Summary
The catfish, *Clarias gariepinus*, is a native fish of Africa but has invaded Indian rivers. It is a hardy carnivorous fish and a prolific breeder, thus possible threat to the fishes of the Indian subcontinent. The present study has been undertaken to investigate the mechanism of oocyte maturation in this fish, so as to devise strategies to regulate its population. The resent dissertation deals with cytoplasmic maturation i.e. clearance of cytoplasm, yolk reorganization and oocyte hydration on meiotic resumption in the African catfish. The fish lays demersal eggs during breeding season. Maturation inducing steroids, DHP and cortisol, are equipotent in inducing oocyte maturation under *in vitro* conditions in *Clarias gariepinus*. Exogenous administration of GnRH is effective on inducing *in vivo* oocyte maturation, ovulation and spawning. The fish released eggs within 11 to 13 hours. An apparent increase of oocyte water content (approximately 10%) during maturation possibly facilitates the rupture of the follicular walls and subsequently, the release of the oocyte from its follicular layers. A substantial increase in the water content of oocytes within four hrs of GnRH administration indicates that meiotic maturation and oocyte hydration are commenced concurrently in *Clarias gariepinus*. We have observed a considerable increase in the water content of liver, kidney and gills also. Expression of aquaporins for the transport of water in and out of reproductive and osmoregulatory organs, on meiotic resumption is implicit in the present study since hydration is inhibited in DHP/cortisol induced oocyte maturation in the presence of channel blockers. Taking together the results of expression analysis and water content in various tissues, it is proposed that in *Clarias gariepinus*, *aqp*1 plays a pivotal role during oocyte maturation to maintain water balance, whereas *aqp*1 as well as *aqp*3 are significant for osmoregulation. Up-regulation of *aqp*3 transcript in the gills on stimulating maturational changes in the oocytes by GnRH implies that GnRH may act at several loci to bring additional physiological changes in the catfish. We propose existence three cathepsins (B, D and L) in vitellogenic oocytes of gravid African catfish. Cathepsin D, aspartic proteinases, is a major enzyme activated at the time of vitellogenesis, so that vitellogenin cleaves into its yolk components — Lipovitellin, Phosvitin and β’-components. CatB process CatD proenzyme into active CatD, which then cleaves incorporated vitellogenin into egg-yolk components. In addition, Cathepsin B plays a major role at the time of maturation. Transcripts of these two enzymes are stored for future use. Egg-yolk proteins in the yolky oocytes undergo marginal
proteolysis during maturation in the African catfish. Minor variations in the spectra and relative mobility of the peptide from ovulated oocytes corroborate our conclusion. Analysis of amino acid sequence of tryptic-fragments of peptides from yolky oocyte and peptides from ovulated oocytes indicate that these peptides belong to lipoprotein family as most of the sequences cover lipovitellin (LV) region and domain of unknown function (DUF) of vitellogenin of *Clarias macrocephalus* and few sequences showed significant similarity with lipovitellin Aa as well as with lipovitellin Ab of *Ctenolabrus rupestris*. Since two N-terminal domains are represented in purified lipovitellin sample, contemplates probability of two isoforms of vitellogenin A in *Clarias gariepinus*.

The results and information obtained from this work provides the basic reproductive physiology of this exotic fish, which is banned in India for culture. This information can be helpful to check its reproductive potential.