigeria. Also, lower prevalence rates have been documented in studies of Koongolla et al. (2020) who observed 49.1% prevalence of MPs in fish species from the Beibu Gulf in the South China Sea, 23.3% prevalence in *Mullus barbatu*s and *Merluccius merluccius* from the Mediterranean Sea (Giani et al., 2019) and 12% prevalence in wild *gudgeons (Gobio gobio)* from French Rivers (Sanchez et al., 2014). The prevalence disparity in MPs in different studies documented may be attributed to variations in environmental conditions, human activities, and the ecological characteristics of the study locations.

Highest microplastics occurrence in this study was recorded in *Monodactylus sebae* (23%); a *benthopelagic* feeder (which feeds on both benthic and mid-water column organisms), is likely exposed to a broader range of microplastics from surface water and sediment accumulation, which explains its high MP prevalence. Similarly, *Clarias lazera* (19%) and *Galeoides decadactylus* (19%) are both benthic feeders which showed a significant MPs occurrence. These species primarily forage on the riverbed, where microplastics tend to accumulate due to sedimentation, exposing them to higher contaminants concentrations.

In contrast, *Carranx hippos* (18%); a pelagic feeder, is likely to ingest microplastics either directly from its environment or through its prey. Although, its MPs prevalence is slightly lower than benthic feeders. The lower occurrence of MPs in Kribia kribensis and *Chrysichthyes filamentous* and *Callinectes pallidus* could be attributed to their feeding habits, which may expose them to fewer microplastics compared to the other species. *Kribia kribensis* and *Chrysichthyes filamentous* likely feed on invertebrates and detritus, while *Callinectes pallidus*, a *benthic scavenger*, may be encountering microplastics less frequently in its habitat. The findings was in agreement with Bessa et al. (2018) and Adeogun et al. (2020) who affirmed the assertion that benthopelagic species have higher MPs accumulation than pelagic/demersal species. These emphasized the critical role of feeding behaviour in influencing microplastics exposure and accumulation across different fish species, highlighting the necessity for targeted environmental management strategies that account for species-specific feeding ecologies.

Conclusively, the study revealed that *Majidun* River, Lagos Nigeria is highly contaminated with microplastics, comprising various polymers that reflect the diverse nature of waste entering the River. With a 100% prevalence observed in aquatic organisms from the River, this underscores the alarming extent of microplastic pollution and highlights the urgent need for consistent monitoring. Furthermore, these results should prompt immediate action from government bodies, health officials, and policy makers to mitigate the environmental and public health risks associated with microplastics contamination.

REFERENCES

1. Abdulraheem MA, Muhammad-Lawal A, Olasore AA, and Oni O. Assessment of animal protein consumption and food security among rural households in Kwara State, Nigeria. American Journal of Business and Society. 2016; 1(4): 233 – 245.

2. Adeogun AO, Ibor OR, Khan EA, Chukwuka AV, Omogbemi ED. And Arukwe A. Detection and occurrence of microplastics in the stomach of commercial fish species from a municipal water supply lake in southwestern Nigeria. Environmental Science and Pollution Research. 2020; 27: 31035 – 31045.

3. Akarsu C, Kumbur H. and Gökdağ K. Microplastics composition and load from three wastewater treatment plants discharging into Mersin Bay, north eastern Mediterranean Sea. Mar. Pollution Bulletin. 2020; 150: 110776.

4. Alfred O, Shaahu A, Jibung GG, Amon TE, Msaakpa TS, Orban, DA. and Egwenomhe M. Fish nutrition: plant source as an alternative. International Journal of Research and Scientific Innovation. 2020; 7(12): 106 – 115.

5. Andrady AL. and Neal MA. Applications and societal benefits of plastics. Phil. Trans. Biol. Sci. 2009; 364: 1977e1984.

6. Attah JS, Stanley HO, Sikoki FD and Immanuel OM. Assessment of Microplastic Pollution in Selected Water Bodies in Rivers State, Nigeria. Archives of Current Research International. 2023; 23(7): 45 – 52.

7. Ayejuyo OO, Olowu RA, Megwa KC, Denloye AA. and Owodehinde FG. (2003). Trace metals in Clarias lazera, water and sediments from Majidun River Ikorodu, Nigeria. Research Commun. Fisheries. 2003; 1: 27 – 31

8. Babayemi OJ, Ogundiran MB, Weber R. and Osibanjo O. Initial inventory of plastic import in Nigeria, bias for more sustainable management policies. Jounal of Health Pollution. 2018; 8(38): 1 – 7.

9. Bessa F, Barría P, Neto JM, Frias JP, Otero V, Sobral P. and Marques JC. Microplastics in juvenile commercial fish from an estuarine environment. In Proceedings of the international conference on microplastic pollution in the mediterranean Sea. Springer International Publishing. 2018; Pp. 131 - 135.

10. Borah H. and Dutta U. Trends in beverage packaging. Trends in beverage packaging. 2019; 1-19.

11. Buyukunal SK, Koluman A. and Muratoglu, K. Microplastic pollution of drinking water in a metropolis. Journal of Water and Health. 2023; 21(6): 687 – 701.

12. Coleman EA. (2017). Plastics additives. In Applied Plastics Engineering Handbook. William Andrew Publishing.2017; Pp. 489 - 500.

13. Connell J, Lowitt K, Saint Ville A. and Hickey GM. Food Security and Sovereignty in Small Island Developing States: Contemporary Crises and Challenges. In J. Connell & K. Lowitt (Eds.), Food Security in Small Island States. Springer. 2020. Pp. 1 – 23.

14. Costa MF, daCosta JP. and Duarte AC. Sampling of micro (nano) plastics in environmental compartments: How to define standard procedures?. Current Opinion in Environmental Science and Health. 2018; 1: 36 – 40.

15. Dumbili E, Henderson L and Letcher TM. The challenge of plastic pollution in Nigeria, in: Plastic Waste and Recycling, Academic Press. 2020. Pp.

16. Ezcurra MV. and Bisogno M. (2022). Are plastic taxes environmental or fiscal measures? A legal analysis of the Italian and Spanish cases under the circular economy strategy. In Green Deals in the Making. Edward Elgar Publishing. 2022; Pp. 185 – 199.

17. Giani D, Baini M, Galli M, Casini S, and Fossi MC. 2019). Microplastics occurrence in edible fish species (Mullus barbatus and Merluccius merluccius) collected in three different geographical sub-areas of the Mediterranean Sea. Marine Pollution Bulletin. 2019; 140: 129 – 137.

18. Gomna A. and Rana K. (2007). Inter-household and intra-household patterns of fish and meat consumption in fishing communities in two states in Nigeria. British Journal of Nutrition. 2007; 97(1): 145 – 152.

19. Gore PM, Khurana L, Dixit R, Balasubramanian K. Keratin-Nylon 6 engineered microbeads for adsorption of Th (IV) ions from liquid effluents. J. Environ. Chem. Eng. 2017; 5: 5655 – 5667.

20. Gourmelon G. Global plastic production rises, recycling lags. Vital Signs, 2015; 22: 91 – 95. IBM Corporation. IBM SPSS statistics for Windows, version 20.0. Armonk, NY: IBM Corp. 2011

21. Koongolla B, Lin L, Pan YF, Yang CP, Sun DR, Liu S. and Li HX. Occurrence of microplastics in gastrointestinal tracts and gills of fish from Beibu Gulf, South China Sea. Environmental Pollution, 2020; 258: 113734.

22. Marn N, Jusup M, Kooijman SALM. and Klanjscek T. Quantifying impacts of plastic debris on marine wildlife identifies ecological breakpoints. Ecol Lett. 2020; 23:1479 – 1487.

23. Obiezu T. (2019). Nigerian recyclers reduce plastic waste by exchanging trash for cash of

microplastics in subsurface seawater in the NE Pacific Ocean. Marine Pollution Bulletin. 2019; 79(1): 94 – 99.

24. Ogbomida ET, Obazele EO, Aganmwonyi I, Chukwuka O, Emeribe CN, Omoigberale MO. Assessment of Microplastics in Water, Sediment, and Fish of Ikpoba Rivers of Edo State, Nigeria. Afr. Sci. 2023; 24: 366 – 375.

25. Oladunjoye RY. Pollution in Water and Fish of Tropical Majidun Creek, Lagos Nigeria. FUW Trends in Science & Technology Journal. 2022; 7(2): 827 – 834.

26. Olarinmoye OM, Stock F, Scherf N, Whenu O, Asenime C. and Ganzallo S. Microplastic presence in sediment and water of a lagoon bordering the urban agglomeration of Lagos, Southwest Nigeria. Geosciences. 2020; 10(12): 494.

27. Ouyang Z, Yang Y, Zhang C, Zhu S, Qin L, Wang W, et al. Recent advances in photocatalytic degradation of plastics and plastic-derived chemicals. Journal of Materials Chemistry A. 2021; 9(23): 13402-13441.

28. Parvin F, Jannat S. and Tareq SM. Abundance, characteristics and variation of microplastics in different freshwater fish species from Bangladesh. Science of the Total Environment. 2021; 784: 147137.

29. Riaz T, Zeeshan R, Zarif F, Ilyas K, Muhammad N, Safi SZ. and Rehman IU. FTIR analysis of natural and synthetic collagen. Applied Spectroscopy Reviews 2018: 53(9): 703 - 746. https://doi.org/10.1080/05704928.2018.1426595

30. Sanchez W, Bender C. and Porcher JM. Wild gudgeons (Gobio gobio) from French rivers are contaminated by microplastics: preliminary study and first evidence. Environmental Research, 2014; 128: 98 – 100.

31. Talari ACS, Martinez MAG, Movasaghi Z, Rehman S. and Rehman IU. Advances in Fourier transform infrared (FTIR) spectroscopy of biological tissues. Applied Spectroscopy Reviews 2016;52(5):456–506. https://doi.org/10.1080/05704928.2016.1230863

32. Udayakumar KV, Gore PM. And Kandasubramanian, B. Foamed materials for oil-water separation. Chem. Eng. J. Adv. 2021; 5: 100076.

33. Vadera S. and Khan S. (2021). A critical analysis of the rising global demand of plastics and its adverse impact on environmental sustainability. Journal of Environmental Pollution Management. 2021; 3: 105.

34. Yahaya T, Adewale MK, Fagbayi T, Salisu TF, Umar JA. and Nasir J. (2024). Concentration, characterization, and risk assessment of microplastics in two main rivers in Birnin Kebbi, Nigeria. Environmental Health Engineering and Management Journal, 2024; 11(3): 315 – 325.

APPENDICES
Appendix A.Figures

Appendix A.1

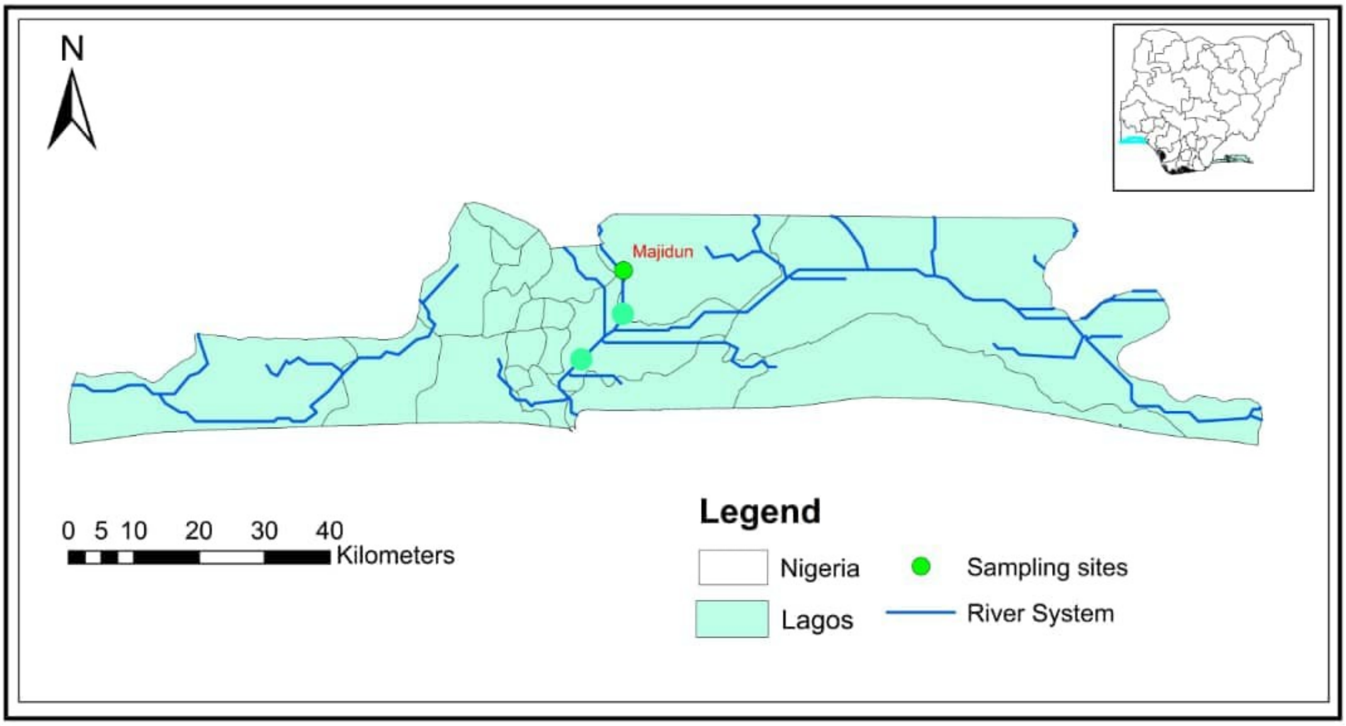

Figure 1: Map showing the Majidun River and sampling location

Appendix A.2

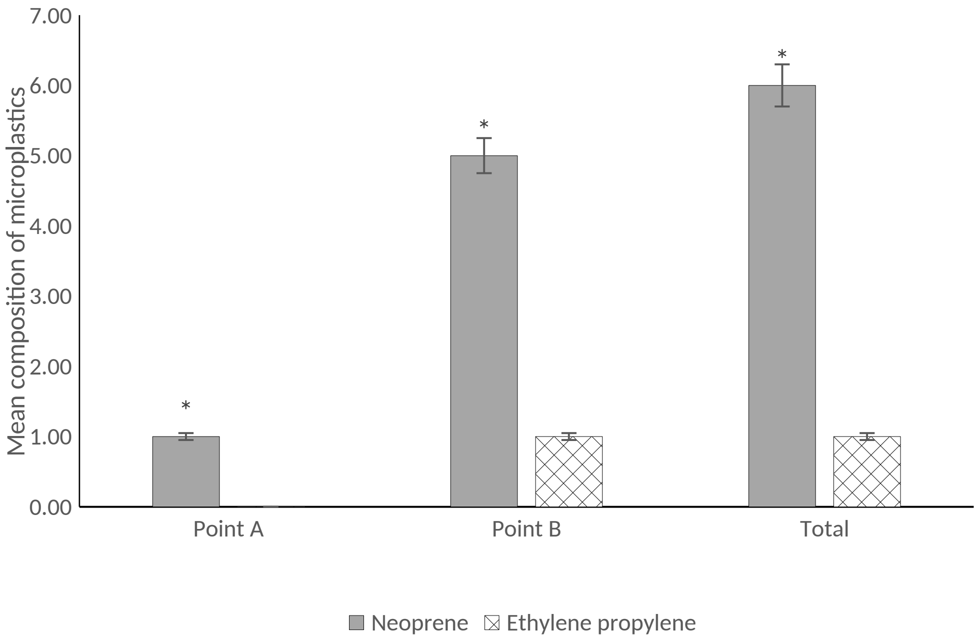

Figure 2: Mean composition of microplastics of Majidun River, Lagos Nigeria

Appendix A.3

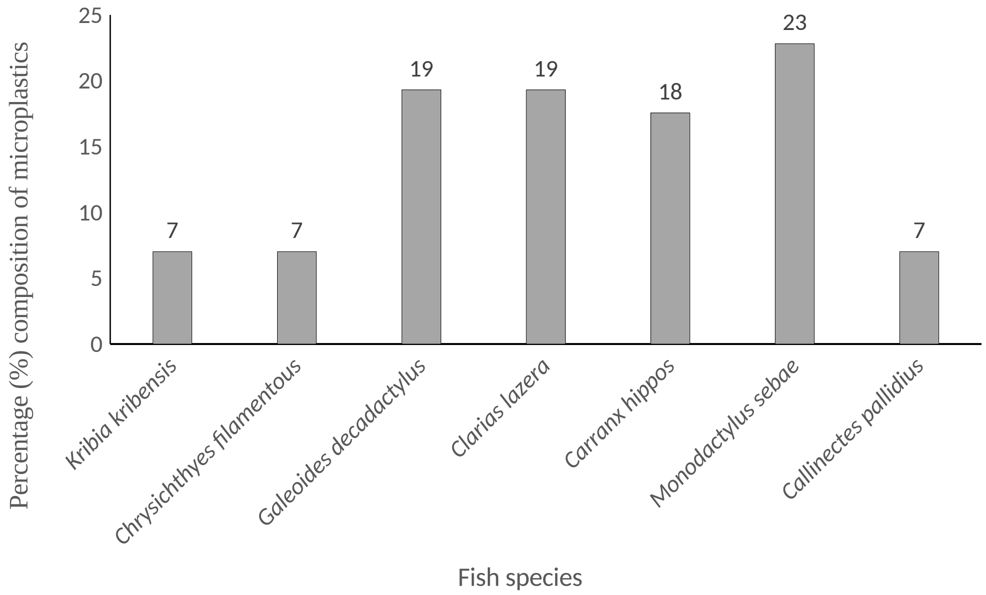

Figure 3: Occurrence of microplastics in the Aquatic Biota of Majidun River, Lagos Nigeria

Appendix A.4

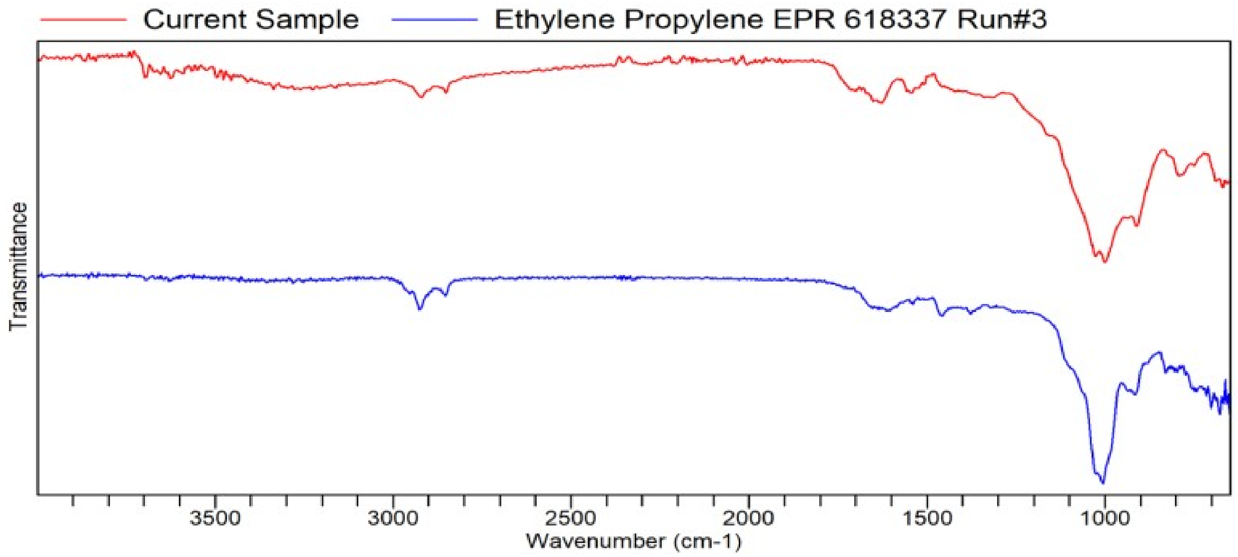

Figure 4: FTIR spectrum of Chrysichthyes filamentous in comparison with microplastics library

Appendix A.5

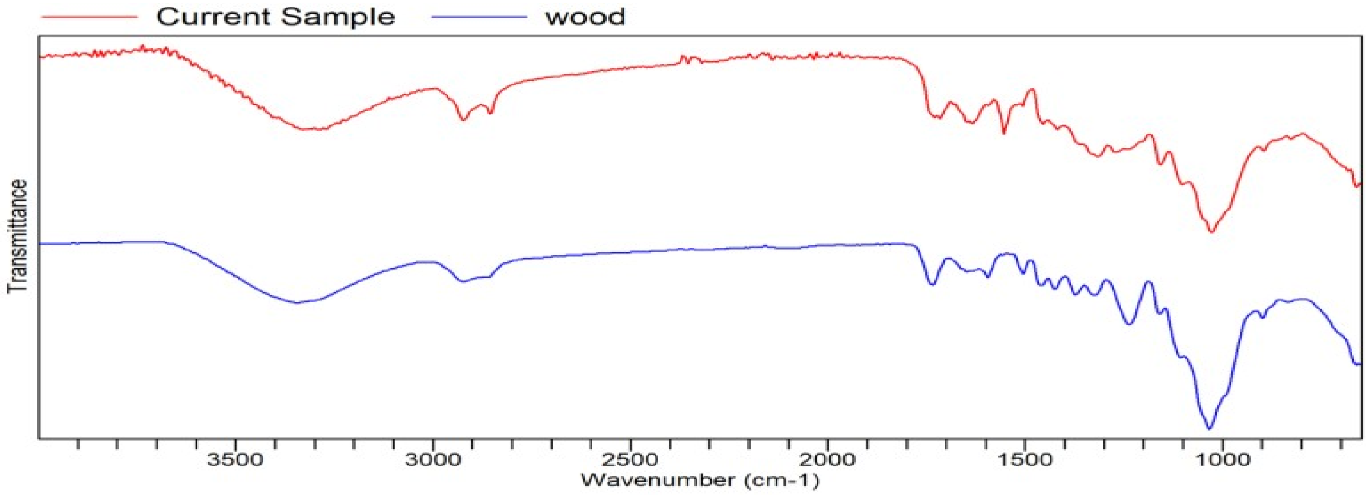

Figure 5: FTIR spectrum of Carranx hippos in comparison with microplastics library

Appendix A.6

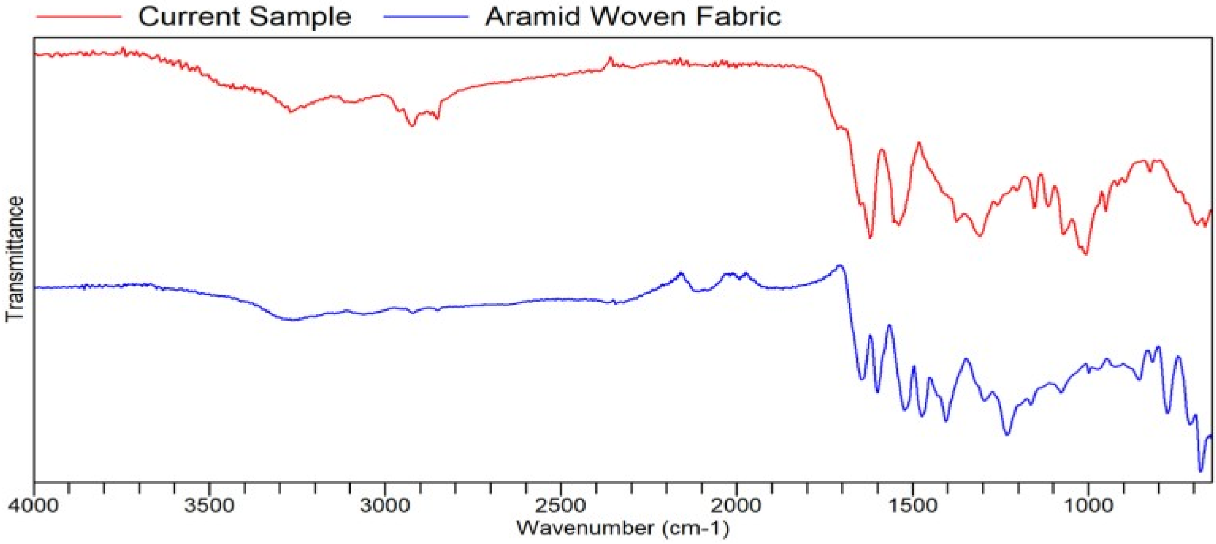

Figure 6: FTIR spectrum of Clarias lazera in comparison with microplastics library

Appendix A.7

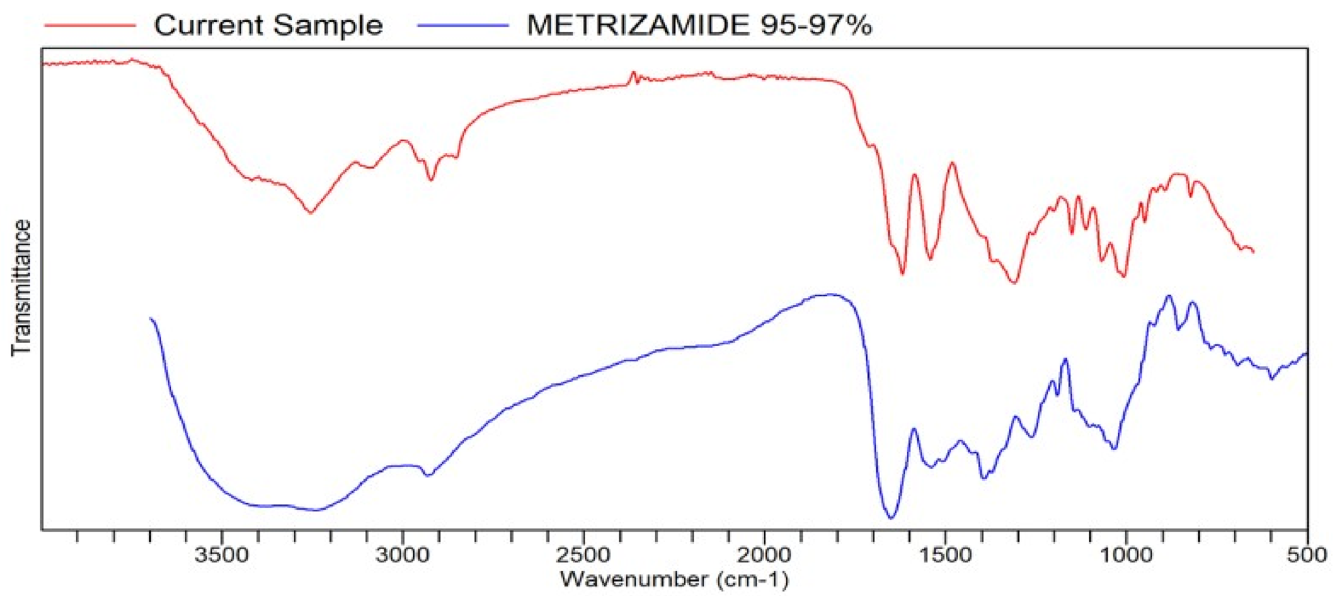

Figure 7: FTIR spectrum of Callinectes pallidus in comparison with microplastics library

Appendix A.8

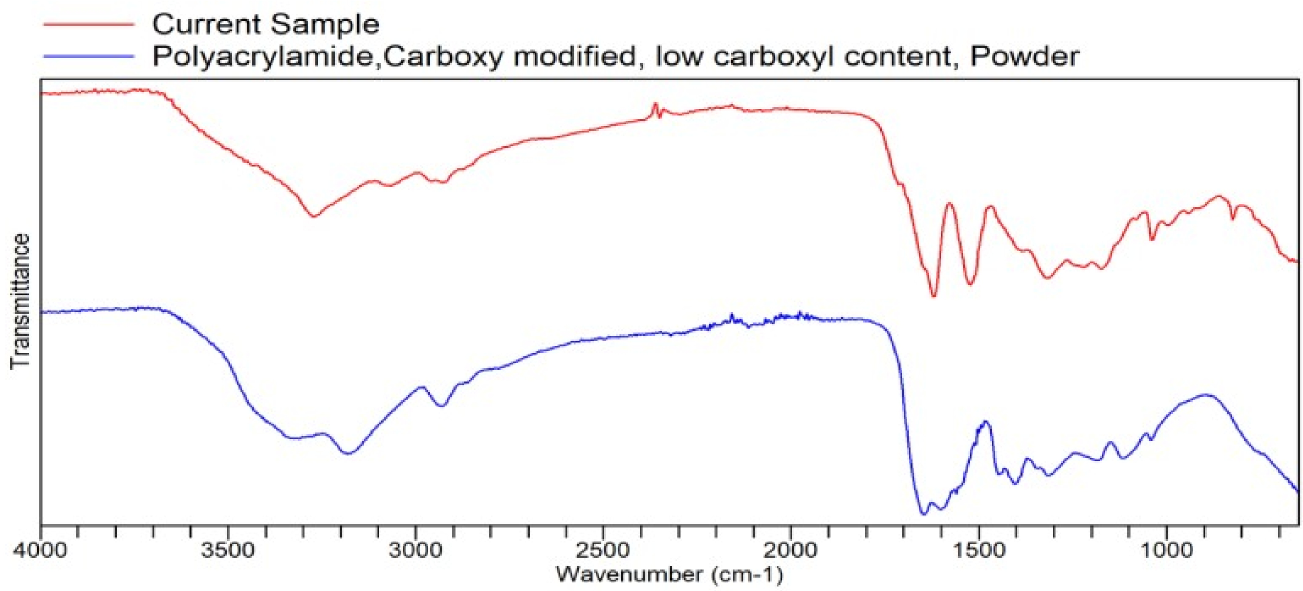

Figure 8: FTIR spectrum of Galeoides decadactylus in comparison with microplastics library

Appendix A.9

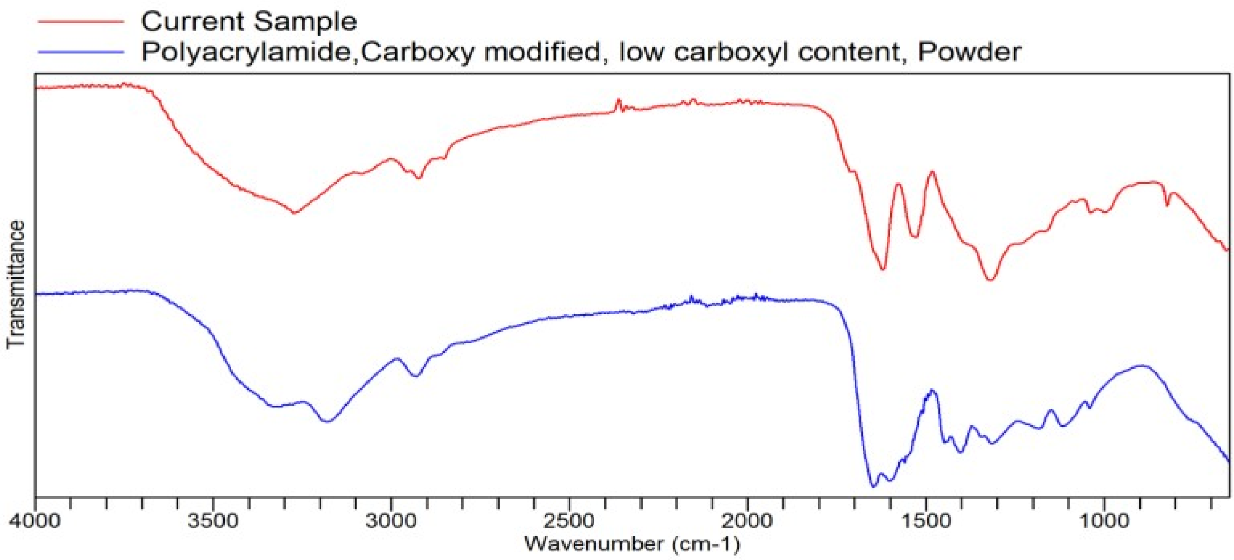

Figure 9: FTIR spectrum of Kribia kribensis in comparison with microplastics library

Appendix A.10

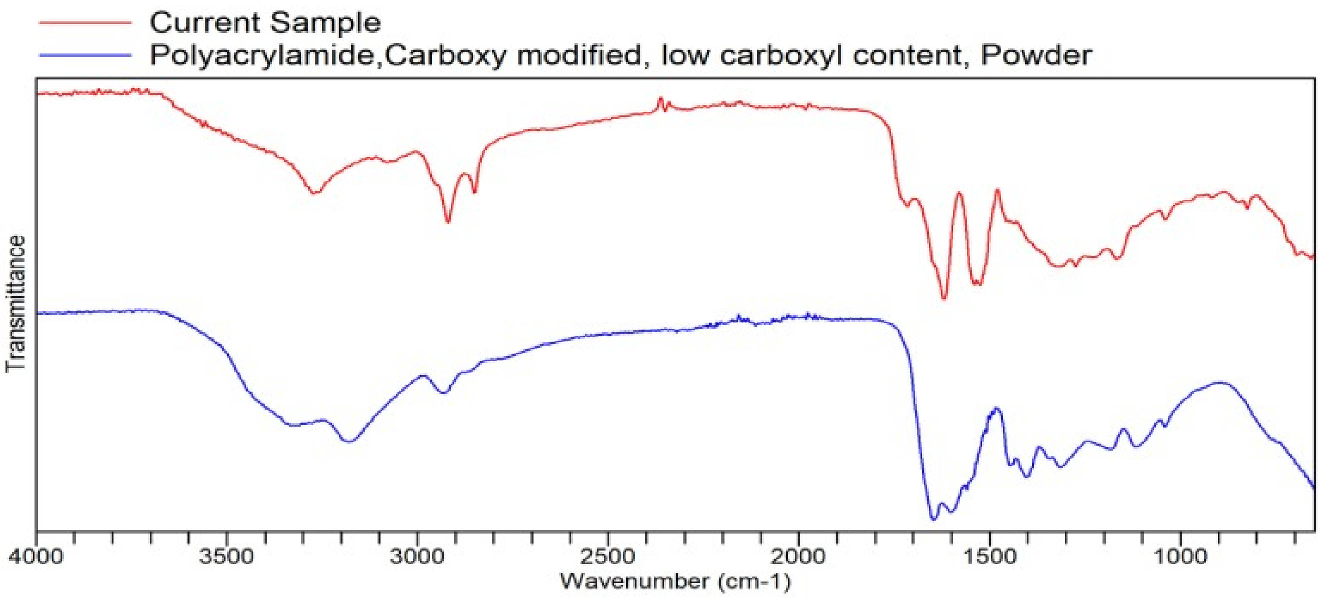

Figure 10: FTIR spectrum of Monodactylus sebae in comparison with microplastics libraryigure 9: FTIR spectrum of Kribia kribensis in comparison with microplastics library

Appendix B. Tables
Appendix B.1

Table 1: Mean composition of microplastics in the Aquatic Biota of Majidun River, Lagos, Nigeria

	Kribia kribensis	*Chrysichthys filamentous*	*Galeoides decadactylus*	*Clarias lazera*	*Carranx hippos*	*Monodactylus sebae*	*Callinectes pallidius*
Poly acrylamide (PAA)	3.00±0.20[a]	ND	3.00±0.10[a]	ND	ND	3.00±0.40[b]	3.00±0.40[a]
Poly Aramid (PA)	1.00±0.10[b]	ND	3.00±0.50[a]	3.00±0.20[a]	ND	3.00±0.20[b]	1.00±0.20[b]
Nylon (N)	ND	ND	4.00±0.30[a]	1.00±0.10[b]	ND	6.00±0.30[a]	ND
Poly butylene terephthalate (PBT)	ND	ND	1.00±0.05[b]	1.00±0.20[b]	ND	1.00±0.09[c]	ND
Poly vinyl alcohol (PVA)	ND	4.00±0.40[a]	ND	ND	ND	ND	ND
Ethylene propylene (EP)	ND	ND	ND	ND	4.00±0.30[b]	ND	ND
Neoprene(NP)	ND	ND	ND	4.00±0.40[a]	6.00±0.50[a]	ND	ND
Poly urethane (PU)	ND	ND	ND	2.00±0.30[b]	ND	ND	ND

ND – Not Detected