III. SUMMARY

1. Significantly different locations (A, B, C, D), including two sandy loams and two clay loams, have been selected to study the ecology of the earthworms of Madras.

2. Atmospheric temperature, soil temperature, moisture, pore space of soil, water holding capacity of soil, organic matter, pH and the availability of nutrients (N, P₂O₅, K₂O) have been correlated with the distribution of earthworms.

3. The distribution of earthworms is significantly correlated with temperature and moisture at locations A and B, with moisture at C, and with soil type at D.

4. Earthworm activity was observed between July and March with a peak between September and January at A, throughout the year with a peak between December and May at B, between August and January with a peak between September and December at C, between August and March with a peak between October and February at D.

5. Lampito mauritii in locations A and B is distributed in association with Drewida modesta, Ramiella pachpaharensis,
Octochaetona pattoni, and Octochaetona thurstoni.

6. Octochaetona measi n.sp. occurs as the only species at C, and may be present with L. mauritii and Octochaetona thurstoni at D.

7. Immature forms of L. mauritii occur between September and February at A, with about 60% of the annual nonclitellate population occurring during the months December and January, while at B they occur throughout the year with a maximum during February. The nonclitellate population of O. measi n.sp. at C shows two peaks, one during October and the other during December, indicative of two generations.

8. During unfavourable conditions (summer especially) L. mauritii migrates either horizontally to moist soils or moves vertically to greater depths, while O. measi n.sp. undergoes diapause by encircling itself.

9. Six species of earthworms have been recorded in the present investigation from Madras. They are: Drawida modesta, Lempito mauritii, Octochaetona measi n.sp., Octochaetona pattoni, Octochaetona thurstoni and Ramiella pachpaharensis.
10. *Octochaetona measi* has been described as a new species. This species is closely related to *Octochaetona pattoni*.

11. *Octochaetona thurstoni* has been redescribed. Additional taxonomic characters have been assigned to the members of *Lampito mauritii* particularly with reference to the ultra structure of the penial setae.

12. Photon output by the bioluminescent earthworm, *Lampito mauritii*, on stimulation by hydrogen peroxide has been recorded to be $3.29 \times 10^{14}$ photons at an average.

13. Treatment of the bioluminescent earthworms with $0.1 \text{ M MnCl}_2$ solution prior to stimulation enhances the photon output to $4.22 \times 10^{14}$ photons at an average.

14. Absorbancy peak of *L. mauritii* luciferin and the fluorescence spectrum of the untreated exudate has been recorded.

15. Principles of electrobioluminescence have been recorded in a specially designed circuit at the Tata Institute of Fundamental Research, Bombay, by stimulating the earthworms by several voltage pulses of amplitudes 2.5 V, 5.0 V, 7.5 V, 10.0 V and 15 V.
16. The bioluminescent cell of \textit{L. mauritii} has been characterised.

17. The probable role of bioluminescence in the earthworm \textit{L. mauritii} has been elucidated.