ABSTRACT

In Rasbora daniconius (Ham.), a fresh-water teleost, the cellular basis of formation of the characteristic colour-pattern in normal conditions of the fish i.e., the presence of the brownish 'General Body Surface' (GBS), the dark lateral band and the silver zone (SZ) with a metallic lustre has been worked out by the method of statistical assessment of chromatophore population of these three regions of the body. The melanophores of this fish have been classified into five morphologically different types. The differential distribution of these five types of the melanophores has been studied in scales of the band and of the GBS regions.

The quantitative changes in the number of melanophores belonging to different sites of the fish body resulting due to the effect of the responses of normal, black and white backgrounds for 90 days have been studied. The rate of recovery of the degenerated melanophores against the rate of loss of the newly formed melanophores has also been investigated out on reversing the backgrounds i.e., from white to black and vice-versa after the adaptation for a period of 90 days on each of these two backgrounds. These quantitative changes in the number of melanophores have been utilised as an evidence in explaining the nature of controlling mechanism of the colour change process in this fish.
The effects of prolonged background stimuli of normal, black and white backgrounds (by keeping the fish separately for 72 days on each of these backgrounds) upon the cells of pars intermedia of the pituitary gland have been studied with a view to determine whether these cellular differences throw any light upon the nature of hormonal control of the colour change mechanism in this fish.

The rates of colour change mechanism resulting due to background responses of white and of black backgrounds (i.e., the relation of the time with the maximum paling and maximum darkening of the two regions) have been derived out separately for each of the two regions viz., the MS and the band regions. These observations have also been considered as an evidence in respect of the nature of control of the colour change mechanism in this fish.

In order to investigate the nature of hormonal control of the colour change mechanism in this fish, the presence of a melanophore stimulating hormone within its pituitary gland and the nature of its effect (paling or darkening or mixed) upon the melanophores has been demonstrated by injecting the pituitary extract into the entire fish (i.e., in vivo) and also its action on an isolated scale (i.e., in vitro).

The presence of the chromatic nerve fibres and the vertebral level of their exit after running through the spinal cord has been demonstrated by transecting the spinal cord at various vertebral levels and thus, the existence (and to some extent, the mode of
working) of the nervous control of the colour change mechanism has been made clear. In order to elucidate the nature of this nervous control further, the spinalectomised fishes have been treated with adrenalin. An attempt has also been made by these experiments to exhibit the presence of a paling hormone constituting the hormonal control of the colour change mechanism in this fish.

The existence of an active nervous control and the nature of its working whether through adrenergic (sympathetic) or cholinergic (parasympathetic) or mixed nerve fibres has been pharmacologically elucidated by injecting a number of drugs (which are already known to affect the autonomic nervous system in mammals and some teleosts) into the fish both in vivo and treating the melanophores in isolated scale i.e., in vitro.