

STUDY OF MICROPLASTIC ABUNDANCE IN ANIMAL FISH (*Stolephorus Sp*) WITH MICROPLASTIC CONTENT IN STUNTING CLOWN'S BREAST MILK (Study in Kragan District, Rembang Regency)

Maziyyah Mufia¹, Globila Nurika²

¹Environmental Health Specialization Study, Faculty of Public Health, Jember University

²Environmental Health Section, Faculty of Public Health, Jember University
Jalan Kalimantan 1/93 - Bumi Tegal Boto Campus, Jember, East Java, Indonesia
Email: ziyyam15@gmail.com

Article Info

Article history:

Received August 25, 2023

Revised August 25, 2023

Accepted July 01, 2024

Keywords:

Microplastics
Stolephorus Sp
Stunting
Breastmilk

ABSTRACT

Study of Microplastic Abundance in Animal Fish (*Stolephorus Sp*) With Microplastic Content in Stunting Clown's Breast Milk. This study, conducted in Kragan District, Rembang Regency, investigated the prevalence of microplastics in *Stolephorus sp.* and their occurrence in the breast milk of stunted infants. Microplastics, emerging as a global oceanic pollutant, pose significant challenges due to their small size and potential impacts on marine and human health. The study focused on their possible transfer to infants via breast milk, raising concerns about associated health risks, including toxicity and infection. Stunting, a critical health issue affecting 14% of Rembang Regency's population, provided the backdrop for this research. The study included all *Stolephorus Sp.* Sold in Kragan Subdistrict and collected breast milk samples from 11 stunted infants. Employing a descriptive quantitative approach with a case study design, the researchers utilized total sampling based on predefined criteria. Analysis revealed microplastics in both *Stolephorus Sp.* and breast milk, predominantly as fibers and filaments in black and blue colors. Particle sizes varied widely, with *Stolephorus sp.* containing 1.00–2.13 particles per specimen and breast milk containing 0.20–3.00 per milliliter. The study identified a correlation between microplastic abundance in *Stolephorus sp.* and its presence in breast milk among stunted infants. However, no correlation was found between *Stolephorus sp.* Consumption frequency and microplastic levels in breast milk. These findings underscore the potential pathways of microplastic exposure to infants and highlight the need for further investigation into their health impacts, particularly among vulnerable populations. Future research should continue exploring these dynamics to understand better and mitigate the risks associated with microplastic contamination in food chains and human health.

This is an open access article under the [CC BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license.



INTRODUCTION

Pollution from waste, particularly plastic waste, has now become a global issue. One of the world's concerns is plastic waste in the sea, which is a global challenge ⁽¹⁾. Microplastic waste receives special attention because it is very small. The lack of technology to measure its presence could potentially have a negative impact on marine biota and human health ⁽²⁾. Microplastics can be translocated in marine biota such as fish, namely the digestive tract, gills,

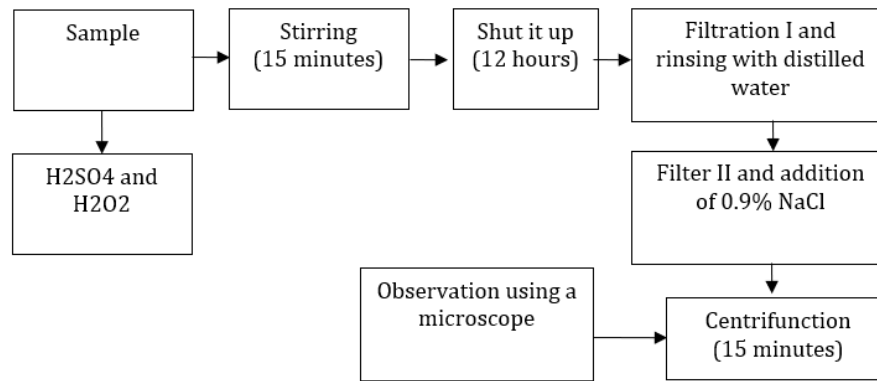
and flesh ⁽³⁾. Mothers giving birth in Rome, Italy, have been proven to contain microplastics in breast milk. It was found that 75% of breast milk was contaminated with microplastics (26 out of 34 mothers). Mothers often consume food and drinks packaged in plastic, seafood, and personal hygiene products that contain plastic. The chemicals that breastfeeding mothers may consume can be transferred to their offspring and have the potential to cause toxic effects. This condition has the potential to cause infection, which will affect the nutritional status of the baby ⁽⁴⁾.

Stunting is a health problem that is national in scope. Several internal factors that cause stunting are exclusive breastfeeding, complementary foods for breast milk (MPASI), a mother's condition, food quality, genes, infections, and food and water safety ⁽⁵⁾. The prevalence rate of stunting in Rembang Regency is 14%, with a target of zero stunting by 2024. The incidence of stunting is particularly high in five villages, namely Pandang Wetan Village, Balong Mulyo Village, Karanganyar Village, Karangharjo Village, and Karanglincak Village. According to the latest data, there were 71 stunting incidents, with the number of stunted clowns at 11 incidents. Data from the Indonesian Ministry of Environment and Forestry (2021) regarding Waste Management Performance Achievements shows that Rembang Regency handled 89,666.36 tons of waste in 2021, of which only 13,292.21 tons (14.82%) were managed, compared to 27,915.60 tons (31.13%) in the previous year ⁽⁶⁾. Microplastics were found in the digestive tract of anchovies (*Stolephorus Sp*) in 4 of the 10 fish sampled. Coastal communities, including breastfeeding mothers, often consume fish as daily food, such as anchovies (*Stolephorus Sp.*), which are in high demand due to their medium economic value ⁽⁷⁾.

Based on the biotransformation of microplastics through an exposure process that can result in toxin exposure through the digestive tract, Microplastics that have accumulated in the environment increase the potential for biota contamination due to recurring food chain processes ⁽⁸⁾. In the toxokinetic process, toxicants can be released through milk, and this is very dangerous because it can transfer toxicants from mother to child or from animals to humans. The toxodynamic process, which is the interaction between toxin and receptors, can produce toxic effects ⁽⁴⁾. Therefore, this research examines the relationship between the abundance of microplastics in anchovies (*Stolephorus Sp*) and the microplastic content in the breast milk of stunted clowns in Kragan District, Rembang Regency.

MATERIALS AND RESEARCH METHODS

This research employs a descriptive style with a quantitative approach and a case study design. This research will examine the relationship between the abundance of microplastics in anchovies (*Stolephorus Sp*) and the microplastic content in the breast milk of stunted clowns in Kragan District, Rembang Regency. The population of this study was all anchovies (*Stolephorus Sp*) sold in Kragan District, Rembang Regency, and 11 stunted female mothers in Kragan District, Rembang Regency. The study employed a total sampling technique, which was based on the inclusion criteria. These included stunting female mothers who were breastfeeding, had consumed anchovies (*Stolephorus Sp*) within the last month, and provided exclusive breast milk. The exclusion criteria included stunted female mothers who refused to have their breast milk samples taken.



Source:(1)

Figure 1. Observation Procedure Diagram

This research uses secondary and primary data. Secondary data on toddlers suffering from stunting was obtained from the Kragan I and II Community Health Centers through midwives and cadres from View Wetan Village, Balong Mulyo Village, Karanganyar Village, Karangharjo Village, and Karanglincak Village in the form of data on toddlers suffering from stunting. Primary data was obtained from interviews with stunting clown mothers using semi-quantitative questionnaires and food frequency questionnaires. In addition, testing was carried out for microplastic content in anchovies (*Stolephorus Sp*) consumed by mothers of stunted toddlers and the breast milk of stunted toddlers in the ecoton laboratory (Figure 1). Univariate data analysis is used to describe and present the characteristics of each variable in the study using cross-tabulation. The data presentation is presented descriptively, namely by describing the results of laboratory tests regarding the characteristics of microplastics in anchovies (*Stolephorus Sp*) and the breast milk of stunted clowns based on shape, color and size, as well as describing the abundance of microplastic content and the level of public consumption of anchovies (*Stolephorus Sp*), and the relationship between the abundance of microplastics in anchovies (*Stolephorus Sp*) and the microplastic content in the breast milk of stunting clowns and the relationship between the average frequency of consumption of anchovies (*Stolephorus Sp*) and the average abundance of microplastics in the breast milk of stunting clowns in Kragan District, Rembang Regency in tabular form as well as images equipped with narrative explanations.

RESEARCH RESULTS AND DISCUSSION

Characteristics of Microplastics in Anchovies (*Stolephorus Sp*) and Breast Milk from Stunting Baduta

On June 8, 2023, anchovies (*Stolephorus Sp*) were collected from interviews with stunting clown mothers at four sales locations in Kragan District. K1 and K4 are located in the Kragan market, while K2 and K3 are located in the Plawangan market. Figure 2 shows the outcomes of tests done on four samples of anchovies (*Stolephorus Sp*) at the Ecoton Laboratory in Krajan Hamlet, Wringinanom Village, RT 01 RW 05, Wringinanom District, Gresik Regency.



Figure 2. Visual of Microplastic Shapes

The microplastic particles found at locations K1 to K4 were 20 particles, 20 particles, 19 particles, and 17 particles, respectively, and the majority were in the form of fibers. The total number of microplastic particles found was 76, with 72 particles in fiber form (94.74%) and 4 particles in filament form (5.26%). Overall, the microplastic particles found based on laboratory tests were of two particle forms, with the fiber form predominating. Community activities, such as washing clothes and disposing of used and degraded plastic sacks originating from activities on land, can be one of the triggers for the presence of fiber-type microplastics. ⁽⁹⁾ Apart from that, people in coastal areas and surrounding areas, most of whom have fishermen's livelihoods, use fishing equipment, which is usually made from fiber rope. Microplastics in the form of fibers are often found as a result of activities originating from local communities, where these objects experience friction and then decompose into very small plastic particles, which are then carried by currents into the water. Therefore, fiber-shaped microplastics can dominate ⁽¹⁰⁾. Filament-type microplastics are frequently found due to the generation of rubbish or waste that is thrown directly into rivers, such as plastic bags, sachet plastic, and other plastic food packaging. Filament has a lower density than other types, so it can be distributed through water media. This relatively simple filament distribution process is one of the reasons this type of microplastic is more commonly found in waters than in sediments. In tilapia fish, filament-type microplastics were found to dominate, with an average abundance of 18.45 particles per fish in each sample ⁽⁸⁾.

On June 8, 2023, stunting toddler mothers in Kragan District were subjected to breast milk sampling. Breast milk sampling activities were carried out on 8 stunting toddler mothers in 5 villages, namely Pandang Wetan Village, Balong Mulyo Village, Karanganyar Village, Karangharjo Village, and Karanglincak Village. According to laboratory results, microplastics were detected in breast milk in Rome, Italy ⁽⁴⁾. The differences in the various forms of microplastics usually depend on the activities carried out by the community ⁽¹¹⁾. According to laboratory tests carried out on the breast milk of stunting clowns, microplastic particles in the form of fibers and filaments were found. The total number of microplastic particles in the 8 samples was 22 particles, with 9 fiber particles (40.90%) and 13 filament particles (59.10%). Overall, there are 2 forms of microplastic particles, with the filament form being the most common. Fiber-type microplastic particles can be found because fishing activities use nets, which allow fiber degradation in fishing gear ⁽¹²⁾. Meanwhile, this type of filament originates from the same waste, specifically from human activities such as the disposal of degraded plastic bottles, bags, and single-use plastic cups ⁽¹²⁾ ⁽¹¹⁾. When microplastics accumulate in the environment, the potential for biota contamination increases due to the food chain processes that occur. Once microplastics infiltrate the biota, they pose a significant risk of entering the human body through the food chain. When microplastics are brought into contact with food, the pathogenic substances carried by these microplastics can pose a threat to human health ⁽⁸⁾. Breastfeeding mothers can transfer biota containing microplastics to their children, potentially causing toxic effects ⁽⁴⁾.

According to laboratory test results in anchovy (*Stolephorus Sp*) samples, the colors of microplastics are black, blue, red, green, and white. Black with 39 particles and blue with 29 particles were the dominant colors found in the anchovy (*Stolephorus Sp*) samples. The black color of microplastic particles can come from the color of the origin of the plastic; it can also indicate the number of contaminants absorbed in the microplastic particles found or the length of the degradation process in the ocean ⁽¹³⁾. Meanwhile, the blue color of microplastics is thought to come from the original color of clothing threads and wastewater from washing. Blue is not only an artificial color resulting from anthropogenic processes, but it can also be a color that has been degraded by sunlight.

Based on laboratory test results, the colors of microplastics found in breast milk samples from stunting clowns were black, blue, purple, white, brown, and yellow. The colors that dominate the entire sample are blue and purple. Six blue microplastic particles and six purple

particles were found. Long-term exposure to high-intensity sunlight makes plastic particles weak, brittle, and vulnerable to damage, as well as microplastics. Furthermore, the color of the microplastics formed will also undergo changes. Many fragments were found to be translucent (transparent), which can be caused by the discoloring action of ultraviolet light or also be white, blue, red, or orange in color. ⁽¹⁵⁾.

Microplastic particles have a variety of sizes, most of which come from the degradation and fragmentation of large plastics due to mechanical processes and solar radiation. It is thought that the small size of microplastic particles makes it easy for them to enter fish, either intentionally or unintentionally, in the process of looking for food ⁽¹⁶⁾. In samples of anchovy (*Stolephorus Sp*) in Kragan District, various lengths of microplastic were found at 4 sampling locations, but overall, they ranged from 0.504 to 5.684 mm. Overall, the average size of microplastics is <5 mm. Aside from that, there was one particle with a size greater than 5 mm, namely 5.684 mm. This is consistent with a study where the data collection revealed the presence of large microplastic fragments, specifically those measuring more than 5 mm.

Test results on 8 samples of breast milk from stunted babies in 5 villages in Kragan District showed that all of them contained microplastics with various sizes ranging from 0.069 to 3,200 mm. Overall, microplastics in the breast milk of stunted babies were found to be <5 mm in size. The size of microplastics in the human body is most likely based on the size of the biota, or source of microplastics, which are then used or consumed by humans. Microplastics that have accumulated in the bodies of biota will have a negative impact on the bodies of biota. Moreover, when humans consume biota containing microplastics, they have the potential to infiltrate the body. Microplastics pose a significant risk to human health and can have a toxic impact on the human body ⁽¹⁸⁾.

Microplastics are abundant in anchovies (*Stolephorus Sp*) and ASI Baduta Stunting.

Table 1 presents the abundance of microplastics in anchovies (*Stolephorus Sp*) and the breast milk of stunting Baduta.

No	Sample Code	Abundance of Microplastics in Anchovies (<i>Stolephorus Sp</i>) (Particles/fish)	Microplastic Abundance (Particles/ml)
1.	K1	1.00	-
2.	K2	2.50	-
3.	K3	3.80	-
4.	K4	2.13	-
5.	S1	-	0.20
6.	S2	-	0.25
7.	S3	-	0.50
8.	S4	-	0.25
9.	S5	-	0.50
10.	S6	-	3.00
11.	S7	-	0.25
12.	S8	-	0.50

At location 1, namely Kragan Market, 20 microplastic particles were found in 20 fish samples, so the abundance was 1 particle per head. At location 2, namely at Plawangan Market, 20 particles were found in 8 fish samples, so the abundance was 2.5 particles per fish. At location 3, namely at Plawangan Market, 19 particles were found in 5 fish samples, so the abundance was 3.8 particles per fish. At location 4, namely Kragan Market, 17 particles were found in 8 fish samples, so the abundance was 2.13 particles per fish. According to several studies conducted by the Ecoton Laboratory, the average results for microplastic content ranged from <0.5 particles/head to 3.8 particles/head, so if we refer to previous research, the results of this study are included in the high category.

Kragan District is a sub-district in the North Coast region. Several villages are situated directly adjacent to water areas, where most of the population relies on fishing for their livelihood, making fish a popular food. In Kragan District, there is also a tourist destination in the form of a beach that is busy with visitors. According to the results of the interviews, a

number of visitors exhibit a less environmentally conscious attitude. Several visitors were still found throwing away cigarette butts, wrappers, or leftover food they brought to the beach. Apart from that, people in consumer societies also have a less aware attitude towards the environment, where a lot of rubbish is found around the beach. Research shows that in residential activities among people who are less aware, microplastic particles were found in all sub-district samples originating from the coast ⁽¹⁹⁾. Location 3 is where the largest microplastic particles were found. The residential population in location 3 is denser than the others, resulting in a lot of household waste and unused fishing equipment being thrown directly into the sea.

According to the interview results, Baduta's mother likes to eat fish, such as anchovies (*Stolephorus Sp*), which, based on laboratory test results, contain microplastic particles. Many people rely heavily on marine products as one of their main food sources, especially those who live near coastal areas. Microplastic pollution in the sea leads to the contamination of marine products ⁽²⁰⁾. When microplastics penetrate the biota, they have the potential to enter the human body through the food chain, posing a significant threat. When microplastics are brought in with food, they have the potential to carry pathogenic substances carried by microplastics from the environment, thus threatening human health ⁽²¹⁾. Breast milk was found to be contaminated with microplastics, according to research conducted on mothers giving birth in the city of Rome. In 34 breast milks, 75% of microplastics were detected. Apart from that, previous research found microparticles contained in the human placenta ⁽⁴⁾.

Breast milk samples were taken from eight stunted female mothers who consumed anchovies (*Stolephorus Sp*) in the last month. Microplastics are calculated based on the content of microplastic particles or tails.

Frequency of Consumption Levels of Anchovies (*Stolephorus Sp*) in Stunting Mothers

The sample size of baduta mothers at locations 1, 2, 3, and 4, specifically Kragan Market, was 1, 5, 3, and 1 person, respectively. The results of the FFQ interview regarding the average frequency of consumption of anchovies (*Stolephorus Sp*) can be seen in Table 2.

Table 2. Frequency of Consumption Levels of Anchovies (*Stolephorus Sp*) in Stunting Baduta Mothers

No	Frequency of Consumption	Number of people)	Percentage (%)
1.	Very often	2	25.00
2.	Often	2	25.50
3.	Seldom	4	50.00
Total		8	100.00

Anchovies (*Stolephorus Sp*) are one of the marine biological resources that are available in almost all Indonesian waters and are one of the commodities in the marine fisheries sector. Anchovies (*Stolephorus Sp*) are popular with Indonesians because of their nutritional content. Anchovies (*Stolephorus Sp*) are marketed in fresh form, commonly called wet anchovies, or in processed form, which is dried as salted fish ⁽²²⁾. From an economic perspective, anchovy (*Stolephorus Sp*) is a food that is relatively cheap and easy to obtain ⁽²³⁾. Fishermen with small boats often find anchovies (*Stolephorus Sp*) in the waters of Kragan District, which local people often consume.

People's eating habits are influenced by how they obtain food sources, eating habits, the family's economic level, and the surrounding environment. There are two factors that influence eating patterns and habits: external and internal. External factors include culture, religion, economic factors, media, and advertising. Meanwhile, internal factors include emotional associations, physical condition, food availability, and family traditions themselves ⁽²⁴⁾. The diet of the people of Kragan Subdistrict, especially in 5 villages, namely Kalian Wetan Village, Balong Mulyo Village, Karanganyar Village, Karangharjo Village, and Karanglincak Village, is influenced by the livelihoods of local people and geographical environmental conditions. People tend to use sea catches to fulfill their daily needs, such as consuming and

selling their catches. According to interviews with eight stunted female mothers, the majority of people consume anchovies (*Stolephorus Sp*) twice a month. Food consumption refers to the type and amount of food eaten by a person at a given time. Consumption levels are used to determine the nutritional content of certain foods consumed by a person. Measuring food consumption can produce two types of data, one of which is qualitative. The qualitative method is used to determine the frequency of consumption and eating based on the type of food and to dig up information about food habits and how these foodstuffs are obtained. ⁽²⁵⁾ Daily nutrient intake data can be obtained using a semi-quantitative food frequency questionnaire (FFQ), which is a method of obtaining data on the frequency of consumption of food ingredients or ready-made food during a certain period every day, week, month, or year. ⁽²⁵⁾

Table 3. Average Consumption of Anchovies (*Stolephorus Sp*) among Stunting Baduta Mothers

No	Component	Number of people)	Percentage (%)	Total
1.	Average Consumption (grams/day)			
	≤ 10	5	62.50	8 people
	> 10	3	37.50	100.00%
2.	Average Abundance of Microplastics in Breast Milk (Particles/ml)			
	≤ 0.987	7	12.50	8 people
	> 0.987	1	77.50	100.00%

This research used the semi-quantitative FFQ method to determine the level of consumption of stunted female mothers of anchovies (*Stolephorus Sp*). Interviews with stunting female mothers were used to get information on their average daily consumption (in grams). This information was then processed further by turning each frequency of consumption into a number of days. Next, the frequency of consumption in days is multiplied by the amount of consumption, which has been converted into grams, and the average consumption is obtained. Based on calculations of the consumption levels of stunted female mothers in Kragan District, Rembang Regency, it was found that the average consumption of anchovies (*Stolephorus Sp*) was 5 of <10 grams/day, and 3 respondents were >10 grams/day. If people consume fish containing >10 grams per day of microplastics, the possibility of microplastic contaminants being absorbed by the body will also be much greater. Microplastics found in the human body, including breast milk, can impact a very vulnerable population of babies. In fact, chemicals that may be contained in food, drinks, and personal care products consumed by breastfeeding mothers can be transferred to their offspring and have the potential to cause toxic effects. ⁽⁴⁾.

Correlation between the abundance of microplastics in anchovies (*Stolephorus Sp*) and the content of microplastics in the breast milk of Stunting Baduta

Table 4. Correlation between the abundance of microplastics in anchovies (*Stolephorus Sp*) and the microplastic content in ASI Baduta Stunting

		Abundance of Microplastics in Breast Milk of Stunting Baduta				Total
		0.20	0.25	0.50	3.00	
Microplastic Abundance In Anchovies (<i>Stolephorus Sp</i>)	1.00		1			1
	2.13	1	1			2
	2.50		1	3		4
	3.18				1	1
Total		1	3	3	1	8

Fish traded at the port contain several microplastics, such as fragments, films, styrofoam, and monofilament. This further clarifies the existence of plastic pollution ⁽²⁶⁾. Microplastics in

anchovies (*Stolephorus Sp*) were found to be the result of an environment polluted by plastic waste ⁽⁷⁾. In Krangan District, there are microplastics in all the breast milk of stunted mothers. This research shows that in the abundance of 1 particle per head of anchovy (*Stolephorus Sp*) consumed, 0.25 particles per ml of microplastics were found in 1 stunted baby's breast milk. At an abundance of 2.13 particles per head of anchovy (*Stolephorus Sp*) consumed, 0.20 particles/ml of microplastics were found in 1 breast milk of stunting toddlers and 0.25 particles/ml of microplastics in 1 breast milk of stunting clowns. At an abundance of 2.50 particles per head of anchovy (*Stolephorus Sp*) consumed, 0.25 particles/ml of microplastics were found in 1 breast milk of a stunted baby boy and 0.50 particles/ml of microplastics in 3 breast milks of a stunted baby boy. At an abundance of 3.18 particles/head of anchovy (*Stolephorus Sp*) consumed, 3 microplastic particles/ml were found in 1 stunted baby's breast milk. These results show that the amount of microplastics in anchovies (*Stolephorus Sp*) eaten is directly related to the amount of microplastics in stunting clowns' breast milk. The sources used to get these results didn't consider how often the baduta mother ate.

Microplastics have a negative impact on public health, including causing inflammation in the brain, increasing oxidative stress, disrupting the digestive system, causing cancer, skin irritation, cardiovascular disease, respiratory problems, and reproductive problems in humans. ⁽¹¹⁾ Microplastics have been proven to be present in human breast milk. Previous findings suggest that human placentas also contain microplastics. The existence of microplastics is worrying because they can impact a very vulnerable baby population. The toxic effects of chemicals that contaminate breast milk can be transferred to offspring through breast milk consumed by toddlers ⁽⁴⁾. Based on research results, breast milk containing many microplastic particles does not affect the quantity.

The characteristics of microplastics found in anchovies and stunted clown breast milk have several differences. Differences in characteristics can be caused by microplastic particles that enter the mother's body not only through ingestion but also through inhalation. Microplastic particles in breast milk do not only come from consuming anchovies; they can also come from food, drinks, and personal care products consumed or used by the mother.

Table 3 provides the average abundance of microplastics. Seven individuals in the breast milk of stunting toddlers had an average microplastic abundance of less than 0.987 grams per day, while one individual had an abundance of more than 0.987 grams per day, as measured by particles per milliliter.

This study examines the relationship between the average frequency of anchovy (*Stolephorus Sp*) consumption and the average abundance of microplastics in the breast milk of stunting Baduta.

Table 5. Correlation between the Average Frequency of Anchovy Consumption (*Stolephorus Sp*) and the Average Abundance of Microplastics in Stunting Baduta' Breast Milk

		Average Frequency of Consumption of Anchovies (<i>Stolephorus Sp</i>)		Total
		≤ 10 grams/day	> 10 grams/day	
Average Abundance Microplastics in Stunting Baduta's Breast Milk	≤ 0.987 particles/ml	4	1	5
	> 0.987 particles/ml	3	0	3
Total		7	1	8

This study found that stunting toddler mothers who have an average of 0.987 microplastic particles per day are more likely to eat anchovies (*Stolephorus Sp.*) (10 grams per day), while those who have less than 0.987 particles per day are less likely to eat them (37.5%). The average amount of anchovy (*Stolephorus Sp*) consumed was >10 grams/day in 1 (12.5%)

stunted toddler mother with an average abundance of microplastics in breast milk of ≤ 0.987 particles/day. This shows that the frequency of consumption of anchovies (*Stolephorus Sp*) does not affect the abundance of microplastics in the breast milk of stunting clowns. These results were obtained based on the frequency of consumption without considering the source of the anchovies (*Stolephorus Sp*) consumed by the baduta's mother. The large amount of microplastics in a mother's breast milk may not only be due to eating anchovies. Other types of seafood can also be a trigger. In another study, it was explained that one of the reasons microplastic particles were found in breast milk was because the mother often consumed seafood ⁽⁴⁾.

CONCLUSIONS AND RECOMMENDATIONS

Microplastic particles in anchovies (*Stolephorus Sp*) found in the waters of Kragan District have two forms, namely fiber and filament, dominated by fiber. The particles are black, blue, red, green, and white, with the dominant colors being black and blue. The particle size ranges from 0.504 to 5.684 mm. The abundance of microplastics ranged from 1–3.8 particles per head. Microplastic particles in the breast milk of stunted babies have two forms, namely fiber and filament, with filaments predominating. Particles are black, blue, purple, white, brown, and yellow. The particle size ranges between 0.085 and 3.200 mm. The abundance of microplastics ranges from 0.2–3 particles/mL. There is a link between the abundance of microplastics in anchovies (*Stolephorus Sp*) and the abundance of microplastics in the breast milk of stunting clowns. The greater the abundance of microplastics in the anchovies (*Stolephorus Sp*) consumed, the greater the abundance of microplastics in the breast milk of stunting clowns. However, there was no association between the frequency of consumption of anchovies (*Stolephorus Sp*) and the abundance of microplastics in the breast milk of stunting clowns.

The suggestions given are to provide adequate waste disposal facilities in coastal areas, not to throw solid or liquid waste into coastal areas, the community, especially fishermen, not to throw used ropes and nets onto the coast, and the community to limit consumption of anchovies (*Stolephorus Sp*) and/or not consume it every day in large quantities.

REFERENCES

1. Prasetiawan T. Upaya Mengatasi Sampah di Laut. Pus Penelit Badan Keahlian DPR RI. 2018;X(April):13–8
2. Liu K, Wang X, Wei N, Song Z, Li D. Accurate Quantfication and Transport Estimation of Suspended Atmospheric Microplastics in Megacities : Implications for Human Health. Environ Int [Internet]. 2019;132(July):105127. Available from: <https://doi.org/10.1016/j.envint.2019.105127>
3. Barboza LGA, Lopes C, Oliveira P, Bessa F, Otero V, Henriques B, et al. 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. Sci Total Environ [Internet]. 2019;717:134625. Available from: <https://doi.org/10.1016/j.scitotenv.2019.134625>
4. Ragusa A, Notarstefano V, Svelato A, Belloni A, Gioacchini G, Blondeel C, et al. Raman Microspectroscopy Detection and Characterisation of Microplastics in Human Breastmilk. J Polym. 2022;1–14.
5. Nirmalasari NO. Stunting Pada Anak : Penyebab dan Faktor Risiko Stunting di Indonesia. Qawwam J Gend Mainstreaming. 2020;14(1):19–28.
6. Kementrian Lingkungan Hidup dan Kehutanan RI (KLHK RI). Capaian Kinerja Pengelolaan Sampah [Internet]. 2021 [cited 2022 Nov 7]. Available from: <https://sipsn.menlhk.go.id/sipsn/public/data/capaian>
7. Tahir A, Rochman C. Plastic Particles in Silverside (*Stolephorus heterolobus*) Collected at

- Paotere Fish Market, Makassar. *Environ Sci Int J Agric Syst*. 2014
8. Al Fatih ANF. Identifikasi Mikroplastik Pada Sistem Pencernaan Ikan Nila (*Oreochromis Niloticus*) Di Kali Pelayaran Kabupaten Sidoarjo. *Environ Pollut*. 2021;1(3):237–44.
9. Kurniawidjaja LM, Lestari F, Tejamaya M, Ramdhan DH. Konsep Dasar Toksikologi Industri. FKM Universitas Indonesia. Fakultas Kesehatan Masyarakat Universitas Indonesia; 2021. 181 p.
10. Hanif KH, Suprijanto J, Pratikto I. Identifikasi Mikroplastik di Muara Sungai Kendal, Kabupaten Kendal. *J Mar Res*. 2021;10(1):1–6.
11. Octarianita E, Widiastuti EL, Tugiyono T. Analisis Mikroplastik Pada Air Dan Sedimen Di Pantai Teluk Lampung Dengan Metode Ft-Ir (Fourier Transform Infrared). *J Sumberd Akuatik Indopasifik*. 2022;6(2):165–72.
12. Sugandi D, Agustawan D, Febriyanti SV, Yudi Y, Wahyuni N. Identifikasi Jenis Mikroplastik dan Logam Berat di Air Sungai Kapuas Kota Pontianak. *Positron*. 2021;11(2):112–20.
13. Puspita D, Nugroho P, Sena ENK. Analisa Kandungan Mikroplastik pada Oragan Ikan Konsumsi dari Rawa Pening. *J Sci Biodivers*. 2023;4(1):16–22.
14. Shafani RH, Nuraini RAT, Endrawati H. Identifikasi Dan Kepadatan Mikroplastik Di Sekitar Muara Sungai Banjir Kanal Barat Dan Banjir Kanal Timur, Kota Semarang, Jawa Tengah. *J Mar Res*. 2022;11(2):245–54.
15. Kapo FA, Toruan LNL, Paulus CA. Jenis dan Kelimpahan Mikroplastik pada Kolom Permukaan Air di Perairan Teluk Kupang. *J Bahari Papadak*. 2020;1(1):10–21.
16. Pamungkas NAG, Hartati R, Redjeki S, Riniatsih I, Suprijanto J, Supriyo E, et al. Karakteristik Mikroplastik pada Sedimen dan Air laut di Muara Sungai Wulan Demak. *J Kelaut Trop*. 2022;25(November):421–31.
17. Senduk JL, Suprijanto J, Ridlo A. Mikroplastik pada Ikan Kembung (*Rastrelliger sp.*) dan Ikan Selar (*Selaroides eptolepis*) di TPI Tambak Lorok Semarang dan TPI Tawang Rowosari Kendal. *Bul Oseanografi Mar*. 2021;10(3):251–8.
18. Victoria AV. Kontaminasi Mikroplastik di Perairan Tawar. *Tek Kim ITB [Internet]*. 2017;(January):1–10. Available from: https://www.researchgate.net/publication/312159424_Kontaminasi_Mikroplastik_di_Perairan_Tawar
19. Hafidz MK, Amin MF. Identifikasi Mikroplastik pada Udang Putih (*Penaeus indicus*) dan Ikan di Muara Sungai Barito Kota Banjarmasin, Provinsi Kalimantan Selatan. *Enviromental Pollut J*. 2022;2(2):390–8.
20. Joesidawati MI. Pencemaran Mikroplastik di Sepanjang Pantai Kabupaten Tuban. *Semin Nas Has Penelit dan Pengabd Masy* 3. 2018;(September):7–15.
21. Amqam H, Afifah N, MuktaDir MI Al, Devana AT, Pradana U, Fitri Z. Kelimpahan dan Karakteristik Mikroplastik pada Produk Garam Tradisional di Kabupaten Jeneponto. *J Kesehat Masy*. 2022;12(2):147–54.
22. Prata JC. Airborne Microplastics: Consequences to Human Health? *Environ Pollut [Internet]*. 2018;234:115–26. Available from: <https://doi.org/10.1016/j.envpol.2017.11.043>
24. Nurcholis I, Zairion, Mashar A. Journal of Tropical Fisheries Management. *J Pengelolaan Perikan Trop*. 2018;2(2):1–74.
25. Ratnasari D, Wahyani AD. Analisis Kandungan Protein dan Daya Terima pada Biskuit Tepung Ikan Teri (*Stolephorus Sp*) dan Isolat Protein Kedelai (Glycine mix) untuk PMT-P Balita Kurang Gizi. *J-KESMAS J Kesehat Masy*. 2022;8(2):116.
26. Zulkarnaen TA, Dahlan M, Ahmadin. Konstruksi Sosial, Budaya dan Ekonomi pada Pola Makan Masyarakat Kelurahan Benteng Somba Opu Kabupaten Gowa. *J Kaji Sos dan Budaya Tebar Sci [Internet]*. 2022;6(2):97–104. Available from: <http://ejournal.tebarscience.com/index.php/JKSB/article/view/115>
27. Kemenkes RI. Survey Konsumsi Pangan Individu. Kementerian Kesehatan Republik

- Indonesia; 2018. 161 p.
28. Afdal M, Werorilangi S, Faizal A, Tahir A. Studies on Microplastics Morphology Characteristics in the Coastal Water of Makassar City , South Sulawesi , Indonesia. Int J Environ Agric Biotechnol. 2019;4(4):1028–33.

