THE EFFECTS OF BROOD STOCK SIZE ON THE ECONOMY OF CATFISH (*Clarias auguillaris*) FRY PRODUCTION USING THE HORMONE INDUCED NATURAL BREEDING TECHNIAUE.

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ABSTRACT

89 ripe female brooders of the catfish, Clarias anguillaris (Body wt. Range: 150g – 1,200g) were induced to spawn by hormone (Ovaprim) induced natural spawning technique over a period of 10 weeks. Matching ripe males were used for pairing the females at the ratio of two males to a female. Six ranges of brood stock body weights were considered as follows: <200g; 200g-399g; 400g-599g; 600-799g; 800g-999g; >1000g and the number of fry produced by each female brooder was scored/recorded against the corresponding body weight range. The number of fry per unit quantity of hormone and the cost of producing a fry based on the current price of Ovaprim (hormone) were determined so as to ascertain most economic size range. The best and most economic size range was between 400g – 599g body weight with about 20,000 fry per ml of hormone and N0.028 per fry, while the females above 1000g gave the poorest results of 9,519 fry per ml of hormone and N0.059 per fry. For optimum production of Clarias anguillaris fry and maximum return on investment female brooders of body weights ranging between 400g – 599g are recommended for hormone induced natural breeding exercises.

INTRODUCTION

Induces spawning hormones are very expensive in Nigeria and hatchery operators are usually scared of big sizes of brood stock not just because of the large quantities of spawning hormone that will be used but also because, most often, corresponding large numbers of fry are not usually realized. Very small brooders, on the other hand, are most times the stunted varieties that do not produce fast-growing offsprings. Hatchery operators area, therefore very keen to know the appropriate brood stock size/size range that will be economical on their hormones but maximal on fry productivity when induced breeding techniques are used for the commercial production of *Clarias anguillaris* fingerlings.

Three major techniques can be applied in the induced spawning of fish. These are, induced natural spawning without hormone treatment, hormone induced natural spawning and stripping/artificial fertilization (Woynarovich and Horvath, 1980; Delince *et al.*, 1987; Madu, 1989; Shepherd and Bromade, 1992 and Madu, 2004). For the breeding of *Clarias anguillaris*, the hormone induced natural spawning and the stripping techniques are commonly employed by the former is most popularly practiced by the hatchery operators in Nigeria (Madu, 1995). This technique has the advantage of not involving the sacrifice of any brood fish and hence, the depletion of the much cherished brood stock is avoided. However, in the hormone induced natural spawning of *Clarias* and *Heterobranchus* the quantity of eggs oviposited cannot be predicted based on the size of the female brood fish (Madu, 1989). This situation makes it difficult for a hatchery operator to economically select his brood stock for maximum fry production.

This study therefore, determines the range of brood stock sizes with highest economic advantage based on the number of fry produced per female and the quantity/cost of breeding hormone injected. The interplay of these two factors will produce the most profitable size range of brood stock for the hatchery management of *Clarias anguillaris*.

MATERIALS AND METHODS

The Experimental System.

The experiment was carried out at the Fish Hatchery Complex of the National Institute For Freshwater Fisheries Research (N.I.F.F.R.), New Bussa, Niger state. 12 indoor breeding tanks (2m x 2m x 1m: LxWxH) and 60 outdoor concrete tanks (2m x 2m x 1m) were used for the breeding exercises. All the tanks had provisions for water inlet and drainage and facilities for aeration connected from central Elmog blowers and compressors. Water was supplied from a nearby earth dammed water reservoir (about 1.5 ha. surface area). To purify the water for breeding exercise, the reservoir water was passed through a biological filtration system with large stones, gravels and beach sand as the major filter compartments.

The Experimental Fish and Acclimatization

100 female and 250 male brooders of *Clarias anguillaris* of various sizes (150g – 1,100g body weight) were procured for the experiment. The brooders were then sorted out into 6 size ranges as follows: >200g; 200g-399g; 400g-599g; 600g-799g; 800g-999g; >1000g. The different size ranges were stocked in separate brood stock concrete tanks at the Fish Hatchery complex of the Institute. The males were stocked separately from the females to avoid indiscriminate spawning and also to increase their "libido" (sexual urge) for breeding. The brooders were fed pelleted artificial feed of 40% crude protein content at 4% of their body weight per day in two rations, morning (8.00a.m. – 9.00a.m.) and evening (5.00p.m. – 6.00p.m.) in order to fatten and ripen them for the breeding exercise.

Sampling and Selection of "Ripe" Brooders:

The brooders were sampled weekly for tests of "ripeness" (readiness to spawn). A female was considered ripe if the abdomen was distended and eggs oozed out when the abdomen was gently pressed anteroposteriorly. The male was ripe if the tip of the genital papilla was reddish in colour. The fish were usually anaesthetized with M.S 222 Sandox to prevent them from struggling and to avoid handling stress.

Pairing and Hormone injection of Ripe Brooders:

Selected ripe males and females from each size range were paired in the ratio of two males to a female. Males and females in each group were weighed individually and injected with adequate doses of "Ovaprim" (gonadotropic hormone) at 0.5ml per kilogram of fish body weight as prescribed by Woynarovick and Horvath (1980), Madu, (1989). The males were administered with only half of the female does (Deline et all., 1987). The injection exercise took place between 2.00 p.m. and 4.00 p.m. so as to allow courtship, spawning and egg fertilization to occur within the night (8-12 hours latency time).

Spawning and Hatching of Eggs

Indoor breeding tanks were prepared with adequate spawning receptacles and water was released to about 0.3m depth. The injected males and females were then released into the prepared breeding tanks (one group per tank) and allowed to spawn and fertilize the eggs naturally within the night. The brooders were removed from the tanks in the morning and their spent weights taken and recorded. The fertilized eggs were allowed to incubate and hatch inside the breeding tank through constant mechanical aeration and water flow-through.

Estimation of Fry Population and the economic size range of brood stock.

The hatchlings usually clustered at the corners of the tanks within the first two days of life and later go out for exogenous feeding at about the third day of life. The fry were then fed *ad libitum* with zooplankton thrice daily morning (8 a.m. – 9 a.m.), afternoon (1 p.m. – 2 p.m.) and evening (5 p.m. – 6 p.m.). On the fifth day of life, the fry populations were estimated using a combination of numerical, volumetric and visual methods as described by Fermin (1995). The number of fry and the quantity of hormone used for each breeding exercise were recorded.

At the end of the breeding exercises, which lasted 10 weeks, the mean number of fry produced per female, the number of fry produced per unit volume of hormone and the cost of a fry based on the current price of Ovaprim in the market were determined for each size range. The values for each size range were subjected to statistical analysis to determine levels of significance using the S.P.S.S. 7.5 computer programme.

RESULTS AND DISCUSSIONS

Out of the 100 female brooders procured for this experiment only 89 ripe ones were selected for the breeding exercises based on the various size ranges. Table I shows the number of female brooders per size range, the mean number of fry produced per female, mean number of fry produced per unit volume of hormone (1.0 ml) and the mean cost of a fry at the various size rangers while in Fig. I the number of fry per ml of hormone and the cost of fry at the various size ranges are displayed concurrently in the form of a histogram. The best and most economic size range was between 400g – 599g with a mean of 20,000 fry per ml of hormone and N0.028 per fry. This was followed by the size range between 200g – 390g with 18,530 fry per ml of hormone and N0.30 per fry. Female brooders above 1000g (1.0kg) body weight gave the poorest values of 9,519 fry per ml of hormone and N0.059 per fry.

It is interesting to observe that though the size range between 600g – 799g gave the highest number of fry per female (5850) this was not the most economical size range based on the number of fry produced per ml of hormone and the cost per fry. This figure could give an erroneous impression of high productivity if not subjected to economy of production/economic index based on hormone utilization. Ayinla and Nwadukwe (1989) recommended the use of female brooders ranging between 500g to 800g for catfish fry production. The stripping technique was however, used and the results were not subjected to hormone economy.

It is also observed from Table I, and Fig. I that the number of fry produced by a female brooder increased with increase in body weight up to the 600g – 799g body weight range and decreased, thereafter, with increase in body weight. This corroborates the work of Sherpherd and Bromade (1992) who observed that fecundity/fry production increased with increase in brood stock body weight up to a peak/optimum after which fecundity/production decreased. This peak must be determined for culture species used for fingerling production and the economy of hormone must be put into consideration and assessed if the hormone induced natural breeding technique is to be applied.

CONCLUSION

Hormone cost is a major input in the recurrent expenditure of any fish hatchery or fingerling production project and could drastically affect the expected profit margin of a hatchery project if the optimum brood stock size is not used. Hatchery operators should therefore, consider the economy of hormone when adopting the hormone induced natural breeding technique for their fish breeding exercises. For maximum production of *Clarias anguillaris* fry and highest returns on investment in fish hatcheries, female brooders of body weights ranging between 400g – 599g are, hereby, recommended for hormone induced natural breeding exercises.

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Table I.

Number of fry produced per unit quantity of hormone at the different size ranges of female *Clarias anguillaris* brood stock and the economy of hormone usage.

Ser./No.	Size range (g)	No. of Fish	Mean No of fry produced per female	Mean quantity of hormone used (ml)	No of fry produced per ml of hormone	Cost per fry (#).
1.	<200	14	1200	0.08	15,000	0.036
2.	200-390	15	3150	0.17	18,530	0.030
3.	400-599	15	4400	022	20,000	0.028
4.	600-799	15	5850	0.35	16,700	0.033
5.	800-999	15	4950b	0.44	11,136	0.049
6.	>1000	15	4900b	0.52	9519	0.059

* 1.0ml of hormone (Ovaprim) = N550.00