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Planktons In Aquaculture

Musori.A[1], Ambika Binesh[2] and V. Kaliyamurthi[2*]

[1]Institute of Fisheries Biotechnology, Tamilnadu Dr. J. Jayalalithaa Fisheries University, OMR Campus, Chennai – 603103, TamilNadu, India.

[2]Institute of Fisheries Post Graduate Studies, TamilNadu Dr. J. Jayalalithaa Fisheries University, OMR Campus, Chennai – 603103, TamilNadu, India.

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Abstract

Plankton play a crucial role in aquaculture systems, serving as a fundamental component of the aquatic food chain and providing a source of nutrition for many farmed organisms. Plankton, including both phytoplankton (microscopic plants) and zooplankton (microscopic animals), serve as primary producers in aquatic ecosystems. In aquaculture, they act as a natural food source for many farmed organisms, particularly in the larval stages. Plankton play a crucial role in maintaining water quality in aquaculture systems. Plankton form the base of the aquatic food chain, providing food for a wide range of organisms, from small invertebrates to larger fish and marine mammals. By promoting planktonic growth in aquaculture systems, farmers can create a more natural and sustainable environment, facilitating the transfer of energy through trophic levels.

Introduction

Aquaculture, the farming of aquatic organisms, has emerged as a vital industry to meet the growing global demand for seafood. One of the key components of a healthy aquatic ecosystem is plankton, a diverse community of microscopic organisms that forms the base of the marine food chain. Plankton encompasses two main groups: phytoplankton, consisting of microscopic plants such as algae, and zooplankton, comprising small animals including larvae, crustaceans, and other invertebrates. These tiny organisms play a crucial role in the aquatic environment, influencing water quality, nutrient cycling, and the overall productivity of the ecosystem. In the context of aquaculture, understanding the dynamics of plankton becomes paramount. Plankton serves as a natural food source for many farmed species, particularly in their early life stages when they are highly dependent on the availability of nutritious and appropriately sized prey. Moreover, the presence of plankton in aquaculture systems can help improve

water quality by consuming excess nutrients, preventing eutrophication and maintaining a healthy balance.

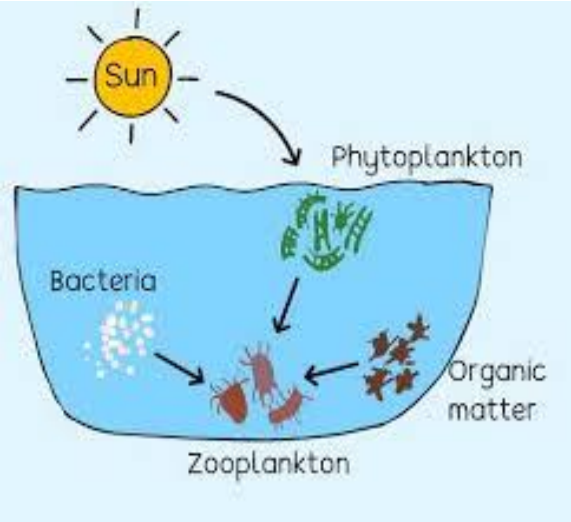

Figure 1. Role of phytoplankton and zooplankton in aquaculture

Role of phytoplankton and zooplankton in aquaculture

Phytoplankton and zooplankton play vital roles in aquaculture systems, especially in the early stages of fish and shrimp farming. Phytoplankton, which are microscopic plants, serve as a natural food source for zooplankton. They produce oxygen, remove excess nutrients, and contribute to water quality maintenance. Phytoplankton also serve as a primary food source for many larval fish and shrimp, providing essential nutrients and fostering their growth. Zooplankton, on the other hand, are microscopic animals that consume phytoplankton and serve as a bridge between primary production and higher trophic levels. They convert phytoplankton into a more digestible form for fish and shrimp larvae, making them an important link in the aquatic food chain. Zooplankton are often cultured alongside larvae in aquaculture systems to ensure a consistent and nutritious food source. Overall, the presence and abundance of phytoplankton and zooplankton in aquaculture systems are crucial for maintaining water quality, supporting larval growth, and ultimately enhancing the success of aquaculture operations.

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Ecological Significance of Plankton

- Primary Production: Phytoplankton perform photosynthesis, converting sunlight and nutrients into organic matter. They are responsible for a substantial portion of the Earth's primary production, producing oxygen and serving as the foundation of the aquatic food web.
- Nutrient Cycling: Phytoplankton uptake and recycle nutrients, such as nitrogen and phosphorus, in the water column. They help maintain nutrient balance, preventing eutrophication and promoting overall ecosystem health.
- Carbon Sink: Phytoplankton absorb carbon dioxide (CO2) from the atmosphere during photosynthesis, acting as a significant carbon sink. They play a crucial role in regulating global climate by sequestering carbon and reducing greenhouse gases.
- Food Web Dynamics: Zooplankton, as primary consumers, feed on phytoplankton and transfer energy to higher trophic levels. They serve as a crucial link between primary production and larger organisms, supporting the growth and survival of fish, marine mammals, and other predators.
- Oxygen Production: Phytoplankton are responsible for a significant portion of the Earth's oxygen production through photosynthesis. They contribute to oxygenating aquatic environments and maintaining suitable oxygen levels for marine life.

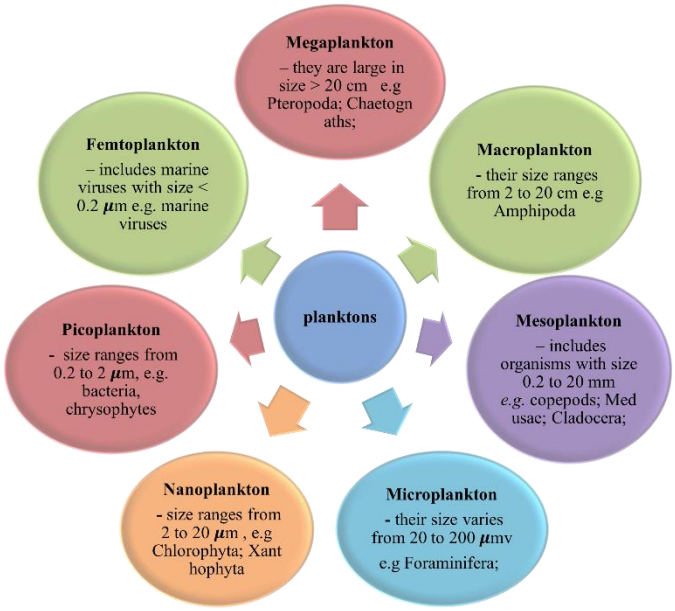

Figure 2. Classifications of plankton based on size

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- Indicator Species: Changes in plankton abundance, composition, or distribution can indicate environmental changes or disturbances, making them important ecological indicators. Monitoring plankton communities helps assess ecosystem health and identify potential issues.
- Global Biogeochemical Cycles: Plankton influence biogeochemical cycles by cycling nutrients, carbon, and other elements between the atmosphere and the oceans. They impact the global carbon cycle, nutrient availability, and the regulation of greenhouse gases.

Challenges

Managing plankton in aquaculture is a complex task. While a sufficient supply of plankton is essential, excessive or uncontrolled blooms of certain species can be detrimental, leading to reduced water quality, oxygen depletion, and even mortality of farmed organisms. Therefore, achieving a harmonious relationship between plankton and aquaculture operations requires careful monitoring, understanding of ecological interactions, and the implementation of appropriate management strategies.

Conclusion

In conclusion, plankton play a vital role in aquaculture by serving as a natural food source, providing essential nutrients, maintaining water quality, supporting trophic interactions, acting as biological filters, and requiring careful management to prevent harmful algal blooms. Understanding and effectively harnessing the potential of plankton in aquaculture can contribute to the sustainable and successful production of farmed aquatic species.

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