FISH POND MANAGEMENT TECHNIQUES FOR AQUACULTURALISTS AND SCHOOLS

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ABSTRACT

For an insight into fish pond Management techniques, this research was focused to review and synthesize pond Management practices in the areas of water quality, fertilization, stocking, feeds and feeding, stock manipulation, diseases, weeds and predators control of major fresh water and brackish water species of fish such as Carp, Tilapia etc. Pond water quality such as temperature, dissolved oxygen, P.H., carbon-dioxide, etc. were elicited as most important in pond management practices since the lives of all aquatic organisms including fish is most dependent on the limnological parameters. Water analysis kit among others were considered very useful for field and experimental uses. Aeration, Liming, Draining and Refilling of Ponds, etc. were considered most necessary for good water quality. The addition of either organic or inorganic fertilizers to fish ponds result into increased productivity above that possible under natural pond conditions. The stocking rate and stocking density are all dependent on size of fish, feeding regime among others. Supplemental feeding however was noted to bring about greater fish yield in ponds than if the fish were left to feed only on the natural foods. Various methods however, were synthesized for use in stock manipulation as found in hybridization, sex reversal, biological stock manipulation among others. The use of chemicals and mechanical methods were found most useful for diseases, weeds and predators control.

INTRODUCTION

Fish cannot be put into ponds, left uncared, and expected to grow and provide food and income. Successful culture system requires active attention to be ensured. Water to fish does not merely serve as a solvent for life, but an indispensable habitat for fish; its degree of excellence is the most determining factor for the propagation of desirable aquatic organisms. Fish pond management however includes all management practices applied to fish ponds in order to increase the yield per unit area of pond; for example, the water quality, fertilization of ponds, feeding, stocking, stock manipulation etc.

Such practices indeed are likely to vary not only between species but also between different socio-economic settings. It is against this background we shall discuss water quality and fish pond management with the view to eliciting necessary guidelines for Aquaculturalists / schools

Water Quality Management

Important in fish culture are limnological parameters such as temperature, DO_2, PH, CO_2, total alkalinity, total hardness, total ammonia, Nitrite, Filterable orthophosphate, BOD, turbidity etc. However, only the most important; experienced in our tropical ponds shall be discussed. Although water quality problems can be remedied by several other methods, the more permanent remedy is draining and refilling of ponds:-

Temperature: Surface temperature of fish ponds in the tropics generally vary between 21-32°C. The degree of annual variation in temperature has great impact upon production and it is important in determining the fish that can be cultured. Temperature affects the levels of DO_2 in ponds. DO_2 concentration decreases proportionally with rise in temperature. Yet rise in temperature increases the O_2 consumption of fish. However, since such rise in temperature would normally occur in the day time when photosynthesis is taking place; in a pond where only adequate amount of fertilizer has been applied and therefore contains a good crop of phytoplankton, the surface layers of the water would be super-saturated with DO_2 and such saturation helps the fish to tide over the periods of very high temperature. Extreme high temperature may affect the resistance of pond fish pathogens. The high temperature of tropical fish ponds also enhance the breeding frequency of tilapia; resulting in the production of runts. It is however advantageous in some fish species. Besides, sudden changes in water temperature can cause the death of fish as a result of temperature shock. Thus when transferring fish from hauling unit to pond, culturist must be sure there is little difference in the temperature between the waters; if there is a difference of 5^0C or more, conditioning becomes very necessary (Allen et al, 1973). Extreme temperature can be mitigated by ensuring natural sheds in farms; most times, flow-through systems are considered essential.

Dissolved Oxygen: This is a critical factor in intensive fish culture, and the success or failure in fish farming often depends on the ability of the farmer to cope with the problems of low DO_2. Problems with low DO_2 concentration are infrequent in fertilized pond. However when fish culture is intensified through feeding, problems with Dissolved Oxygen increases in frequency and severity (Boyd 1984). It is therefore necessary to measure DO_2 concentration of ponds regularly using O_2 meter and when in deficit, aeration should be an approach. DO_2 problem can also be remedied by passing run-offs through to pond. In most cases the addition of 6ppm KMO_4 also provide temporary relief. However, fresh water and reduction of fertility provide the most lasting solution. During periods when the culturist is attempting to correct low DO_2 conditions, the fish should not be fed.

PH: This is a measure of hydrogen ion concentration and it indicates whether water is basic, acidic or neutral in reaction. In extreme cases of PH, it is desirable to raise the value to desirable range of between 6.5-9 to avoid catastrophe. However, low PH values are associated with low alkalinity. Liming should therefore be recommended to permit normal responses of fish production to fertilization and other management procedures. Most used is Agric. Lime. The effect of Agric. Limestone treatment (4,300-4,900kg) on production of Tilapia species was determined in fertilized ponds. Alkalinity of unlimed ponds ranged from 11.6 to 18.4mg/l but limed ponds had 20-40mg/l Net production of fish was about 25% higher in limed ponds than in unlimed ponds (Arce and Boyd, 1975).

Amonia: Amonia is a major end product of protein catabolism excreted by aquatic animal amonia. In water, it consists of unionised amonia and ionized ammonia (NH^4) form. Unionized ammonia can be toxic to fish and other animals and is therefore of considerable aquacultural significance. The temperature and P^H of pond waters should be measured at the time of stocking so that the percentage of unionized amonia can calculated using the procedure and formular outlined by stirling (1985).

$$\text{Unionized amonia} = \frac{100}{1} \text{ x antilog (pka PH)}$$

where pka = the ionization constant which depends on temperature.

The European Inland Fisheries Advisory Commission (1973) had that toxic concentration of amonia for short - term exposure are between 0.6 and 2mg/l of amonia - Nitrogen for most species. On another note, Robinette (1976) reported that 0.12mg/l of amonia caused reduced growth and gill damage in catfish. However, he did not notice any harmful effects for 0.06mg/l of NH_3.

Nitrite: This is an intermediate product in the nitrification of NH_3 to Nitrate. It is toxic to fish and therefore is important for aqauaculturists. Concentration of Nitrite as low as 0.5mg/l' were toxic to certain cold water fish (Crawford and Allen, 1977). Besides using kit, the procedure for the sampling is analytical.

Turbidity: This is a term that indicates that water contains suspended materials, which interfere with the light passage into water column. Turbidity caused by plankton is generally desirable in fish ponds. Plankton turbidity favours greater fish production by stimulating the growth of fish food organisms. Turbidity range of between 30-60cm is desirable. At less than 30cm, there is an increase in the frequency of DO_2 values. At values greater than 60cm, light penetrates, encouraging under water macrophyte growth; plankton and consequently fish production decreases. Fertilization therefore becomes very necessary. Turbidity readings however are taken using the secchi disc.

Pond Fertilization: The application of fertilizer in the form of either organic manure (such as poultry and pig dropping, cow dung, compost manure) or in the form of inorganic fertilizer (such as super phosphate amonia sulphate, potassium nitrate) either singly or in combination to gives suitable Nitrogen-phosphorus potasium (N.P.K) ratio, generally increases the fish yield of pond. The direct influence of fertilization is to stimulate phytoplankton productivity. Few species of fish, feed directly or entirely on phytoplankton but greater abundance of phytoplankton favours higher densities of zooplankton and which serve as food for fish. As a result, fish production is usually closely related to phytoplankton abundance, except in ponds to which large amount of fish feed are applied. Care should however be taken to avoid excessive plankton blooms which can lead to DO_2 depletion and fish kill.

Stocking of pond: This means the putting of fish inside ponds, and can either be monoculture or polyculture. The more the fish stocked, the higher the yield provided, there is no competition for food. Stocking density can however be increased through polyculture which allows the various water layers and all potential food sources to be utilized. The yield of fish depends on putting on the right number of fish into the ponds. The age and size of fish must also be considered when stocking ponds. For example, more fingerlings can be placed in a pond than brood fish. If the foods available in ponds are not supplemented, proper rates and densities should be considered paramount. Yung (1983) observed that the most widely used stocking methods in based on expertise and common sense.

Feeding: As feeding rates increase in ponds, water quality becomes poorer and finally limits production of fish (Swingle 1968). This is most striking in situations where most farmers dump all forms of materials inside ponds for example spent gains. Poultry feeds, carcass etc, in the bid to keeping to good feeding standards. It therefore becomes necessary that ponds be normally stocked and palled feeds applied daily at certain percentage of body weight, with rates adjusted periodically by weight gain of fish. 2 to 5% of body weight per day could be ideal, depending on size.

Stock Manipulation: This includes selection for required traits such as fast growth quality flesh etc. This could take the form of production of monosex tilapia through hybridization process of sex reversal; but most appreciated for our purpose and level for this work is just the biological method of stock manipulation; using predatory fish like catfish; hence controlling the prolific nature of tilapia. This results to an increase in yield, with the added production of the predators as bonus.

Control of Disease, weeds and predators

Transmission of diseases is either likely to be water borne, through the introduction of infected stock or by predators which act as the final host of the parasites. Diseases are liable to become enzootic in intensified fish culture system, where there is an in balance in the dynamic equilibrium relationship normally set up between host and parasites. It is however better to prevent outbreak of diseases by keeping the ponds, well aerated and fish in good health condition than attempting treatment.

Weeds on the other hand can be a nuisance in tropical ponds. They are best removed by hand; but in larger ponds, suitable herbicides for example 2,4-D, Diuron can be used.

It is also necessary to check the ponds against predators for example birds, frogs, snakes, crabs and wild fishes. Widely advised for use are mechanical and chemical methods to get rid of the predators of fish.

CONCLUSION

In conclusion therefore, it is worthy of mention that good management is a key to good fish harvest. It is important that farmers realize this and identify the need to involve experts in their fishery ventures; for it pays more dividend doing so than losing huge profit and at times, even capital, in the hands of quacks.

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