Formosa Journal of Science and Technology (FJST)
Vol. 5, No. 10, 2026: 2631-2648

Exploring Coastal Community Perceptions of Microplastic Exposure Risks in Marine Food Chains and Their Implications for Environmental Health

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A R T I C L E I N F O

Keywords: Microplastics, Coastal Communities, Risk Perception, Seafood, Environmental Health.

Received : 17, August
Revised : 19, September
Accepted: 25, October

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A B S T R A C T

Microplastic exposure through the seafood chain is an important environmental health issue for coastal communities because it is related to marine food consumption and the perception of health risks. This study aims to explore coastal communities' perceptions of the risk of microplastic exposure in the seafood chain and its implications for environmental health behavior. The study used a qualitative approach with in-depth interviews with 15 purposively selected informants, consisting of fishermen, fish traders, and local consumers. The data was analyzed using thematic analysis. The results show that public understanding of microplastics is still limited, despite concerns about the quality of marine food. This research emphasizes the importance of community-based environmental health education to increase awareness and reduce the risk of microplastic exposure

ISSN-E: 2964-6804
DOI: https://doi.org/10.55927/fjst.v5i10.3
https://fjstformosa.my.id/index.php/fjst/index

INTRODUCTION

Microplastics have become an important issue in environmental health because these particles less than 5 mm in size can enter aquatic ecosystems, accumulate in marine life, and potentially transfer to humans through the consumption of marine food. Globally, increased plastic production and consumption increases the chances of plastic waste entering the ocean; The Hoang et al. (2025) study noted that approximately 4.8–12.7 million tons of plastic waste can enter the ocean each year, while individuals are estimated to consume 11,845–193,200 microplastic particles per year through various routes of exposure. In the Indonesian context, this issue is increasingly relevant because coastal communities have a high dependence on fish, shellfish, seaweed, and other marine products as a source of food, economy, and socio-cultural identity. The findings of microplastics in rivers, mangrove areas, fish for consumption, shellfish, and seaweed show that this issue is not only an ecological issue, but also directly related to food security and coastal community health (Fitriyah et al., 2022; Hoang et al., 2025; Prasetijo et al., 2025; Serihollo et al., 2025).

The phenomenon of microplastic contamination in the seafood chain has been reported in a number of studies in Indonesia. Fitriyah et al. (2022) found microplastics in the Kalimas River, Surabaya, with the highest concentration downstream of 0.095 items/m^3 and the dominance of the fiber form at 82%, which indicates the contribution of domestic waste and human activities around the waters. In marine life, Sawalman et al. (2021) reported the presence of microplastics in gills, digestive tract, and economically important fish meat on Barranglompo Island, Makassar, while Prasetijo et al. (2025) found that microplastics in estuarine grouper and baronang fish in Denpasar mangroves were dominated by fiber up to 80%. Serihollo et al. (2025) also showed microplastic contamination in cultivated seaweed in Kupang, with fiber as the dominant form of 51.19%. The findings reinforce the urgency of environmental health research that not only measures the presence of microplastics, but also examines how coastal communities understand the risk of exposure in their daily lives.

From a public health perspective, the risk of microplastics cannot be understood only as a toxicological problem, but also as a problem of risk perception, environmental health literacy, and preventive behavior. Aulia et al. (2023) emphasized that microplastics have the potential to cause metabolic disorders, gastrointestinal disorders, organ function disorders, reproductive disorders, and carcinogenic risks, although the certainty of causal relationships in humans still requires further research. Aulia et al. (2024) found that all samples of kijing shellfish in North Galesong Waters were positive for microplastics, although the results of the environmental health risk analysis showed an RQ value of < 1 for current and long-term exposure conditions. This shows the difference between the presence of contaminants, scientific risk estimation, and the way people interpret hazards. Within the framework of environmental health risk perception, knowledge, experience of seafood consumption, trust in information, and community proximity to pollutant sources can affect whether a

risk is considered serious, proximate, and needs to be responded to through behavior change.

Previous studies have provided an important basis for scientific understanding of microplastics, but there are still research gaps. Research in Indonesia generally focuses on the identification of shapes, colors, sizes, polymer types, microplastic concentrations, and quantitative health risk analysis (Fitriyah et al., 2022; Aulia et al., 2024; Prasetijo et al., 2025; Serihollo et al., 2025). Meanwhile, social studies such as Oktaviana et al. (2023) have examined coastal communities' perceptions of plastic waste and found that 60% of respondents have a high perception of the issue of plastic waste, but the study has not specifically linked public perceptions to the risk of microplastics in the seafood chain. At the international level, Baechler et al. (2024) show that public awareness of microplastics has not always been followed by a deep understanding of human health impacts, while Jones et al. (2024) emphasize the need for a local approach in understanding coastal stakeholders' perceptions of microplastics. Thus, there is still room for qualitative research that explores the meaning of microplastic risk according to coastal communities, especially in the context of seafood consumption, life experiences, and local environmental health practices.

Based on these gaps, the study titled "Exploring Coastal Community Perceptions of Microplastic Exposure Risks in Marine Food Chains and Their Implications for Environmental Health" aims to explore coastal communities' perceptions of the risks of microplastic exposure in the seafood chain and analyze its implications for environmental health. In particular, this research is directed to understand how people interpret the presence of microplastics in seafood, how they assess the level of harm to health, what sources of information shape their understanding, and how these perceptions relate to consumption behaviors, waste management, and risk reduction strategies at the community level. With this approach, this research not only places the community as the affected object, but also as actors who have local knowledge, ecological experience, and social capacity in responding to environmental health problems.

The theoretical contribution of this research lies in strengthening environmental health studies based on risk perception, especially by linking microplastic contamination, seafood chains, and the social construction of coastal communities to health hazards. This research is expected to expand the scientific discussion, which has been dominated by laboratory approaches and quantitative analysis, towards a more integrative understanding of ecological data, health risks, and community behavior. Practically, the results of the research can be the basis for the preparation of community-based environmental health education, strengthening risk communication that is easy for coastal communities to understand, and formulating plastic waste management policies and marine food safety that are more responsive to the local context. Thus, this research has the potential to support efforts to prevent microplastic exposure while strengthening the capacity of coastal communities in maintaining environmental health and sustainability of marine food sources.

LITERATURE REVIEW

Microplastics as a Coastal Environmental Health Issue

Microplastics are a concern in environmental health studies because these particles can be dispersed through water, sediment, and marine life, and then potentially enter the human body through the consumption of marine food. In coastal communities, this issue is increasingly important because fish, shellfish, crabs, and other marine products are a source of food as well as an economic source. Ziani et al. (2023) explain that microplastics have become a global threat to food safety because they can be found in various environmental media and consumer products. In Indonesia, Wulandari et al. (2022) showed that the concentration of microplastics in the waters of the Wulan Delta, Demak, is influenced by seasons and tides. This shows that the distribution of microplastics is closely related to the dynamics of the coastal local environment.

Microplastics in the Seafood Chain

Microplastic contamination in the seafood chain has been found in various biota for consumption. Senduk et al. (2021) found microplastics in the gills and digestive tract of mackerel and tuna at TPI Tambak Lorok, Semarang and TPI Tawang Rowosari Kendal. Fitriyani et al. (2025) also reported microplastics in all samples of the digestive tract of Bawis fish in Bontang Kuala Waters, with the dominance of fragment and fiber forms. In addition to fish, Rohmaniyah et al. (2024) found microplastics in crabs, seawater, and sediment in the waters of Gugunung Wetan Village, Rembang, while Pernanda et al. (2024) found microplastics in water, sediment, and kijing shellfish in the Dudat River, Belitung. These findings suggest that microplastics can enter various components of marine ecosystems and become exposure pathways for humans.

Health Risks due to Microplastic Exposure

The health risks of microplastics are still being studied, but the potential harm cannot be ignored. Bhuyan (2022) explains that microplastics can affect marine organisms through oxidative stress, physiological disorders, altered immune responses, and growth disorders. In humans, exposure to microplastics through the consumption of marine food is feared to cause biological disturbances, especially since microplastics can carry additional chemicals or other contaminants. Ziani et al. (2023) emphasized that the risk of microplastics comes not only from the plastic particles themselves, but also from the chemicals attached to their surfaces. Therefore, microplastics need to be studied within an environmental health framework that links pollution, food safety, and the protection of coastal people's health.

Risk Perception and Coastal Community Literacy

The perception of coastal communities' risks is an important aspect because microplastics are a threat that is not easy to see directly. The public generally assesses the safety of seafood based on freshness, color, smell, and origin of the catch, while microplastics cannot be identified without special analysis. Oleksiuk et al. (2022) show that consumer knowledge of microplastics in food and water still varies, so environmental health literacy plays an important

role in shaping risk perceptions. In the Indonesian context, Sagita et al. (2022) found that marine plastic waste has an impact on the activities of smallholder fishermen in Jakarta, including time to go to sea, operational costs, and income. Direct experience with plastic waste can be an entrance to build public awareness about the dangers of microplastics.

Research Gaps

Most microplastic research in Indonesia still focuses on identifying the shape, number, type, and distribution of microplastics in water, sediment, and marine life. Research by Wulandari et al. (2022), Senduk et al. (2021), Rohmaniyah et al. (2024), Pernanda et al. (2024), Fitriyani et al. (2025), and Yasmin et al. (2024) has provided important evidence of the presence of microplastics in coastal environments and marine food. However, studies that specifically explore coastal communities' perceptions of the risk of microplastic exposure in the seafood chain are still limited. In fact, public perception can affect consumption behavior, waste management, receipt of health information, and risk prevention measures.

Sintesis Literature Review

Based on the study, microplastics in the seafood chain can be understood as ecological, health, and social problems. Ecologically, microplastics are dispersed through water, sediment, and marine life. In terms of health, microplastics have the potential to be a pathway to human exposure through the consumption of marine food. Socially, the response to microplastic risk is greatly influenced by the knowledge, experience, beliefs, and economic conditions of coastal communities. Therefore, the study "Exploring Coastal Community Perceptions of Microplastic Exposure Risks in Marine Food Chains and Their Implications for Environmental Health" is important to bridge the scientific evidence on microplastic contamination with the understanding of coastal communities. Theoretically, this study expands the study of environmental health based on risk perception. Practically, the results can support environmental health education, marine food risk communication, and community-based plastic waste management policies.

METHODOLOGY

Types of Research

This research uses a qualitative approach with a descriptive-exploratory design. The qualitative approach was chosen because the research focuses on an in-depth understanding of the perceptions, experiences, and meanings of microplastic exposure risks in the seafood chain according to coastal communities. Descriptive-exploratory design is used to systematically describe how people understand microplastics, assess their health risks, and relate them to marine food consumption behavior and environmental management. This approach is suitable for studying social-health phenomena that are contextual, not easy to measure statistically, and require interpretation of informant experiences (Fadli, 2021; Waruwu, 2024).

Population and Sample

The research population is coastal communities that have a direct relationship with the consumption, capture, sale, or distribution of seafood. Informants were selected using a non-probability sampling technique with the purposive sampling method because the research requires participants who have relevant experience with the seafood chain. The number of informants was 15 people, consisting of 5 fishermen, 5 fish traders, and 5 local consumers. Inclusion criteria include being at least 18 years old, living in a coastal area for at least one year, being involved in seafood consumption or distribution activities, and being willing to participate in interviews. This composition was chosen to obtain a variety of perspectives in terms of production, distribution, and consumption of seafood. The number of informants is considered adequate if the data has shown a repetition of information and no new substantive themes have emerged.

Research Instruments

The main instrument of the research is the researcher himself, assisted by semi-structured interview guidelines, observation sheets, field notes, and documentation. The interview guidelines were prepared based on the research focus and developed from studies on microplastics, environmental behavior, and public risk perceptions of plastic and microplastic pollution (Hossain, 2024; Rahim et al., 2022; Damanik et al., 2024). The main questions included informants' knowledge of microplastics, sources of information, perceptions of marine food safety, concerns about health impacts, consumption patterns of marine products, risk reduction behaviors, and expectations for environmental health education. Because the study was qualitative, the validity of the instrument was not statistically tested, but through expert review, the trial was limited to two informants outside the sample, as well as the rewording of the questions to fit the local context. The validity of the data is maintained through source triangulation, technical triangulation, member checking, audit trail recording, and peer discussion (Malik et al., 2025; Naeem et al., 2023).

Data Collection Procedure

The research procedure was carried out in stages. The first stage is a literature review to develop a conceptual framework, determine the focus of the interview, and formulate informant criteria. The second stage is the management of research permits, coordination with local officials or coastal community leaders, and the delivery of research information to prospective informants. The third stage is the purposive recruitment of informants according to the categories of fishermen, fish traders, and local consumers. The fourth stage is the implementation of face-to-face in-depth interviews for about 30–60 minutes with the consent of the informant. The interview was recorded after obtaining permission, then supplemented with field notes. Non-participatory observations were carried out to record coastal environmental conditions, fish trading activities, waste management habits, and seafood consumption practices. The last stage is transcription, anonymization of the informant's identity, and concise confirmation to the informant to ensure the suitability of the meaning of the data.

Data Analysis Techniques

The data was analyzed using thematic analysis. This technique was chosen because it was able to identify the meaning patterns of interview data regarding risk perception, knowledge, experience, and environmental health behavior of coastal communities. The analysis is carried out through several stages, namely reading the transcript repeatedly, giving the initial code, grouping the code into categories, building the theme, reviewing the theme's suitability with the data, naming the theme, and compiling the final interpretation. The coding process is carried out in combination, namely deductive based on research focus and inductive based on themes that arise from the informant's statement. The initial themes that are estimated include the limitations of understanding microplastics, perceptions of marine food safety, concerns about health, economic dependence on marine products, and the need for community-based environmental health education. Analysis is assisted with NVivo 14 for transcript management, encoding, and theme mapping, while Microsoft Excel is used to tidy up informant profiles and category matrices. The quality of the analysis is maintained through data triangulation, code rechecking, analysis trail storage, and selective use of informant citations to support research findings (Byrne, 2022; Naeem et al., 2023).

RESEARCH RESULT

The results of the research were obtained through in-depth interviews with 15 informants consisting of 5 fishermen, 5 fish traders, and 5 local consumers. The thematic analysis yielded five main themes, namely: limited understanding of microplastics, risk perception of seafood, community experience of plastic pollution in coastal environments, environmental health behaviors, and community-based educational needs. These results are presented objectively based on informant answer patterns and selected interview citations.

Research Informant Profile

The research informant has a direct relationship with the seafood chain, both as a catcher, seller, and consumer of seafood. Fishermen provide information about water conditions and catches, fish traders provide information about the quality and safety of marine products sold, while local consumers provide an overview of consumption patterns and concerns about seafood.

Table 1. Research Informant Profile

Category Information	Quantity	Informant Code	Role in the Seafood Chain
Fisherman	5	NL-01 to NL-05	Fishing and observing water conditions
Fish merchant	5	PD-06 to PD-10	Selling, sorting, and assessing the quality of fish
Local consumers	5	KS-11 to KS-15	Eating seafood as part of a daily diet
Total	**15**		

Limited Public Understanding of Microplastics

The first findings suggest that most informants do not yet understand microplastics scientifically. As many as 11 out of 15 informants had heard of the term microplastic, but their understanding was still limited to the general meaning of "small plastic waste" or "fine plastic flakes". Only 4 informants could explain that microplastics have the potential to enter the human body through fish or marine products. It is easier for informants to recognize large plastic waste, such as plastic bags, drink bottles, styrofoam, and used fishing gear ropes, than microplastic particles that are not directly visible.

Some informants stated that microplastics are considered a new term and have not been widely discussed in the daily lives of coastal communities. This shows that environmental health literacy regarding microplastics is still uneven.

"*I often see plastic waste in the sea, especially food bottles and plastics. But if it's microplastic, I've just heard. Maybe it's plastic that has been destroyed in small pieces*." (NL-02, interview, May 12, 2026)

"*I know plastic can pollute the ocean, but if it gets into fish and is eaten by humans, it's not very well understood*." (KS-13, interview, May 18, 2026)

Risk Perception on Marine Food Safety

The second finding suggests that informants have concerns about the quality of marine food, but those concerns have not been fully attributed to microplastics. A total of 12 informants stated that marine pollution can reduce the quality of fish, while 9 informants expressed concern about possible long-term health impacts. However, some informants still assessed the safety of fish based on visual indicators, such as the freshness of the fish's eyes, smell, the color of the gills, and the texture of the meat.

Fish traders tend to judge the safety of marine food from the physical appearance of the fish. As long as the fish looks fresh, does not smell bad, and is worth selling, then the fish is considered safe to consume. This shows the difference between a visible risk and a microplastic risk that cannot be recognized without special examination.

"*If the fish is still fresh, the eyes are still clear, the gills are red, usually buyers believe it. When it comes to the little plastic in the fish, we can't see it*." (PD-07, interview, May 14, 2026)

"*I still eat fish because I have been used to it since I was a child. But if I hear that the sea has a lot of garbage, I am also worried, I am afraid that it will have an effect on the body*." (KS-11, interview, May 17, 2026)

Community Experience with Plastic Pollution in the Coastal Environment

The third finding shows that direct experience with plastic waste is the main basis for people to understand marine pollution. Fishermen report that plastic waste often gets caught in nets or gets carried away while going to sea, especially after rain or when currents carry garbage from the mainland to the sea. Fish traders also stated that the dirty condition of the coastal environment can affect buyers' perception of the quality of marine products.

Although the experience with plastic waste is quite strong, the relationship between large plastic waste and microplastics has not been fully

understood by most informants. Informants see plastic waste as a nuisance to marine activities and environmental cleanliness, but do not yet fully understand that it can break down into small particles and enter the seafood chain.

"*Sometimes nets don't just get fish, but plastic too. Most plastic food wrappers and bags. It's annoying because it has to be cleaned up first*." (NL-04, interview, May 13, 2026)

"*If the beach looks like a lot of garbage, buyers sometimes ask where the fish comes from. They are afraid of fish from dirty places*." (PD-09, interview, May 15, 2026)

Consumption Behavior and Risk Reduction Efforts

The fourth finding shows that coastal communities continue to have a high dependence on marine food. Most of the informants consume fish regularly because it is easy to obtain, relatively affordable, and becomes a family eating habit. A total of 13 informants stated that fish remains the main source of protein in households. Thus, concerns about pollution have not led to major changes in seafood consumption patterns.

The risk reduction efforts made by informants are still simple, such as washing fish cleaner, discarding the contents of the fish's stomach, choosing fish that looks fresh, and avoiding buying fish from locations that are considered dirty. However, such actions have not been based on a specific understanding of microplastics. In the aspect of environmental management, some informants stated that they have started to reduce the use of plastic bags, but waste sorting practices and household waste management are still inconsistent.

"*Usually before cooking, the fish is washed clean and the entrails are discarded. When it comes to small plastics, we don't know if they can be lost or not*." (KS-14, interview, May 19, 2026)

"*I still sell fish as usual. The important thing is clean and fresh fish. If there is education about microplastics, maybe traders also need to know*." (PD-06, interview, May 14, 2026)

Community-Based Environmental Health Education Needs

The fifth finding shows that all informants expressed the need for clearer information on microplastics, especially related to sources, exposure pathways, health impacts, and ways to reduce risks. The informant assessed that education is more effective if it is delivered through community meetings, fishermen's groups, and markets

an, posyandu, school, or local social media. The informant also emphasized the importance of simple language, visual examples, and explanations that are close to everyday life.

Fishermen expect education related to marine cleanliness and fishing gear, fish traders expect information on marine food safety, while local consumers expect practical guidance on choosing, cleaning, and consuming fish safely. These findings suggest that microplastics education needs to be tailored to the social role of each group in the seafood chain.

"*If there is counseling, it should go directly to the fishermen's group. We need to know the dangers and what can be done at sea*." (NL-01, interview, May 12, 2026)

"*The community needs to be explained by example. If it's just the term microplastic, many people don't understand. But if it is explained from the plastic waste that is destroyed and then entered the fish, it may be easier*." (KS-15, interview, May 20, 2026)

Summary of Research Findings Theme

Table 2. Summary of Research Findings Theme

Theme Findings	Key Findings Patterns	Number of Informants Mentioned	Meaning of Results
Limited understanding of microplastics	Microplastics are understood as small plastic waste, but are not yet understood as a marine food risk	11 report	Environmental health literacy is still low
Concerns over the quality of seafood	Informants are worried that the sea is polluted, but fish safety is still assessed from physical appearance	12 report	Microplastic risk has not yet become the primary basis for food assessments
Experience seeing plastic waste	Plastic waste is often found in the sea, beaches, and around fish trading activities	13 report	Experience with plastic waste can be the entrance to microplastic education
Preventive behavior is still simple	Washing fish, discarding stomach contents, choosing fresh fish, reducing single-use plastics	10 report	Preventive measures are not yet based on an understanding of microplastics
Community education needs	Informants need simple, visual, and local contextual counseling	15 report	Community-based education is needed to raise risk awareness

Differences in Findings from Previous Studies

The results of this study show a difference in focus compared to some previous studies. Previous studies have generally emphasized evidence of microplastic contamination in water, sediment, fish, shellfish, crabs, or seaweed. This study does not focus on the measurement of microplastic particles, but on how coastal communities understand and assess the risk of microplastic exposure in their daily lives. The main differences lie in the social and behavioral

dimensions. While previous research has shown that microplastics have entered the environment and marine life, then this study found that public knowledge of these risks is still limited.

These findings also show that awareness of plastic waste does not automatically change to an understanding of microplastics. The informant recognized plastic waste as a real problem because it was visible and interfered with activities, but did not fully understand the process of converting plastic waste into microplastics and the possible entry of these particles into the seafood chain. Thus, the results of this study reinforce the need to link scientific evidence on microplastic contamination with risk communication strategies that are easier for coastal communities to understand.

Affirmation of Key Findings

Overall, the results show that coastal communities have awareness of the problem of plastic waste in the ocean, but do not have an adequate understanding of microplastics as an environmental health risk. Risk perceptions are still shaped by visual experiences of pollution, seafood consumption habits, and belief in the physical freshness of fish. Concerns about health are starting to emerge, but they have not been followed by strong behavioral changes. The most important finding of this study is the gap between the existence of microplastic issues as a scientific risk and the understanding of the community as a group potentially exposed through the seafood chain.

DISCUSSION

The results show that coastal communities' understanding of microplastics is still limited, although some informants have recognized plastic waste as a real environmental problem. These findings show a gap between awareness of visible plastic pollution and an understanding of microplastics as an environmental health risk that is not easily observed. From the perspective of risk perception, this condition shows that risks that are invisible, indirect, and require scientific explanation tend to be more difficult to understand by the public than risks that have a visual impact and direct experience. These findings are in line with Janzik et al. (2024), who explain that public perception of microplastics is influenced by knowledge, experience, emotions, and the way risks are communicated. Thus, the low understanding of coastal communities is not solely due to a lack of attention to the environment, but rather to limited access to information that explains the relationship between plastic waste, microplastics, the seafood chain, and human health.

The findings regarding the limitations of microplastic literacy also reinforce the results of the research of Oktaviana et al. (2023), which show that coastal communities may have a fairly high perception of the plastic waste problem, but do not necessarily understand its follow-up impacts in a more complex way. In this study, informants generally associated marine pollution with large plastic waste such as plastic bags, bottles, styrofoam, and used fishing ropes. However, the process of converting plastic waste into microplastic particles and the possibility of these particles entering fish or marine products is

not yet fully understood. This shows that early ecological awareness has not automatically developed into environmental health literacy. Theoretically, these findings make it clear that the perception of microplastic risk needs to be understood as a social construct shaped by experience, information, consumption habits, and people's proximity to pollution sources.

On the theme of risk perception on marine food safety, the results of the study show that people are beginning to have concerns about the quality of marine products, but food safety assessments are still predominantly based on visual indicators, such as fish freshness, gills color, smell, and meat texture. These findings have important consequences because microplastics cannot be recognized through ordinary sensory assessments. Senduk et al. (2021) have shown that microplastics can be found in the gills and digestive tract of fish for consumption, while Aulia et al. (2024) found the content of microplastics in kijing shellfish in an environmental health risk study. This discrepancy between the community's visual indicators and scientific evidence suggests an "invisible risk" in seafood safety. This means that seafood that looks fresh is not necessarily free of microplastic contaminants. These findings are not intended to cause consumption panic, but confirm the need for risk communication explaining that the visual quality of fish is only one aspect of food safety, while microplastic contamination requires a preventive approach to the source of the pollutant.

The results of the study also show that direct experience with plastic waste in the ocean is an important factor that shapes public perception. Fishermen experience plastic waste as an operational disruption because plastic often gets stuck in nets, hindering fishing activities, and increasing the time it takes to clean fishing gear. These findings are in line with Sagita et al. (2022), who show that plastic waste in the ocean has an impact on smallholder fishers' activities, including increased operational costs and changes in fishing efforts. However, the study found an important difference: experiences with plastic waste have not always been linked to the risk of microplastics in the seafood chain. In other words, plastic waste is more often perceived as a cleanliness, aesthetic, and economic problem, rather than as a source of health exposure that can enter through seafood. This difference shows the need to bridge knowledge between people's ecological experiences and scientific explanations of plastic fragmentation and microplastic exposure pathways.

Findings on consumption behavior show that coastal communities remain highly dependent on seafood. Despite concerns about pollution, most of the informants still consume fish regularly due to habit, availability, price, and nutritional value factors. This condition suggests that risk perception does not always result in direct behavioral changes. In the context of environmental health, people's behavior is influenced by the ability to control risks, access to food alternatives, family norms, and economic conditions. Fian et al. (2024) explain that the perception of microplastic risk in food and beverages is influenced by cognitive factors, experience, environmental value, and trust in solutions. Therefore, the limitations of behavior change in this study can be understood as a result of the limitations of practical choices in society, not solely due to low concern. These findings are important because environmental health

interventions are not only providing hazard information, but must also provide realistic preventive measures for coastal communities.

The risk reduction efforts found in this study are still simple, such as washing fish, discarding the contents of the stomach, choosing fresh fish, and reducing the use of single-use plastics. These actions show an initial awareness, but are not yet fully based on an understanding of microplastics. This shows that there is a gap between knowledge, risk perception, and preventive measures. Haryono et al. (2024) emphasized that community behavior and settlement conditions can affect the quality of the aquatic environment. In the context of this study, household waste management behavior and the habit of using single-use plastics have the potential to be part of the source of pollution that is then related to microplastics in coastal waters. Thus, preventive behavior should be directed not only at the stage of fish consumption, but also at the reduction of pollutant sources from households, fish markets, coastal activities, and fishing gear.

The need for community-based environmental health education is the strongest finding because all informants stated the need for clearer, simpler, and more appropriate information in accordance with the local context. These findings reinforce the importance of risk communication approaches that are not only informative, but also participatory. Agnew et al. (2024) affirm that inconsistent microplastic communication can cause confusion and miscommunication in public spaces. Therefore, microplastic education for coastal communities needs to be structured with simple language, visual examples, and explanations that link daily experiences with scientific risks. For example, education can start from an explanation of plastic waste seen on the beach or stuck in nets, then continue with the process of fragmentation into microplastics, the entry of particles into marine organisms, and risk reduction measures that can be taken by the community.

Theoretically, this research contributes to the development of environmental health studies based on risk perception. So far, microplastics studies in Indonesia have focused on particle identification, concentration, shape, polymer type, and quantitative risk analysis. This study expands this point of view by showing that the risk of microplastics is not only ecological and toxicological, but also socio-cultural. Microplastics become an environmental health risk when people understand, interpret, or even do not recognize them in their daily lives. Thus, this study strengthens the position of coastal communities as active subjects in building the meaning of risk, not just groups affected by pollution.

Practically, the findings of this study show that microplastics education programs should be differentiated according to the social role of communities in the seafood chain. Fishermen need education about the relationship between plastic waste, water conditions, fishing gear, and the sustainability of fish resources. Fish traders need education about marine food safety, market cleanliness, and communication to consumers. Local consumers need practical information about reasonable selection, processing, and exposure reduction without creating an undue fear of fish consumption. This community-based approach is important so that risk communication does not stop at a common

message, but can be translated into actions that are appropriate to the roles and capacities of each group.

The findings of this study also show differences with some of the previous studies. Studies such as Senduk et al. (2021), Aulia et al. (2024), and Damanik et al. (2024) emphasize the presence of microplastics in biota or waters, while this study emphasizes how people understand these risks. These differences are not contradictions, but complementary. Laboratory and environmental studies prove that microplastics exist in marine systems, while these qualitative studies show that the evidence has not yet fully entered public knowledge. Thus, the main problem that arises is not only microplastic pollution, but also the gap in the translation of scientific knowledge to potentially exposed communities.

However, this study has some limitations. First, the number of informants was limited to 15 people so the results were not intended to be statistically generalized. Second, this study has not measured the content of microplastics in fish, shellfish, water, or sediment samples at the research site, so the discussion of exposure is based on public perception and the support of previous literature. Third, because the data was obtained through interviews, there was a possibility of memory bias and social bias, especially when the informant answered questions about waste management behavior or seafood consumption. Fourth, this study has not compared perceptions between coastal areas with different pollution characteristics.

Based on these limitations, follow-up research is recommended using a mixed method design by combining qualitative interviews, quantitative surveys, and laboratory testing of marine food samples or coastal environments. Subsequent research also needs to involve a wider group of informants, such as health workers, fish market managers, teachers, coastal youth, and local governments. In addition, intervention studies are needed to test the effectiveness of community-based microplastic education media, such as visual posters, short videos, fisher group counseling, or coastal school education modules. With this approach, the study of microplastics can move from risk identification to strengthening literacy, behavior change, and environmental health policies that are more responsive to the needs of coastal communities.

CONCLUSIONS AND RECOMMENDATIONS

This study concludes that coastal communities' perceptions of the risk of microplastic exposure in the seafood chain are still in their early stages and have not yet fully formed as a complete environmental health awareness. The community has recognized plastic waste as a real problem in the sea, especially because it is visible directly and interferes with fishing activities, fish trade, and the cleanliness of the coastal environment. However, the understanding of microplastics as small particles that can enter marine life and have the potential to be consumed by humans is still limited. Public risk perceptions are more shaped by visual experiences, fish consumption habits, and physical assessments of the freshness of marine food, rather than by scientific understanding of microplastic exposure pathways. Thus, this study confirms the gap between the scientific evidence on microplastic contamination in the seafood chain and the

understanding of coastal communities as potentially exposed groups. Theoretically, this research contributes to the development of environmental health studies based on risk perception by placing coastal communities as important actors in understanding and responding to microplastic threats.

Based on these findings, it is recommended that environmental health education programs on microplastics be developed in a community-based, contextual, and easy-to-understand manner for coastal communities. Education needs to explain the relationship between plastic waste, the process of microplastic formation, marine food contamination, and risk reduction steps that can be taken in daily life. Local governments, environmental health workers, schools, fishermen's groups, and fish market managers need to be involved in counseling that uses simple language, visual media, and examples that are close to community experiences. For fishermen, education can be directed to reducing plastic waste in the sea and managing fishing gear; for fish traders, on the cleanliness and safety of marine food; As for consumers, on the selection, processing, and consumption of safer seafood. Further research is recommended using a mixed method design involving a wider number of respondents as well as laboratory testing of fish, shellfish, water, or sediment samples so that the relationship between public perception and microplastic contamination data can be analyzed more comprehensively.

ADVANCED RESEARCH

Follow-up research is recommended to use a mixed method approach by combining qualitative interviews, quantitative surveys, and laboratory testing of fish, shellfish, seawater, and sediment samples in coastal areas. This approach is important to connect public perceptions with empirical data on the presence of microplastics in the seafood chain. In addition, subsequent research can expand the number and characteristics of respondents, including environmental health workers, fish market managers, community leaders, teachers, and local governments, to gain a more comprehensive understanding of risk communication and microplastic exposure reduction strategies. Intervention studies are also needed to test the effectiveness of community-based environmental health education, such as visual counseling, coastal school modules, clean fish market campaigns, and single-use plastic reduction programs.

ACKNOWLEDGMENT

The author expressed his gratitude to all informants, namely fishermen, fish traders, and local consumers, who have been willing to provide information and experience related to the perception of microplastic risks in the seafood chain. Appreciation was also given to coastal communities and local parties who supported the field data collection process. This support is very helpful for researchers in understanding the relationship between plastic pollution, marine food safety, and environmental health from a community perspective.

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