

Applied Ecology - A New Discipline to be Developed to Support Aquaculture

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Aquaculture or cultivation in water has become a common practice in almost all countries during recent times in the context of the limitations of harvest from the sea, or from freshwater bodies. Planned development by modern approaches in this sector will normally make it possible for organising aquaculture in the same way as agriculture and in many countries large scale cultivation of fish, edible oysters, mussels, prawns, pearls, algae etc. are streamlined on industrial basis with proper management networks at production, marketing and at consumer levels. India has made considerable progress in recent times in developing the technological know how for aquaculture. Unlike agriculture, since the cultivation is to be done in aquatic medium the knowledge on the ecology of the medium is to be judiciously applied for better economy. However ecological investigations connected with aquaculture in various countries are still remaining in the level of pure or basic sciences and a breed of scientists who are capable of applying ecological principles derived by basic investigations to practice is a must for consultancy and management purposes. A codification of the ecological findings to a core discipline which can be practiced in the

applied level will generate such a breed of scientists and this is found necessary for faster development in the field of aquaculture.

PRESENT TREND IN ECOLOGICAL STUDIES

Scientists throughout the world are conducting investigations on various interrelationships and interactions of the parameters of the ecosystem like salinity, temperature, oxygen, Hydrogenion concentration, bacterial complexity, substratum and its effect, the faunal ingredients and their interrelationships, the physiological limitations on the faunal complexity of various environments etc. under ecology. When new areas are selected for farming purposes, it has become customary to initiate investigation on these lines and this has become a time consuming process for practical applications to give immediate benefit to the aquaculturists and also for implementation within targetted timings. In fact before completion of these studies, the culture itself may have to be abandoned in many cases. The failures in culture can also happen if compactness of the optimum know-how required is lacking since the basic knowledge is at the fragmentary stage. However these investigations

prior to the involvement at the practical level are to remain only at the level of fundamental or theoretical sciences with few exceptions and further coordination of the knowledge deleting the unproductive investigations will help to develop an applied branch of science by itself. When this branch is evolved to the level of a separate discipline it will become capable of decoding natural principles involved in the ecosystem. The decoded principles can be artificially applied to the ecosystem by a specialist in ecology-i.e, applied ecologist-and it will be possible to manipulate the system in such a way that the farm conditions will be made suitable for aquaculture, by easy methods for better productions. In short the functional margin of Applied ecology as a discipline will be within the application level rather than to the level of fundamental or theoretical investigation.

WHY APPLIED ECOLOGY FOR ECONOMY OF CULTURE ?

Culture involves heavy investments for developing the infrastructures and this will be in geometrical multiples if any geological or physical manipulations are required. The culture environment can be generally classified as (1) marine areas, involving coasts or open bays with or without proper protection from heavy surfs with a stable equilibrium (2) estuaries connected with rivers or bays having heavy drains by monsoon rains, with a dynamic ecosystem having annual faunal recycling and (3) fresh water reservoirs, lakes or tanks having an annual faunal rhythm or faunal recycling.

Any other reclaimed environments attached with any one of the above

environments will have the limitations of one of these systems. These systems are having a definite biological, geological and chemical condition of definite pattern of its own with its respective community structure. When we introduce culture to any one of these ecosystems, it is more or less the artificial creation of a parallel community which is already developing elsewhere in the nature with perfect harmony. The applied ecologist has a major role in conditioning these environments. Any imperfection in the creation of harmony in the new culture environment artificially made (Farm) will naturally give an adverse impact on the production side of the animal to be cultivated. At such circumstances the knowledge on the parallel community concept can be applied, which is only a biological manipulation avoiding geological or physical manipulation, which is involving heavy investment of money. This is one of the roles, applied ecology plays in developing aquaculture. Similarly selection of cultivable organisms for the type of ecosystem also could be made easy by applied ecology.

HOW ENVIRONMENTAL STANDARDISATION POSSIBLE BY APPLIED ECOLOGY?

For all practical purposes, the study of biological associates give a clear picture of the environmental conditions also. When culture is to be started in a new environment, it may be necessary that even animals new to the area are to be introduced. It has been observed that such environments after introduction of the animals attract biological associates new to the area changing the faunal and floral complexity. It is also found possible

that by introducing biological associates, desirable faunal pattern can be created to attract the desirable larval forms of the animals to be cultivated by reversion of the process. It is needless to mention that such biological manipulations may trigger the stable equilibrium of the system to a dynamic condition even in a closed condition of small ponds. This example is presented only to show how biological manipulation can condition the environment for favourable and unfavourable levels for maintaining culture as well as for eradication of predators. Thus stabilisation of the environment can be maintained at different levels depending upon the requirements of the farm by biological means.

APPLIED ECOLOGY AS A DISCIPLINE :

Studies like hydrography, physiology, biochemistry, bacteriology, biology of various animals, feeding and nutritional requirement etc. connected with the ecosystem are only the different tools for applied ecology. When the results are published in the respective fields they form only papers dealing with ecology. The concerned paper of the particular discipline will only have a fractional knowledge of the culture ecosystem and a total approach of the problems involved with aquaculture cannot be materialised. That is why many culture programmes are becoming total failures.

A synchronised channelisation of the knowledge desired by these tools is essential and are to be properly synthesised bringing in applied ecology

to the context. When this synthesised product is practically applied for the management as well as manipulation of the ecosystem, it becomes applied ecology just like any other applied science. The breed of scientists who specialise in this branch will have practical knowledge for developing farm conditions. Under this situation culture is made more easy and the cultured organism becomes only part of the ecosystem which is thus managed by him. Thus applied ecology can be developed into a new discipline for practical application in aquaculture as well as for farm management.

Even though this article is dealing only with the section of applied ecology for aquaculture, there are possibilities of developing applied ecology for forestry, horticulture, agriculture, etc. by codifying respective topics for the particular field of work. This also helps to expand the science of Ecology into new dimensions and also helps for application of this science to practical purposes. To quote a few examples, the disciplines like Fishery statistics, Agricultural Statistics, structural engineering, Naval architecture etc. are only the offshoots, evolved from the respective basic sciences and it is time that scientists throughout the world consider the expansion of Applied ecology as a separate discipline.

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