



## Ph in Water Pollution Implications for Aquatic Life

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### Abstract

Due to its influence on the chemical and biological processes that take place in water bodies, pH is an essential parameter for evaluating water quality. Both natural and man-made factors, such as atmospheric deposition, industrial activities, and agricultural practices, can have an impact on the pH of water. The effects of pH on water quality on aquatic life, human health, and environmental sustainability are examined in this paper. Low pH values can result in the release of toxic metals from sediments, and pH changes can affect the solubility and availability of nutrients and minerals for aquatic organisms. The pH of water bodies can also be altered by human activities, which can have negative effects on aquatic life and human health. In order to ensure the safety of drinking water and promote environmental sustainability, pH levels in water bodies must be monitored.

**Keywords:** Water quality, aquatic life, human health, environmental sustainability

### Introduction

All living things, including humans, animals, and plants, require water for survival. Several factors influence the quality of water, including pH, a measurement of water's acidity or alkalinity. Because it affects the chemical and biological processes that take place in water bodies, pH is an important parameter for evaluating water quality. Both natural and man-made factors, such as atmospheric deposition, industrial activities, and agricultural practices, can have an impact on the pH of water. The implications of pH's influence on water quality for aquatic life, human health, and environmental sustainability are the subject of this research paper.

### How important pH is to the quality of water

The concentration of hydrogen ions ( $H^+$ ) in water is measured by pH. A pH of 7 indicates water that is neutral, a pH of less than 7 indicates acidic water, and a pH of more than 7 indicates alkaline water (Sengupta, B. 2013) [3]. The presence of dissolved minerals, the amount of organic matter, and the concentration of atmospheric gases like carbon dioxide can all have an impact on the pH of natural water bodies. The pH of water bodies can also be affected by human activities, such as agricultural and industrial practices (Environmental Defense Fund). 2017) [12].

Because it affects the chemical and biological processes that take place in water bodies, the pH of the water is an important parameter for determining the quality of the water. For instance, the solubility and accessibility of nutrients and minerals for aquatic organisms can be affected by pH (Hossain, *et al.*), (2019) [5]. Low pH levels can result in the sediments releasing toxic metals that can harm aquatic life. By reducing the availability of dissolved oxygen, which aquatic organisms require, high pH values can also harm aquatic life.

### Consequences for Aquatic Life

Aquatic life is significantly affected by water's pH. The physiology, behavior, and survival of aquatic organisms can be affected by changes in pH because they have adapted to particular pH ranges. Because they respire with dissolved

oxygen, fish and other aquatic organisms are particularly sensitive to pH changes (Wang, *et al.*, 2019) [4]. Hypoxia, which can be fatal to aquatic organisms, can result from a reduction in the amount of oxygen that is dissolved in the water due to low pH values. By altering the chemical composition of the water and making it less habitable for aquatic organisms, high pH values can also be harmful to aquatic life (web search). 2016 pH fact).

### Consequences for Human Health

According to a web search, the pH of water has an impact on human health as well. 2016 pH fact). The consumption of water with a pH outside the range of 6.5 to 8.5 can have negative effects on one's health. Copper and lead can be leached from pipes by acidic water with a pH below 6.5, which can be harmful to human health. According to Wang, *et al.*, alkaline water with a pH higher than 8.5 can cause gastrointestinal issues, skin irritation, and other health problems. 2019) [4].

### Sustainability of the environment

Additionally, an essential criterion for evaluating environmental sustainability is the pH of water. The chemistry and biology of water bodies can be affected by changes in pH, which can alter the structure and function of ecosystems (American Chemical Society). 2016) [13]. Alkalization can result in the proliferation of harmful algal blooms, while acidification of water bodies can result in the loss of biodiversity. The productivity of aquatic ecosystems can also be affected by changes in pH, which can have an impact on food security and economic sustainability (web search). 2016 pH fact).

### Review of Literature

Researchers and policymakers have long been interested in the role that pH plays in water quality. The effects of pH on aquatic life, human health, and environmental sustainability have been the subject of numerous studies.

Lee *et al.* conducted one study (2018) [1] looked at how pH affected freshwater fish's growth and survival. According to the findings of the study, fish may experience decreased

rates of growth and survival at pH values that are too low, whereas fish may experience increased rates of growth at pH values that are too high. The study came to the conclusion that freshwater fish's growth and survival depend on maintaining a neutral pH range.

Another study that was carried out by Kadirvelu *et al.* (2018) [2] looked at how pH affected how heavy metals were removed from water. The study found that the optimal pH for heavy metal removal from water is between 6 and 8, and that pH plays a crucial role in this process. The study came to the conclusion that effectively removing heavy metals from water requires controlling pH levels.

The effect of pH on human health has also been the subject of research. Sengupta (2013) [3] looked at how pH in drinking water affected human health in one study. According to the findings of the study, consuming water with a pH that is outside the range of 6.5 to 8.5 can have negative effects on one's health, including issues with one's digestive system and skin irritation. The study came to the conclusion that safe drinking water requires a pH range that is neutral.

The study of pH and water quality is also interested in environmental sustainability. Wang *et al.* conducted one study (2019) [4] looked at how pH affects how productive aquatic ecosystems are. According to the study, changes in pH can have a significant impact on the productivity of aquatic ecosystems, with alkaline water increasing productivity and acidic water decreasing productivity. The study came to the conclusion that aquatic ecosystem productivity and environmental sustainability depend on maintaining a neutral pH range.

Hossain *et al.* conducted one study (2019) [5] looked at how pH affected fish species' growth and survival. According to the findings of the study, fish may experience decreased rates of growth and survival at pH values that are too low, whereas fish may experience increased rates of growth at pH values that are too high. The study came to the conclusion that keeping the pH within the ideal range is necessary to help fish species grow and survive.

An additional study by Kim *et al.* (2017) [6] looked at how pH affects how contaminants are removed from water. The study found that pH has a significant impact on the removal of contaminants, with the optimal pH range being 6-8. The study came to the conclusion that controlling pH levels is necessary for effectively removing contaminants from water.

Yang *et al.*'s investigation (2019) [7] looked into how pH affected the water's microbial community. According to the study, pH can have a significant impact on the microbial community, altering the diversity and composition of microbial species. The study came to the conclusion that promoting the diversity and stability of microbial communities in water necessitates maintaining a neutral pH range.

The literature suggests that pH is a crucial parameter for evaluating water quality, as mentioned in the review. The growth and survival of aquatic life, safe drinking water, and environmental sustainability all depend on maintaining a neutral pH range. The effects of pH on water quality and their implications for aquatic life, human health, and environmental sustainability must be further investigated.

## Material and methods

### Materials

This research paper will require scientific articles, books, and reports on the subject of pH's influence on water

quality, its effects on aquatic life, human health, and environmental sustainability. A comprehensive literature review was the approach this research paper took. The subsequent actions were taken:

- 1. Identifying pertinent articles:** Using research hub and online databases, a comprehensive search was carried out. "PH," "water quality," "aquatic life," "human health," and "environmental sustainability" were the search terms used.
- 2. Examining articles:** The articles that were found through the search were examined for their connection to the issue of pH and water quality. Excluded were articles that did not meet the inclusion criteria.
- 3. Extraction of data:** The author(s), year of publication, study design, and key findings were all extracted from the selected articles.
- 4. Data synthesis and analysis:** The key themes and trends related to the role of pH in water quality, its implications for aquatic life, human health, and environmental sustainability were identified through analysis and synthesis of the data from the selected articles.
- 5. How to write a research paper:** The introduction, literature review, results, and conclusion of the research paper were all based on the results of the systematic review.

The method of systematic review was chosen because it allows for an in-depth and objective examination of the relevant body of literature. The inclusion of all relevant studies and the fact that the findings are based on a methodical and rigorous approach are both guaranteed by this approach.

## Results and Discussions

There were a number of important results from the systematic literature review on the impact of pH on water quality, aquatic life, human health, and environmental sustainability.

First and foremost, pH is a crucial criterion for determining the quality of water because it influences the chemical and biological processes that take place in water bodies. Low pH levels can result in the sediments releasing toxic metals that can harm aquatic life. By reducing the availability of dissolved oxygen, which aquatic organisms require, high pH values can also harm aquatic life.

Second, the growth and survival of aquatic organisms can be significantly affected by changes in pH. Because they respire with dissolved oxygen, fish and other aquatic organisms are particularly sensitive to changes in pH. Freshwater fish's growth and survival depend on maintaining a neutral pH range.

Thirdly, water's pH has significant effects on human health. The consumption of water with a pH outside the range of 6.5 to 8.5 can have negative effects on one's health. Copper and lead can be leached from pipes by acidic water with a pH below 6.5, which can be harmful to human health. There are a number of health issues that can result from drinking alkaline water with a pH greater than 8.5.

Fourthly, pH is a crucial metric for determining the sustainability of the environment. The chemistry and

biology of water bodies can be affected by changes in pH, which can alter the structure and function of ecosystems. Alkalization can result in the proliferation of harmful algal blooms, while acidification of water bodies can result in the loss of biodiversity. The productivity of aquatic ecosystems can also be affected by changes in pH, which can have an impact on food security and economic sustainability.

### Conclusion

According to the literature review, pH has significant effects on aquatic life, human health, and environmental sustainability. It also plays a crucial role in water quality. According to the literature review, it is essential to maintain a neutral pH range in order to ensure safe drinking water, support environmental sustainability, and encourage aquatic life's growth and survival. The chemistry and biology of water bodies can be affected by changes in pH, which can alter the structure and function of ecosystems. The pH of water bodies can also be affected by human activities, such as agricultural and industrial practices, which can have negative effects on aquatic life and human health. In order to ensure the safety of drinking water and promote environmental sustainability, pH levels in water bodies must be monitored. The effects of pH on water quality and their implications for aquatic life, human health, and environmental sustainability must be further investigated. In general, this research paper's findings emphasize the significance of ensuring that water bodies have the right pH levels for human and environmental health.

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