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SEXUAL CYCLE OF THE TELEOST CLARIAS BATRACHUS

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Abstract:

The clarias Batrachus having mouth is broad, although the gape is not great. The lips are fleshy, the upper more so than the lower. The walking catfish possesses very small eyes, a lengthy dorsal and anal fin that each terminate in a lobe near but free from the caudal fin, and pectoral fins with rigid spine-like elements. C. batrachus inhabits lowland streams, swamps, ponds ditches, rice paddies, rivers, flooded areas, canals and stagnant water (Froese and Pauly, 2009).

There are four different Indian freshwater catfishes, viz. Clarias batrachus, Heteropneustes fossilis, Rita rita and Mystus vittatus, have been investigated for detailed structure of their ampullary organs. The ontogenetically development of these organs was followed in one of these catfishes, namely H. fossilis, using light microscopy. It was found that the organs of these catfishes essentially resemble those of freshwater catfishes of other tropical parts of the world and of tropical freshwater weakly electric teleosts of S. America and S. Africa. The ecological conditions of the water and nocturnal habit of the fishes in the case of the Indian species parallels those of fishes of other countries. All these facts suggest an lectroreception function for the ampulla organs of Indian species as well. Developmental studies show that in H. fossilise, fully formed ampulla organs are present in the larval stage, indicating that these may be functional at this stage of life as well as assisting in the location of food and the detection of enemies.

Introduction:

The males have distinct sexual papilla (elongated with red tip and located on the ventral aspect). This penile shaft is leaner when compared with the H. longifilis broodstock males. A sexually primed female has a swollen, usually reddish genital opening. Chronic exposure (30 days) to arsenic (As2O3, 0.50 µM) in the same species of fish led

to a significant increase in arsenic content in the HK accompanied by reduction in both head kidney macrophage (HKM) number and head kidney somatic index. Transmission electron microscopy of arsenic-exposed HKM revealed prominent endoplasmic reticulum, chromatin condensation, and loss in structural integrity of nuclear membrane. HKM from exposed fish demonstrated significant levels of superoxide anions but on infection with Aeromonas hydrophila the fish were unable to clear the intracellular bacteria and died. Exposure–challenge experiments with A. hydrophila revealed that arsenic interfered with the phagocytic potential of HKM, and helped in intracellular survival of the ingested bacteria inside the HKM thereby inducing significant HKM cytotoxicity. The immunosuppressive effect of arsenic was further evident from the ability of A. hydrophila to colonize and disseminate efficiently in exposed fish. Further, arsenic suppressed the production of pro-inflammatory "IL-1β-like" factors from HKM. These data suggest that arsenic even at very low concentrations is immunotoxic to fish and the changes observed in HKM may provide a useful early biomarker of low-level.

Results:

Courtship is preceded by highly aggressive encounters between males. Courtship and ating takes place in shallow waters between isolated pairs of males and females. The male lies in a U-shape curved around the head of the female, held for several second An optimum result was found in induced spawning by using hormone at the dose of 0.8 ml kg-1 body weight to female followed by stripping method with higher rate of fertilization (80.4%) and hatching (84.1%). Further, frequency of some common morphological deformities (1.27-3.83%) was also recorded in the induced bred C. In Cell Cultures. Noga (1987) cultured the parasitic dinoflagellates aseptically using a combination of artificial seawater, mammalian cell culture medium, and GIB cells. The GIB cell line was initially isolated from gill tissues of the freshwater catfish, Clarias batrachus (see Noga and Hartman, 1981). The culture medium was later simplified; parasites grew and multiplied on GIB cells in a medium (I02/HBSS) with only mineral ions (Na, K, Ca, Cl, SO4, and PO4), glucose, and phenol red as a pH indicator (Noga, 1989). In the cultures held at 25°C the dinospores produced trophonts that fed on the cells in the monolayer (Figure 1.43). Three to four days later, they detached to form tomonts which sporulated and released new dinospores. These reinfected the cells in the cultures where they developed as trophonts. The cycle was repeated until all the GIB cells were killed. Each in vitro cycle required about a week for completion. The time for

completion of a cycle of growth in culture was thus similar to the time for completion of a cycle on fish held at the same temperature (Lawler, 1980).

Materials and Methods:

β-endorphin (β-EP):

In nature, C. gariepinus has a discontinuous reproductive cycle regulated by cyclically active gonad tropes. A gonadotropin surge trigger off by environmental cues usually facilitates spontaneous oocyte maturation, ovulation or spermiation β-EP, is a 31 a.a. peptide, which binds preferably to MOR and to a lesser extent to DOR (Bodnar, 2018). The prohormone POMC consists of sequences for other peptides such as ACTH and different forms of MSH and β-lipotropin. The distribution of POMC cell body groups in the CNS of different fish groups has been reviewed (Vallarino et al., 2012; Herrero-Turrión, 2017). Although synaptic contacts between GnRH and β-EP cells were demonstrated in the POA in mammals (Chen et al., 1989), β-EP-like-ir neurons and fibres were detected in both dorsal and ventral components of the preoptic nucleus and the NLT region in the bogue Boops boops (Vallarino, 1985). In addition, scattered β-EP-like-ir fibres were observed in the basal telencephalon, whereas some β-EP-like-positive cells were also found in the neurointermediate lobe of the pituitary of the dogfish Scyliorhinus canicula (Vallarino et al., 1988, 1989). While the scattered β-EP-ir neurons were observed in the NLT region, β-EP-ir fibres along the floor of the infundibulum could be traced rostrally upto the nucleus recesses anterior is and caudally as far as the nucleus recessus posterioris in the green molly Poecilia latipinna (Batten et al., 1990). In the catfish Clarias batrachus, β-EP immunoreactivity was observed in the olfactory bulbs, the telencephalon and the hypothalamus (Khan et al., 1999). Particularly, the occurrence of β-EP-ir cells in the NLT and the pars intermedia (PI) and fibres in the PPD suggested possible regulatory role for this peptide in regulation of gonadotropin secretion. Furthermore, Sarkar and Subhedar (2001) observed the occurrence of β-EP and GnRH-like immunoreactivities in the POA and the NLT and a close association between these two neuropeptides in the PPD as well as the PI regions through double immunolabeling in the catfish. Indeed, an indirect effect of in vitro β-EP treatment on the depolarization of GnRH neurons in the terminal nerve was demonstrated in the transgenic medaka Oryzias latipes (Wayne and Kuwahara, 2007). Besides, Sakharkar et al. (2006) documented the β-EP-ir neuronal profile during different phases of the ovarian cycle in a seasonally breeding Indian major carp Cirrhinus mrigala. They observed an intense immunostaining of β-EP cells during

resting phase compared with prespawning and spawning phases and suggested that the attenuated secretory activity of β-EP-ir cells in the NLT may facilitate release of LH from the PPD in carp during respawning phase. Similar association between β-EP neurons in the NLT and LH secreting cells in the PPD was also found in the continuously breeding fish O. mossambicus (Chabbi and Ganesh, 2016). In this fish, the heightened synthetic and secretory activity of β-EP neurons in the NLT during previtellogenic and vitellogenic phases was concomitant with diminished LH-ir content in the PPD, whereas faintly labeled β-EP-ir cells were correlated with darkly stained accumulations of LH-ir content in the PPD. These studies have provided neuroanatomical evidence for the possible interaction between β-EP and GnRH / LH secreting cells. However, little is known about the influence of β-EP on FSH secretion in fish. The information on occurrence of β-EP in the ovary of fish is rather scanty. To date, acetyl salmon endorphin-like immunoreactivity was demonstrated in the ovary of two teleosts, the gilthead sea bream Sparus aurata and the European sea bass Dicentrarchus labrax (Facchinetti et al., 1997). Indeed, experimental evidences have indicated that β-EP affects vitellogenic follicular development through the suppression of ovarian steroidogenesis in the tilapia (Chabbi and Ganesh, 2013). Although these studies suggest a potential role for β-EP on the ovary, the mechanism by which β-EP influences the ovary is still not clear. Studies involving localization of opioid receptors at the cellular level in the ovary might be helpful to address this lacuna.

Discussion:

The pair swim together in circles (encircle), and the male oscillates his body close to the female (quivering). Occasionally, the pair appear to court while in contact with the wall (pin). The male enfolds the female with his trunk (wrap around), and both sexes release their gametes (spawning) .Gill and renal excretory routes were not separated but the gills would account for the bulk of excretion. By day six NH4Cl treated fish had a whole body urea clearance rate approximately 1.7 times that of controls. The activity of some key amino acid metabolism-related enzymes also increased in NH4Cl-exposed fish. The activities of glutamine synthetase, glutamate dehydrogenase, aspartate aminotransferase and alanine aminotransferase increased significantly in the liver, kidney, and muscle. Wang and Walsh (2000) reported similar results in the gulf toadfish (Opsanus beta) exposed to sub-lethal concentrations of NH4Cl in the bathing water. By 48 h, urea production had increased and whole body urea clearance in the NH4Cl treated fish was approximately 3.5 times that of controls.

As in the study by Saha et al. (2002), gill and renal excretory routes were not separately measured, although the gills would be responsible for most of the excretion. A urea transporter has been isolated from the Gulf toadfish gill (Walsh et al., 2000) and when expressed in Xenopus laevis oocytes, this protein increases urea permeability significantly. This transporter shares a high homology with mammalian urea transporters, specifically UT-A2.

Conclusion:

The length- weight relationship in the logarithmic mode for this fish can be written as: Log W =-2.5661 + 3.3705 Log L. The correlation coefficient (r) was found to be 0.948 which showed a good relationship between the two parameters. Key Words: Length-weight relationship, Clarias batrachus, Bhadravathi area he accessory respiratory organs of Clarias batrachus are comprised of the fol- lowing parts : (1) the supra-branchial chamber, (2) the “fans” or gill-plates, (3) the dendritic organ or the respiratory tree, and (4) the respiratory membrane. The African catfish, Clarias gariepinus are piscivorous fish. They have a great economic importance firstly as they reach a large size and secondly being piscivorous, they affect other fish. They affect fish culture as they attack the fry, fingerlings or even adult transplanted fish.

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