NISEB JOURNAL Vol. 1, No. 1 January 31, 2001
Printed in Nigeria

NISEB 016/1106

Effect of Latency Period on Spawning and Different Salinity Levels on Fertilization and Hatching of *Clarias gariepinus* and *Heterobranchus bidorsalis*

O. O. Fafioye

Department of Biological Sciences, Ogun State University, P. M. B. 2002, Ago–Iwoye, Nigeria

(Received July 26, 2000)

ABSTRACT: Mudfish (*Clarias gariepinus and Heterobranchchus bidorsalis*) broodstock were induced for maturation and ovulatin with acetone –dried carp pituitary (ADCP) at 4mg/kg weight of fish. Different spawning latency periods (SLPs,) for egg stripped per fish were between 8-13 hours with peak at 10 hours. At this SLPs, fecundity was between 33.1 (*C. gariepinus*) and 29.4 x 10^3 (H. bidorslis) eggs /female brookstock. Fecundity peak of 59.6in *C. gariepinus* and 51.2 x 10^3 in *H. bidorsalis* female broodstock occurred at 10 hours.

The effect of five (0.0, 0.2, 0.4, 0.6, and 0.8%) different levels of saline solutions on the fertilization and hatching of these mudfish were also investigated. Both fish eggs survived under this range of saline concentration, with survival increasing with an increase in salinity from 0.0 to 0.4% (peak) and decreasing as the level of salinity increase. Analysis of variance (ANOVA) at $P > 0.05$ between the fertility and hatching at 0.4 and 0.5% salinity was significantly different.

Key Words: African catfish; Mudfish; *Clarias gariepinus*; *Heterobranchus bidorsalis.*

INTRODUCTION

Hypopthysation of crude extracts of piscine pituitary gland has been in existence for some time new As pointed out by Woynarovich (1978), the controlled reproduction of fishes has been, is, and will be of increasing for a dependable and continuous (even out of season) supply of fry for the aquaculture industry. The process is an asset to the rural fish farmer for both economical and technical reason.

Treatment of intact fish with fish or mammal pituitary material has proved a highly effective approach to the breeding of commercially important fishes of the freshwater system (Ayinla and Nwadukuwe 1987). However, induced breeding has its limitation and as a result, fish farmers encounter shortages of fingerlings with which to stock their ponds in spite of the many hatcheries in different areas. This is because successful artificial fish seed propagation hinges on good hatchery condition and operation .

Culture of African catfish, *Clarias gariepinus* has been advocated since the early 1970's (Huisman, 1974) with new improvements recently (Haylor 1992; Middendorp 1993; Little *et al* 1994). The catfish (*C. gareiepinus* and *Heterobranchus bidorsalis)*are important freshwater species for African aquaculture. The expansion of their culture is hampered by the low egg hatchability and high larval mortality. This way not

always the due to bacterial, fungal and protozoans infection maturity stage of the fish but due to environmental and other physico-chemical factors sure as salinity.

Saline solution is commonly in use for induced fish spawning in Nigeria both as a carrier for pituitary homogenates and preservative for the milt. While inadequate saline solution produces acute effect on the call, on standard measurement of this solution is practiced. Major fish hatcheries in the country depend on trial and error amount of salt concentration. This study was designed to identify the best latency period post hypophysation for optimal egg prolificity and determine the best saline concentration for optimal performance of milt and eggs in the fertilization and hatching processes of mudfish (*C. gariepinus* and H. *bidorsalis).*

Materials and Methods

Induced maturation of ovulation in the broodfish (weight =580$\pm$ 11.3g) was carried out using acetone – dried carp pituitary (ADCP) extract at a dosage of 4 mg/kg (Ayinla and Nwadukwe 1987). A total of 9 male and 6 females broodstock of each fish species were used for this investigation. Eggs and milt were stripped manually at different (8 – 5 hours) latency periods.

Four different saline solution (0.2, 0.4, 0.6, and 0.8%) were prepared by dissolving 0.2, 0.4, 0.6 and 0.8g of sodium chloride (common salt) in 100 ml distilled water respectively. A solute –free solution (distilled water) was used as control experiment. The stripped egg were equally distributed amount five plastic dishes containing saline solution and a control and the prepared milt was added and mixed thoroughly for fertilization. Mean percentage fertility in each test solutions was computer

Five concrete hatchery tanks (1.2 x 1.2m each) containing hatching nets were used for incubation and hatching of the fertilized eggs. One hundred and twenty fertilized eggs from each treatment were treatment were transferred to hatching tanks and twenty fertilized egg from each treatment were transferred to hatching tanks and filled with water to depth of 8 cm. Aeration was supplied using an electric air pump model XP440 to boost oxygenation of the water while temperature was maintained at $27^{o}C \pm 0.5^{o}C$. Percentage hatchability of the eggs was computer as percentage of fertilized eggs that hatched. Significant differences between fertilization and hatching due to different salinity levels were tested using analysis of variance (ANOVA) at $P < 0.05$.

Results

Both fish species (*C. gariepinus* and *H. bidorsalis)* produced eggs when stripped. However, more eggs were yielded as the latency time increased and was highest (59.6 in *C. gariepinus);*(51.2 in *H. bidorsalis)* at the latency period of 10 hours (Table 1). There was no significant difference (P.0.05) between the number of eggs yielded in each fish species at 11 hours (57.3 in *C. gariepinus* and 49.7 in *H. bidorsalis)* and that at 10 hours. But there was significant difference in the number of eggs yielded amongst the two fish species at difference latency periods. *Clarias gariepinus* produced more eggs than *H. bidorsalis.* The colour of the striped egg was slight brown to dark brown, while after fertilization it changed to light brown colour and translucent. The unfertilized eggs were white and opaque in colour.

Figure l shows the fertilization in *C. gariepinus* and *H. bidorsalis* eggs exposed to different solution of salinity. Fertilization of egg was 24, 30, 68, 44, and 35% in 0.0, 0.2, 0.4, 0.6 and 0.8% saline solutions respectively in *H bidorsalis* and 33, 40, 82, 70 and 50% in similar saline solution, respectively in *C. gariepinus.* There was significant difference ($P < 0.05$) between the fertility at 0.4 and 0.6% salinity in each fish species and between fertility of both fish species. The peak fertilization occurred at 0.4% salinity and was 68% in *H. bidorsalis* and 83% in *C. gariepinus.* The lowest fertility occurred at 0.0% (distilled water) salinity and was 24% *H. bidorsalis* and 33% in *C. gariepinus*. The varied percentages in fertilization of the eggs in various salinity solutions indicated the readiness of *C. gariepinus* to breed in controlled captivity better than *H. bidorsalis.*

The rate of hatching of *H. bidorsalis* and *C. gariepinus* eggs in the different salinity levels was 14% and 18% in 0% saline; 18% and 28% in 0.2% saline; 60% and 73% in 0.4% saline; 40% and 51% in 0.6%

saline ; 30% and 35% in 0.8% saline solution, respective, with significant differences (P.0.5) between the treatment (Fig. 2) Percentage hatching of eggs was higher in *C. gariepinus* than *H. bidorsalis* in both control and treatment tanks.

Table 1: Variation in reproductivity of *Clarias gariepinus* and *Heterobranchus bidorsalis* at different artificial spawning latency periods at 27^{o}

Latency period (Hours)	*C. gariepinus*	*Mean eggs spawned ($x10^3$)* *H. bidorsalis*
8	33.1	29.4
9	46.3	38.6
10	59.6	51.2
11	57.3	49.7
12	40.2	34.7
13	44.4	36.1
14	39.8	30.2
15	22.8	13.3

Discussion

The latency period (LP) of 10 hours recorded for *C. gariepinus* and *H. bidorsalis* was encouraging as it falls between the range of 8 – 9 hours for C gariepinus, Orji et al (1997) obtained a LP of 10 hours for *H. bidorsalis*, while Ufodike and Madu (1988) recorded a LP of 10 – 11 hours for *C. anguillaris*. There showed a direct relationship between period (LP) and fecundity.

Results further showed that fertilization could take place without saline solution but performance was better when saline solution was used. This is an indication that spermatozoa of both mudfish can survive under a wide range of saline concentrations with survival increasing with increase in salinity form 0 to 0.4% and then decreasing with subsequent increase in salinity. The optimal survival for both fish species was obtained at 0.4% saline solution, similar to Orji *et al*. (1997) documentation on *H. bidorsalis.*

The relationship between latency period (LP) and egg hatchability observed in different saline solution showed that, fertility and fecundity are directly related to latency period. Ufodike and Madu (1988) similarly observed that fertility and fecundity in *C. anguillaris* are directly related to latency period (LP). The lower salinity tolerance might be based on the fact that both *C. gariepinus* and *H. bidorsalis* are freshwater fish and higher salinity would probably plasmolyse the sperm cells due to osmotic effect. Orji *et al*. (1997) explained that freshwater fish live in hypotonic water but the skin and mucus greatly reduce water permeability. Therefore when the sperm is not protection by fish skin, an isotonic medium must be provided to extend the cells life span, increasing the need for increased salinity.

The work reveals good potentials for artificial propagation *H. bidorsalis* which otherwise has been known to propagate naturally with great difficulty and *C. gariepinus* at the latency period of 10hours in 0.4% saline solution at 27^{0} *C.*

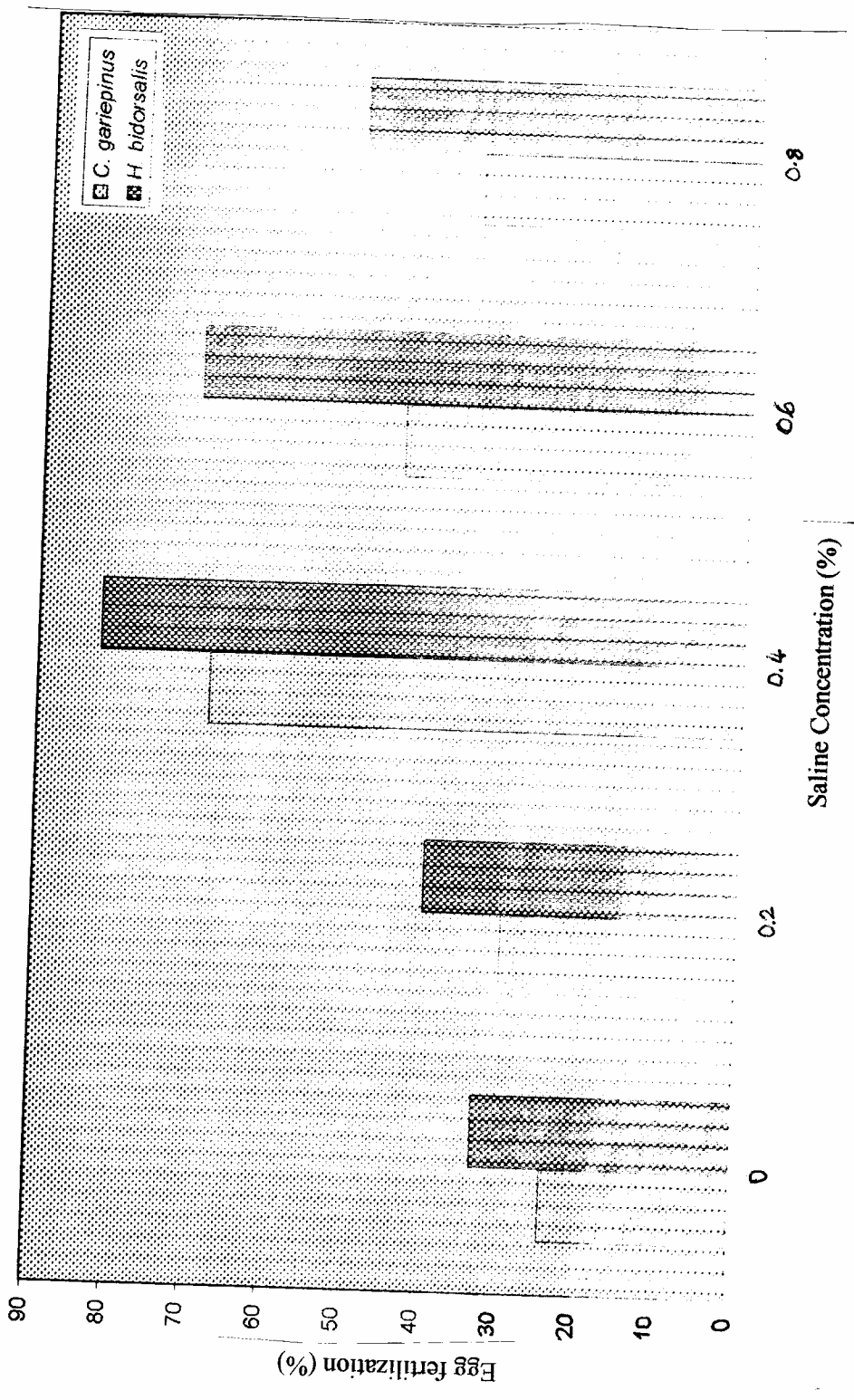

Fig. 1: Fertilization in *Clarias gariepimus* and *Heterobranchus bidorsalis* eggs subjected to different salinity levels.

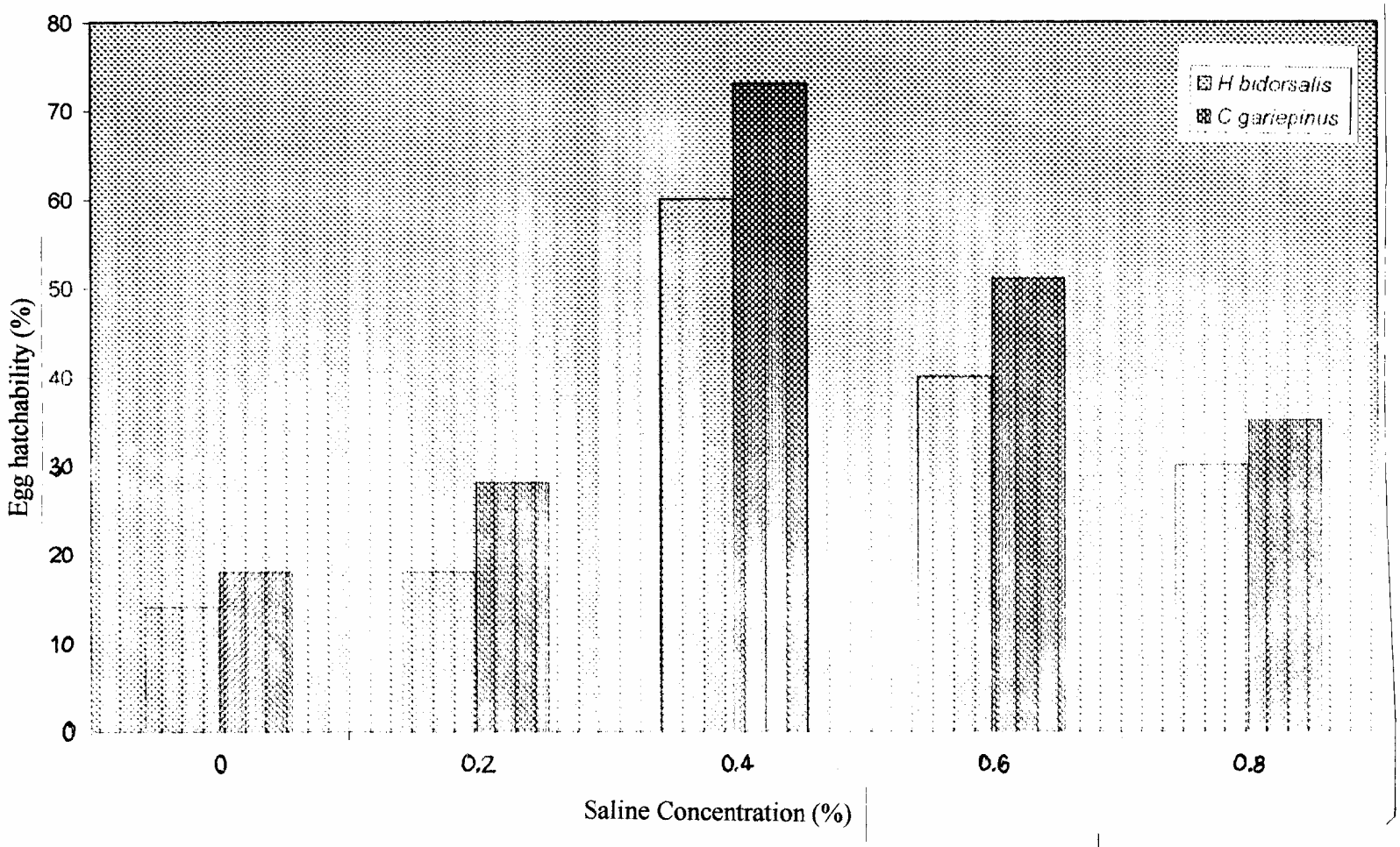

Fig. 2: Hatchability rates of *Clarias gariepinus* and *Heterobranchus bidorsalis* eggs subjected to different salinity levels.

References

Ayinla, O. A. and Uwadukwe, F. (1987). Fish feed production. In: Proceedings of the Aquacultre Training Program sponsored by DIFRRI and Organized by NIOMR, Lagos August 31 – September 26, 1987.

Haylor, G.S (1992) Aspects of the biology and culture of the African catfish *C. gariepinus* (Burchell 552) with particular reference to developing African countries p. 233 - 294. In: J. F. Muir and R. J. Robert (Eds). Recent advances in aquaculture E. L. B. S. Publication, Oxford, U.K.

Huisman, E.A. (1974). A study of optimal rearing condition for carp, *Cyprinus* carpio (L). Thesis State Agric. University, Wageningen, Netherlands.

Little, D.C., Kaewpaitoon, K. and Haitook, T. (1994). The commercial use of chicken processing wastes to raise Hybrid catfish *(Clarias gariepinus* and *Clarias macrocephalus)* in Thailand. Aquabyte section ICLARM, 17

Middendorp, H.A.J. (1993). Production of fingerlings and marketable size African Catfish (*Clarias gariepnus)* in ponds in Northern Cameroon ICLARM Q, 16(4): 21-22.

Orji, R.C.A.; Nnadi, C. N.; Onyike, G. and Ogbona, J. (1997). Effects of different salinity levels on the fertilization and hatching of *Heterobranchus bidorsalis* ICLARM, 20 (2), 21-22.

Ufodike, E.B.C. and Madu, C. T. (1998). Effects of latency period between hypophsation and artificial fertilization on fecundity in *Clarias anguillaris.* J. Aquatic Scs. 13:1-3.

Viveen, W.J.R., Richter, C.J.J., Van Dordt, P.G., W.J., Janssen, J.A.L. and Huisman, E.A. (1986). Practical manual for the African catfish *C.gariepinus.* The Hague, Netherlands and Agriculture University of Wageningen Netherlands pp.5.

Woynarovich, G.(1978). The role of induced breeding in fish culture development. In workshop on controlled reproduction of cultivated fishes. ELFAC. Tech .Pap. 25, 18-24.