THE EFFECT OF HOMOPLASTIC PITUITARY INJECTION OVERDOSE ON INDUCED SPAWNING OF AFRICAN CATFISH *Clarias gariepinus*, BURCHELL 1822

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ABSTRACT

Twelve pairs of male and female African catfish, Clarias gariepinus broodfish were monthly treated with graded doses of crude homoplastic pituitary injection. Different sets of pairs were used for each month, after certifying their gonadal maturity fitness for induced breeding. The first two pairs of spawners received one pituitary gland (3.8 – 5.7 mg) each from donors having equivalent body weight. The second two pairs received two glands (7.2 – 11.3 g), the third two pairs received three glands (10.1 – 16.2 mg) the fourth two pairs received four glands (13.5 – 22.2 mg) and the fifth two pairs received five glands (17.7 – 27.5 mg) the sixth two pairs (control) were not injected. Each spawning pair was kept in concrete spawning tank for 24 hours for natural spawning to take place. Administration of one pituitary injection failed to induce spawning, two and three glands yielded optimum results. Four and five yielded good spawning but all the hatchlings died after hatching. Death may be attributed to over secretion of thyroxin, thus leading to faculty vitellogenesis.

Keywords: Overdose, Homoplastic, Pituitary injection, *Clarias gariepinus*

INTRODUCTION

Since the origin of induced breeding, several authors have recorded varying successes in induced spawning of differing species of fish with varied techniques (Pickford and Atz, 1957; Dekimpe and Micha, 1971; Eyo, 1997; Ofor, 2001; Orji *et al*, 2002 and Yousuf *et al*, 2003). Harvey and Hoar, (1979) observed that since its inception, induced breeding has generated increased interest and solutions to the problem of piscine reproduction.

Recently, purified gonadotropins, hypothalmic releasing hormones, hormones of mammalian origin, sex steroids and such "extra-biologic" substances, such as antiestogen clomiphene, have been employed with various degrees of successes. Also various investigators have examined the effect of pituitary dosage administered (Ufodike *et al*, 1986). Zonneveled *et al*, (1988) and Carolfeld *et al*, (1988) had determined the optimum dosage required to ensure no hormonal wastage.

This work investigated the effect of pituitary overdose in the African catfish, *Clarias gariepinus.* Earlier, Clemens and Sneed (1971) stated that low dosages will not lead to spawning.

MATERIALS AND METHODS

Broodfish used for this study were raised from egg to maturity in an indoor hatchery and grow-out ponds. Broodfish weights were determined with a salter weighing balance after drying the fish with towel. Total and standard length measurements were determined to the nearest (mm). The weight of the pituitary was determined with a Mettler H30 balance after drying it with blotter and the dosage determined by grinding the appropriate number of glands in 2 m/s of distilled water with mortar and pestle.

The broodfish served as both spawners and donors for pituitary glands. Gonad stages, extraction of pituitary, preparation of pituitary homogenates and hormonal injections were carried out according to Hogendoorn, (1979 and Viveen *et al,* 1985). Assessment of female gonadal maturation was based on its exhibition of protruding reddish vent and swollen abdomen that oozed out brownish or greenish ripped eggs (0.9 – 1.2 mm) with slight manual pressure. Matured males exhibited reddish elongated, conical genital papillae. It was also observed that matured males had highly vascularized fins (dorsal, anal, pelvic and pectoral).

Twelve pairs of broodfish received graded doses of crude pituitary injections for four successive months (April to July 1998). Different sets of broodfish were used each month. The first two pairs of spawners received one gland (3.8 – 5.7 mg) of pituitary injection each, from donors of equivalent body weight; the second set of two pairs received two glands (7.2 – 11.2 mg) of pituitary infection each, the third set of two pairs received three glands (10.1 – 11.2 mg), the fourth set of two pairs received four glands (13.8 – 15.4 mg) each and the fifth set of two pairs received five glands (17.7 – 27.5 mg) each. The sixth set of two pairs (control) received no pituitary injection. Each injected male and female were kept in a concrete spawning tank for natural spawning, in a randomized block experiment. The methods of Hogendoorn (1979) were applied to determine the number of spawned eggs (relative fecundity), percent fertilization, percent hatching and percent fry survival.

RESULTS

Table 1 demonstrates the effects of overdose pituitary injection on induced breeding of *C. gariepinus*. Female spawners injected with one gland

Table 1: The Effect of homoplastic pituitary homogenate injection overdose on induced spawning of *Clarias gariepinus*

S/NO Injected	No. of Glands	Mean Weight of Glands	Mean % Fertilization	Mean % Hatch	Mean % survival
1	1	7.5	–	–	–
2	1	6.6	–	–	–
3	2	10.2	87	85	20
4	2	11.2	79	79	15
5	3	18.2	79	83	13`
6	3	19.0	74	59	07
7	4	26.1	85	83	–
8	4	25.1	83	81	–
9	5	37.2	85	91	–
10	5	32.0	86	80	–

did not spawn. Two and three glands gave optimum results, with mean percentage fertilization, percentage hatch and percentage fry survival ranges as 79 – 87 %, 79 – 85 % and 15 – 20 % respectively. For three glands, the ranges were 74 – 79 %, 59 – 83 % and 7 – 13 % respectively for percentage fertilization percentage hatch and percentage fry survival. For four and five glands the values for percentage fertilization and percentage hatched were 80 – 86 %, 80 – 91 % and zero for fry survival, as all the hatchlings died 24h after hatching. This response was repeated in each of the four months trials. The male and female sets paired without pituitary injections (control) failed to spawn.

DISCUSSION

The fact that female broodfish injected with one gland from donors of equivalent weights failed to spawn indicated that an insufficient dosage was administered to effect spawning. Clemens and Sneed (1971) conducted similar investigation with *Carpiodes velifera* pituitary which are relatively small (1 gland weighed 1 mg) compared with *C. gariepinus* (1 gland weighed 3 – 10 mg). They found no ovulation using a single pituitary homogenates.

When the number of glands increased from two to five for each male and female pair, relative fecundity, fertilization, hatching and fry survival of two to three glands were quite satisfactory, while for four and five glands, all the hatchlings died 24h after hatching. Clemens and Sneed (1971) observed that in almost all negative instances where nine or more glands were injected into a fish, blood exuded from the oviduct, when hand stripping was applied, suggesting an overdose for the fish. They concluded that the response was a physiological rather than pharmacological. However, matching the recipients' size with that of the donor was not reported, as such the case of injection overdose should not have been reported.

Pickford and Atz (1957) stated in their review that improper application of the pituitary injection during ovulation induction can yield inferior sex products. Inferior sex products refer to infertile eggs, or sperms, reduced viability, incidence of monsters and in the case of sturgeons, pathenogenic development of eggs. Clemens and Sneed (1971) attributed the effect of inferior sax products to extremely large dosage of pituitary homogenates, faulty techniques, state of pituitary gland in the donor species and the use of unripe or spent fish as recipient.

The larval mortalities within 24 h reported for the pair that received above three glands of pituitary in this study can neither be attributed to poorly developed or immature gonads nor pituitaries that contain toxic materials as suggested by Clemens and Sneed (1971). Since this response occurred repeatedly for four months, a more plausible explanation may be an over secretion of thyroxin resulting from overdose of pituitary homogenate injection. Hurlburt (1977) pointed out that low doses of thyroxin stimulated vitellogenesis in *Carasius auratus.* The above assumption is based on the fact that *C. gariepinus* fry could depend on their yolk for seven days after hatching before exploring for exogenous food, (Mgbenka and Orji 1997). If the endogenous food (yolk) was lacking or faulty due to faulty process of vitellogenesis the fry could die sooner than usual.

Davy and Chouinard (1980) also observed that excessive use of human chronic gonadotropin (HCG) could produce immunological effects. Be that as it may there is need for more investigation involving endocrinologist, nutritionist physiologist and fish biologist into the feed back mechanism responsible for the shut down of vitellogenesis due to overdose of pituitary homogenates in fish.

REFERENCES

CAROLFELD, J., RAMOS, S. M., ORMANEZI, R., R., GOMES, J. H., BARBASS, J. M. and HARVEY, B. (1988). Analysis of protocols for application of LHRH analogue for final induced maturation and ovulation of female Pacu- *Piaractus mesopotamicus. Aquaculture, 74:* 49 – 55.

CLEMENS, H. P. and SNEED, K. E. (1971). *Bioassay and use of pituitary materials to spawn warm water fishes.* United States Government Printing Office, Washington DC. 30 pp.

DAVY, F. B. and CHOUINARD, A. (1980). *Induced Fish Breeding in Southeast Asia.* International Development Research Centre Canada TS 21e, 48 pp.

DEKIMPE, P and MICHA, J. C. (1971). Guidelines for the culture of *Clarias lazera* in Central Africa. *Aquaculture, 4:* 227 – 248.

EYO, J. E. (1997). Effects of *in vivo* crude human chorionic gonadotropin on ovulation and spawning of the African catfish, *Clarias gariepinus. Journal of Applied Ichthyology, 13:* 45 – 46

HARVEY, B. J. and HOAR, W. B. (1979). *The theory and practice of induced breeding in fish.* International Development Research Centre Canada – TS 21e 48 pp.

HOGENDOORN, B. (1979). Controlled propagation of the African catfish, *Clarias Lazera* I. Reproductive biology and field experiment *Aquaculture, 17*: 323 – 333

HULBERT, M. E. (1977). Role of the thyroid gland in ovarian maturation of gold fish, *Carassius auratus*. *Canadian Journal of Zoology, 55:* 225 – 258

MGBENKA, B. O. and ORJI, R. (1997). Use of fresh palm fruit extract as a feed ingredient in the diet of larval catfish, Journal of Applied *Aquaculture, 7(4):* 79 – 91

OFOR, C. O. (2001). Spawning pattern of *Nametopalaemon henstatus* in the artisanal and shrimp fishery in the outer Cross River estuary. Pages 105 – 107. *In:* EYO, A. A. (ed.) *16th Annual National Conference of Fisheries Society of Nigeria*, 4th – 9th November, 2001.

ORJI, R. C. A., MGBENKA, B. O. and INYANG, N. M. (2002). Induced breeding of *Clarias gariepinus* in hapa pens. *Journal of Sustainable Agriculture and Environment, 4(1):* 71 – 76

PICKFORD, G. E. and ATZ, J. W. (1957). *The physiology of the pituitary gland of fishes.* New York Zoological Society, New York. 61 pp.

STACIA, A. S., WATTON, W. D., IWAMOTO R. and HERSHBERGER, W. K. (1980). Hormone induced ovulation in Coho salmon. *Annual Report, No. 555 University of Washington, Washington DC. USA.* 39 pp.

UFODIKE, E. C. B., EDO, E. A. B. and ANTHONY, A. D (1986). Effect of intramuscular dose level of deoxycorticosterone acetate and crude pituitary extract on fecundity and fertilization of *Clarias lazera*. *Journal of Applied Fishery and Hydrobiology, 1:* 17 – 20.

VIVEEN, W. J. A. R., RICHER, C. J. J., VON – OORDT P. O. W. J., JANSSEN, A. L. and HUTSMOM, E. A. (1985). *Practical manual for the culture of the African catfish, Clarias gariepinus.* Director General, International Co-operation for the Ministry of Internal Affairs, The Hague, The Netherlands, 5 – 9.

YOUSUF, Y., NOORDELOOS, M and OLIVER, J. (2003). Spawning information. *Naga World Fish Centre Quarterly, 26 (4):*28 – 29.

ZONNEVELD, N., RUSTIDJA, E. J., VIVEEN, W. J. A. R and WAYAN, M. (1988). Induced spawning and egg incubation of the Asian catfish *Clarias bactracus. Aquaculture, 74:* 41 – 47.