ISETC2025

UNIVERSITI TEKNOLOGI MARA

ISETC2025

2 ND INTERNATIONAL SCIENCE, ENGINEERING AND TECHNOLOGY COLLOQUIUM

THE POWER OF SCIENTIFIC INNOVATION

INTELLIGENT SOLUTIONS FOR A SUSTAINABLE WORLD

ORGANIZED BY:
FACULTY OF APPLIED SCIENCES
UNIVERSITI TEKNOLOGI MARA
PERAK BRANCH, TAPAH CAMPUS
MALAYSIA

CO-ORGANIZED BY:

三重大学
MIE UNIVERSITY

2nd International Science, Engineering and Technology Colloquium

(ISETC 2025)

Faculty of Applied Sciences,
Universiti Teknologi MARA,
Perak Branch, Tapah Campus,
35400 Tapah Road, Perak, Malaysia.

Colloquium date: 9th July 2025
Publication date: 9th September 2025

Proceedings of Extended Abstracts

EDITORS

Dr. Emi Norzehan Mohamad Mahbob
Dr. Saiyidah Nafisah Hashim
Ms. Lili Widarti Zainuddin
Ms. Nurul Nazwa Mohammad
Ms. Rozaina Saleh

e-ISBN: 978-629-97630-5-5

Published by Faculty of Applied Sciences, Universiti Teknologi MARA,
Perak Branch, Tapah Campus, 35400 Tapah Road, Perak, Malaysia.

PREFACE

Welcome to the 2nd International Science, Engineering and Technology Colloquium 2025 (ISETC 2025)!

It is with great pleasure that we present this year's colloquium, a distinguished gathering of scholars, researchers, and professionals dedicated to the advancement of applied sciences. Held virtually on 9th July 2025, ISETC 2025 serves as a platform to highlight cutting-edge research, foster meaningful networking, encourage collaborations, and explore innovative solutions to global challenges.

This year's theme, "The Power of Scientific Innovation: Intelligent Solutions for a Sustainable World" highlights our shared goal to solve global challenges through applied science. It celebrates innovation as a key to building a more sustainable and resilient future. We're proud to feature keynote speakers and presenters who bring fresh insights, bold ideas, and breakthroughs shaping tomorrow's world.

We would like to extend our heartfelt appreciation to the Faculty of Applied Sciences, Universiti Teknologi MARA, Perak Branch, Tapah Campus, for their outstanding support and assistance throughout the planning and execution of the event. Their dedication has been instrumental to the success of this colloquium. We would like to sincerely thank all participants and researchers for their valuable contributions. We also appreciate the reviewers for their careful evaluations and helpful feedback. Your hard work and support mean a lot to us.

As editors, we are proud to present this collection of proceedings. It is an honour to bring together the interesting and meaningful work of our speakers and authors. We hope the ideas shared will lead to new discoveries, encourage more research, and help solve global challenges through science and innovation.

Warm regards,

Dr. Emi Norzehan Mohamad Mahbob
Dr. Saiyidah Nafisah Hashim
Ms. Lili Widarti Zainuddin
Ms. Nurul Nazwa Mohammad
Ms. Rozaina Saleh

ISETC 2025 Proceedings Editors

BASELINE ASSESSMENT OF MICROPLASTIC IN PACKAGED SARDINE PRODUCTS FROM SABAH LOCAL MARKETS

Nurul Natasyah Hanafiah[1*], Nur Zaida Zahari[2]

[1]*Environmental Science Programme, Faculty of Science & Technology, UMS Road, 88400 Kota Kinabalu, Sabah, Malaysia*
[2]*Rural Water Supply Living Lab, Faculty of Science & Technology, UMS Road, 88400 Kota Kinabalu, Sabah, Malaysia*

**Corresponding author: natasyahasyah4392@gmail.com*

Abstract: In recent decades the production of plastic has increased rapidly worldwide. The expanding usage of plastic for almost every sector in the industry has been penetrated in the infrastructure of daily life. The implication of this scenario causes notable issues to the environment, human beings and economy. Numerous studies have shown that microplastics are widely distributed in the environment. However, very few studies have determined the presence of microplastic in canned fish sardines, especially in Sabah, Malaysia. Therefore, this study was done to quantify the presence of microplastics in canned sardines (*Sardine spp*.) that sold in local market in Sabah. The physical characteristics of microplastics found such as shape, color and size were investigated. A total of 200 sardine samples were collected from various brands and analyzed through a combination of visual sorting and density separation technique. The results showed that a total of 12 MPs were recovered during the quality control process (not including in the tissues samples) in 5 different brands accounting of 6% of the canned sardined samples. The majority of the microplastic were measured <0.5 mm with light yellow in colors. Fragments were the most common types found in this study followed by fiber respectively. The findings indicate that the potential external contamination occurred during the processing, packaging, or canning stages rather than from the fish's natural ingestion. This study highlights the necessity of implementing rigorous hygiene standards in seafood processing facilities to minimize the risk of microplastic contamination during handling, packaging, and canning processes.

***Keywords*:** *Microplastics, sardines, canned fish, food contamination, packaging processing*

INTRODUCTION

Microplastics are plastic particles smaller than 5 mm which can be categorized as primary or secondary plastic. Primary microplastic are particles initially created in small quantities and mostly for industrial purposes while the secondary microplastic are particles that are produced from breakdown of bigger size plastic. Microplastic can enter the human body via the food chain by consuming food that has been contaminated with microplastic. However, the awareness of the hazard of dietary exposure to humans is so limited. Studies indicate that microplastics can lead to inflammation, oxidative stress, and tissue damage, with emerging research suggesting links to cancer, cardiovascular diseases, and autoimmune disorders (Winiarska et al., 2024). The potential health risks associated with microplastics have prompted studies on their impact on specific human organs. For instance, microplastics have been detected in human stool samples, lung tissue, and even the placenta, raising concerns about their bioaccumulation and long-term effects on health (Barceló et al., 2023).Numerous studies have shown that microplastics are widely distributed in the environment. Beyond environmental contamination, microplastics may be introduced during processing and packaging stages. Fishing equipment, such as nets and lines made from synthetic materials, can release microplastics into the catch during handling of raw sardine. Containers and plastic gloves used in processing sardines may also shed microplastics through direct contact. Furthermore, canned sardines are often packed in plastic-lined cans, where microplastics or chemical residues can migrate into the food product, especially under high temperatures or prolonged storage conditions (Crutchett et al., 2020). These potential contamination sources emphasize the importance of evaluating the entire supply chain to understand microplastic contamination in seafood products fully. Therefore, this study aims to identify microplastics present on packaged sardines as part of the quality control process, without examining their accumulation in tissue samples. This is important for distinguishing between environmental and post-processing sources of contamination, thereby improving food safety assessments and informing better packaging and handling practices in the seafood industry.

MATERIALS AND METHODS

Canned Sardined Sampling

A total of 200 canned sardine from 12 brands were purchased from five supermarkets located in Kota Kinabalu, Sabah. The samples will be purchased from Bataras Hypermarket, Servay Supermarket, U-plus Market and Eco-Shop Market via non-probability sampling. The entire samples were manufactured in different place, state and country such as from Thailand and Indonesia. The sample will be stored in a glass or metal container to avoid any contamination or direct contact with plastic. All the equipment that is used in this research should be made of non-plastic materials and thoroughly cleaned (Sharma et al., 2024).

Pre-Extraction Method for Microplastic Isolation from Canned Sardines

Prior to microplastic analysis, a pre-extraction protocol was implemented to minimize contamination and ensure reliable isolation of microparticles from canned sardine samples. A total of 200 cans were opened using a stainless-steel opener in a clean laboratory environment. The sardines were carefully removed, and the packaging liquid (brine, oil, or sauce) was collected separately. To capture potential microplastic particles adhering to the can interior or sardine surfaces, each can and fish sample was thoroughly rinsed with filtered distilled water. The combined packaging liquid and rinse water were then filtered through pre-weighed glass fiber filters (GF/C, pore size ~1.2 μm) using a vacuum filtration unit (Rani et al., 2023). The filters were stored in clean, sealed Petri dishes for subsequent analysis.

Microplastic Quantification and Physical Characterization

Following the isolation of microplastics from the surface of canned sardines and their associated packaging liquids, quantification was performed based on visual and spectroscopic identification. Suspected microplastic particles were enumerated and categorized by shape (fragment, fiber, film, bead) and color, in accordance with morphological criteria outlined by Karami et al. (2018). The total number of microplastic particles was normalized per can and reported as items per unit.

Visual Identification of the Microplastic

A detailed visual examination of the filter membranes was conducted using a microscope (Model: Zeiss Primostar). Particles exhibiting morphological and color characteristics consistent with micro- and mesoplastics were identified based on criteria established by Karami et al. (2018).

RESULTS AND DISCUSSION

The results showed that a total of 12 microplastic (MP) particles were recovered during the quality control assessment of canned sardines, with no inclusion of tissue samples in the analysis. These particles were distributed across five different commercial brands, corresponding to 6% of the total samples analyzed. Although this percentage is relatively low, the presence of MPs in processed food products particularly from external contamination sources give a concern regarding post-harvest handling and packaging practices. The size distribution of the recovered particles indicated that the majority were smaller than 0.5 mm, placing them within the lower microplastic size range. Smaller MPs, particularly those under 0.5 mm, are of significant concern as they are more likely to go unnoticed during processing and may be more easily ingested by consumers. These results are consistent with other studies, as reported by Barboza et al. (2020) and Akhbarizadeh et al. (2020) which have documented the frequent occurrence of sub-millimeter MPs in seafood products, especially when derived from packaging and contact surfaces. In terms of color, light yellow was the most common color found followed by red and black. The color of microplastic particles may provide insights into their potential sources; for instance, light or faded hues could suggest aging or degradation, likely originating from deteriorated packaging components such as plastic linings or sealing materials. Although color assessment is inherently subjective, it remains a valuable criterion for distinguishing synthetic particles from natural debris during the visual identification process (Karami et al., 2018)

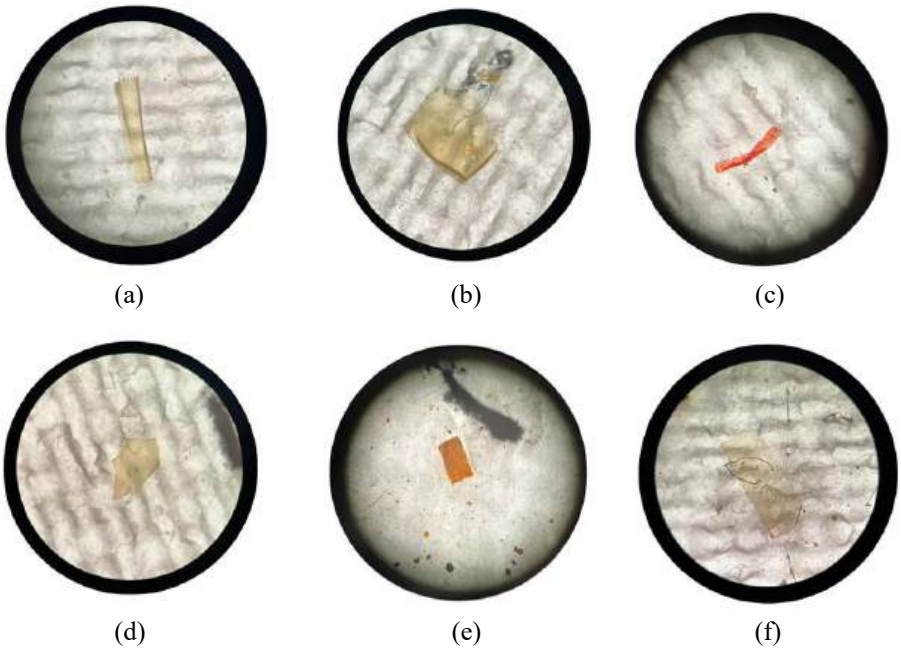

Figure 1. Extracted microplastics with different colors and shape (a)- (e) light yellow, red and orange fragment, (f) red film recovered from the packaged sardined

The findings further indicated that, based on morphological classification, fragments were the most frequently detected microplastic type, followed by fibers (Figure 1). Fragments are commonly derived from the physical degradation of larger plastic components and are typically linked to food-contact materials such as plastic can linings or rigid packaging surfaces. The detection of fibers likely points to external contamination from synthetic sources, including textiles from clothing, disposable gloves used during handling, or airborne particulates present in the processing environment. This morphological pattern is consistent with previous research by Rochman et al. (2015) and Dehaut et al. (2016) who similarly reported fragments and fibers as the predominant microplastic forms in processed seafood products.

CONCLUSIONS

These findings highlight an important distinction in microplastic contamination in the external origin of MPs in canned seafood. Since tissue analysis was excluded, all detected MPs were attributed to post-catch contamination, likely occurring during washing, handling, or packaging stages. Several potential sources include plastic-lined cans, synthetic gloves, and processing equipment, especially under conditions of mechanical abrasion or elevated temperatures during sterilization and sealing processes. This emphasizes the importance of monitoring and improving food safety protocols, particularly in minimizing contact between food products and plastic-based materials throughout the production chain. The presence of MPs in canned sardines also raises consumer perception issues regarding seafood quality and hygiene standards and underscores the need for stricter regulations in packaging material selection, processing hygiene, and post-processing monitoring. Future studies should extend these findings by incorporating tissue-based assessments, polymer identification using spectroscopy, and quantitative exposure assessments to better evaluate potential risks to consumers.

REFERENCES

Akhbarizadeh, R., Dobaradaran, S., Nabipour, I., Tajbakhsh, S., Darabi, A. H., & Spitz, J. (2020). Abundance, composition, and potential intake of microplastics in canned fish. *Marine Pollution Bulletin*, *160*, 111633. https://doi.org/10.1016/J.MARPOLBUL.2020.111633

Barboza, L. G. A., Lopes, C., Oliveira, P., Bessa, F., Otero, V., Henriques, B., Raimundo, J., Caetano, M., Vale, C., & Guilhermino, L. (2020). Microplastics in wild fish from North East Atlantic Ocean and its potential for causing neurotoxic effects, lipid oxidative damage, and human health risks associated with ingestion exposure. *Science of The Total Environment*, *717*, 134625. https://doi.org/10.1016/J.SCITOTENV.2019.134625

Barceló, D., Picó, Y., & Alfarhan, A. H. (2023). Microplastics: Detection in human samples, cell line studies, and health impacts. *Environmental Toxicology and Pharmacology*, *101*, 104204. https://doi.org/10.1016/J.ETAP.2023.104204

Crutchett, T., Paterson, H., Ford, B. M., & Speldewinde, P. (2020). Plastic Ingestion in Sardines (Sardinops sagax) From Frenchman Bay, Western Australia, Highlights a Problem in a Ubiquitous Fish. *Frontiers in Marine Science*, *7*, 537534. https://doi.org/10.3389/FMARS.2020.00526/BIBTEX

Dehaut, A., Cassone, A. L., Frère, L., Hermabessiere, L., Himber, C., Rinnert, E., Rivière, G., Lambert, C., Soudant, P., Huvet, A., Duflos, G., & Paul-Pont, I. (2016). Microplastics in seafood: Benchmark protocol for their extraction and characterization. *Environmental Pollution*, *215*, 223–233. https://doi.org/10.1016/J.ENVPOL.2016.05.018

Karami, A., Golieskardi, A., Choo, C. K., Larat, V., Karbalaei, S., & Salamatinia, B. (2018). Microplastic and mesoplastic contamination in canned sardines and sprats. *The Science of the Total Environment*, *612*, 1380–1386. https://doi.org/10.1016/J.SCITOTENV.2017.09.005

Rani, M., Ducoli, S., Depero, L. E., Prica, M., Tubić, A., Ademovic, Z., Morrison, L., & Federici, S. (2023). A Complete Guide to Extraction Methods of Microplastics from Complex Environmental Matrices. *Molecules*, *28*(15), 5710. https://doi.org/10.3390/MOLECULES28155710

Rochman, C. M., Tahir, A., Williams, S. L., Baxa, D. V., Lam, R., Miller, J. T., Teh, F. C., Werorilangi, S., & Teh, S. J. (2015). Anthropogenic debris in seafood: Plastic debris and fibers from textiles in fish and bivalves sold for human consumption. *Scientific Reports*, *5*. https://doi.org/10.1038/SREP14340

Sharma, P., Sharma, P., & Abhishek, K. (2024). Sampling, separation, and characterization methodology for quantification of microplastic from the environment. *Journal of Hazardous Materials Advances*, *14*, 100416. https://doi.org/10.1016/J.HAZADV.2024.100416

Winiarska, E., Jutel, M., & Zemelka-Wiacek, M. (2024). The potential impact of nano- and microplastics on human health: Understanding human health risks. *Environmental Research*, *251*, 118535. https://doi.org/10.1016/J.ENVRES.2024.118535

Pejabat Perpustakaan
Library Office

Universiti Teknologi MARA
Cawangan Perak
Kampus Seri Iskandar
32610 Bandar Baru Seri Iskandar,
Perak Darul Ridzuan, MALAYSIA
Tel: (+605) 374 2093/2453 Faks: (+605) 374 2299

UNIVERSITI TEKNOLOGI MARA

Surat kami : 700-KPK (PRP.UP.1/20/1)
Tarikh : 20 Januari 2023

Prof. Madya Dr. Nur Hisham Ibrahim
Rektor
Universiti Teknologi MARA
Cawangan Perak

Tuan,

PERMOHONAN KELULUSAN MEMUAT NAIK PENERBITAN UiTM CAWANGAN PERAK MELALUI REPOSITORI INSTITUSI UiTM (IR)

Perkara di atas adalah dirujuk.

2. Adalah dimaklumkan bahawa pihak kami ingin memohon kelulusan tuan untuk mengimbas (*digitize*) dan memuat naik semua jenis penerbitan di bawah UiTM Cawangan Perak melalui Repositori Institusi UiTM, PTAR.

3. Tujuan permohonan ini adalah bagi membolehkan akses yang lebih meluas oleh pengguna perpustakaan terhadap semua maklumat yang terkandung di dalam penerbitan melalui laman Web PTAR UiTM Cawangan Perak.

Kelulusan daripada pihak tuan dalam perkara ini amat dihargai.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Setuju.

27.1.2023

PROF. MADYA DR. NUR HISHAM IBRAHIM
REKTOR
UNIVERSITI TEKNOLOGI MARA
CAWANGAN PERAK
KAMPUS SERI ISKANDAR

Saya yang menjalankan amanah,

SITI BASRIYAH SHAIK BAHARUDIN
Timbalan Ketua Pustakawan

nar