CHAPTER 1

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The poikilothermic vertebrates (Pisces, Amphibians, and Reptiles) present interesting problems for investigations with respect to their physiological and biochemical functions at various levels during different stages of life history. These vertebrates being imperfect regulators unlike homoiotherms are more or less at the mercy of their ambient/environmental conditions in regard to the body temperature they attain (Prosser, 1973; Hoar, 1983). However an organism has a certain capacity for both “tolerance” and “resistance” (Hoar, 1983). Among the poikilotherms the pisces particularly the major carps are very interesting group of animals from the viewpoint of their typical life history, distribution, physiology and breeding habits.

Major carps normally breed in suitable riverine habitats during the monsoon months but carp culture in stagnant pond water is gaining popularity in our country. As a result the need to ensure a dependable source of quality seeds has been regularly felt. To solve this problem concerted efforts were made to study the factors responsible for spawning of carps so that they could be induced to breed in ponds. Some external factors such as rain water, flood, optimum temperature and dissolve oxygen content of water are considered to be more important environmental factors responsible for spawning. Among the internal factors, sex stimulating hormones of pituitary gland play an important role in the development and maturation of gonads and spawning in fishes. The major Indian carps have been successfully induced to breed by administrating fish pituitary hormones (Hypophysation) in confined waters, where they become refractory in the absence of suitable environmental factors (Chaudhury
As in higher vertebrates, in fish the secretions of pituitary gland control directly and indirectly a wide variety of physiological processes. The growth and development of sexual organs are under the regulation of gonadotropin of pituitary and some external environmental factors like temperature and rainfall etc. (Chaudhury and Singh, 1984). The endocrine secretions are always transported and mediated by the blood.

Blood, the liquid connective tissue is a dynamic fluid and is heterogenous in composition. It performs varieties of physiological functions in mediating and co-ordinating the functioning of various tissues and organs of the body, such as transport of oxygen, carbon dioxide, absorbed food materials, nitrogenous metabolic waste, metabolites and hormones; regulations of osmotic balance, body temperature, metabolism, immunologically defensive mechanism and maintenance of normal acid base balance.

It shows distinct species-specific age related changes in the physiochemical characteristics in order to maintain homoiostasis. Animals have to withstand changes in composition and properties of this liquid tissues within certain limits. It is greatly influenced by age, sex, individual variation, disease, nutritional status and seasonal cycle etc.

In recent years although a great deal of work has been done on various aspects of blood physiology of carp (Field et. al., 1943; Gregersen and Rawson, 1959; Houston & Madden, 1968; Golovnev et. al., 1982; Ikeda, 1982; Kikuchi and Hughes, 1982; Atkinson et. al., 1983; Gabryelak et. al., 1983; Ikeda et. al., 1983; Tishinvoa Nonava, Vesselina, 1983; Kazennova et al, 1984; Houston, 1985; Dabrowskii & Wlasow, 1986; Romanenko et. al., 1986; Yamasaki et.al., 1986; Beena and Viswaranjan, 1987; Naidu et. al., 1987; Kumari et. al., 1989;
Sakthivel and Sampath, 1989; Kaviraj and Das, 1995) little attention has been given on hematological changes during induced breeding by hypophysation.

Eventhough estimation of hematological changes have been made in carp, most of them are restricted to cytological parameters like RBC count, Hemoglobin concentration, Thrombocytes count, WBC count and blood coagulation time etc. (Bagchi and Ibrahim, 1974; Riazada and Singh, 1981; Behera and Panigrahi, 1982; Beena and Viswaranjan, 1987; Kumari et al., 1989; Behera et al., 1990). However little attention has been given on estimation of physiological and biochemical parameters of blood plasma. Cytological and biochemical changes occurring in blood picture of carps induced by season have not been carried out so far.

Surprisingly no work has been done on cytological, physiological and biochemical changes in blood parameters induced by pituitary hormone administration during breeding and non breeding periods in carps. Hence no references have been made available in this regard.

Therefore it has been tentatively planned to investigate various hematological changes such as total RBC count, Hemoglobin concentration, packed cell volume, Blood coagulation time, Total leukocyte count, Thrombocyte count and biochemical changes like blood glucose, total protein, free amino acids and blood cholesterol induced by season and different dose administration of pituitary extract in an exotic carp, Cyprinus carpio (Linnaeus). Unlike other cultivable carp viz. (catla, rohu, mrigal, Silver carp, grass carp) the common carp Cyprinus carpio has been given much attention in pisciculture because it breeds in ponds and has two breeding seasons on the plains of India viz. monsoon (July – August) and post winter periods (January – March).

In the present study rather than trying to control all these variables or evaluate their effects, some simplified approach to establish some of the normal
hematological characteristics of a common carp *Cyprinus carpio* (Linnaeus) has been used.

Fishes of certain body weight were collected directly from their natural habitat. They were not subjected to possible stresses such as temperature, dehydration and crowding etc., nor were maintained artificially in the laboratory. A small sample of blood was collected by gill puncture for determination of different blood parameters. The blood picture of such animals probably reflects the normal pattern and any variation from the normal picture may be brought due to the impact of changing environmental conditions, i.e. seasonal variation.

Fresh specimens were collected from their natural habitat as usual and males and females were inoculated with pituitary extract (Ovaprim) at the dose rate of 0.1 ml/kg body weight and 0.2 ml/kg body weight respectively.

Blood samples were collected from the treated specimen at an interval of 2hrs., 4hrs., 8hrs., 16hrs., and 24 hours after induction and the hematological parameters were determined. The variables were compared with normal blood picture and any variation noted there upon might be due to the effect of pituitary administration.

Since *Cyprinus carpio* has two breeding periods, its blood picture induced by season might be different from those of other carps (having only one breeding period). There might be individual variation, sexual variation, seasonal variation and above all when would be interacted by pituitary hormone administration the whole blood picture is expected to be very complex.

In the language of Chaudhury and Singh (1964), “The exact role of the exogenous pituitary regulating ovulation and spawning particularly in the difficult-to-spawn major carps, is still little understood. It is quite expected that this control ovulation may differ from species to species. It is essential that detail histo-physiological investigation on their maturity cycle, hormonal
regulation and mechanism of ovulation and spawning are carried out. Studies in this direction have to be pursued to gain further insight into the reproductive physiology of these carps......”

The present investigations during breeding and non-breeding seasons and the consequent blood picture derived thereupon might throw some light for the purpose.