MICROPLASTICS ANALYSIS WHICH ACCUMULATED IN BIVALVES CAUSED BY MARINE DEBRIS IN TAMBAK LOROK SEMARANG INDONESIA

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Abstract - Plastics are a major component of waste in the ocean. The amount is nearly 95% of the total waste collected along the coastline, surface and seabed. In general, the process of plastic decomposition takes place very slowly[1)]. Microplastic is a small plastic (≤ 5 mm) that is difficult to decompose, thus making this material will remain in the long term. Microplastic in aquatic ecosystems produce wider and more harmful effects on living things[2) 3)]. This research used shellfish because it's filter feeder and often consumed by humans. The purpose of this research is to know the abundance of microplastic at Pernaviridis, Anadaragranosa and Amusumpleuronectes, the organ in every shellfish that contain the most microplastic, and the effect of boiling of shellfish with high temperature to microplastic abundance. Methods of microplastic abundance analysis were done by isolating the microplastic on each boiled shell sample and not by dissolving the shell in a 65% HNO_3 solution, diluted and then observed by a microscope. The result shows that the average microplastic abundance in shells Anadaragranosa, Amusumpleuronectes and Pernaviridisie 11.89; 3.44; and 14, 64 particles/gram. The microplastic content of the fiber group is the most dominant in the three types of shellfish. Most microplastic content found in gastrointestinal organs of the Pernaviridis is 44 particles. There is no difference in the microplastic abundance of shellfish that has been boiled or not.

Keywords - Amusiumpleuronectes, Anadaragranosa, Microplastic, Perna viridis

I. INTRODUCTION

Plastics are a major component of waste in the ocean. Annual plastic production currently exceeds 380 million tons, summing up to 8300 million tons produced until 2015[1)].The amount is nearly 95% of the total waste collected along the coastline, surface and seabed. In general, the process of plastic decomposition takes place very slowly[2)]. While the plastic particles themselves are dangerous to marine life, the danger is increased due to the many toxic chemicals used in the production of plastics[3)]. The toxins contained in the plastics can act as endocrine disruptors in some animals, and can lead to the bioaccumulation of dangerous chemicals throughout the food chain[4)].

Microplastic is a small plastic (≤ 5 mm) that is difficult to decompose, thus making this material will remain in the long term. Microplastic in aquatic ecosystems produce wider and more harmful effects on living things[5) 6)]. Ingestion of plastic by marine animals has become more common and more concerning, and has been reported in numerous species of fish, turtles, large marine mammals, and in particular seabirds, which will accidentally feed them to their chicks[7)].Often these particles of plastic are too large to be passed through the young or juvenile's digestive system and will lead to high chick mortality, which is extremely concerning since an estimated 44% of all seabirds accidentally ingest plastic particles[7)]. Besides entanglement and ingestion, both of which can kill marine animals, plastic pollution also causes other problems[3)].

Pernaviridis, Anadaragranosa and Amusumpleuronectes are types of shellfish that are often consumed by humans and have economic value. Shellfish are filter feeding organisms they strain the surrounding water through their gills which trap and transfer food particles to their digestive tract. If the water is contaminated with microplastics, it's also trapped and consumed as food. Because shellfish pump large quantities of water through the gills each day. Humans then eat the entire animal, including everything that was accumulated through the process of filter feeding.

Based on these facts, the purposes of this research are to know the abundance of microplastic at Pernaviridis, Anadaragranosa and Amusumpleuronectes, the organ in every shellfish that contain the most microplastic, and the effect of boiling of shellfish with high temperature to microplastic abundance.

II. DETAILS EXPERIMENTAL

2.1. Collection and Boiling of Shellfish Samples

Samples ofAmusiumpleuronectes, Anadaragranosa and Pernaviridis were taken from Fish Auction Place (TPI) TambakLorok. The shellfish taken is a common shellfish sold and consumed by humans. Some samples of shellfish boiled in water with a temperature of 100^0C for 15 minutes and some of shellfish didn't boil. Shellfish samples are preserved by soaking them in ziplock plastic containing 70% of alcohol.

2.2.Microplastic analysis in Amusiumpleuronectes, Andaragranosa and Pernaviridis

Microplastic analysis of shellfish was carried out on 3 samples of each shellfish in each treatment. The

analysis process began with soaking in a ziplock that contained of 70% alcohol solution. Shells that have been soaked were measured by total mass, soft tissue mass, and the length of the shell. The soft tissue that has been separated was soaked in a 65% HNO3 solution for 12 hours. Immersion in HNO3 was carried out to dissolve soft shells, but didn't dissolve microplastics in the shells. Microplastic particles will be in the HNO3 solution. The results of the marinade were then diluted 1/10 with distilled water. The results of dilution pipetted into the room count to be analyzed under a microscope and seen microplastic presence. Then, Microplastics were grouped into four groups, namely pellets, fibers, films, and fragment[8)]. Microplastic analysis of raw shells was also carried out to determine the most widely found microplastic organs. Analysis was observed under a microscope. Shellfish dissection began with soaking the mussels with alcohol. Before it, the length of the shell, soft tissue mass, and the mass of whole shells were measured. Furthermore, shellfish samples will be separated between the shell and soft tissue. Soft tissue shellfish samples were observed and dissected under a binocular microscope to calculate the number and microplastic presence in the shell organs.

III. RESULTS AND DISCUSSION

Microplastic was grouped into four based on the source of the plastic. The appearance of microplastic groups can be seen in the figure.The four microplastic groups, namely pellets or granules were the main raw materials for the manufacture of plastic products, fragments were microplastic derived from very strong synthetic polymer pieces, such as pieces of plastic tool waste, microplastic sheet films commonly derived from plastic bag waste or plastic packaging, plastic film groups had low density and fiber or fishing lines in the form of elongated threads or fibers which generally came from rope or ship mines, as well as synthetic fibers.

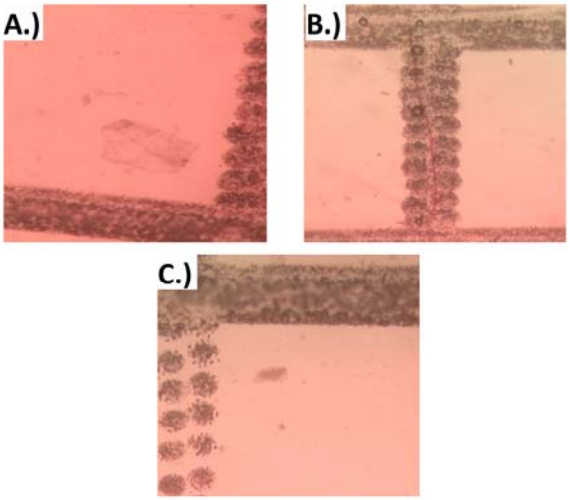


Figure 1. Mikroplastics contain in ShellfishA.) Film B.) Fiber and C.) Fragmen

Table 3. 1. The number of each microplastic group in shells

Types of Shellfish	Number of Microplastics (Particles)				Total
	Pelet	Film	Fragmen	Fiber	
Anadaragranosa	0	38	21	48	107
Amusiumpleuronectes	0	77	41	33	151
Perna viridis	0	54	38	113	205

The microplastic groups were found in A. pleuronectes, Anadaragranosa and Pernaviridis were films, fragments and fibers. The fiber group was the most commonly found in Anadaragranosa and Pernaviridis while the film group was found mostly in A. pleuronectes. Shellfish were generally filter feeders which means filtering water and getting food from the water. Filter feeder animals and deposit feeders will eat microplastic by themselves if there was microplastic in their environment. These shells can eat microplastic groups of fiber and films from water in their habitat, so that microplastics can be found in shells with many microplastic contaminated habitats[9)]. Fewer fragments found in shellfish were due to fragments generally having greater density than other microplastic groups[10)]so that the microplastic groups of fragments were more easily found in sediments than in water. Bivalves grew much closer to the surface of the water because phytoplankton which was a food for young shellfish (spat) were common[11)]. Pernaviridis contained the most microplastic among the three shells with a total number of microplastic particles 205.

Table 3. 2. The number of each microplastic group in shellfish organs

Types of Shellfish	Organ	Particles of Microplastic				Total
		Pelet	Fragmen	Film	Fiber	
Anadaragranosa	Respiratory	0	3	3	5	11
	Digestion	0	1	7	6	14
Perna viridis	Respiratory	0	5	12	3	20
	Digestion	0	14	20	10	44
Amusiumpleuronectes	Respiratory	0	4	10	4	18
	Digestion	0	4	10	4	18

The most common microplastic content was found in the digestive and respiratory systems of Pernaviridis with a number of 44 and 20 particles, the shellfish which had the least microplastic of digestion and respiration were Anadaragranosawith 14 and 11 particles. The number of microplastic particles in green mussels, especially in the digestive system was influenced by the eating habits of green shellfish that actively filter food 24 hours a day[8)] so that the possibility of microplastic particles was sucked by

Pernaviridis compared to other shells. Pernaviridis was able to survive and breed at high ecological pressures withoutexperiencing significant disturbances[8].

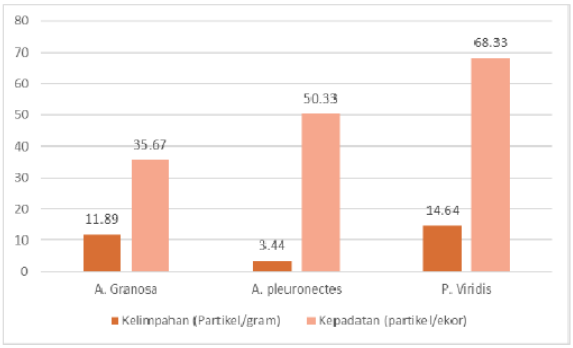


Figure 2. Graph of mean abundance and density in shellfish

The highest average value of microplastic abundance was found in green mussels which were 14.64 particles/gram and the lowest abundance value was found in the scallop shell which was 3.44 particles/ gram. The highest average microplastic density was found in green shells with 68.33 particlesand the lowest density value was found in blood clams containing 35.67 particles.

Table 3. 3. The number of each microplastic group in heated shellfish

Types of Shellfish	Number of Microplastics (Particles)				Total
	Pelet	Film	Fragmen	Fiber	
Anadaragranosa	0	30	21	57	108
Amusiumpleuronectes	0	20	22	55	97
Perna viridis	0	60	30	108	198

Film of micoplastic groups, fragments and fibers can be found in shells that had been heated for 15 minutes. The number of microplastic particles in shells that were heated and not heated, it didn't differ greatly between the same types. it was because plastic had a difficult nature to degrade (nonbiodegradable) so that it was difficult to decipher, the melting point of plastic is 950C - 1650C and if burned it will release carcinogenic substances or cancer-causing substances[12].

CONCLUSIONS

Based on this research the average microplastic abundance in shells Anadaragranosa, Amusumpleuronectes and Pernaviridisie 11.89; 3.44; and 14, 64 particles/gram. The microplastic content of the fiber group is the most dominant in the three types of shellfish. Most microplastic content found in gastrointestinal organs of the Pernaviridis is 44 particles. There is no difference in the microplastic abundance of shellfish that has been boiled or not.

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