Earthworms, the "Golden-bough of our agricultural history" are the terrestrial oligochaetes of the class Chaetopoda and phylum Annelida. They are of enormous ecological importance to mankind, particularly in his agricultural endeavours, as witnessed by the effects of the common earthworms on soil fertility, and probably because of this they have received appreciations about their bioecology from the stalwarts like Aristotle and Darwin. Earthworms make a large contribution to the total weight or biomass of invertebrates in soil particularly in temperate regions. Aristotle first drew attention to their role in turning over the soil and called them "intestine of the earth". However, it was Darwin who concentrated attention on the role of earthworms in breaking down of dead plant and animal material in soil and forest litter, and in maintenance of soil structure, aeration and fertility. In his famous book "The Formation of Vegetable Mould through the Action of Worms" he expressed the opinion that earthworms are beneficent gardeners and industrious ploughmen and have played a most important part in the history of the world.
Studies on the basic taxonomy, biometry and to some extent on biology are quite extensive, though in the realm of physiology earthworms have not yet encouraged on exotic bloom of publications in spite of their versatile potentiality. In recent years, there has been a series of elegant publications from H. Herlant-Meewis, N. Takeuchi, A. Gallissian, C. Chapron, R. Marcel and others, illuminating the neurosecretory architecture of the earthworms. From India, K.P. Rao and collaborators deciphered the mechanisms underlying the thermal acclimation in Lampito mauritii. Whereas few physiological aspects like reproduction, neurosecretion, thermoregulation, respiration etc. have been elegantly studied by G.S. Dogra in Pheretima posthuma, M.M. Hanumante in Perionyx excavatus and by M.S. Kodarkar in Octochaetoides sudershensis. But still there is a wide gap between the tropical earthworms and the knowledge about their physiology as compared to temperate species, and the bridging of which is not merely an academic duty but an ecological necessity too. Moreover, in this tropical region (Aurangabad, Maharashtra State, India), megascolecid earthworms are in abundance throughout the year. This prompted the author to undertake present course in investigation on commonly available earthworm, Metaphire houleti (Perrier, 1872), for uncovering different avenues of its physiology.
The data obtained through investigation of past few years on some physiological attributes of *Metaphire houletti* have been presented under four chapters.

In the first chapter efforts have been expended to screen the neuroendocrine system at light microscopic level. Histomorphological features of neurosecretory cells and histochemical characteristics of neurosecretory material have been reported. Neurosecretory architecture of central nervous system, containing brain, segmental ganglia and ventral nerve cord is discussed.

In the second chapter an humble endeavour has been made to determine influences of intrinsic and extrinsic factors on the oxygen consumption of *Metaphire houletti*. Probable hormonal control of oxygen consumption has also been discussed.

The process and physiology of regeneration in *Metaphire* has been enumerated in penultimate chapter 3 along with the endocrine control of regeneration.

In the ultimate chapter entitled Osmotic behaviour, fluctuations in body weight of the earthworms in various media and involvement of hormones in osmotic behaviour are illuminated.
It is humbly hoped that the present investigation will definitely shed some additional light on the multi-dimensional physiology of one more tropical earthworm.