Impact Of Physico-Chemical Parameters On Growth Of Indian Major Carps Cultured In Different Ponds At Krishna District, Andhra Pradesh, India

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***Abstract*—Water quality is determined by maintaining the optimum levels of variables like temperature, turbidity, carbon dioxide, pH, alkalinity hardness etc. In the present study water quality management principles in fish culture have been reviewed to make aware to fish culturists and environmentalist about the important water quality factors that influence health of a pond and are required in optimum values to increase the fish yields to meet the growing demands of present day scenario of the world. This study will aid fish farmers on the necessary treatment needed to effectively use water from this source for fish farming.**

Keywords— Water quality parameters, Fishculture, Indian major carps

I. INTRODUCTION

Fish is an inexpensive source of protein and an important cash crop in many regions of world and water is the physical support in which they carry out their life functions such as feeding, swimming, breeding, digestion and excretion (Bronmark, and Hansson, 2005). Water quality is determined by various physico-chemical and biological factors, as they may directly or indirectly affect its quality and consequently its suitability for the distribution and production of fish and other aquatic animals (Moses, 1983). Many workers have reported the status of water bodies (lentic and lotic) after receiving various kinds of pollutants altering water quality characteristics (physical, chemical and biological). All living organisms have tolerable limits of water quality parameters in which they perform optimally. A sharp drop or an increase within these limits has adverse effects on their body functions (Davenport, 1993) and good water quality is very essential for survival and growth of fish. The fish is an important protein rich food resource and there has been sharp increase in demand of fish products due to increasing population pressure in this century. Thus to meet the demand of present food supply, water quality management in fish ponds is a necessary step that is required to be taken up. The objective of the present study is to review and present a concise opinion regarding the optimum levels of water quality characteristics required for maximum fish production.

II. STUDY OF AREA

Machilipatnam (pond-1) is a town in Krishna district of Andhra Pradesh located at 16° 9'59.65"N 81° 7'34.45"E on the southeast coast of India(Fig-1).

Kaikalur (pond-2) is a town in Krishna district of Andhrapradesh located at 16°32'58.18"N 81°12'47.26" on the south east coast of India (Fig-1).

III. METHODOLOGY

At regular intervals in a month in morning time the water quality analysis was under taken for the estimation of the physico-chemical parameters of two different ponds, 1 in Kaikaluru and 1 in Machilipatnam.

The following water quality parameters were studied with the following procedures.

- pH: by Digital pHmeter(API freshwater master testing kit)
- Temperature: by Thermometers(API freshwater master testing kit)
- Turbidity: (Nephello Turbid Meter)
- Dissolved oxygen: Using standard Winkler method by titration (Winkler 1888.)
- Alkalinity: By titration method (apha 2320)
- Chloride: By titration method (Mohrs method 1856)
- Total hardness: (EDTA method Gloterman1996)
- BOD: By titration (IS3025 (PART44) –Rezaffirmed, 2003.

The supplementary feeds (local made rice bran,oil cake,soya beans, and corn powder) were given at 4% of fish body weight of *Catla catla*, *Labeo rohita* and *Cirrhinus mrigala* in both the ponds and the stocking density is *Catla catla* 2000 fishes, *Labeo rohita* 10000 fishes and *Cirrhinus mrigala* 600 fishes in both the ponds.

Correlation was carried out by using Microsoft excel.

IV. Result and Discussion

A. pH

The range of pH observed between 7.0 - 8.1 with an average of 7.75 ± 0.28 in pond -1 and between 7.6 - 8.7 with an average of 8.02 ± 0.33 in pond-2 (Fig-2).

B. Temperature

The range of temperature observed between 24.3 to 41.3ºc with an average of 29.8 ± 5.5ºc in pond-1 and between 28.8 to 41.3ºc with an average of 33.11 ± 3.58 in pond-2.(Fig-3)

C. Turbidity

The range of turbidity was observed between 20 to 28 NTU units with an average of 25 ± 2.7 in pond-1 and between 28.8 NTU units to 41.3 with an average of 25.62 ± 2.77 in pond-2. (Fig-4).

D. DissolvedOxygen

The range of dissolved oxygen was observed between 3.4 to 4.5mg/l with an average of 3.7 ± 0.18 in pond-1 and between 3.4 to 5.5 with an average of 3.93 ± 0.53 in pond-2 (Fig-5).

E. Alkalinity

The range of alkalinity was observed between 70 to 95 ppm. with an average of 86 ± 7.9 in pond-1 and between 70 to 95 ppm in pond-2 with an average of 87.1 ± 8.6.(Fig-6).

F. Chloride

The range of chloride was observed between 15 to 40 mg/l with an average of 27.2 ± 7.7 in pond-1 and between 15 to 40mg/l. with an average of 32.7 ± 3.5 in pond-2(Fig-7).

G. Total hardness

The range of total hardness was observed between 90 to 110 ppm with an average of 102.5 ± 6.7 in pond-1 and between 90 to 110 ppm. with an average of 105.5 ± 6.8 in pond-2(Fig-8)

H. Biological Oxygen demand

The range of BOD was observed between 2.0 to 5.0 mg/l with an average of 3.5 ± 0.9 in pond-1 and between 3.0 to 5.0 mg/l with an average of 4 ± 0.7 in pond-2 (Fig-9).

Growth and Feed:

Catla, Rohu, Mrigal were stocked in both the ponds andinitial weight of catla rohu and mrigal was 60g, 100g, and ,80g respectively in pond-1, where as in pond-2 the initial weight of catla, rohu and mrigal was 50g, 50 g ,50 g respectively. The weight of catla rohu and mrigal at their observed harvest was 1300g, 1000g ,and 950g respectively in pond-1 where as in pond-2the final weights of catla,rohu,and mrigal observed were 1100g,650g, and 980g respectively in pond-2.

Correlation at 5% level indicated that the water quality parameters were negatively correlated with the growth of catla rohu and mrigal in pond-1. the water quality parameters like temperature dissolved oxygen and pH were negatively correlated but alkalinity, total harness, turbidity and BOD were positively correlated with growth of catla, rohu, and mrigal in pond-2.

Shrivastava and Kanungo (2013), and Shyamala et al. (2008) reported the range of pH 6.93 to 7.55 and 7.5 to 8.4 respectively. Choudhary et al. (2014) reported a range of pH in between 7.0 and8.3. According to Umavathi et al. (2007), pH ranged between 5.0 to 8.5 was best for planktonic growth. Thripathaiah et al. (2012) and Shyamala et al.,(2008) also reported the range of temperature in between 24.75 to 28.5°C and 26.3 to27.2°C respectively. Boyd and Lichtkoppler (1979) suggested that the clay turbidity in water to 30 cm or less may prevent development of plankton blooms, 30 to 60 cm and as below 30 cm - generally adequate for good fish production and there is an increase in the frequency of dissolved oxygen problems when values above 60 cm, as light penetrates to greater depths encourage underwater macrophyte growth .But in present study we observed turbidity comparatively suitable for fish growth. According to Shrivastava and Kanungo (2013) reported a range of DO 2.43 - 4.45 mg/l in their study. Thirupathaiah et al. (2012) reported a range of DO in between 5.18-9.72mg/l. Benerjee (1967), and Torzwall (1957) had reported that if the concentration of DO is about 5mg/l, throughout the year, the reservoir will be productive for fish culture. Boyd and Lichtkoppler (1979) suggested that water with total alkalinities of 20 to 150 mg L-1 contain suitable quantities of carbon dioxide to permit plankton production for fish culture.

According to Santhosh and Singh (2007) the ideal value for fish culture is 50-300 mg L-1. According to Stone and Thomforde (2004) the desirable range of chlorides for commercial cat fish production is above 60 mg L-1 and acceptable range is 10 times the nitrite concentration. In present study chloride obtained was in the range of 15 to 40mg/l. reported chloride value ranged between10 25mg/l in his findings good for fish culture but according to above value, the values which we got in our findings are little more. The recommended ideal value of hardness for fish culture is at least 20 ppm (Swann, 1997) and a range of 30-180 mg L-1 (Santhosh and Singh, 2007). According to Stone and Thomforde (2004) the desirable Range is 50-150 mg L-1 as CaCO3 and acceptable Range is above 10 mg L-1 as CaCO3. According to Bhatnagaret al. (2004) the BOD level between 3.0-6.0 ppm is optimum for normal activities of fishes; In present study the value of BOD is ranged between 2.0mg/l to 5.0mg/l which are harmony for Water Quality Management for fish culture.

Fish do not like any kind of changes in their environment. Any changes add stress to the fish and the larger and faster the changes, the greater the stress. So the maintenance of all the factors becomes very essential for getting maximum yield in a fish pond. Good water quality is characterized by adequate oxygen, proper temperature, transparency, limited levels of metabolites and other environmental factors affecting fish culture. The initial studies of water quality of a fish pond in India were probably conducted by Sewell (1927) and Pruthi (1932). After that many workers have studied the physico-chemical condition of inland waters either in relation to fish mortality or as part of general hydrological survey (Alikunhiet al., 1952: Upadhyaya, 1964). The details of various pond ecosystems also have been studied by workers (Mumtazuddinet al., 1982: Delince, 1992: Garg and Bhatnagar, 1999:

Bhatnagar, 2008). Bhatnagar and Singh (2010) studied the pond fish culture in relation to water quality in Haryana.

However, the present study would provide the basic guidelines, parameter wise for the fish farmers in obtaining high fish yield in low input via maintaining water quality of their ponds.

V. SUMMARY

In the present study pH and DO values are little more in pond 2 Kaikalur and other parameters are within the normal range in both Machilipatnam and Kaikalur ponds which is suitable for fish culture. There is desirable need to analyze the fish pond water at regular intervals. Liming should be done at regular intervals of time depending on the pH of pond water. Drag-netting operation racking should be done at least once in a month to disturb the pond bottom and to ensure good quality conditions. If pond condition is maintained properly no doubt a better yield of fishes can be obtained and it is economically advantage to farmers. It was further noted the growth of indian major carps in pond-1 was little higher than the pond-2.

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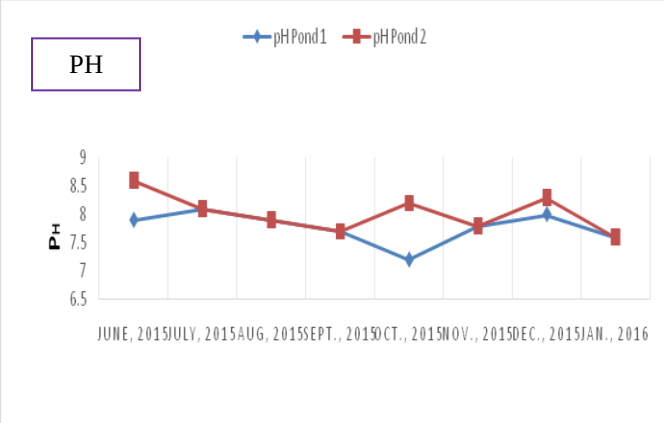
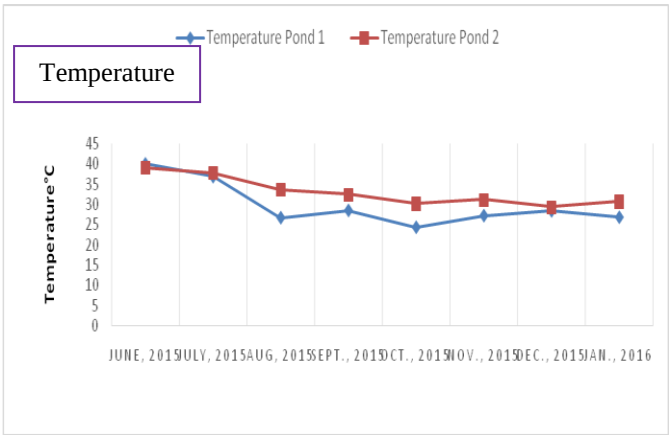
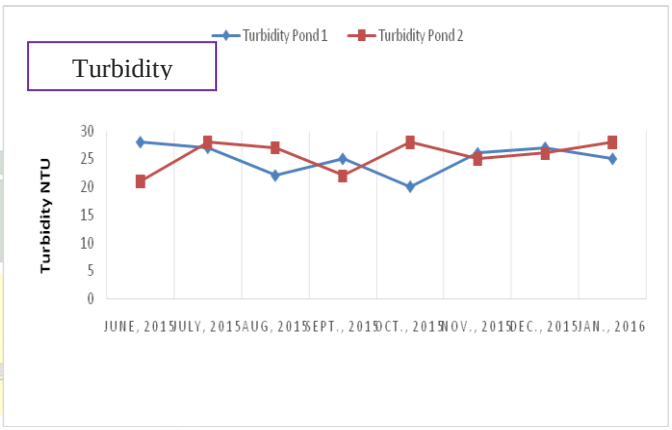
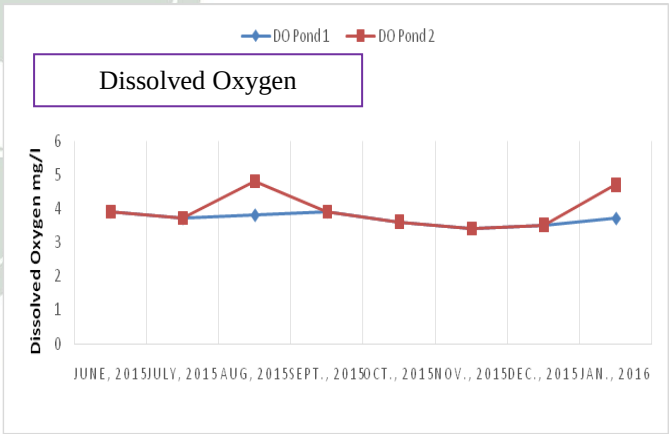
VI. TABLES AND FIGURES

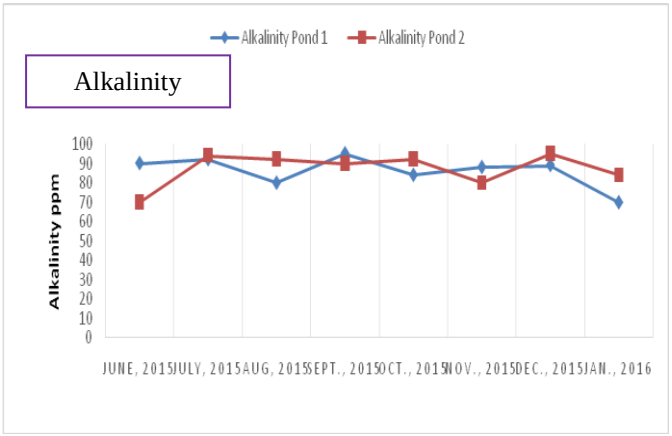
Fig. 1. Map showing sampling area.

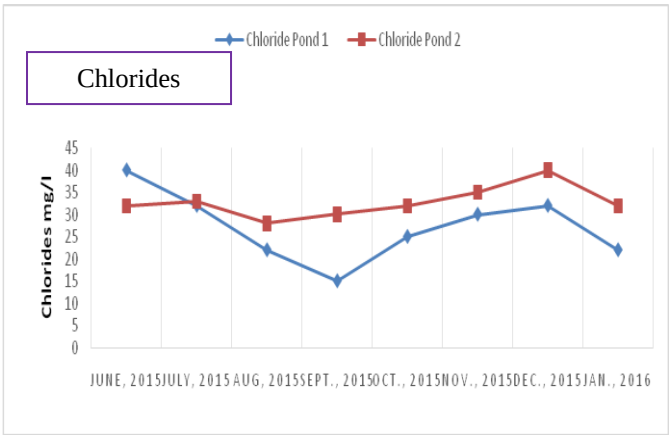


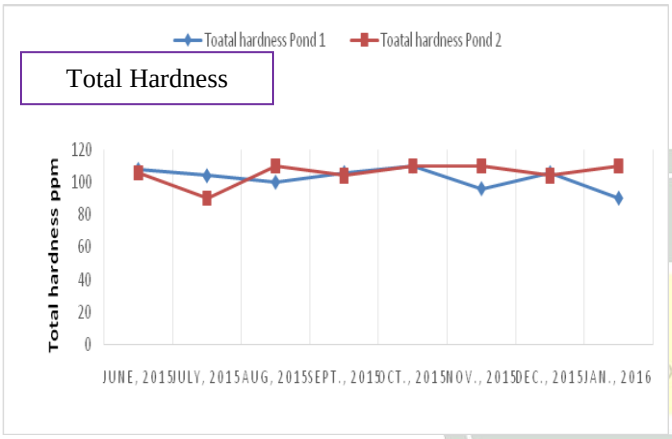












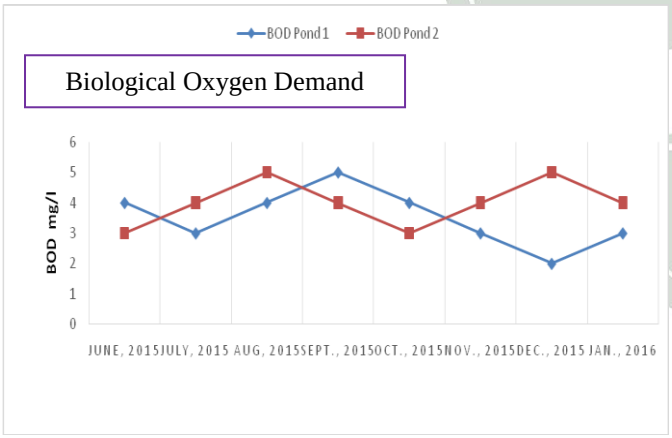


Fig. 2. Water quality parameters in fish ponds at Krishna District.

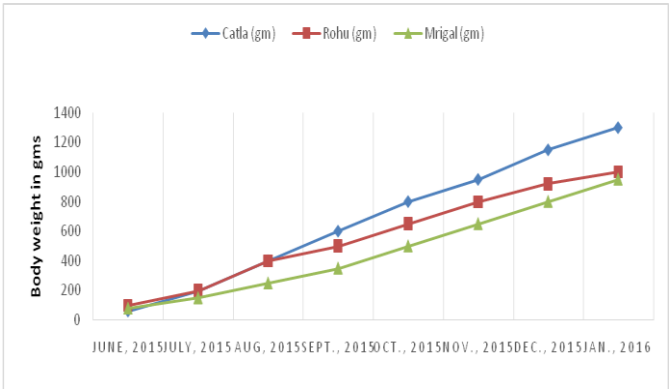


Fig. 3. Growth of Indian Major Carps in Pond-1.

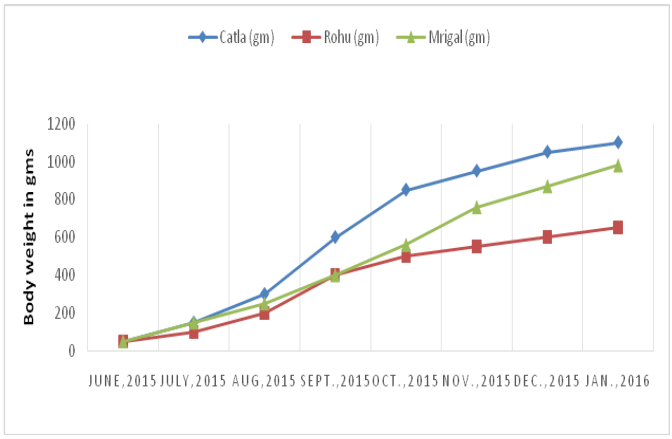


Fig. 4. Growth of Indian Major Carps in Pond-2.

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REFERENCES

[1] Alikunhi, K. H., Ramachandra, V. and Chaudhuri, H., (1952), Mortality of carp fry under supersaturation of dissolved oxygen in water, Proceedings of the national institute of sciences of India, 17 (4), pp 261-264.

[2] APHA, AWWA, WPCF (1998) Standard methods for the examination of water and waste water 20th Edition. APHA, NY, USA.

[3] Banerjea SM. 1967. Water quality and soil condition of fish ponds in states of India in relation to fish production. Indian journal of Fisheries, 14 (1&2): 115-144

[4] Bhatnagar, A., (2008), Productivity and fish biodiversity of selected ponds of Haryana, Project Report submitted to Department of fisheries Government of Haryana.

[5] Bhatnagar, A., Jana, S.N., Garg, S.K. Patra, B.C., Singh, G. and Barman, U.K., (2004), Water quality management in aquaculture, In: Course Manual of summerschool on development of sustainable aquaculture technology in fresh and saline waters, CCS Haryana Agricultural, Hisar (India), pp 203- 210.

[6] Bhatnagar, A. and Singh, G., (2010), Culture fisheries in village ponds: a multi-location study in Haryana, India. Agriculture and Biology Journal of North America, 1(5), pp 961-968.

[7] Bronmark, C. and Hansson, L. A., (2005), The biology of lakes and ponds, Oxford University Press, Oxford, pp 285.

[8] Boyd, C.E and Lichtkoppler, F., (1979), Water Quality Management in Fish Ponds. Research and Development Series No. 22, International Centre for Aquaculture (J.C.A.A) Experimental Station Auburn University, Alabama, pp 45-47.

[9] Choudhary P, Dhakad NK, Jain R. 2014. Studies on the Physico-Chemical Parameters of BilawaliTank,Indore (M.P.) India. IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSRJESTFT).8(1): 37-40

[10] Davenport, Y., (1993), Responses of the Blenniuspholis to fluctuating salinities, Marine Ecology Progress Series, 1, pp 101 – 107.

[11] Delince, G., (1992), The ecology of the fish pond ecosystem, Kluwer AcadmicPublisers London, pp 230.

[12] Ekubo, A. A. and Abowei, J. F. N., (2011), Review of some water quality management principles in culture fisheries, Research Journal of Applied Sciences, Engineering and Technology, 3(2), pp 1342-1357.

[13] Garg, S. K. and Bhatnagar, A., (1999), Effect of different doses of organic fertilizer (cowdung) on pond productivity and fish biomass in still water ponds. Journal of Applied Ichthyology, 15, pp 10-18.

[14] Moses BS, Introduction to Tropical Fisheries. University Press, Ibadan, 1983; pp. 105.

[15] Moyle, J.B., (1946), Some indices of lake productivity, Transactions of the American Fisheries Society, 76, pp 322-334.

[16] Mumtazuddin, M., Rahman, M. S. and Mostafa, G., (1982), Limnological studies of four selected rearing ponds at the aquaculture experiment station, Mymenshingh. Bangladesh Journal of Fisheries Research, 2-5 (1-2), pp 83-90.

[17] Pruthi, H.S., (1932), Investigations regarding a recent epidemic of fish mortality in the tank in the Indian museum compound with remarks on the causation of such epidemics in general. Review of Hydrobiology Hydrographic, 26, pp 242-257.

[18] Santhosh, B. and Singh, N.P., (2007), Guidelines for water quality management for fish culture in Tripura, ICAR Research Complex for NEH Region, Tripura Center, Publication no.29

[19] Sewell, R.B.S., (1927), On mortality of fishes, Journal of the Asiatic Society of Bengal, 22, pp 177-204.

[20] Shrivastava S, Kanungo VK. 2013. Physico-Chemical Analysis of Pond Water of SurgujaDistrict,Chhattishgarh, India. International Journal of Herbal Medicine, 1(4): 35-43

[21] Shyamala R, Shanthi M, Lalitha P. 2008. Physicochemical analysis of Borewell water samples of Telungupalayam Area in Coimbatore District, Tamilnadu, India. E-Journal of Chemistry, 5(4): 924-929.

[22] Stone, N. M. and Thomforde H. K., (2004), Understanding Your Fish Pond Water Analysis Report. Cooperative Extension Program, University of Arkansas at Pine Bluff Aquaculture / Fisheries.

[23] Swann, L.D., (1997), A Fish Farmer's Guide to Understanding Water Quality, Aquaculture Extension Illinois, Purdue University, Indiana Sea Grant Program Fact Sheet AS-503.

[24] Thirupathaiah M, Samatha CH, Chintha S. 2012.Analysis of water quality using physico-chemical parameters in lower manair reservoir of Karimnagar district, Andhra Pradesh. International Journal of Environmental Sciences. 3(1): 172-180.

[25] Tarzwell CM. 1957.Water quality criteria for aquatic like. In: Biological Problems in Water Pollutions. U.S.Dept. of Health Education and Welfare, 246-272

[26] Umavathi S, Longakumar K, Subhashini. 2007. Studies on the nutrient content of Sulur pond in Coimbator,Tamil Nadu. Journal of Ecology and Environmental Conservation, 13(5): 501-504

[27] Upadhyaya, M.P., (1964), Seminar on inland fisheries development in U. P., pp 127-135.