

# IMPORTANCE OF PLANKTON IN AQUATIC ECOSYSTEM

## Abstract

Natural resources are greatly impacted by the fast-growing pace of human population expansion worldwide. It has an impact on the water quality, one of the characteristics of a natural resource. Therefore, we may use plankton, or water quality indicators, to assist us in determining the condition of the water. For the restoration and management of aquatic ecosystems, plankton evaluation provides important information. Zooplankton is microscopic aquatic organisms that either exclusively or partially exists as plankton. In the aquatic food chain, they offer essential food sources for aquatic creatures, particularly fish. Certain types of plankton serve as markers for pollution. Plankton populations depend on both biotic and abiotic factors for their development and dispersion, making them extremely sensitive to changes in the environment. Because of this, alterations in the variety and abundance of species as well as the structure of communities can serve as crucial markers of environmental change.

**Keywords:** Zooplankton, Phytoplankton, Water, Ecosystem.

## Authors

### **Suresh Kumar**

Department of Zoology,  
Maharana Pratap Govt. P.G. College,  
Chittorgarh, India.

### **Dr. Bharati Veerwal**

Department of Zoology,  
Maharana Pratap Govt. P.G. College,  
Chittorgarh, India.

The word 'plankton' is evolved from the Greek word 'planktos' which means 'drifting' and is also referred as 'floaters'. Plankton communities evolve in terms of tolerance, abundance, diversity, and dominance in the natural environment in reaction to changes in their environment, which they respond to quickly. Plankton may have a body size of more than 200 micrometers or fewer than 2 micrometers. The category includes many different species of organisms in seawater and freshwater ecosystems. There are two broad group of planktons i.e., Phytoplankton planktonic plants which are producers (capable of photosynthesis) and zooplankton-planktonic animals which are consumers.



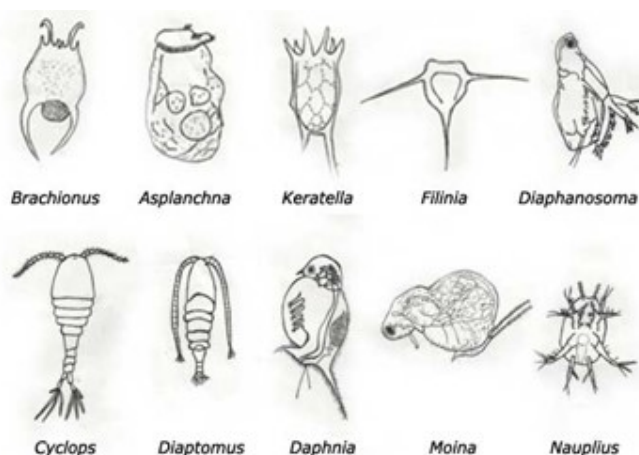
**Figure 1:** Phytoplankton, Weblink <https://tinyurl.com/54rbhy2b>

## I. PHYTOPLANKTON

Being are the earliest organisms to produce energy from light sources like the Sun. Phytoplankton are the primary creators of their environment. Through photosynthesis, they convert acquired light energy into carbohydrates. Approximately 3% of the light shining on the ocean is absorbed by phytoplankton. In contrast, only 15% of the sunlight is absorbed by terrestrial plants.

## II. ZOOPLANKTON

Heterotrophic organisms called zooplankton consume phytoplankton. They are secondary consumers since they acquire their energy by eating the primary energy producers in their environment. Zooplankton, like phytoplankton, use some of the energy from their diet for maintenance and save the rest for ingestion by other creatures. A larger animal that grazes on plankton or another zooplankton species is another possibility. (Biodiversity of the sea, <https://shorturl.at/jsxY1>). Most researchers use aquatic zooplankton as one of the bioindicators for assessing the ecological health of water bodies. (Ismail & Adnan, 2016; Rahkola-Sorsa, 2008; SantosWisniewski et al., 2006).

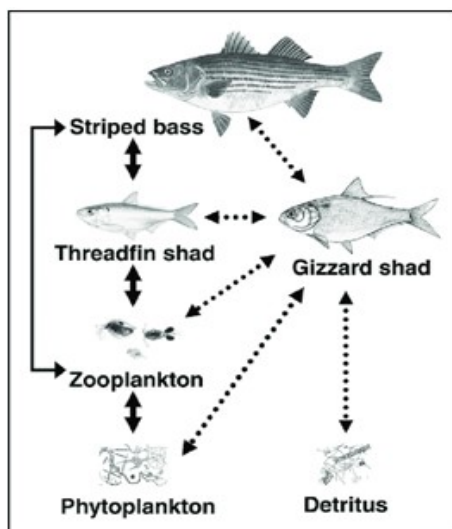


**Figure 2:** Zooplankton, Weblink-<https://tinyurl.com/pc527zpj>

### III. PLANKTON AND THE ECOSYSTEM

An ecosystem is a complex network of interactions between the biotic and abiotic elements of a specific environment. The biotic component is made up of living things like birds, animals, plants, and microorganisms, whereas the abiotic component is made up of things like land, air, and water. An aquatic ecosystem is defined as a water-based habitat in which organisms interact with physical and chemical parameters in the environment. Aquatic organisms are living things whose basic needs such as nutrition, shelter, reproduction, and others are dependent on the existence of water. Aquatic ecosystems are essential components of the Earth's biosphere (Hader et al., 2003).

Phytoplankton absorb at least the same amount of atmospheric carbon dioxide as terrestrial ecosystems; they produce more than 50% of the biomass on our planet. (Zepp et al., 2007). Aquatic ecosystem can be divided into two categories: marine ecosystems and freshwater ecosystems (Jim Jansen, <https://shorturl.at/sQUX4>). The foundation of complex food webs in freshwater and marine ecosystems is made up of primary producers, who also supply energy to primary and secondary consumers. As a result, primary producers play a crucial role in the production of marine mammals, fish, and crustaceans, which are staples of the human staple diet (Hader(a), 2003; Hader(b), 2003; Sinha et al., 2002).



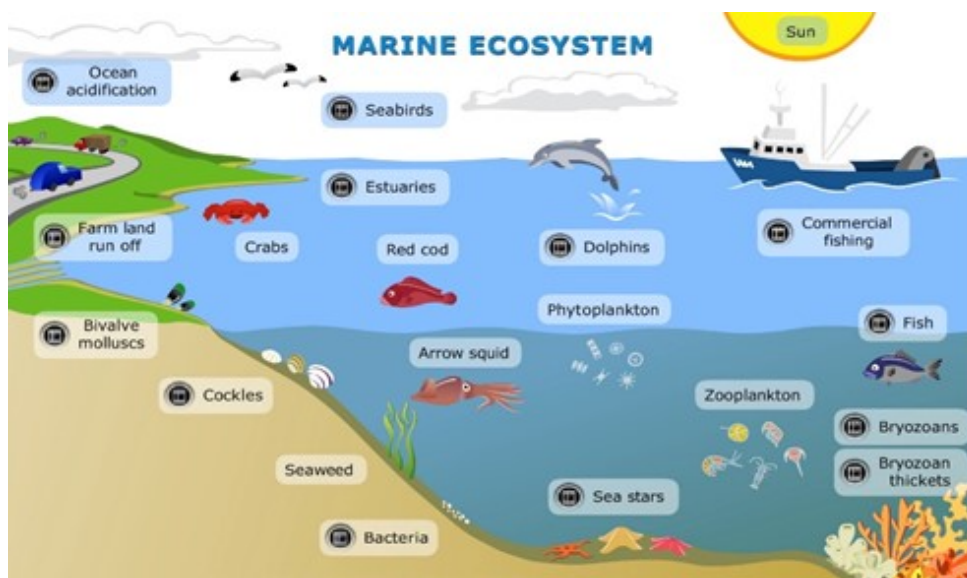
**Figure 3:** Aquatic food chain Weblink- <https://shorturl.at/dfmn>

Freshwater habitats are the least frequent, only remaining on 1.8% of the surface of the Earth. Several kinds of fish, amphibians, reptiles, birds, and mammals live in these diverse systems, which are made up of lakes, rivers, streams, and springs. In addition, microorganisms, mollusks, as well as abundant algae, plants, and phytoplankton, form the foundation of the freshwater food web. Freshwater is a resource that is utilized for drinking, farming, industry, sanitation, recreation, and transportation.



**Figure 4:** Freshwater ecosystems, Weblink-<https://shorturl.at/djK26>

The majority of ecosystems on Earth are marine ecosystems, which belong into three categories: shallow ocean, deep ocean water, and deep ocean bottom. The ecosystems of coral reefs in shallow ocean conditions are incredibly diverse. Phytoplankton, a collection of small photosynthetic organisms found in ocean waters, is responsible for 40% of all photosynthesis on Earth. (Biomes chapter. <https://shorturl.at/rRV01>)



**Figure 5:** Marine ecosystem, Weblink <https://shorturl.at/beky2>

Due to their wide range of sizes, plankton serve as an important source of food for both animals and other plankton. Even whale sharks, which are among the biggest marine species, mostly eat plankton. Most of plankton is consumed by filter feeders, which filter water through their teeth to feed and then eat the leftovers. Many different animals, including fish, mammals, and squid, are filter feeders. The availability of plankton in the pelagic zone of the water column, which forms the base of the food chain, is essential to maintaining the equilibrium of energy in aquatic ecosystems.

#### IV. AS ECOSYSTEM MARKERS OF HEALTH

The pioneer in the aquatic food chain is phytoplankton. Any aquatic body's biological production can be utilized as a measure of its trophic state and potential for fishery resources. (Jhingan, 1992). Since phytoplankton play a significant role as primary producers and can have an impact on higher trophic levels by supplying as a source of nutrition for zooplankton, which in turn provides food for other organisms in aquatic ecosystem. Aquatic ecosystem health is determined by phytoplankton and zooplankton. In most of the studies that were reported, the abiotic elements of the aquatic environment were closely connected with the diversity and abundance of phytoplankton and zooplankton. Some species were found to be less common because of pollution, but other species were shown to be tolerant of the harsh abiotic conditions present in contaminated bodies, potentially serving as biological indicators in studies to monitor water quality (Jakhar, 2013; Narasimha, 2013; Emmanuel & Onyema, 2007). Their productions are connected to the physicochemical factors. The majority of lake food webs depend on phytoplankton, and this organism is also a factor in fish production. Among other factors, their growth and diversity can be controlled by seasonal temperature fluctuations and rising water temperatures (Schabhtl, 2013).

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