Performances of Dutch Claries Juvenile Stocked at Different Densities in Out-door Happas

***Sogbesan, Olukayode Amos[1] and Aderolu, Zaid Ademola[2] and Panya, Micheal Wilson[1]**

[1]Department of Fisheries, Federal University of Technology, Yola.

[2]Department of Marine Sciences, University of Lagos, Akoka

*Correspondence author: Email: sokay_2003@yahoo.com

Abstract: The differences in optimum stocking levels reflect differences in species culture condition and size of fish used in the studies. Hollandis fingerlings will be stocked at 5, 10, 15 and 20 per happas of sizes (1m X 1m X 1m) and coded T1, T2, T3 and T4 respectively. They were fed 5% body weight of 45% crude protein diet for ten weeks. The results of the experiment showed that Happa stocked at 10 hollandis juvenile had the highest specific growth rate of 0.89%/day while those stocked at 20 Juvenile per m^2 had the lowest specific growth rate of 0.26%/day. These were significantly different ($p<0.05$) to each other. The survival and condition factors were also significantly different ($p<0.05$) between T2 and T4. The condition factors for fish stocked above 15Juvenile/m^2 of happas were below 1.00 while those from fish stocked below 15Juvenile/m^2 were above 1.00. The Feed conversion rate ranged between 1.23 to 2.04. The best from T1 and the worst from T4. There were no significant difference between feed conversion rate in T2 and T3. From this study and foregoing, Hollandis can still be stocked at 10 Juvenile per m^2 for sustainability of aquaculture.

[World Rural Observations 2009;1(1):17-23]. ISSN: 1944-6543 (print); ISSN: 1944-6551 (online).

Key words: growth; feed conversion rate; survival; Hollandis; stocking density

1. Introduction

In spite of remarkable success reported on the induced breeding of Dutch *Clarias*. It's still beset with survival during the fry and fingerlings stage. This is attributed to lack of proper awareness and technical "know-how" about principles of hatchery management. Studies on the effect of stocking densities and feeding frequency of other aquaculture species have yielded different results. Optimum stocking for which fish density was reported as 60 fish/m^3 for estuary grouper, (maximum weight of 15.2g) (Teng and Chua, 1978), 150 fish/m^3 for rainbow trout *Oncorhynchus mykiss* (Trzebiatowski *et al*., 1981); 100 fish/m^3 for *Clarias anguillarias* (2.5g) (Madu, 1989). The differences in optimum stocking levels reflect differences in species culture condition and size of fish used in the studies.

There is currently very scanty information on the optimum stocking density and feeding frequency of Dutch *Clarias gariepinus* "Hollandis" juveniles. According to Viveen *et al.* (1986) optimum stocking density for effective hapa management of fry must be established since the performances in confinement are largely influenced by stocking density. In view of this, there is a clear need to look at the space requirement for optimum performance for dutch *Clarias gariepinus* juvenile.

2.Materials and methods

(1) Study area

The research was carried out in the Fisheries Farm of Federal University of Technology Yola, Adamawa State between September to December, 2008.

The research area is located within the Sudan Savannah and lies between latitude 7^0 and 11^0 North of the equator and between longitude 11^0 and 14^0 East of the Greenwich Meridian. The mean annual rainfall is about 1000mm and the average minimum temperature is 40^0c (Adebayo, 1999).

(2) Methods and materials for the construction of hapas

Fishing Net of mesh size, Fishing Twine, Needle, Scissors, and Meter Rule. (Plate 1.0.). Twelve hapas net of sizes 1m X 1m X 1m were constructed as described by Otubusin (1985) and Otubusin and Opeloye (1985) in order to determine the stocking densities of Dutch Clarias. The net hapas were attached to the concrete tank on the floating culture system (see plate 1).

Plate 1. Experimental happas in the out-door concrete tank

(3) Experimental fish

200 Juveniles of Dutch domesticated strain of *Clarias gariepinus* produced by artificial spawning of the domesticated broodstock of average weight 15.40±3.24g were purchased from Gessedaddo Farms Limited Km 11 Yola, Numan Road, Adamawa State. These were also acclimatized in outdoor concrete tanks at the Research farm of Department of Fisheries, Federal University of Technology, Yola.

(4) Feed ingredients and formulation

The Dutch *Clarias* will be fed on mainly essential nutrient of complete diet purchased from the market. The materials for the composition of the fish feeds ingredients are as follows. Maize, Groundnut cake (GNC), Soya beans, Groundnut oil, Fish meal, Vitamin and mineral premix, Salt and Starch were purchased from Fish feed store in Yola, Adamawa. They were used to formulate 45% crude protein pelleted feeds as shown in Table 1 and fed to the fish.

Table 1. Experimental diet (DM/100g) and Proximate composition of the feed

Ingredients	**compositions**
Groundnut cake	17.00
Fish meal	32.00
Soybeans	14.00
Yellow maize	34.00
Starch	3.00
Salt	0.4
Vitamin and Mineral premix	1.6
Palm oil	1.00

Total	**100.00**
Calculated crude protein (%)	40.00
Proximate composition	
Dry matter	87.89%
Crude protein	40.20%
Crude lipid	14.45%
Crude fibre	4.57%
Ash	11.20%
Nitrogen free extract	17.47%

(5) Acclimatation of the fish and experimental set-up

C. gariepinus fingerlings will be randomly assigned to each of the eight experimental Hapas at different stocking densities and feeding frequency. The stocking density and feeding frequency of fingerlings per (m^3). A 45% dietary crude protein prepared according to Eyo (2003).

(6) Stocking density

Hollandis juveniles were stocked at 5, 10, 15 and 20 per hapas of sizes (1m X 1m X 1m) and fed 5% body weight of 45% crude protein diet for eight (8) weeks

(7) Water quality and temperature

The temperature, dissolve oxygen, nitrite and pH will be determined using Boyd, (1992) methods.

(8) Monitoring

The fish were monitored for survival by removing the dead fish and recording their numbers.

Each experimental set-up will be monitored for weekly weight by recording the fish using OHAUS weighing balance. The new weekly weighed will be used to adjust the quantity of the ration given to the fish.

(9) Data collection

The weight and quantity of feed given per each setting will be recorded on weekly basis.

(10) Chemical analysis

Feed formulated shall be analyzed for the proximate composition using AOAC, (2002) methods.

(11) Growth and feed relation parameters

The following parameter shall be determined using the weekly weight, length and quantity of feed fed. Weight gain (g/fish, Specific growth rate (%/day), Relative weight gain (%), Condition factors, Feed Supplied, Feed conversion ratio, Protein efficiency ratio, Survival

(12) Data analysis

The data collected will be subjected to one way analysis of variance and differences among means will be deleted with least significant. Difference multiple range test at 0.5% probability to accept or reject the level (Sokal and Rohlf, 1981). Graphically, the weekly weight and feeds fed shall be represented.

3. Result

The feed proximate composition shows that the protein content was 40.20% and lipid was 14.45% as shown on Table 1.

The result of the data collected in respect of the research into the stocking densities and growth performance of Dutch Claris (Hollandis) reared in happas at different stocking rates in outdoor concrete tank is presented in Figure 1 as well as graphical depiction. There was significant different in the mean weight gain obtained in all the four treatments. Table 3 shows the survival rate of Dutch Clarias juvenile in the outdoor concrete tanks during the experimental period. Fish survival was between 80% and 90%. Details of number of Dutch Clarias juvenile that survivals during the experiment are shown in table.

Table2. Growth performances of Hollandis raised in Happas at different stoking densities

Parameter	**T1**	**T2**	**T3**	**T4**
Stocking densities	5/m^3	10/m^3	15/m^3	20/m^3
Initial mean weight (g/Fish)	18.12	15.00	13.62	14.84
Final mean weight (g/fish)	27.48	22.14	21.34	20.08
Mean weight gain (g/fish)	9.36	7.14	7.72	5.24
Relative weight gain (%/fish)	51.66[a]	47.60[a]	56.68[a]	35.31[b]
Specific growth rate (%/fish)	0.32[a]	0.30[a]	0.35[a]	0.23[b]
Food conversion ratio	0.06[b]	0.08[ab]	0.13[a]	0.17[a]
Protein efficiency rate	0.14[b]	0.19[b]	0.33[a]	0.45[a]
Feed intake	158.16[a]	93.92[b]	58.24[c]	29.11[d]
Condition factor K1	0.72	0.80	0.71	0.68
Condition factor K2	0.59	0.65	0.66	0.63
Initial length (cm)	13.62	12.34	12.42	12.98
Final length (cm)	16.72	15.06	14.82	14.74
Length gain (cm)	3.10	2.72	2.40	1.76

All data with different superscripts are significantly different ($p<0.05$)

Table 3. Cost analysis of Hollandis Stocked at different densities and raised in Happas for 56days

Cost (₦)	**T1**	**T2**	**T3**	**T4**
Mean Cost of feeding	596.18	540.31	514.62	438.99
Mean Cost of Juvenile	80	80	80	80
Cost of construction of Happas	1200	1200	1200	1200
Miscellaneous	200	200	200	200

Expenditure	2076.18	2020.31	1994.62	1918.99
Value of Fish	125.73	130.00	116.08	147.19
Net profit/loss	-1950.45	-1890.31	-1878.54	-1771.8
Incidence of cost	154.9	157.4	212.6	156.1
Profit index	0.211	0.241	0.226	0.335
Cost benefit ratio	0.0605	0.0643	0.05819	0.0767

The specific growth rates were also significantly different amongst treatment ($p<0.05$). Treatment 1 with the least stocking densities (5fish/M^2) had a SGR of 0.53 while treatment 3 with (15fish/M^3) stocking density had the least specific growth rate of 0.29. Although there were variation in the mean gain in length. The lengths of the juvenile were not significantly different $p>0.05$.

The mean weight gain per day for juvenile was found to be highest (1.12g/day) in treatment 1 followed by juvenile in treatment 2 (1.1g/day), treatment 4 with (1.1g/day) and treatment 3 (0.81g/day), respectively.

This means that treatment 3 had the least mean weight gain of 0.81g/day. The mean number of fast growers was found to be highest in treatment 1 with stocking density of (5fish/m^2) while lowest stocking density. Highest stocking density (15fish/m^2) gave rise to fewer but bigger jumpers. Water quality parameter measured varied as followed; temperature 28^0C to 28.5^0C, dissolved oxygen, 4.68 to 5.73 mg/l, pH, 7.40 to 7.52.

4. Discussion

Result of this study showed that stoking density affect the growth and survival of Hollandis under happas management system (see fig 1). Similar results were found in other mudfish: *C. gariepinus*, maintained at a density of 100fry per m^3 grew significantly faster than when maintained at 50/m^3 (Madu, 1989). Fish stocked at higher densities (values) showed a significant increase in the mean fish weight, weight-gain per fish, specific growth rate as well as survival, compared to those at the lower stocking densities. The specific growth rate was highest in treatment A with the lower stocking densities and lowest in treatment D with the highest stocking density. This conforms to the findings of Haylor (1992) who stated that specific growth rate deceases with increase density. The increase in the development of "Jumpers" as the stocking levels increased, further support the effect of overcrowding. Growth and production of fish are to a certain extent dependent on the population density (Siddiqui *et al*, 1989). In the present study, the harmful effects that higher stocking density had on the rearing of juvenile were reduction in growth and lowering of survival.

A similar trend was reported by Ita *et al*, (1989) for the fry of *C. anguillaris* under outdoor hatchery management system. Higher stocking density (Value) gave rise to fewer but bigger "jumpers". Mortality of fish during the study might have resulted mainly from cannibalism and space effects. The dissolved (DO), pH and Temperature (T^0C) estimated during the experiment were within the acceptable range for warm water fish culture (Boyd, 1981).

When all these are considered, the best option that can guarantee highest revenue, largest turnover and a reduced production cost will be the tank with 20 Juvenile/m^3 (Table 3). The study carried out on the utilization of happas in raising fish as been practised in cage culture may not be economically viable based on the fact that the cost of producing happas is higher than either an earthen pond or a concrete pond if aquaculture is to be practised as a sustainable venture. The study is recommending a stocking density that will be as high as 20Juvenile /m^3 for dutch Clarias which will turn out as economically viable. This is against the conventional 5Juvenile/m^3. This could have been as a result of the fact that the fish studied (Dutch clarias) is an improved variety of a naturally hardy fish of the family Clariidae.

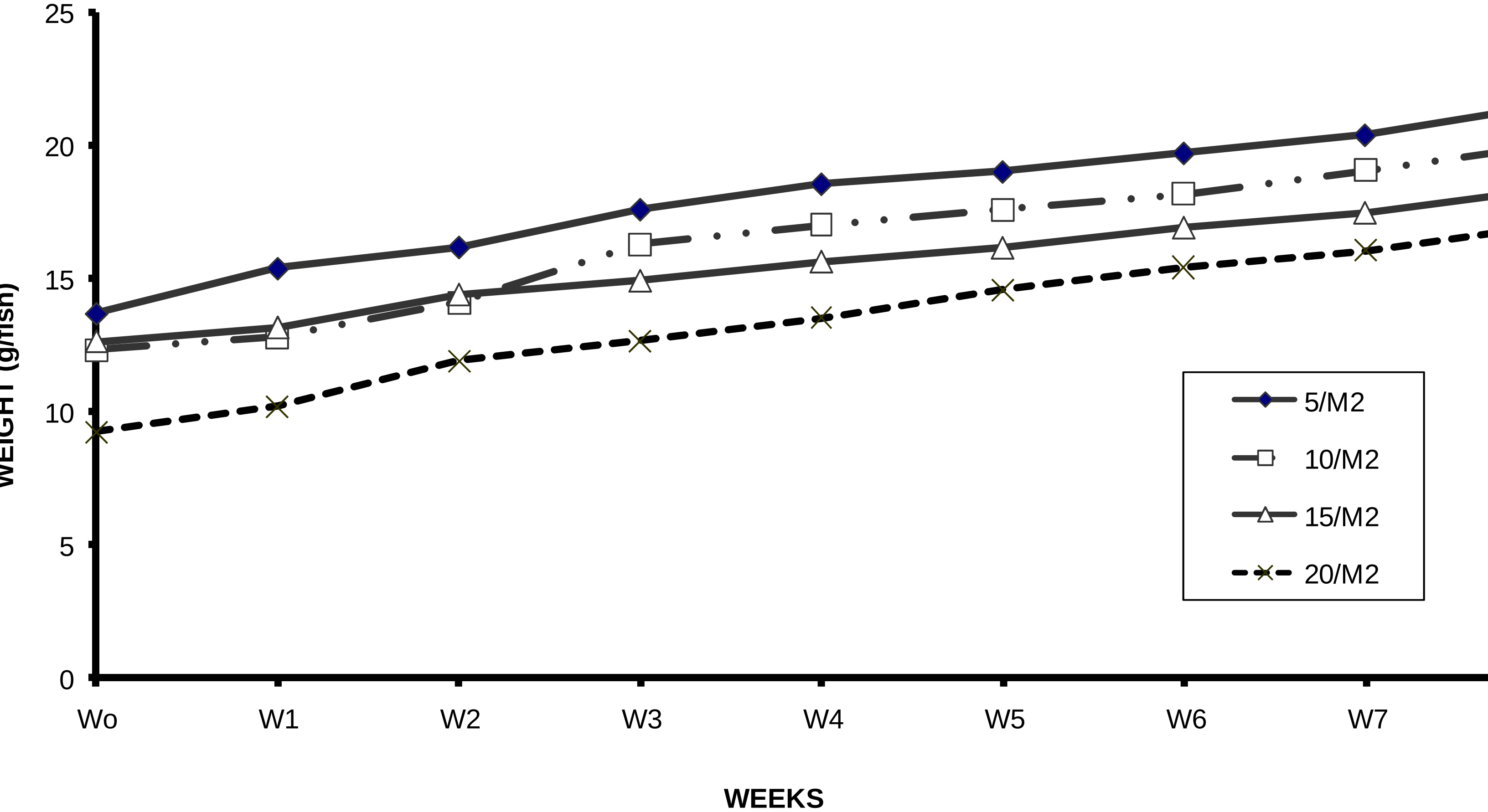

FIGURE 1. WEEKLY WEIGHT CHANGES IN DUTCH CLARIAS RAISED IN HAPAS AT DIFFERENT STOCKING DENSITIES

References

[1] Adebayo, A.A. Climate II in Adamawa Statae in maps edition. Al parceled publishers. Yola, Nigeria 1999: 11-13.

[2] Agnese, J.F., Otemee Z.J., Gilles S. Effects of domestication on genetic Variability, Survival and Growth rate in a tropical Siluriform: Heterobranchus longifilis Valenciennes 1980. Aquaculture 1995;131: 197-204.

[3] Association of Official Analytical Chemist Official Methods of Analysis, 17th Edition Washington, D.C., U.S.A.2007.

[4] Dada, A. A. , Wonah, C. Production of Exotic Clarias gariepinus fingerlings at vary stocking densities in outdoor concrete ponds. J. Aquac. Sci.2003; 18(1): 21-24.

[5] Eyo A.A. Fundamentals of fish nutrition and diets development. An Overview. In: proceeding of the Joint Fisheries Society of Nigeria/National Institution for Freshwater 2003.

[6] Holcik, J. Fish introduction in Europe with particular reference to its Cental and Eastern part. Can. J. Fish. Aquat. Sci.1991; 48(Suppl. 1): 13-23.

[7] Huisman, E. J. , Richter, C.J.J. Reproduction, Growth, Health Control and Aquaculture Potential of the Afican Catfish, Clarias gariepinus (Burchell, 1822). Aquaculture 1987;63: 1-14.

[8] Madu, C.T. Hatchery management of the mudfish, Clarias anguillaris (I) PhD. Thesis University of Jos, Nigeria 1989.

[9] Otubusin, S.O., G. Opeloye. Studies on fish production using floating bamboo net cages and hapas in Kainji Lake Basin. KLRI annual Report 1985: 82-87.

[10] Richter, C.J.J., Viveen, W.J.A.R., Eding, E.H., Sukkel, M., Rothuis, A.J., Oordt, P.G.W.J.The significance of photoperiodicity, Water temperature and an inherent endogenous rhythm for the production of viable eggs by the African catfish, Clarias gariepinus, kept in subtropical ponds in Israel and under Israeli and Dutch hatchery conditions. Aquaculture 1987;63: 169-185.

[11] Sokal, R.R., Rohif, F.J. Biometry. Freeman, New York, N.Y. 1981:85.

[12] Tacon, A.G.J. The Nutrition and feeding of farmed fish and shrimp. A training manual, 3-feeding methods F.A.O. field Document Project CP/RLA/075/ITA, Field Document No. 7, Brasilia, brazil 1988:208.

[13] Teng, S.K., Chua, T.E. Effect of stocking Density on the Growth of Estuary Grouper, Epinephelus salmoides Maxell, Cultured in Floating Net Cages. Aquaculture 1998;15: 237-287.

[14] Teugels, G.G. Preliminary results of a morphological study of five African species of the subgenus Clarias (Clarias) (Pisces: Clariidae). J.Nat.Hist.1982; 16: 439-464.

[15] Teugels, G.G. A systematic revision of the African Species of the genus Clarias (Pisces: Clariidae). Afrique Centrale 1986; 247: 199.

[16] Teugels, G.G. and Adriaens, D. Taxonomy and phylogeny of Clariidae: An overview. In: G. Arratia, B.G. Kapoor, M. Chardon, R. Diogo (Eds.), Catfish. Science publishers, Inc. Enfield (USA) 2003;1:465-487.

[17] Trzebiatowski, R; Filipak, J., Jakubowski, R. Effect of Stocking Density on Growth and Survival of Rainbow trout (Salmo gaidneri Rich.). Aquaculture 1981;22: 289-295.

[18] Viveen, W.J.A.R., Richter, C.J.J., Van Oordt, P.G., Janssan, J.A.L., Huisman, E.A. Practical manual for the African catfish Clarias gariepinus. Section for Research and Technology, Box 20061, 2500 EB. The hague, the Netherlands 1986:121.

[19] Welcomme, R.L. International Introductions of inland aquatic species. F.A.O. Fish. Tech 1988:294-318.