

The Impact of Visitors and Domestic Waste on Water Quality and Fish Ecosystems in the Cirahab Water Source in Curuggoong Village, Padarincang District, Serang Regency, Banten

Original Article

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Abstract

Detergent is a product that has a function as a dirt remover on clothes when washing, detergent is thrown away excessively in the waters it will have a bad impact on aquatic biota, such as fish, aquatic plants, or organisms that live in water, besides that it will also reduce the O₂ levels in the water, damage organs in fish and death in fish due to detergent pollution. The more the level of detergent pollution in the water, the more severe the death of the aquatic biota, and vice versa, the lower the level of pollution, the better the life of the aquatic biota there. Pollution is also one of the disruptors in the respiration process in the ecosystem in it so that the ecosystem will be disturbed by the amount of pollution from tourists and the domestic waste they bring. This research was conducted qualitatively using observational and experimental methods to measure detergent levels in the waters. The parameters examined were water temperature, pH, chemical content, and the fish present in the Cirahab waters. The results showed very high detergent concentrations, with plastic waste, bottles, and food waste from visitors scattered throughout the Cirahab waters. This disrupted the aquatic ecosystem and threatened the survival of aquatic life, including fish. Fish experienced respiratory problems, including gill damage, and even mass mortality in the Cirahab waters.

Keywords: Detergent Contamination, Domestic Waste, Fish Ecosystem, Visitors, Water Quality.

1. Introduction

Cirahab is a local recreational bathing site located in Curuggoong Village, within the Padarincang District of Serang Regency, Banten. It is frequently visited by tourists from Ciomas, Pabuaran, Serang City, and even from as far away as Tangerang and Jakarta. The Cirahab baths are located at Jl. Palka, Km. 24, Serang, Banten. Cirahab is a place used by local residents for bathing, washing, and other activities, which generates detergent waste in the waters. Waste frequently dumped in the waters includes shampoo, soap, used laundry detergent, and other household items (Chaturvedi & Tiwari, 2013). This inevitably negatively impacts water quality and disrupts the fish ecosystem in Cirahab's waters, potentially killing fish in the waters surrounding the river.

Research by Sutrisno (2017) indicates that domestic waste contributes 60% to 70% of river pollution. One of the most common sources of water pollution is detergent waste from washing household items, which can cause various damage and even death to aquatic life. Furthermore, detergent is a substance that functions as a dirt remover on clothing. It contains three ingredients: surfactants, builders, and additives, such as bleaching agents and fragrances



(Achaw & Danso-Boateng, 2021). Many residents around the Cirahab waters bathe and wash their clothes, allowing detergent waste to flow freely into the waters.

The large amount of detergent waste consumed by fish can cause organ damage, such as damage to the gills and livers (Sadiqa et al., 2024). This is because detergents are toxic and poisonous to the organisms that consume them. The gills are the primary respiratory organs of fish. Excessive detergent waste in the waters can damage and destroy these gills due to the detergent's toxic nature (Borah, 2022). Furthermore, this detergent waste can damage other ecosystems in the waters. Detergents in water damage the respiratory system of fish gill epithelium, causing them to lose balance and have difficulty breathing (Novotny, 2021). They then die with their mouths wide open. Furthermore, the gill epithelium becomes swollen, and the fish's body becomes covered in mucus.

Detergents polluting waters also cause complications in fish, including hemorrhage, intestinal overgrowth, and subepithelial gill lesions (Ogundiran et al., 2009). Fish can die due to the increased detergent content in the water (Pechiammal & Vasanthi, 2017). In carp, the surfactant from the detergent Deodecl Sulfanate at a concentration of 5 mg/L causes fusion of the gill lamellae and necrosis (damage to cell tissue) in the gill epithelium, which tends to fuse. The higher the detergent concentration in the water, the more severe the damage to the fish epithelial cells, leading to mass fish mortality.

In light of these environmental pressures, this study aims to evaluate how recreational visitors and their domestic waste affect the Cirahab water source due to environmental pressures. It specifically looks at the degradation of important water quality parameters and the impact on the local fish ecosystem. The findings are intended to provide crucial data for local environmental management and conservation efforts.

2. Methods

This study was conducted in the Cirahab waters, located in Curuggoong Village, Padarincang District, Serang Regency, Banten, in February 2025. The research employed an observational survey method, which is commonly used in environmental and aquatic studies to describe and assess natural conditions without experimental manipulation. This approach is appropriate for evaluating water quality and ecological conditions based on direct field observations. Field observations were carried out to document the physical and environmental characteristics of the Cirahab waters, including visible water conditions and surrounding activities that may influence water quality. Observational methods are grounded in aquatic ecology theory, which emphasizes the importance of in situ observations for understanding interactions between water bodies and their surrounding environments (Sagarin & Pauchard, 2010).

In addition to field observations, water samples were collected for chemical analysis to assess water quality. The analysis of chemical parameters is based on water quality assessment theory, which states that chemical indicators are essential for evaluating the suitability and health of aquatic ecosystems. The collected samples were analyzed to determine key chemical properties of the water, providing quantitative data to support observational findings. The combination of direct observation and chemical analysis allows for a more comprehensive assessment of the Cirahab waters by integrating qualitative environmental observations with quantitative water quality measurements. This integrated approach enhances the reliability and validity of the research findings.

3. Results and Discussion

3.1. Research Results

This study, conducted in the Cirahab waters, aimed to determine the impact of visitors and associated domestic waste on local water quality and the fish ecosystem. Pollution also has a negative impact on water quality and can damage the fish ecosystem, due to the toxic chemical content found in detergents and other waste brought by visitors when they come to Cirahab, such as plastic waste, bottles or other materials that pollute the waters in Cirahab. This can also be seen in Figure 1 below:



Figure 1. Visitors to Cirahab Spring Water

This research also aimed to determine the impact of visitors and domestic waste such as detergents, soap, trash, and other substances on the aquatic ecosystem of the Cirahab water source, based on the level of pollution and its impact on the waters within. One of the causes of the high levels of pollution in the waters is the excessive use of accumulated domestic waste, which is toxic to the fish ecosystem there, thus contaminating the organisms living in the waters.



Figure 2. Cirahab Spring Waters

Visitors often bring home waste such as plastic snack bags, food wrappers, drink bottles, or leftover food, which they discard into the Cirahab River. This disrupts the aquatic ecosystem and even leads to numerous fish deaths.

Aquatic ecosystems, which are predominantly composed of abiotic components, are water itself. Therefore, any ecosystem, whether in lakes, rivers, or even the sea, is susceptible to environmental pollution if frequented by visitors or tourists.

Environmental pollution is also defined as a change in abiotic factors resulting from activities that exceed the limits of a biotic ecosystem. Pollution can also be caused by various factors, including humans. Humans are the primary cause of various types of pollution, both

in the environment and in waters. Uncontrolled population growth leads to increased levels of pollution.

Unknowingly, many daily activities have contributed to environmental damage, such as the use of detergents, soaps, and other substances that poison aquatic life. Human activity is a major cause of much pollution of aquatic ecosystems and the environment, disrupting and even destroying both.

Further, many tilapia fish died suddenly due to poisoning from domestic waste, such as detergents, soaps, and food waste thrown away by visitors or tourists during their visit to the Cirahab baths. The dead fish were characterized by white eyes, slimy bodies, hardened gills, and open mouths due to the lack of oxygen in the water, causing many of the fish to die suddenly. Images of dead fish can be seen in Figure 3 below.



Figure 3. Fish Dies Suddenly

The fish found in Cirahab are very diverse, including wader (paray), tilapia, carp, catfish, chana (Bogo), eels, Siamese gourami, sili-sili, jendol fish, semak fish, and other species that inhabit the Cirahab aquatic ecosystem in Padarincang District, Serang Regency. These fish often die suddenly due to excessive human activity there, especially on Saturdays and Sundays, or holidays, when people visit Cirahab. Consequently, this high level of human activity in Cirahab waters further degrades the fish ecosystem and disrupts their reproduction. Furthermore, many people catch fish there by netting, fishing, and many people electrocute fish in the waters of Cirahab's springs. These are the main factors contributing to the damage to the Cirahab fish ecosystem.

Table 1. Cirahab Water Parameters

No.	Water Parameters	Water Parameters Measurement Location		
		1	2	3
1	Water Temperature (°C)	24	23	23
2	Depth of water flow	1	1.5	2
3	Clarity Level	80	90	90
4	Water pH	7	6.7	7
5	Current Speed (m/s)	0.20	0.30	0.25

As shown in table 1, the measured water quality parameters in the Cirahab waters, temperature of approximately 24 °C, water depth around 1 meter, clarity of about 90 cm, neutral pH (7), and a moderate current speed of approximately 0.25 m/s, indicate generally good environmental conditions for supporting freshwater organisms. These values fall within ranges commonly considered suitable for aquatic life, suggesting that the basic physical and chemical characteristics of the water do not significantly limit ecosystem functioning. Water temperature and pH support normal biological processes, while sufficient clarity allows light

penetration and primary productivity. However, the shallow depth and moderate flow may increase the sensitivity of the ecosystem to external disturbances, as pollutants can accumulate more easily under such conditions. Overall, the results suggest that the living quality of the area is good to moderate, but potentially vulnerable to degradation if additional stressors are introduced.

3.2. Discussion

The results of this study indicate that human activities, particularly tourism and domestic waste disposal, have a significant impact on the water quality and fish ecosystem of the Cirahab waters. The measured physical and chemical parameters, water temperature, depth, clarity, pH, and current speed, generally fall within ranges that are considered suitable for freshwater fish habitats. However, despite these seemingly favorable conditions, the observed fish mortality suggests that water quality degradation is primarily driven by anthropogenic pollution rather than natural environmental factors.

Previous studies on freshwater ecosystems have shown that domestic waste, especially detergents and soaps, contains surfactants and chemical compounds that are toxic to aquatic organisms (Kulkarni & Jaspal, 2023; Chaturvedi & Tiwari, 2013). These substances can reduce dissolved oxygen levels, damage fish gills, and disrupt metabolic processes, leading to sudden fish deaths. The symptoms observed in dead fish in the Cirahab waters, such as open mouths, hardened gills, and slimy bodies, are consistent with findings from earlier research that associates such characteristics with chemical poisoning and hypoxic conditions in polluted waters.

The neutral pH values recorded in this study (around pH 7) align with optimal conditions reported in previous studies for freshwater fish survival. Similarly, the water temperature of approximately 23-24°C falls within the tolerance range for many tropical freshwater species, including tilapia and carp. These results indicate that temperature and pH were not the primary stressors, supporting previous findings that chemical pollutants and organic waste are often more critical drivers of ecosystem degradation than basic physical parameters alone (Akhtar et al., 2021). Water clarity levels ranging from 80-90 cm suggest relatively clear water conditions. However, prior studies have emphasized that high clarity does not necessarily indicate low pollution levels, as many dissolved chemical pollutants are not visually detectable. This supports the notion that chemical contamination from visitor activities can occur even when physical water characteristics appear normal.

The increased human activity during weekends and holidays, as observed in Cirahab, has been widely reported in earlier research as a major factor accelerating aquatic ecosystem degradation. Activities such as improper waste disposal, fishing pressure, and destructive practices like electrofishing contribute to habitat disturbance, reduced fish populations, and impaired reproduction. The diversity of fish species recorded in Cirahab reflects a once-healthy ecosystem, but continued anthropogenic pressure threatens its sustainability. Overall, the findings of this study are consistent with previous research indicating that uncontrolled tourism and domestic waste disposal are major contributors to freshwater pollution and fish mortality. Although the physical water parameters remain within acceptable ranges, the accumulation of toxic substances and excessive human interference have caused ecological imbalance. These results highlight the importance of effective waste management, visitor regulation, and conservation strategies to protect the Cirahab aquatic ecosystem.

4. Conclusion

Visitors or tourists are the main factor in the damage to the fish ecosystem in Cirahab, in addition to the activities of residents who wash and bathe, causing detergents and toxic materials that flow into the waters of Cirahab, killing fish suddenly. Because the detergent content in the water will also greatly affect the life of the fish ecosystem. Where the more detergent in the water, the more it will worsen the fish ecosystem in it, causing fish to die suddenly with the characteristics of an open mouth, white eyes, slimy body due to detergent poisoning that local residents throw into the waters when bathing and washing clothes. In addition, polluted water and containing a lot of foam will cover the surface of the water, so that the water cannot provide the supply of Light and oxygen in it, causing fish to go to the surface of the water with their mouths open, the gill organs in the fish will then experience respiratory disorders and can experience fatal damage, resulting in the sudden death of the fish in the waters of Cirahab which are heavily contaminated by waste brought by tourists and detergents produced from washing clothes by residents.

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