Journal of Agriculture and Environment Vol. 6 Nos.1&2, 2010: 63-68
ISSN 1595-465X

# EFFECT OF DIFFERENT DIETS AND FEEDING FREQUENCY ON THE GROWTH AND SURVIVAL OF CATFISH (*Clarias gariepinus*) FRY

**B. O. Omitoyin**

Department of Wildlife and Fisheries Management, University of Ibadan, Ibadan, Nigeria

## ABSTRACT

The effect of food type (live or prepared) and feeding frequency on the growth and survival of *Clarias gariepinus* fry were observed over 13-day experimental period. Four-day old larvae of *Clarias gariepinus* with initial weights ranging from 2.4 to 3.1mg and initial length of 5.5-6.9 mm, were reared in 40 litre (L) capacity plastic aquaria filled with 10L of water maintained at 26.80 $^{o}$C. The fry were fed with 60% crude protein compounded feed, Artemia, Zooplankton, and combination of zooplankton and compounded feed at different frequencies of twice (0800 and 1600hrs): 4 times (0800, 1100, 1400 and 1700hrs): 6 times (0800, 1000, 1200, 1400,1600 and 1800hrs): and 8 times (0800, 0930, 1100, 1230, 1400, 1530, 1700 and 1830 hrs) daily. Feeding was to satiation (*ad libitum*). Fry fed combined diets significantly ($P<0.05$) had better growth performance and survival rate than fry fed compounded diet alone. There were no significant differences noticed among frequencies of feeding in all diets. Fry should be fed to satiation two to eight times daily on combined diets of zooplankton, artemia and compounded feed for better weight gain and higher survival rate.

**Key words**: Feeding frequency; *Clarias gariepinus* fry; Growth performance

## INTRODUCTION

Fish is an important component of man's diet and could be considered a possible potential solution to world food shortage in terms of protein. To ensure all year round supply of fish, breeders have developed techniques of induced spawning that if efficiently controlled will produce fertile eggs and good progeny (Cho *et al.*, 1985). For fish to grow, it needs balanced diet. An individual fish in nature has to take care of this need by itself, but as soon as fish becomes farmed animals, there is the need to have information about their nutritional requirements (Faturoti *et al.*, 1992).

*Clarias gariepinus* from both wild and farmed sources are of great importance as food in Africa and are widely cultured. The importance attached to the culture of catfish particularly in Nigeria is not only because it is a highly esteemed species that commands high market value, but also it is hardy and can tolerate low dissolved oxygen level and other adverse conditions where most other cultivable species cannot survive (Omitoyin, 1995). These qualities, coupled with its low bone content, fine flavour, high growth rate and its ability to feed on virtually anything make it to be preferred by fish farmers in Nigeria.

Artificial propagation of catfish through hypophyzation was reportedly initiated in Western Nigeria in 1973 (Eliot, 1975). Since then, mass propagation of this species has been a problem due to low survival rate of hatchlings.

The feeding of *Clarias gariepinus* hatchlings is recognized as a major problem in its management since life has been described by van Dewind (1979) as obligatory for its successful development. After the first one to three days of yolk absorption of *Clarias* fry, the swim up larvae require exogenous source of food to live and grow. Therefore, suitable food must be provided for ingestion in sufficient quantities if undesirable morbidity and mortality are to be averted. In rearing fish, nothing is more important than a well balanced diet and adequate feeding methods in order to achieve good growth (Craig and Helfrich, 2002). However, food can only be provided with the understanding of the food and feeding requirements of the fry. High mortality of *Clarias gariepinus* fry is a common occurrence in many fish hatchery in Nigeria due to dearth of information on their food requirement and feeding frequency.

This study therefore, examined the effects of different types of diet and feeding frequencies that can ensure good growth and enhance higher survival of *Clarias gariepinus* fry under cultured condition.

## MATERIALS AND METHODS

### Experimental Diets and Fish

This experiment was carried out in the teaching laboratory of the Department of Wildlife and Fisheries Management, Faculty of Agriculture and Forestry, University of Ibadan, Nigeria. A total of 14,400 four-day old larvae of *Clarias gariepinus* from initial average weight ranging between 2.4-3.1mg and initial average length of 5.5-6.9 mm were used. The larvae were obtained from a pair of brood fish of *Clarias gariepinus***,** weighing 500 g, obtained from a reputable fish farm in Ibadan. The brood fish were artificially reproduced using dry pituitary gland extract according to the methods described by Viveen *et al.* (1985). Six different diets were used either alone or in different combinations for this experiment viz: Freshly hatched artemia (Treatment 1), zooplankton (Treatment 2), 60% crude protein diet (Treatment 3), zooplankton with 60 % crude protein diet (Treatment4), Artemia with 60 % crude protein diet (Treatment 5), Artemia, zooplankton and 60 % crude protein diet (Treatment 6).

### Rearing Facilities

The experiment was conducted in 40 litre capacity aquaria. It was filled with water to a capacity of 10litres in order to maintain the desired larvae density of 20 fry per litre of water. Water quality in the aquaria was maintained by replacing 80 % of the volume every day before feeding commences. The source of water used for this study was tap water stored in an open tank for at least 24 hours prior to use.

### Water Quality Parameters

The bulk of the water used on daily basis was replaced with 80 % fresh water and samples of water used was analysized for the following parameters: dissolved oxygen, temperature, nitrogen (IV) oxide, ammonia, nitrate, and hydrogen ion concentration (pH) using Hatch Water Analysis Test Kit Model FF1A Cat. No. 2430-02.

**Experimental Procedure**

This experiment was divided into six treatments representing different feeds and/or combination of diets, and lasted for 13 days. Fry in treatment 1 were fed with compounded feed, treatment 2 (Artemia), treatment 3 (zooplankton), treatment 4 (zooplankton an compounded feed), treatment 5 (Artemia and compounded feed) and treatment 6 (Artemia, zooplankton and compounded feed).

Fish in each treatment were fed at different frequencies viz: twice at 0800hr and 1600hr; four times at 0800hr, 1100hr, 1400hr, and 1700hr; six times at 0800hr, 1000hr, 1200hr, 1400hr, 1600hr and 1800hr and eight times at 0800hr, 0930hr, 1100hr, 1230hr, 1400hr, 1530hr, 1700hr, and 1830hr respectively. Each treatment was replicated three times. Fry in each treatment were randomly sampled on days 1, 4,7,10 and 13 for weight and length measurement using sensitive weighing balance (ACCULAB of model metller balance 200) and graduated transparent plastic ruler respectively on each sampling day.

**Data Analysis**

The data were analyzed using analysis of variance (ANOVA) in a randomized complete block design (RCBD) followed by least significance difference (LSD) for separation of significantly different means.

## RESULTS

The results of the physico-chemical parameters of the water used are presented in Table 1, while the mean final length, weight and survival rate of *Clarias gariepinus* fry fed different diets at different feeding intervals are presented in Tables 2 and 3 respectively. There were no significant differences ($P>0.05$) noticed among the mean values for length, weight and percent survival rate at different feeding frequencies.

Table 1: Physico-chemical parameters of the water used for raising *C. gariepinus* fry

| Parameter | Average value |
|---|---|
| Temperature ($^oC$ ) | 26.80 |
| Hydrogen ion concentration (pH) | 7.06 |
| Dissolved oxygen (mg/l) | 6.83 |
| Ammonia (mg/l) | 0.03 |
| Nitrate (mg/l) | 0.29 |
| Nitrate (mg/l) | 0.59 |

Fry fed eight times had the highest mean standard length and weight gain of 11.29 mm and 26.04 mg,respectively and the least percentage survival rate of 89.23 while the least mean standard length, weight gain and highest percentage survival rate of 10.97mm, 25.04 mg and 90.56 %, respectively were recorded in fry fed twice daily.

There were significant differences ($P<0.05$) noticed among the treatments for final mean values (length, weight and percent survival rate) of *Clarias gariepinus* fry fed different types of feeds (Table 3). Mean standard length of fry in Treatments 2, 3, 4, 5 and 6 were significantly ($P<0.05$) higher when compared with Treatment 1.

Table 2: Mean final values for length, weight and percent survival rate of *C. gariepinus* fry fed at different feeding frequencies.

| Feeding frequency | Length (mm) | Weight (mg) | % survival rate |
|---|---|---|---|
| 2 | 10.97 | 25.04 | 90.56 |
| 4 | 11.07 | 25.50 | 89.28 |
| 6 | 11.29 | 25.94 | 89.78 |
| 8 | 11.29 | 26.04 | 89.23 |

Table 3: Final mean values for length, weight and percentage survival rate of *C. gariepinus* fry fed different types of diets.

| Treatment | Type of feed | Length (mm) | Weight (mg) | % survival rate |
|---|---|---|---|---|
| 1 | Compounded feed (Cf) | $9.94^{a}$ | $23.34^{a}$ | $79.96^{a}$ |
| 2 | Artemia | $11.50^{b}$ | $25.74^{ab}$ | $89.46^{b}$ |
| 3 | Zooplankton | $10.62^{b}$ | $23.45^{a}$ | $89.96^{b}$ |
| 4 | Cf + zooplankton | $10.96^{b}$ | $24.62^{a}$ | $91.13^{b}$ |
| 5 | Artemia +zooplankton | $11.69^{b}$ | $28.93^{bc}$ | $94.67^{b}$ |
| 6 | Cf + Atemia +zooplankton | $11.72^{b}$ | $32.19^{c}$ | $93.09^{b}$ |

Means in a column followed by same letters are not significantly different (P>0.05).

Mean weight gains of Treatments 5 and 6 were significantly different (P<0.05) when compared with Treatments 1, 2 and 3. However, there were no noticeable significant differences in the percent survival rates of Treatments 2, 3, 4, 5 and 6, but these Treatments were significantly higher (P< 0.05) than Treatment 1, which had the least value.

## DISCUSSION

The quality of the water used for the experiment was within the optimum range for African catfish (Viveen *et al*, 1985). The growth performance of fish in this study agrees with the observation of Fermin and Bolivar, (1996) that co-feeding of larvae with live and inert improved growth of *Clarias gariepinus* larvae. Also, Treatments 4 and 5, which were diets of zooplankton with 60 % C.P. compounded feed and artemia with 60 % compounded feed, respectively gave better results than using a single diet. This is in line with the report of Fermin and Bolivar (1996) and Okoye *et al.* (1990) that mixed diets provide the best specific growth and survival rate relative to artificial diet alone. All treatments containing live food in combination or singly performed better than Treatment 1, which contained only compounded feed. The result is in agreement with the Hogendorn and Vismas (1980), who observed that survival and growth of *Clarias gariepinus* fry was much better when fed on natural food either alone or combined with artificial feed, which showed the least growth performance and survival rate. Live food proves to be more acceptable than artificial feed because live food organisms have a triggering effect by their continuous movement allowing an enhanced perception by the feeding fry. The poor growth performance observed in compounded feed (Treatment 1) could be as a result of non-acceptability of the

compounded feed. Madu (1989) reported that functional digestive tract system of first feeding larvae dictates the possibility of the larvae to digest the food ingested.

Also the fry food should contain enzymatic systems which allow autolysis (i.e., self digestion of the food particles) and the feed should be partially and easily digestible. Feeding *Clarias gariepinus* fry twice daily was found to be economically optimal but more frequent feeding did not affect growth but increased the feed conversion ratio (Tabthimon, 1990).

The higher survival rate of *Clarias gariepinus* fry fed diet containing zooplankton may be due to the continuous existence of the remaining zooplankton after each feeding. Mortality recorded in fry fed diet 2 (artemia) may be due to fouling of the water from the dead artemia. The low survival rate noticed in fry fed compounded feed could be as a result of non-acceptability of compounded feed due to its inert nature in water, which makes it unattractive to the fry.

## CONCLUSION

Feeding fry with combinations of diets gave the best result compared to feeding them with zooplankton, artemia or compounded feed alone. The frequency of feeding fry (two to eight times daily) did not give significant differences in the treatments considered in this study.

## REFERENCES

Cho, C.Y., C. B. Cowey and T. Watanabe (1985). *Fin fish Nutrition in Asia. Methodological Approaches to Research and Development*. IDRC-233e. 154 P.

Cho, K.W. (1981). Micro encapsulated egg diets for fish larvae. In: Fish Feed Technology, ADCP/REP/80/11, pp 355-381.

Craig, S. and A. Helfrich (2002). Understanding fish Nutrition, feeds and feeding. Virginia Cooperative Extension Publication Number 420-256.

Dewind van, J. J. (1979). Feeds and feeding in fry and fingerlings culture EIFAC Technical Paper No35 Supplementary, pp 59-67.

Eliot, O. O. (1975). Biological observation of some species used for Aquaculture in Nigeria. *FAO/CIFA symposium on Aquaculture in Africa*, Ghana. CIFA/75/SE 18.

Faturoti, E. O., B. O. Omitoyin and B. S. Aliu (1992). Suitability of calorie-fortified diets for improving the production of *Clarias gariepinus* broodstock and fry. *In*: *Proceedings of the 10th Annual Conference of the Fisheries Society of Nigeria (FISON)* pp 105-122.

Fermin, A. C. and M. E. C. Bolivar (1996). Weaning of the Asia catfish, *Clarias macrocephalns* Gunther, larvae to formulated dry diet. *In*: Santiago, C., Colso, R. M. Millanena, O. M. And Borlomgan, I. G. (Eds.). *Feeds for Small Scale Aquaculture*. *Proceedings of the National Seminar Workshop in Fish Nutrition And Feeds.* 1-2 June, 1994. Tigbauan, Iloilo Philippines. pp 83-86.

Hogendoorn, H. and M. Vismans (1980). Controlled propagation of the African catfish (*Clarias lazera C & R*) II Artificial reproduction. *Aquaculture* 21:29-53.

Madu, C.T. (1986): Preliminary investigation into the food and food selectivity in hatching of the mind fish Clarias anguillaries (L). *In*: National Institute for Freshwater Fisheries Research, Nigeria (1986) (NIFFR) Annual report: 61-63.

Madu, C.T. (1989): Hatchery Management of Mudfish, Clarias anguillaris (L). Ph.D. Thesis, University of Jos, Nigeria 218pp.

Okoye, F.C., C. Ekeoyo and J. C. Amadi (1990). The survival of *Clarias gariepinus* fry and fingerling at the outdoor hatching system of Oguta field station under various forms of zooplankton. *In*: *Annual Report of the National Institute of Fresh water Fishery Research (Nigeria)*: 70-74

Omitoyin, B.O. (1995): Utilization of Poultry By-products (feathers and offal) in the Diets of the African catfish *Clarias gariepinus* (Burchell). Ph.D. Thesis University of Ibadan, Nigeria, 219p.

Tabthimon, P. (1990). Optimal feeding rate and feeding frequency on nursing of walking catfish (*Clarias macrocephalus* Gunther). *Fisheries Science*, 1:25-28.

Viveen, W. J. A. R, J. J. C. Riditer, P. G. W. I. Oordtrot, J. A. L. Janseen and E. A. Huisman (1985). *Practical Manual for the culture of the African Catfish Clarias gariepinus.* Directorate General for International Cooperation, The Hague, Netherlands. 94p.