Journal of Entomology and Zoology Studies
Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2020; 8(5): 143-146

Received: 25-07-2020
Accepted: 28-08-2020

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Assessment of water quality parameters in grow out phase of brackish water fish *Lates calcarifer* (Seabass) in floating net cages

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Abstract
Cage culture is an alternative to inland and brakishwater farming, whereby existing water resources are used to increase fish and shell fish production and the fish are enclosed in a cage allowing the water to pass freely between the fish in the sea. The mesh retains the fish, making it easier to feed, observe and harvest them. The mesh also allows the water to pass freely between the fish and surrounding water resource, thus maintaining good water quality and removing wastes. The present studies were conducted in the closed bay near Suryalanka, Baptla, Guntur district. Prior to start of the experiment, the transported fish were acclimated with the sea environment by rearing them in hapa net for one week. Fish with an average initial weight of 351.72±1.05g were randomly stocked in the net cages at 6fish/ m^3, 8fish /m^3, 10fish /m^3, 12 fish/ m^3. Standard methods (APHA) used for analysis of water quality. All important water quality parameters was analysed for a period of 90 days with 15 days interval. The growth parameter of fishes from each net cage were estimated by taking the individual body length and weight at every 15 days of interval. This paper gives detailed information on water quality parameters such as water temperature, pH, dissolved oxygen, total alkalinity, nitrite, nitrate, ammonia in brackish water fish culture in floating net cages.

Keywords: Cage culture, brackish water, sea bass, stocking density, water quality

Introduction

Aquaculture is one of the fastest growing food production sectors in the world and has been growing steadily over the last three decades and continuing. It is clear that the bulk of fish required to feed the world in the coming decades will come from aquaculture. It is also time to put "nutrition security" at par with "food security". The global aquaculture production has tripled, growing at an average annual rate of 8.8%. Asia accounts for 88% of aquaculture production worldwide [4]. Cage culture is an alternative to inland and brakishwater farming, whereby existing water resources are used to increase fish and shell fish production and the fish are enclosed in a cage allowing the water to pass freely between the fish in the sea. The mesh retains the fish, making it easier to feed, observe and harvest them. The mesh also allows the water to pass freely between the fish and surrounding water resource, thus maintaining good water quality and removing wastes [9]. Cage culture of seabass is quite well developed in Thailand, Malaysia, Indonesia, Hong Kong and Singapore. The success of marine cage culture of seabass and its economical viability have contributed significantly to large scale development of this aquaculture system [24].

The Asian seabass (*Lates calcarifer*) known as "Kaalangi" or "Narimeen" in Kerala is an important candidate finfish species for farming. Seabass is a euryhaline fish, growing rapidly up to 3-5 kg within a growing period of 2-3 years in both freshwater and brackishwater environments. For maturation and spawning it migrates to the sea while the postlarvae and juveniles migrate to lagoons and backwaters for growing. It is a voracious carnivorous fish. However, the juveniles are omnivorous, feeding mainly on crustaceans and other small fishes. Seabass attains maturity at the age of 3-4 years at a length and weight range of 60 to 70 cm and 2.5 to 4.0 kg respectively. Males are generally small and in the size range of 2.0-3.0 kg and the males convert into females as they reach a size above 5.0 kg. The fecundity is between 2.1 to 17.0 million depending upon the size of the fish [24]. Seabass has been commercially cultivated in brackishwater and freshwater ponds and marine cages in many Southeast Asian countries.

While the cagae culture technology is now established. Although considerable progress has been made over the past ten years [24]. Water quality is the most important determinant for maintaining sustainable marine cage farming. Maintaining good water quality of the marine cage culture operations is important to maintain the ecological balance and also for the health of the cage cultured fish [23]. For maintenance of good water quality, it is essential to monitor all the parameters, which influence the growth and health of the fish, at regular intervals throughout the culture period. It is important to develop standard protocols for water quality management for the cultivation of different species. A standard policy should be clearly developed for the water quality criteria to be considered while selecting a site for cage culture operations [23].

Materials and Methods

The work was carried out at closed bay, near Suryalanka, Bapatla, Guntur district, Andhra Pradesh. It lies between latitude -15°51' 04.54" N and longitude 80°31'58.87" E. The experimental site is shown in Fig.1 and the experimental setup is shown in Fig. 2**.** By using standard methods [1], important water quality parameters were analysed. Water quality parameter like temperature, salinity, dissolved oxygen and pH were measured at 8.00 hrs. on 15days interval. Water samples were transported to the FRS laboratory after collection and analysed.

Table 1: Standard methods used for analysis of Physico-Chemical parameters of water

S. No.	Parameter	Method
1	pH	Digital pH meter (model-HI98107 pH ep® HANNA Instruments, Carrollton, TX, USA).
2	Temperature	Celsius glass thermometer.
3	Salinity	Hand held Refractometer (Erma, Tokyo).
4	Dissolved Oxygen	Titrimetric Winkler's method (APHA, 1995).
5	Total Alkalinity	Titrimetric method (APHA, 1995).
6	Ammonia	(APHA, 1995)
7	Nitrite (NO2)	(APHA, 1995)
8	Nitrate (NO3)	(APHA, 1995)

Fig 1: The experimental site

Fig 2: The experimental setup

Results and Discussion

Temperature (°C): The temperature at initial day was recorded as 28.0 °C. The highest and lowest values of temperature recorded were 30.2 °C and 28 °C respectively. On the 90 day sampling the temperature recorded was 30.2 °C which was highest. On the initial day sampling the temperature was recorded same as on 75 day sampling and 15 day sampling the temperature was recorded same as on 45 sampling. At the end of the experiment the temperature recorded was 30.2 °C. The values recorded during the experimental period were slightly fluctuated with a difference of 1.0 °C. The average temperature of 26.81 ± 1.65 ºC was recorded in Nile tilapia cage culture [6]. Nyanti *et al.* [12] reported the temperature of 25.2 to 32.2 ºC in the cage culture site of Batang Ai Hydroelectric dam reservoir, Malaysia. In tilapia cage culture system, temperature ranged from 27.8 to 28.1 ºC [5]. Nyanti *et al.* [12] also reported a range of water temperature from 24.5 to 32.6 ºC in Kubanni reservoir, where African catfish cage culture had been practiced.

Salinity (ppt): The initial day salinity was recorded as 27 ppt and the highest and lowest values of salinity recorded were 31 ppt for 15th day. On 30th and 90th day sampling the salinity recorded was same as 30 ppt. On 45th and 75th day sampling salinity recorded was same as 29 ppt. At the end of the experiment the salinity was recorded as 30 ppt. Similar observations were made by the Tomot *et al.* (2008) [17], where the pH values ranged from 7.8 to 8.8 in Halali reservoir. Dasuki *et al.* (2013) [3] also observed similar pH values in the Kubanni reservoir. In red tilapia cage culture system, pH values ranged from 6.3 to 8.7 in Tasik Kenyir reservoir, Malaysia [15]. Lucas and Southgate (2012) suggested the desirable range of pH value for tilapia culture ranges from 6.5 to 8.5.

Hydrogen ion index (pH): Initially the pH value was recorded as 8.2. The highest and lowest values of pH, recorded during the entire period of experiment were 8.3 (on 15th day) and 7.8 (on 60th day). At the end of the experiment the pH recorded was 8.1. On the 30 day sampling the pH was recorded (8.0) same as on 75 day sampling. Similar observations were made by the Tomot *et al.* (2008) [17], where the pH values ranged from 7.8 to 8.8 in Halali reservoir. Dasuki *et al.* (2013) [3] also observed similar pH values in the Kubanni reservoir. In red tilapia cage culture system, pH values ranged from 6.3 to 8.7 in Tasik Kenyir reservoir, Malaysia [15]. Lucas JS and Southgate PC (2012) [7] suggested the desirable range of pH value for tilapia culture ranges from 6.5 to 8.5.

Dissolved Oxygen (mg/l): The dissolved oxygen was calculated initially after introducing the fishes and the value was recorded as 6.6 mg/l. The highest and lowest values of dissolved oxygen, recorded during the entire period of experiment were 6.6 mg/l (on 1st day) and 5.1 mg/l (on 75th day). At the end of the experiment the dissolved oxygen value was recorded as 5.6 mg/l. Nyanti *et al.* (2012) [12] reported the range of D.O. values from 0.26 to 8.45 mg/l in the Batang Ai Hydroelectric dam reservoir, Sarawak, Malaysia. The minimum DO value (4 mg/l) was observed at 1.5 m depth both in the cage and control sites. This might be due to the decomposition of organic matter and limited flow of water towards the depth. The higher DO value might be due to mixing of water by heavy wind action [17].

Total Alkalinity (mg/l): Initially the alkalinity value was recorded as 139 mg/l. The highest and lowest values of total alkalinity, recorded during the entire period of experiment were 160 mg/l (on 75th day) and 139 mg/l (on 1st day). On 15th day and 90th day total alkalinity was recorded same as 145 mg/l. At the end of the experiment total alkalinity value was recorded as 145 mg/l. The similar results were observed by Murugasan *et al.* (2005) [11] in Odathurai reservoir, Tomot *et al.* (2008) [17] in Halali reservoir and Sugunan VV. (2011) [16] in Indian reservoirs. Mondal *et al.* (2010) [10] reported the average alkalinity value of 142.27 mg/l in the tilapia cage culture system. Siti-Jahrah *et al.* (2008) [14] reported the alkalinity values of Indian reservoirs between 40 and 150 mg/l.

Ammonia (mg/l): The ammonia value initially recorded was 0.01 mg/l. The highest and lowest values of ammonia, recorded during the entire period of experiment were 0.25 mg/l (on 45th day) and 0.01 mg/l (on 1st and 75 day). On 15th day and 90th day ammonia was recorded same as 0.02 mg/l. At the end of the experiment ammonia value was recorded as 0.02 mg/l. Present values were found are similar to the previous reports [6, 12, 15]. Zanatta *et al.* (2010) [21] reported the slightly lower (0.052 µg/l) ammonia concentration in tilapia cage culture at Jurumirim reservoir, Brazil.

Nitrite (mg/l): Initially the nitrite value was recorded as 0.01 mg/l and the highest and lowest values of nitrite, recorded during the entire period of experiment were 0.04 mg/l (on 15th day) and 0.01 mg/l (on 1st, 30th and 75th day). At the end of experiment of nitrite value was recorded 0.02 mg/l. These values were similar to the reports in Tasik Kenyir reservoir in Malaysia [15], sub-tropical reservoir in Brazil [22], in the tilapia cage culture site in Thailand [10], the Nova Avanhandava reservoir, Brazil [8] and the reservoir in Padre Azevedo in Brazil [5].

Nitrate (mg/l): Initially the nitrate value was recorded as 2.56 mg/l. The highest and lowest values of nitrate, recorded during the entire period of experiment were 3.25 mg/l (on 15th day) and 2.28 mg/l (on 60th day). At the end of experiment if nitrate value was recorded 2.30 mg/l. Results of the study are in agreement with the reports in the Jurumirim reservoir, Brazil [22], Indian reservoirs [17], the Manair reservoir [19] and Nova Avanhandava reservoir, Brazil [8].

Fig 3: Asian Sea bass (*Lates calcarifer*)

Table 2: Water quality parameters in floating net cages of sea bass *(Lates calcarifer)* culture in floating net cages

Parameter Period (Days)	Temp. (°C)	Salinity in ppt	pH	D.O (mg/l)	Total Alkalinity (mg/l)	Ammonia (mg/l)	Nitrite (mg/l)	Nitrate (mg/l)
Initial	28.0	27	8.2	6.6	139	0.01	0.01	2.56
15	29.5	31	8.3	5.5	145	0.02	0.04	3.25
30	30.0	30	8.0	6.1	150	0.03	0.01	3.20
45	29.0	29	7.9	5.8	148	0.25	0.03	2.45
60	29.5	28	7.8	4.8	158	0.05	0.02	2.28
75	28.0	29	8.0	5.1	160	0.01	0.01	3.10
90	30.2	30	8.1	5.6	145	0.02	0.02	2.30

Conclusion

During the study period there was a fluctuations in all water quality parameters due to seasonal and diurnal changes, these fluctuations have not shown any considerable negative impact on growth and survival of cultured fish in floating net cages and throughout the study period all parameters were maintained at optimum levels and within the suitable and safe range for seabass culture in cages.

Acknowledgement

The authors thank principal scientist and Head of the Fisheries Research Station, Kakinada and Sri Venkateswara Veterinary University, Tirupati for the guidance and all the facilities provided.

Refer ences

1. APHA (American Public Health Association), 1995.

Standard methods for the examination of water and waste water, 19th ed. American Public Health Association, Washington, DC.
2. Bonded-Reantaso MG, Mohan CV, Crumlish M and Subasinghe RP. Disease in Asian Aquaculture VI. Fish Health Section, Asian Fisheries Society, Manila, Philippines, 505.
3. Dasuki A, Auta J and Oniye SJ, 2013.Effect of stocking density on production of *Clariasgariepinus* (Tuegels) in floating Bamboo cages at kubanni Reservoir, Zaria, Nigeria.*Bajopas*. 6(1), 112-117.
4. FAO 2014. The State of World Fisheries and Aquaculture (SOFIA); Food and Agriculture Organization of the United Nations. Rome, Italy. p. 240.
5. Gorlach-Lira K, Pacheco C, Carvalho LCT, Junior HNM, Crispim MC, 2013.The influence of fish culture in floating net cages on microbial indicators of water quality. *Braz. J. Biol*. 73(3): 457-463.
6. Jiwyam W, 2012. Extensive net cage culture of Nile Tilapia (*Oreochromis niloticus*) fingerlings in nutrient-enriched pond. *Our Nature*. 10, 61-70.
7. Lucas JS, Southgate PC, 2012. Aquaculture farming Aquatic animals and plants. Second edition. Blackwell Publishing Ltd.
8. Mallasen M, Barros, HP, Traficante DP and Camargo ALS, 2012. Influence of a net cage tilapia culture on the water quality of the Nova Avanhandava reservoir, Sao Paulo state, Brazil. *Acta Scientiarum Biological Sciences.* 34(3), 289-296.
9. Masser M. 2008. What is Cage Culture? SRAC Publication No. 160. Mazzola, A.,Favaloro, E. and Sarà, G., 2000. Cultivation of the Mediterranean amberjack,
10. Mondal MN, Shahim J, Wahab MA, Asaduzzaman M, Yang Y, 2010. Comparison between cage and pond production of Thai Climbing Perch (Anabas *testudineus*) and Tilapia (*Oreochromisniloticus*) under three management systems.*J. Bangladesh Agril.Univ.* 8(2), 313-322.
11. Murugesan VK, Manoharan S and Palaniswamy R, 2005. Pen fish culture in reservoirs- an alternative to land based nurseries. *NAGA World Fish Center Newsletter*, 28(1 & 2): 49-52.
12. Nyanti L, Hii KM, Sow A, Norhadi I and Ling TY, 2012. Impacts of Aquaculture at different Depths and Distances from cage culture sited in Batang Ai Hydroelectric Dam Reservoir Sarawak, Malaysia. *World Applied Sciences Journal.* 19(4), 451-456.
13. Sarkar SK, 2011. Freshwater fish culture. Daya Publishing House, Delhi.
14. *Seriola dumerili* (Risso, 1810), in submerged cages in the Western Mediterranean Sea. Aquaculture 181, 257 –268.
15. Siti-zahrah A, Padilah B, Azila R, Rimatulhana R and Shahidan H, 2008. Multiple streptococcal species infection in cage-cultured Red Tilapia But showing similar clinical signs, pp 313-320.
16. Siti-Zahrah A, Misri S, Padilah B, Zulkafli R, Kua BC, Azila A and Rimatulhana R. Pre- disposing factors associated with outbreak of Streptococcal infection in floating cage-cultured tilapia in reservoirs, p. 129. In: 7th Asian Fisheries Forum 04 Abstracts. The Triennial meeting of the Asian Fisheries Society held during 30th Nov - 4 th Dec 2004 at Penang, Malaysia. 2004, 420
17. Sugunan VV, 2011. Reservoir fisheries. Handbook of fisheries and aquaculture. ICAR, New Delhi.
18. Tamot P, Mishra R and Samdutt, 2008. Water Quality Monitoring of Halali Reservoir with Reference to cage Aquaculture as a Modern Tool for Obtaining Enhanced Fish Production. In: Proceedings of Taal 2007: the 12th World Lake Conference, 318-324.
19. Thirupathaiah M, Samatha CH and Sammaiah C, 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.
20. Watanabe T, Davy FB and Nose T, 1989. Aquaculture in Japan. The current status of fish nutrition in aquaculture, pp. 115 – 129. Toba, Japan.
21. Wirat Jiwyam, 2011. The effect of stocking density on yield, growth, and survival of Asian river catfish (*Pangasius bocourti* Sauvage, 1880) cultured in cages. Aquacult Int, 19:987–997.
22. Zanatta AS, Perbiche-Neves G, Ventura R, Ramos IP and Carvalho ED, 2010. Effects of a small fish cage farm on zooplankton assemblages (Cladocera and Copepoda: Crustacea) in a sub-tropical reservoir (SE Brazil). *Pan-American Journal of Aquatic Sciences.* 5(4), 530-539.
23. Jayashree, L. Importance of Water Quality in Mariculture. Karwar Research Centre of CMFRI, Karwar, 91-94.
24. FAO, 2009. Environmental impact assessment and monitoring in aquaculture. FAO Fisheries and Aquaculture Technical Paper No. 527. Rome. 57 pp. Includes a CD-ROM containing the full document (648 pp.) (www.fao.org/ docrep/ 012/i0970e/i0970e00.htm).