The role of phytoplankton in the ecology of the inland water bodies

Science, Biology

The fauna and flora on earth depend on water for survival. Water is therefore an essential life-supporting component of the environment. The waters are contained in the inland water bodies and marine water bodies. The ecology of the inland water bodies is studied in the scientific field of limnology. According to Gupta et al., (2006), this field encompasses the inland waters, both freshwaters and saline waters, and the factors that regulate life found in them.

Limnological studies covers water quality, which is an important aspect of lake ecological studies and therefore studies investigating the physico-chemical variables and their relationship to the plankton communities has been receiving intense global interest over the years. According to Williams (1981), these studies have often focused more on the freshwater resources as compared to the saline water resources, even though the extent of both types of inland waters on the planet earth is nearly equal.

Saline water resources in Africa have unique properties. According to McCulloch et al. (2008), they are closed lakes with elevated levels of salinity and alkalinity, a combination of factors that generate drastic conditions that greatly influence the community structure of the living organisms found in them. These unique properties are part of the environmental variables commonly known as the physic-chemical parameters which according to Adoni (1985), governs the existence and the interactions of plants and animals in the water masses. Plants are the engines of every ecosystem because of their role as primary producers and in lake ecosystems the “ plants” are the phytoplankton. These single-celled plants commonly known

as algae are green in color and sometimes appear collectively as “ algal bloom”.

Phytoplankton plays several roles in the water ecosystems, but the primary function of this microscopic organisms is primary production. Primary production is crucial to the existence of other aquatic life forms since they form the basis for the food web and therefore the whole ecosystem would collapse and eventually die off if the phytoplankton ceases to exist. This therefore makes them the most vital component of these ecosystems. Liu et al. (2015) opines that since the phytoplankton forms the integral quality food for aquatic organisms such as the zooplankton and fish, their changes in their composition and abundance can reveal the nutritional status of the water. Other studies by Wang et al (2013) and Dominguez (2012) point to the conclusion that variations of the phytoplankton seasonally are a central indicator of the conditions of the environment. In addition, phytoplankton is perhaps the major carbon sink in the world because of their domination of the water bodies.

Phytoplankton community is sensitive to changes in the environment and therefore the physic-chemical variables have a massive influence on the phytoplankton structure. And in saline-alkaline lakes, Williams (1998) opines that the most vital physic-chemical variables governing the phytoplankton structure are pH, DO, conductivity, geology, anthropogenic influences, and interactions of the living populations. In addition, nutrients concentrations have also been linked to phytoplankton structure. Several previous studies conducted on African soda lakes indicate that their biological diversity and

community structure are controlled primarily by salinity and the degree of environmental stability. This is because many African soda-lake taxa are widely distributed in a large range of salinities, one would expect the response of soda-lake communities to climatically driven environmental change at time scales of years to decades to be rather small.

Dirk et al. (1997) further asserts that observations from previous field surveys reveal that soda-lake communities are regulated by a variety of environmental factors, among which salinity may be important but not necessarily decisive for survival. Other factors may include nutrient or food availability, temporal variation in dissolved oxygen, water-column transparency, and the stability of various substrata available to benthic organisms.

The influence of various factors on the seasonal appearance of phytoplankton differs significantly, with physical factors (such as temperature and light intensity) being the most important and chemical (DO, pH, salinity, total hardness, EC and nutrient level) being of lesser importance.