

# Energy Transformation Through Primary Productivity and Nutrient Dynamics of Lentic Water

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## ABSTRACT

Some societies can cope, at least temporarily, with pollution and availability constraints. In most of the world, however, population increases continue without significant reduction rates. Growth will continue to impose increasing demands upon freshwater supplies. Control and reversal of degradation requires a proper economic and social valuation of fresh water. Human impact on freshwater ecosystems will increase until industrial growth is stabilized.

Emotionalism and alarmist reactions to the momentum of exploitation by the technological system accomplish little. Understanding the metabolic responses of aquatic ecosystems is essential in order to confront and offset the effects of human alterations. Many small ponds in different parts of the world have been drained or reclaimed to extend arable land. This has caused unusual fluctuations in water land, the impact of which is tremendous. The biodiversity and dynamics of different phytoplankton population are one of the least explored areas in aquatic biology.

Ecological studies give humans a deep insight into principles of life, its forms and levels of existence. F.A forel may be considered as the founder of modern limnology for his original work on Swiss Lakes. The primary social need of every sustainable society is to protect and utilize all their natural resources wisely.

In India, such studies on the pattern of energy flow in aquatic ecosystem by various organisms at different trophic levels are very few. Odum suggested to bring out a comparative picture by investigating the physical, chemical and biological characteristic of lentic water bodies. It is clear that no detailed bioecological investigations have been done so far in this area.

**Keywords-** Ecological, photosynthetic, lentic water bodies.

intelligence or catastrophes, further loses and partially on a global basis. Control and reversal of degradation requires a proper economic and social valuation of fresh water. With proper valuation methods for effective utilization of existing, finite supplies can be applied to agricultural, industrial and residential uses.

Freshwater still serve purposes other than water supply, such as recreation, transportation systems, esthetics, and others. However, the demands of exponential human growth clearly receive total precedence over uses of fresh water for other purpose. The most fundamental laws of resource utilization may be recognized by most agencies and industries, but they are not being implemented significantly. The remarks above, although pessimistic, accurately assess existing pattern of utilization of our water resources. Growth will continue to impose increasing demands upon freshwater supplies either until inefficient utilization creates a disastrous situation threatening the survival of a major segment of human race or until the expenditures of energy needed to obtain water exceed tolerable operational levels. Looking back at the history of responses to impending environmental disasters, we can be optimistic about the future only until such time as our understanding of the operation of the biosphere and our knowledge of freshwater ecosystems in particular, is adequate to allow us to recognize the joint of irreversibility.

As one reflects on the progress that has been made in freshwater biology since its inception a century ago. It becomes apparent that the time available for understanding freshwater is limited. We need to intensify study of and time to understand-' freshwater in systems sufficiently to judge their resiliency and capacity for change in response to exponential human utilization and loading of contaminants. Existing understanding of freshwater ecosystems must be extended to a greater percentage of the population being educated so that this information can be effectively fused into the population at all levels.

It is of the utmost importance, therefore that we understand the structure and function of freshwater ecosystems. Humans are a component of these ecosystems, and this effects on them will increase markedly until industrial growth is stabilized. Emotionalism and alarmist reactions to the momentum of exploitation of the finite biosphere by the

## I. INTRODUCTION

Fresh waters of the world are collectively experiencing markedly accelerating rates of qualitative and quantitative degradation. Some societies can cope, at least temporarily, with pollution and availability constraints and can even decrease freshwater degradation. In most of the world, however population increases continues without significant reduction rates. Until human growth and consumption is stabilized, one hopes by the mid twenty first century, either by

technological system accomplish little and as has been demonstrated repeatedly, are often antagonistic to improvement strict. Conservation and isolation of resource Parcels, in the belief that such areas are exempted from technological alterations of the atmosphere and water supply, are native and little to solution of the overall problem understanding the metabolic responses of aquatic ecosystem is essential in order to confront and offset the effects of these alterations and in order to achieve maximum, effective management of freshwater resources. All waters of course, cannot be managed directly. Rather, an integration of human growth and utilization with the metabolism of fresh water is required to minimize detrimental changes. A well-documented effect of human impact upon aquatic ecosystem is pollution in water a multifaceted term associated with increased productivity, simplification of biotic communities, and a reduction in the ability of the metabolism of the organisms to adapt to the imposed loading of nutrients. These conditions lead to reduced stability; of the ecosystem. In this condition of nutrient enrichment excessive inputs often exceed the capacity of the ecosystem to be balanced. However, the ecosystem is out of equilibrium only with respect to the freshwater chemical and biotic characteristics that are desired by humans for specific purposes. In order to have any hope of effectively integrating humans as a component of aquatic ecosystems, and of monitoring their utilization of these resources, it is mandatory that we comprehend in some detail the functional properties of freshwaters.

Many small ponds in different parts of the world have been drained or reclaimed to extend arable land. This has caused unusual fluctuations in water land, the impact of which is tremendous. The aquatic organism, and ecosystem in which they participate represent a substantial sector of the earth biological diversity. So, the freshwater habitats are considered worthwhile not only as a supply resource but as a living system by which the global ecosystem is balanced. Study of freshwater ecosystems and energy flow in such systems are quite timely. Such studies pave the way to prime regulatory mechanism for the ecosystem as a whole and may reveal both the rate and direction of whatever changes take place within the system. The biodiversity and dynamics of different phytoplankton population and their role in natural water cycle are one of the least explored areas in aquatic biology. All the developmental activities have immediate effects on various water quality parameters including biology. Studies on freshwater ponds and reservoir in our country have gained momentum in recent years. In India, reservoirs which covers three million hectares of surface area considered the prime resources regarding aquatic production potentials. World's lakes and reservoirs are distributed in Africa 31240 km<sup>3</sup>, Europe 2449 km<sup>3</sup>, Asia 29132 km<sup>3</sup>, Australia 192 km<sup>3</sup>, North America 26573 km<sup>3</sup> and South America 1199 km<sup>3</sup>, respectively. Lakes

and wetlands have been recognized worldwide as extremely important biogeography zones. These lentic water bodies are common and stable habitats of the biosphere. In spite of the fundamental importance of lakes reservoirs and wet lands to humans as life supporting systems and as systems providing recreation facilities for the people those have severely been affected by a multitude of anthropogenic disturbances which have led to serious negative effects on the structure of these ecosystem worldwide.

India receives more rainfall per unit area than elsewhere in the world. Despite enormously large population, it receives more per capita rainfall than in the developed countries like Germany and Japan.

Rainfall in India is dependent on south west and north east monsoon. The average annual precipitation of the country is estimated to be 4000 billion m<sup>3</sup> but only 1000 billion m<sup>3</sup> per year available as usable surface water and ground water. The country supports 1/6<sup>th</sup> of world's population and 1/25<sup>th</sup> of world's water resources.

Ecological studies give humans a deep insight into principles of life, its forms and levels of existence and immortality on earth. Ecology reveals to us the truth that there is only own life exists infinitely in interrelations of diverse species in space and time. Ecology provides us with the wisdom that supremacy and freedom, which humans enjoy ones the diverse form of life, are subject to the limits of natural constitutions. Nature shows no special concerns for any individual species human or otherwise unless and until the quest for stability and substances of life on earth. Therefore, the primary social need of every sustainable society is to protect and utilize all their natural resources in a wise manner.

Water Researches came of age in 1901 when Francois Alphonse forel published the first textbook on the subject. F.A forel may be considered as the founder of modern limnology whose original work on Swiss Lakes as elaborated in three volumes the classic entitled "Le Lemane" (Lake Geneva). He was the first to study and elaborate the physical, chemical and biological characteristics of lakes (1888-1909). The first text on limnology as "Handbuch der seankunde Allgemeine Limnologie"

The next to study a lake ecosystem in detail was S.A Forbes of USA whose researches were published in his book "The Lake as a microcosm". The most detailed research on physiochemical and biological characteristics of a lake were carried out. whose reports on lake Wisconsin (Parts I-VIII) detailed the plankton, nekton and Pedon both qualitatively and quantitatively enunciating their relationship with the physicochemical water characteristics.

In Bihar, some limnological investigations were carried out in aquatic ecosystem. Freshwater ecologist has recognized the importance of biological, physico-chemical and environmental factors, which varies greatly with the water bodies. Among these the temperature has

most profound effect on the ecology of aquatic bodies. Transparency, the most important physical factor which measures the penetration of light into water body. The reduction in transparency reduces the photosynthetic activities of the submerged aquatic plants. Besides these, water current and wind in the aquatic habitat also constitute the important factor in the ecology of aquatic ecosystem.

The photosynthetic phytoplankton are the major producers of freshwater, and consists of microscopic plants, which remain suspended in water and move with the water current. A multitude of environmental and biological factors influence the rate of productivity, but nutrient concentration together with irradiance and temperature are the most important. The survey of Indian literature revealed that many workers emphasized the different ecological aspect of producers and its seasonality in lentic environments.

The limnological investigation of producers and productivity of pond have not received much attention in Bihar while some notable contributions are known through the works. The aquatic and waterside vegetation forms an important community of freshwaters. Macrophytes are an important community affecting productivity and energy flow. In fact, primary production in such communities is quite high. The macrophytic luxuriance indicates that the water and watersides offer special advantage in the form of a continuous supply of water and nutrients. Only a few studies on aquatic macrophyte and their production were conducted in India.

Productivity of aquatic ecosystem is dependent on the biogenic capacity to transform solar energy into chemical energy and primary productivity is the rate of formation of new organic matter. The energy or organic matter accumulated at primary producer level passes successfully through a complex trophic chain before an amount of it reaches the organisms' flesh. Researches on the primary productivity and their functional aspects in the Indian inland water resources has so far not received much needed impetus. The biotic communities, producers' consumers and decomposers in an ecosystem are linked with one another with energy chain. Unidirectional flow of energy and nutrient cycle are the two great principles of modern ecology. Complete knowledge of the interrelationship among organisms, flow of energy and nutrients from one trophic level to other and the role of environmental parameters in the energy transformation system is of great importance for the correct analysis of the ecosystem and better utilization of the energy sources.

The energy sources for all the living components on the earth are sun which releases energy in the form of electromagnetic waves. This energy is transformed to potential chemical energy by chlorophyll bearing organism which forms the energy source for the organism at higher trophic levels. The productivity of any aquatic system depends on the efficiency with which

available solar energy are converted to chemical energy by producers and the efficiency with which this energy is utilized by consumers.

## II. CONCLUSION

In India, such studies on the pattern of energy flow in aquatic ecosystem by various organisms at different trophic levels are very few. Odum suggested to bring out a comparative picture by investigating the physical, chemical and biological characteristic of lentic water bodies. It is apparently clear that no detailed bioecological investigations have been done so far in this area. With this objective the author has studied the comparative account of the limnological conditions and the primary productivity in a lentic water body.

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