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The Effects of Microplastic Chemical Waste on the Environment : Literature Review

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Abstract
Microplastics are plastic flakes or crumbs with a size smaller than 5 millimeters that come from large plastic fragments such as crackle bags, clear plastic, clothing waste, plastic bottles, styrofoam and sachets that are fragmented due to water currents and sun exposure. The danger of microplastics when they enter water, can absorb heavy metals and pollutants in the water, such as Chlorine, Phosphate, Manganese, and Chromium. As a result, the water ecosystem will be disrupted. If microplastics are ingested by fish, the fish's reproductive and growth systems are damaged. Moreover, it can interfere with human hormones if you consume the fish. The test was carried out using the Microplastic Rapid Test method using a stereo microscope connected to a monitor, so that with a magnification of 100 to 400 times, it can physically detect microplastics in the water. This researcher is a literature review. The database used in the search for this article uses Google Scholar and ScienceDirect with the keywords "microplastic, plastic waste effect, coastal microplastic, microplastic marine fish, microplastic and health effect", which has been carried out by previous researchers both from within and outside the country. The articles obtained were selected according to the topic of microplastic pollution in coastal areas, which can be downloaded, and articles published from 2018-2024. The articles reviewed were 10 articles that were relevant and according to the topic.

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INTRODUCTION

Plastic pollutants derived from plastic waste will pollute the environment and will ultimately threaten human health; Plastic waste may contain harmful substances that can cause death (Li, et al., 2021) Plastic waste, when released or dumped into the water as sediment with more harmful concentrations, will automatically form in seawater. Some metals that contaminate water due to plastic waste contamination, such as heavy metals and organic chemicals, can poison humans who consume contaminated marine life (Kehinde, et al., 2020). High fish consumption in various countries can also lead to microplastic contamination in humans; The results of the study estimated that microplastic intake ranged from 112-842 microplastics/g/year; This is different in each country. Countries with high fish consumption show high exposure to microplastics, which also range from 3078 microplastics/year/capita (Barboza, et al., 2018).

People in coastal areas have a habit of consuming their caught fish so that it has the potential to bring microplastics into the body through the consumption of marine fish. Another study showed that microplastics were also found in edible fish tissues where out of 270 fish samples, as many as 7% of fish contained microplastics in edible tissues (Daniel, et al., 2020). So that if microplastics contaminate fish consumed by coastal communities, it will bring microplastics into the human body and have the potential to cause health problems if the intensity of exposure is high (Daud, et al., 2021).

Plastic waste is still a serious problem in the world. Plastic waste is the accumulation of plastic objects (e.g. plastic bottles and many more) in the earth's environment that negatively impact the lives of living things in the world. In 2016 the world generated 242 million tons of plastic waste, of which 12% came from urban areas. Based on the report, plastic waste comes from three regions, namely, 57 million tons from East Asia and the Pacific, 45 million tons from Europe and Central Asia, and 35 million tons from North America (Abdulraheem, 2021) Based on a report from the OECD (Organization for Economic Co-operation and Development) in 2019, plastic waste in the world this year has doubled from two decades ago; Most plastic waste ends up in landfills, is burned or dumped into the environment and only 9% is recycled. A study in Spain states that the accumulation of impacts in coastal areas can be caused by population density on the coast and tourism activities (Martín-Lara, et al., 2021).

Research conducted on Kenjeran beach in Surabaya, Indonesia, showed that 10.83% of waste in the Kenjeran beach area is plastic waste (Citrasari, et al., 2021). Plastic waste is very easily carried by currents and winds so that it can reach remote areas; large ocean regions such as the Pacific and Atlantic Oceans have large concentrations of plastic waste and have the potential to affect marine ecosystems (Høiberg, et al., 2022). The increasing amount of plastic waste in the ocean can cause negative interactions between plastic waste and marine life (Neto et al, 2020). Plastics that enter marine ecosystems can be degraded by oxidation, including by ultraviolet radiation and degraded mechanically so that they will become smaller in size so that microplastics are formed. The smaller the size of the plastic will increase the likelihood of plastic bioavailability in marine organisms (Cordova, et al., 2017) Most degradation results in microplastics. Research in Tambak Lorok, Semarang, Indonesia, shows that microplastics have polluted coastal ecosystems (Khoironi, et al., 2020). The results of the study in Ecuador Microplastics were measured on 14 beaches with different levels of urbanization. Coastal waters present a higher amount of microplastics than rivers (Capparelli, et al., 2021).

Microplastics have the potential to have health impacts on humans due to relevant toxic chemicals and other contaminant vectors that can cause chemical and physical biological damage (Yang, et al., 2022). Microplastic pollutants can cause oxidative stress toxicity, inflammation, and increased absorption or translocation. Various studies show that microplastics have the potential to cause metabolic disorders, neurotoxicity and an increased risk of cancer in humans. In addition, microplastics can raise potential health risks such as: immune disorders, neurotoxicity, reproductive disorders and carcinogens (Rahman, et al., 2021).

Other potential risks that can be caused by microplastics and chemicals contained in microplastics are such as reproductive disorders, liver function disorders, kidney function disorders, and anemia, in addition to the bisphenol A content in microplastics detected in the human body is positively correlated with the incidence of diabetes mellitus (Jadhav, 2021). Other studies conducted on experimental animals have also shown that microplastics have the potential to have negative impacts on health such as Alzheimer's, metabolic disorders, gastrointestinal disorders, fertility disorders, impaired liver function and kidney problems (Park, et al., 2020). Other research shows that microplastics exist in the placenta of pregnant women who have given birth. This allows for the effects of transgenerational plasticizers on metabolic and reproductive processes (Ragusa, et al., 2021). Therefore, it is necessary to conduct an in-depth study of the negative impact caused by microplastics on human health. Based on the background that has been explained, a literature review will be conducted on the impact of microplastics on the coastal environment, biota and potential health risks caused by microplastic exposure.

METHOD

This research is a literature review. Systematic review is a term used to refer to a specific research methodology or research to collect and evaluate research related to a particular focus on a topic. The database used in this article search uses Google Scholar and ScienceDirect with the keywords "microplastic, plastic waste effect, coastal microplastic, microplastic marine fish, microplastic and health effect", which has been done by previous researchers both from the national and international levels, but the article search is more focused on focusing on international articles.

The systematic review aims to answer specific research questions regarding microplastic pollution in coastal areas and the potential health risks that may arise from microplastic exposure in coastal areas. In finding suitable articles, the PRISMA method is used to screen articles that are suitable for topics to be studied in depth. PRISMA is a collection of evidence-based minimum items for reporting in systematic reviews and meta-analyses. PRISMA primarily focuses on reporting reviews that evaluate the impact of interventions but can also be used as a basis for reporting systematic reviews with purposes other than evaluating interventions (e.g. evaluating etiology, prevalence, diagnosis or prognosis).

Downloaded articles are articles that have abstracts that are researched and fully available. The selection of literature to be reviewed is determined based on inclusion and exclusion criteria. Inclusions include: (1) Literature taken has a range between 2018-2024, (2) Articles that can be accessed in full pdf. Exclusions include: (1) Articles that do not correspond to the topic "Microplastic Pollution in Coastal Areas," (2) Articles that are not original research.

RESULTS AND DISCUSSION

RESULTS

There are 30 articles that can be found and downloaded, but the articles that can be downloaded are full pdf and according to the topic, namely microplastic pollution in coastal areas and marine life, only 10 articles. The results of article synthesis were carried out on 10 articles found can be seen in Table 1.

The results of the synthesis of the article showed that microplastic pollution in coastal areas not only pollutes the environment such as seawater and sediment but has also contaminated marine fish living in the estuary. Microplastic contamination in fish that lives in waters has the potential to bring microplastics into the human body through the consumption of these marine fish. The results of the review also showed that the most detected types and content of microplastic polymers were fibe and fragment types while the dominant microplastic polymers were polyethylene, polypropylene and polyester. These microplastic polymers, if they enter the human body, have the potential to cause public health problems.

Table 1. List of Microplastic Pollution in Coastal Areas and Marine Life Articles

No.	Author / Title	Article Review Results	Conclusions and Findings	Types and Content of Microplastic Polymers
1.	Murugan Sambandam, et al. 2022. Occurrence, characterization,	This study investigated the abundance, distribution and characterization (shape, size, color, chemical composition) of	Microplastic abundance contained in sediments has High spatial variance was	Forms of microplastics: Fiber Fragments

No.	Author / Title	Article Review Results	Conclusions and Findings	Types and Content of Microplastic Polymers
	and source delineation of microplastics in the coastal waters and shelf sediments of the central east coast of India, Bay of Bengal. Chesmosphere. https://doi.org/10.1016/j.chemosphere.2022.135135	microplastics (MPs) in surface water and sediments from the coastal shelf region of central east India. Microplastics in surface water and sediments were predominantly blue in color. Fibers (77%) and fragments (38%) were the dominant morphotypes in surface water and sediments, respectively. Surface characterization studies using Scanning Electron Microscope (SEM) highlighted the progress of particle breakdown; Microplastics (<1 mm) accounted for >50% of the total and were dominant in the offshore region (10 km). The results revealed that the major source of microplastics is likely to be riverine runoff and fishing-based activities.	observed in Microplastics concentrations and abundances ranged from 1.09 × 105 to 0.1 × 105 particles/km in surface waters and from 80 ± 28 to 480 ± 255 particles/kg sediment. Microplastic contamination was found at moderate levels compared to other areas. Most MPs detected in surface waters and sediments were <1 mm in size, in the form of fibers or fragments, blue in color, and composed of polyolefins.	Film Pellets Microplastic polymer content: Polyproplylene Polyethylene Polyamide Polystyrene Polyvinylchloride Polyethylene terephthalate
2.	Udai Ram Gurjar. 2022. Microplastics pollution in coastal ecosystem off Mumbai coast, India. Chemosphere. https://doi.org/10.1016/j.chemosphere.2021.132484	The average abundance of Microplastics recorded in water samples was 372 ± 143 grains/liter and 9630 ± 2947 grains/kg dry weight (DW) in sediment samples. The average abundance of Microplastics in pelagic fish species ranged from 6.74 ± 2.74 to 9.12 ± 3.57 items/individual and in demersal species the values ranged from 5.62 ± 2.27 to 6.6 ± 2.98 items/individual. In terms of shape, four types of Microplastics were observed in surface water, sediment and all studied species, mainly fibers, followed by fragments, pellets/beads, and films. Seven different colors of Microplastics (red, blue, black, translucent, brown, green, and yellow) were observed from the studied samples. Microplastics with a size below 250 μm formed the dominant size in surface water, sediment and biota samples. Thus, the presence of Microplastics in the studied biota indicates the transfer of MPs	This study assessed the concentration of microplastics in water, sediments and marine organisms, revealing that MPs were found in both pelagic and demersal species, but the relative abundance of MPs was higher in pelagic species. This illustrates that species inhabiting shallow coastal waters are more susceptible to MP consumption as anthropogenic activities along coastal areas lead to higher MP concentrations in coastal areas. Smaller MP sizes (<250 μm) were predominantly observed in the guts of the studied species, indicating the need for consumption of non-veined and cut shrimp	Forms of microplastics: Fiber Fragments Film Pellets/balls Microplastics polymer content: Polypropylene Polyethylene Polyvinyl chloride Polystyrene Polyethylene terephthalate Nylon Polycarbonate Polyacrylamide Polyester Poly methyl methacrylate Polyamide

No.	Author / Title	Article Review Results	Conclusions and Findings	Types and Content of Microplastic Polymers
		through interconnected food chains/webs to higher trophic levels and the occurrence of Microplastics in the gut of fish underlines the need for further studies on processing interventions to reduce microplastic contamination of fish for humans.	and fish species.	
3	Md. Jaker Hossain, et al. 2022. Surface water, sediment, and biota: The first multi-compartment analysis of microplastics in the karnafully river, Bangladesh. Marine Pollution Bulletin. https://doi.org/10.1016/j.marpolbul.2022.113820	Microplastic pollution in seawater and sediments is often detected as transparent/white and blue microplastics, while microplastics found in biota are mostly black and red, indicating a color preference during biological uptake. The Bay of Bengal receives 61.3 × 109 microplastic items per day. The feeding zone of biota influences the level of microplastics, with a trend of pelagic > demersal > benthic > benthopelagic. Polyethylene and polyethylene terephthalate are the most abundant polymers. Using the average fish intake level in Bangladesh, we calculated the possible consumption of 4015-7665 microplastic items/person/year.	Microplastics were found in all water, sediment, fish, and shellfish samples. The abundance of microplastics was mostly found in surface waters and ranged from 0.57 ± 0.07 to 6.63 ± 0.52 items/L, with an average of 2.11 ± 1.15 items/L, indicating moderate pollution levels compared to other rivers. Microplastic concentrations in aquatic species varied from 5.93 ± 0.62 to 13.17 ± 0.76 items/species, with an average of 9.82 ± 1.52 items/species. The presence of MPs in water, sediment, and aquatic species indicates the level of plastic pollution.	Forms of microplastics: Fiber Fragments Film Pellets
4.	Dalila Aldana Aranda, et al. 2022. Widespread microplastic pollution across the Caribbean Sea confirmed using queen conch. Marine Pollution Bulletin. https://doi.org/10.1016/j.marpolbul.20	In this study, Group A had the highest levels of microplastics and consisted of two sites in Central America: Belize (270 ± 55 microplastics/queen conch) and Alacranes (203 ± 29 microplastics/queen conch). Group C, statistically different from all other sites, consisted of one Central American site, Puerto Morelos with the lowest abundance of microplastics (43 ± 2/queen conch). Fiber	This study has demonstrated the effectiveness of using queen conch as an indicator of marine microplastic contamination across the Wider Caribbean region, and the utility of non-destructive techniques that can be adopted for long-term microplastic	Microplastic form: Fiber Film Ball

No.	Author / Title	Article Review Results	Conclusions and Findings	Types and Content of Microplastic Polymers
	22.113582	microplastics were the most frequently found at each site and represented between 60 and 98% of all microplastic particles found. Of all the microplastic particles collected, 79% were fibers, 11% were films and 10% were balls.	contamination sampling programs.	
5.	Mitshuru Yagi. 2021. Microplastic pollution of commercial fishes from coastal and offshore waters in southwestern Japan. Marine Pollution Bulletin. https://doi.org/10.1016/j.marpolbul.2021.113304	We examined Microplastics in the digestive tract of two pelagic fish (n = 150) and five demersal species (n = 235). The fish were caught by pole and line, and bottom trawl at different geographical positions. MPs in pelagic fish (39.1%) were more abundant than in demersal fish (10.3%) and were larger in size. In addition, MPs were correlated with habitat depth and species type and variation in the form and polymer composition of MPs was observed.	This study is the first to document the presence of microplastics in the gastrointestinal tract of two pelagic and five demersal fish species from coastal and offshore waters near Kyushu, Japan. Six of the seven fish species caught by pole and line, and trawl fishing had MPs in their GIT. The incidence of MPs and the amount of MPs ingested varied according to fishing depth, habitat type, and feeding strategy of the fish species.	Microplastic form: Fiber Film Fragments Polymer type microplastic content: Polyethylene Methyl methacrylate Polyisoprene Polyester Polypropylene Poly naphthalene Poly p phenylene Poly polystyrene Polyvinyl chloride
6.	S.A. Vital, et al. 2021. Do Microplastic contaminated seafood consumption pose a potential risk to human health?. Merine Pollution Bulletin. https://doi.org/10.1016/j.marpolbul.2021.112769	Microplastics in the form of blue fragments of polypropylene (PP) with a length of 280 m were detected in one of the crab samples with gills from site 4 (Faro). In addition, a 250 µm long green polyethylene (PE) fragment was found in the hepatopancreas of one Mullus surmuletus. Instead, lawmakers were present in shells from both locations. At site 4 (Faro) of all the shellfish analysed only one shellfish had one MP and two others corresponding to a percentage of 17% while in shellfish from site 6 (Tavira) is the only one clam that has two fragments (6%) that correspond to the range of 0.1-0.2 MP/clam.	A wide range of sizes, shapes, colors and types of MP are detected in commercial shellfish and fish species on the southern coast of Portugal. MP levels are generally lower in the Ria Formosa lagoon than on the coast. The levels of MP ingested by shellfish tend to be related to pollution sources that can cause adverse effects on these commercial species. This data can be considered as baseline from which trends can	Microplastic form: Fragment Pellet Flake Beads Line Polymer type microplastic content: Polypropylene Polyvinyl acetate Transparent pellet Brown line Expanded polystyrene Ethylene vinyl acetate

No.	Author / Title	Article Review Results	Conclusions and Findings	Types and Content of Microplastic Polymers
			be assessed is important to understand the potential human health risks posed by the consumption of seafood contaminated by MP.	
7.	Lucia Guilhermino, et al. 2021. Microplastic in fishes from an estuary (Minho River) ending into the NE Atlantic Ocean. Marine Pollution Bulletin. https://doi.org/10.1016/j.marpolbul.2021.113008	Wild fish (Cyprinus carpio, Mugil cephalus, Platichthys flesus) from the estuary of the NE Atlantic coast were investigated for plastic contamination (N = 128). Of the 1289 particles taken from fish samples, 883 were plastic. Of these, 84% are fibers out of 97% of microplastics present. Thirty-six polymers were identified. Microplastic pollution in the Minho estuary is also reflected in the overall percentage of 94% fish with plastic (79 to 100% per species) and the overall average concentration (± SD) of 8 ± 8 PL/fish (2 ± 2 to 11 fish). ± 9 PL/fish per species) which is one of the highest values reported in the literature. Eighty-nine percent of fish had plastic in GT and 27% in gills, and the overall average (± SD) was 6 ± 7 and 0.5 ± 1.0 PL/fish, respectively.	The conclusions of the research conducted emphasized the urgent need for further research on contamination in estuarine and coastal areas and their contamination of biota by microplastics. Microplastic pollution in fish ecosystems may be risky, in the contamination of fish and other organisms consumed by humans so as to bring microplastics into the human body.	Fiber: Polypropylene, polyacrylate, polyethylene, polyester, rayon Fragmen: cellulose acetate, polypropylene, polyacrylate, polyethylene, polyester, rayon.
8.	Feng Yuan, et al. Microplastic pollution in Larimichthys polyatis in the coastal area of Jiangsu China. 2021. Marine Pollution Bulletin. https://doi.org/10.1016/j.marpolbul.2021.113050	In this study, microplastic pollution (MP) was identified in 349 specimens of Larimichthys polyactis from the coastal area of Jiangsu Province, China. The abundance of MP in L. polyactis was 1.03 ± 1.04 heads/individual and 0.95 ± 0.92 heads/10 g (wet weight). The abundance of MP in specimens from the Haizhou Bay fishing area is slightly higher than that of the specimens from the Lvsi fishing area. Spearman's correlation shows that MP abundance is positively correlated with body length when expressed as an item/individual.	Polymer type microplastic content: In general, MP pollution in L. polyactis in the coastal areas of Jiangsu Province is at moderate to low levels, compared to wilayah lain di Cina. microplastics possible indirectly ingested by higher trophic levels through the consumption of L. polyactis. In this study, the researcher suggested that future research	Microplastic polymer content : Chellophane Rayon Acrylylic Polyethylene terephtalat Polyester Polystyrene Polypropilene Poly amide Resin alkyd Amide polyester

No.	Author / Title	Article Review Results	Conclusions and Findings	Types and Content of Microplastic Polymers
			should focus on the transmissibility and toxicological effects of MP at a reasonable range of concentrations.	
9.	Adian Khoironi, et al. Evaluation Of Polypropylena Plastic Degradation And Microplastic Identification In Sediment At Tamak Lorok Coastal Area, Semarang, Indonesia. 2020. Marine Pollution Bulletin. https://doi.org/10.1016/j.marpolbul.2019.110868	The morphology of the plastic surface changes, indicating plastic disorientation. The results showed that organic carbon decreased by 3.15%, 6.67%, and 16.76% respectively for Polypropylene applied to surface water, at a depth of 50 cm and at a depth of 170 cm. Of the six stations, Polypropylene microplastics are the dominant type, where microplastics in sediments are biofouled fibers with sizes ranging from 255.23 to 1245.71 µm; however, in seawater, it is 7-111 particles/10 mL and measures 270.27-1279.12 µm	The identification of microplastics in seawater and sediment concluded that microplastics have polluted the coastal ecosystem of Tambak Lorok. Further research is needed to investigate the presence of microplastics in fish food products.	Microplastic polymer content : Fiber Filamentous Polymer type microplastic content: Polypropylene
10.	Bin Chen, et al. 2020. Observation of microplastics in mariculture water of Longjiao Bay, southeast China: Influence by human activities. Marine Pollution Bulletin. https://doi.org/10.1016/j.marpolbul.2020.111655	The results showed that microplastics are widely found (250-5150 particles/m³, average 1594 particles/m³) in the water of aquaculture ponds. Microplastics of fragment (41.36%) and fiber (34.93%) are the main components of microplastics and colors predominantly white (45.42%), followed by yellow (32.13%) and black (19.55%). Most microplastics have a particle size between 0.30 µm to 5.00 µm (92.03%). The proportion of PE (34.40%) and PET (30.18%) accounted for more than 60% of the microplastics detected.	In this study, researchers found microplastics that are commonly found in shrimp farming sites. The abundance of microplastics identified ranged from 250 to 5150 (average 1594 ± 1352) particles/m^3. Abundance microplastics in aquaculture have the potential for a positive correlation with local seafood yields and a negative correlation with land area.	Chemical content of microplastic polymers: Polyethylene Polyethylene terephthalate Polystyrene Polypropylene Polycarbonate Polyamide Polyacrylic acid Microplastic polymer content : Fiber fragmen

DISCUSSION

Microplastic-contaminated Objects on The Coast

There are only 30 articles that can be downloaded, but only 10 articles that can be downloaded in accordance with the topic and specific to the coastal area, so only 10 articles are reviewed. Of the 10 articles that have been reviewed, some components in coastal areas contain microplastics. From Table 2, it is explained that of the 10 articles that were reviewed, there were 2 articles that were found that sediments contain microplastics, 5 articles were found that microplastics have contaminated marine fish and 3 articles were found that microplastics have contaminated seawater.

Table 2. Microplastic-Contaminated Objects Found from Article Review Results

No.	Contaminated objects	Number of articles	Percentage	Types of Microplastics	Review article
1	Sediment	2	20 %	Fiber, Fragment, Film Pellet	
2	Fish (marine biota)	5	50 %	Fiber, Fragment, Pellet	10
3	Waters	3	30%	Fiber, Filamen, Fragment, Film Pellet	

The study shows that microplastics are detected in waters, sediments and marine organisms, and studies show that the abundance of microplastics is higher in marine organisms (Gurjar, et al., 2021). Research on the abundance of microplastics in marine life or fish shows that marine biota such as Larimichthys Polylactic fish is 1.03 ± 1.04 fish/individual and 0.95 ± 0.92 fish/10 grams (wet weight) (Yuan, et al., 2021) Research at the mouth of the Minho River states that the overall percentage of fish contaminated with Microplastics is 94% (79 to 100% per species), 89% of Microplastics in fish are found in the digestive tract, and 27% in gills, the average Microplastics found were 6 ± 7 and 0.5 ± 1 Particle/fish (Guilhermino, et al., 2021).

From these various types of literature, the objects that are most often encountered and found to contain microplastics are sediments, marine life, and aquatic areas. Studies have shown that microplastics range from 0.57±0.07 to 6.63±0.52 grains/L in surface water, 143.33±3.33 to 1240±5.77 grains/kg dry weight in sediments, and 5.93±0.62 to 13.17±0.76 grains/species in aquatic biota (Hossain, et al., 2022). The abundance of microplastics contained in sediments is higher in locations with higher population densities than in areas without high population density (Hayes et al, 2021). Microplastics will be widely spread on the coast or coastal areas because the riverbed reaches the beach. The prevalence and diversity of microplastics in estuarine sediments in southern Australia tend to be higher than on the coast, and the particles found in coastal areas are more significant than in rivers. (Hayes, et al., 2021). Other studies have shown that the abundance and source of microplastics on the coast and sediments come from rivers (Sambandam, et al., 2022) Locations with large populations and large areas of forest and construction land tend to have high concentrations of microplastics, and this study shows that sediment samples are more stable in reflecting the presence of microplastics (Zhang, et al., 2022).

Microplastic contamination on the coast can affect living things there, where species that inhabit shallow coastal waters are more susceptible to consuming microplastics. (Gurjar, et al., 2022). Microplastics that pollute the coastal environment have the potential to disrupt the ecology on the coast and have the potential to contaminate living things in coastal areas such as marine life, shellfish and others. Microplastics that pollute living things living in coastal areas are usually consumed by coastal communities so that they have the potential to enter the human body.

Most of the microplastics found in coastal waters in China are fragments (70%), then fibers (24%), films (5%), and others (1%); microplastics with this shape range in size from 0.05mm to 4mm, but more than 80% are less than 0.05 mm (Zhang, et al.,2020). Microplastics can contaminate marine life and enter the human body, which consumes contaminated marine life (Mulu, et al., 2020). The results of a study conducted on *Sardinella lemuru* showed that out of 15 fish samples, 15 microplastic particles were found in the fish's digestive tract. (Yudhantari, et al., 2019). Fish species that inhabit shallow beaches are more susceptible to microplastic consumption due to anthropogenic activity along the coast, with higher concentrations of microplastics in coastal areas (Garcés-Ordóñez, et al., 2022) Fish on small islands are at risk of microplastic contamination, where studies conducted on Indonesia's outer islands show that the samples examined contain fiber-type microplastics. (Yona, et al., 2020). Microplastics that contaminate marine life have the potential to bring microplastics into the human body through the consumption of seafood.

Microplastics can also contaminate other organisms, such as soil organisms. The results of the study showed that exposure to microplastics showed a significant change in activity, but at the relevant exposure concentrations, the threat to soil biota would be minimal, other areas with higher concentrations of microplastics could be assumed as early warnings for more severe and harmful effects. (Lackmann, et al., 2022). Microplastics of fiber and fragment type are categorized as secondary microplastics derived from plastic fragmentation. According to Browne (2011) and Jeyasanta (2020), microplastics in the form of fibers are a type of microplastic that comes from domestic activities such as laundry waste and other fishery activities such as the use of ropes and fishing nets (Yona, et al., 2021).

Microplastic fiber can come from clothing fibers, ropes, nets, threads, paranets, plastic sacks, raffia ropes, for film types it can come from crackle bags, food packaging, toiletry packaging, mulch, polybags, low/high tunnel plastic, UV plastic, and for fragment types can come from drinking bottles, jars, buckets, mica maps, paralon pipes, containers/derigen, irrigation pipes, plastic pots (Sutanhaji, et al., 2021). The most common type of microplastic found is the fragment type. This is evidenced by the fact that fragments are the result of pieces of plastic products with very strong synthetic polymers (Nugroho, et al., 2018). Therefore, it is necessary to monitor and further manage plastic waste caused by daily activities of the community to minimize micro-application pollution in the water area.

Types of Microplastic Polymers and Potential Public Health Risks

In addition to having different shapes, the types of microplastic polymers contained are also different. Based on the results of a review of 10 articles, it was found that the most common types of microplastics are polypropylene, polyethylene, and polystyrene. Based on the results of a study conducted in Turkey, it was shown that out of 26 microplastic samples, the most identified were microplastics containing polypropylene polymers, while the others were polypropylene, polyethylene terephthalate, and polystyrene (Almas et al., 2022) Other studies showed polyethylene (PE) was considered the dominant form of microplastics in surface water samples and sediments (Ding et al., 2022) Polypropylene, high-density polyethylene, and polystyrene were most frequently extracted sediments (Hayes et al., 2021)

The most common microplastic accumulation in fish is found in fish liver, based on studies conducted showing results that fish containing microplastics can be an additive in bioaccumulation of contaminants, and bioaccumulation of contaminants significantly occurs in fish liver (Herrera et al., 2022). Other studies have shown that fish containing microplastics have significantly higher levels of lipid peroxide in the brain, gills, and back muscles and can increase brain acetylcholinesterase than fish without microplastics. These results showed oxidative damage of lipids in the gills and muscles of fish, thereby causing neurotoxicity through oxidative lipid damage and induction of acetylcholinesterase regarding exposure to microplastic chemicals. (Barboza et al., 2020). Microplastic pollution threatens coastal ecosystems and fishery-dependent communities (Garcés-Ordóñez et al., 2022). Coastal communities or people who are used to consuming marine fish have a significant risk of being contaminated with microplastics. The average microplastics consumed in coastal Bangladesh are 4015-7665 microplastics/person/year (Hossain et al., 2022).

Recent research shows that microplastics in the human bloodstream are composed of polymerized polyethylene, polypropylene, and styrene (Leslie et al., 2021), Another study shows that Microplastics enter through inhalation by detecting the presence of Microplastics in the human lungs, with the composition of the most microplastics in the lower lungs (Jenner et al., 2022). Microplastics that contaminate humans can enter human organs through the bloodstream (Turroni et al., 2021) Microplastic polystyrene that enters human blood can cause hemolysis, and if in high concentrations can cause inflammation (Hwang et al., 2020) With the entry of microplastics into human blood, it is possible to cause health problems for humans but further research is still needed on the toxic effects of microplastics on human health. Microplastics can cause toxicity problems, both acutely and chronically if exposed regularly and in large amounts, but further research is still needed on the toxic impact of microplastics on humans and the potential health risks that can be caused by direct and large exposure to microplastics.

Nanoplastics and microplastics are at high risk of chronic toxicity, such as cardiovascular toxicity, hepatotoxicity, and neurotoxicity, genotoxicity (Yuan,et al. 2022) Exposure to microplastics in humans can be at risk of causing oxidative stress, cytotoxicity, neurotoxicity, and immune system disorders, and microplastics are produced through blood circulation throughout the human body (Bhuyan et al., 2022) Mycoplastic types of polyethylene terephthalate were tested using test animals, showing results that microplastics can cause weight loss, cysts, intestinal obstruction, damage, and death of people by 40%; Another study showed that the administration of low-density polyethylene microplastics caused the presence of microplastic particles in the blood of experimental animals, the higher the microplastic particles in the blood caused an increase in the expression of malondialdehyde and 8-OHdG metabolites in hippocampal neurons, the results showed that there was damage to the hippocampal neuronal membrane and deoxyribonucleic acid (Lin et al., 2023). Microplastics detected in the placenta of the mother who gave birth have the potential to cause problems in the metabolic and reproductive processes (Ragusaet al., 2021).

CONCLUSION

Based on the results of a review of 10 articles, it was found that some objects contain a lot of microplastics in coastal areas, such as sediment and seawater. Microplastics that pollute the environment such as seawater and sediment can have an impact on marine life so that they have the potential to contaminate marine life. The most dominant microplastics found in marine waters are fibers, fragments, and films, but the most common are fibers and fragments. The types of microplastic polymer chemical compounds detected from the results of the review of the 13 articles are polypropylene, polyethylene, and polystyrene.

Microplastics that contaminate marine life have the potential to bring microplastics into the body so that they have the potential to endanger the health of people living on the coast and people who consume various types of contaminated marine fish. Various potential health risks that can arise from exposure to microplastics are gastrointestinal disorders, liver function disorders, reproductive disorders, cancer, kidney function disorders, metabolic disorders and disorders in thinking or forgetting.

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