A NEW OBSERVATION ON LARGE SCALE DISINTEGRATION OF EGGS OF INDIAN MAJOR CARPS DURING DEVELOPMENT

Mysterious disappearance of carp eggs from the happa in large scale during development caused considerable loss of spawn raised by induced breeding tecchnique (Chaudhuri and Alikunhi, 1957). Panicker *et al* (1969) have observed such large scale destruction of fertilised eggs by common carp, *Cyprinus carpio,* rupturing the egg shells by sucking from outside the happa containing eggs. But mass scale disintegration of eggs in happas within a few hours has been reported by other workers in ponds devoid of common carps indicating that some other factors are also responsible for untimely rupture of egg shells leading to disintegration of eggs in a short time.

The egg depolarizes at the time of ovulation converting the interior of the cell positive with respect to the surrounding media. The egg membrane alters its permeability accompained by an intracellular increase in Na + and Cl — and decrease in K +. The binding of Ca++ with the cell membrane can effect the net movement of ions across the oocyte during ovulation and thus play an important role in bringing about the movement of ions across the egg membrane (Sundararaj and Goswami, 1969).

The specific permeability of cell membrane depends on the presence of certain salts or ions in the outer fluid, which may be adsorbed on the external surface of the membrane modifying its qualities. Egg cells immersed in water devoid of Ca salts alter their permeability and become permeable to substances such as KCl, which they do not ordinarily allow to pass through (Starling, 1947).

While observing the effect of electrical field on the fertilised and developing eggs of major carps we noticed that the egg membrane ruptured prematurely under the influence of certain potential difference in a media containing dissociated ions. In pond water 66 to 70% of egg shells of *Labeo rohita* broke within to hours when exposed to a potential difference of 40 volts for 15 to 60 seconds. The embryos in normal conditions however continued to hatch out by breaking the egg membrane 6 hours later. Similar results have been noticed in eggs of *Cirhina mrigala* and *Catla catla* where the disintegration of egg shells and rejection of embryos to the extent of 58 to 60% and 32 to 55% occurred 6 hours earlier to normal hatching, when treated with 40 volts for 15 to 60 seconds. Under the influence of increased potential difference of 75 volts for 15 to 60 seconds, the percentage of breaking and disintegration increased from 73 to 90 in *C. catla.* When exposed for 15 seconds to 20 volts, the egg membranes of more than 50% of the eggs broke 8, 6 and 2 hours earlier than normal hatching time in pond water, non-chlorinated tap water and distilled water respectively. The addition of 8 mg of KCl to 25 cc of distilled water (320 ppm) accelerated the process of disintegration of egg shells in 15 volts by 8 hours over normal hatching time when exposed for 60 seconds. Negative ions like HCO_3^- and Cl^- brought about rupture and disintegration of 90 and 76% of egg shells immediately after the current is cut off. Low potential difference of 2 volts in similar conditions, did not cause breaking of egg shells before 6 hours of stoppage of current flow. In higher concentrations of Cl^- ions (640 ppm), premature breaking of egg shells was noticed in a very low potential difference of 2 volts and 100, 80 and 50% of egg shells disintegrated within 20 minu-

tes when exposed for 60, 30 and 15 seconds respectively.

Fertilisation of eggs is accompanied by hydration of oocytes and movement of ions across the egg membrane from the surrounding media. Presence of higher concentration of salts like $NaHCO_3$ and KCl in the surrounding media, causes a potential difference between the inside and outside of egg membrane due to difference in concentrations of diffusible ions. In natural waters and mud potential differences between 0.1 V (O_2-free) and 0.5 V (O_2-saturated) occur (Golterman 1969).

The increase of so called diffusion potential under certain conditions like low redox potential, sudden fluctuations of temperature and pH followed by strong sun or heavy rains in pond water accelerates the diffusion of ions along with water through egg membrane. The egg cells thus rapidly expand and burst dropping the embryos within a very short time. The effect becomes more intense with increased period of electrical tension on the eggs. The interior of egg cell being positively charged in relation to its surrounding media after ovulation, it attracts negative ions (HCO_3^-, Cl^- etc) associated with quicker movement of water and electrolytes across the egg shell, leading to increased tension on the inner surface of egg membrane which ultimately crack and disintegrate rapidly.

Thanks are due to Dr. P. M. Misra, Director of Fisheries, Orissa and Dr. H. Chaudhuri, Officer-in-charge, Central Inland Fisheries Research Sub-Station, Cuttack, for their encouragement to conduct this study.

REFERENCES

Chaudhuri H. and Alikunhi K. H. 1957 *Curr. Sci.*, **26**; 381-382.

Goltman H. L. 1969. *Methods for Chemical Analysis of fresh waters.* Blackwell Scientific Publications, Oxford and Edinburgh.

Panicker, G. C. Ibrahim K. H. and Bhowmic R. M. 1969 *J. Bombay Nat. Hist. Soc.*, **66** (1), 195-198.

Starling E. H. 1947. *Principles of Human Physiology.* J. & A. Churchill Ltd; Gloucester Place, London.

Sundararaj B. I. and Goswami S. V. 1969. *FAO / UNDP Regional Seminar on Induced Breeding of Cultivated fishse.*

K. P. Biswas,
Directorate of Fisheries,
Orissa, Cuttack.

G. N. Saha,
Central Inland Fisheries
Research Sub-Station,
Cuttack.