

Patterns of earthworm abundance in improved pastures at Chiswick

L.A. Lobry de Bruyn¹ and K.L. King²

¹Department of Ecosystem Management, UNE, Armidale, NSW, 2351

²Division of Animal Production, CSIRO, Armidale, NSW, 2350

The impetus for this paper was the clear lack of data concerning earthworm phenology in climates where rainfall is variable and lower in the winter months. Other studies conducted in areas with winter dominant rainfall distributions such as South Australia and Victoria are not applicable.

The survival and proliferation of earthworms in areas with summer dominant rainfall distributions are unknown. The aim was to use a three year data set (1970-74) collected by Drs Kathy King and Keith Hutchinson at Big Ridge 1 to deduce if there were any significant trends in earthworm abundance over the four years, and if these fluctuations in earthworm numbers could be related to rainfall and soil moisture of the top 20 cm.

Methods

The methods are fully reported (King and Hutchinson 1976, Hutchinson and King 1980). In each treatment 16 soil cores (10 cm in diameter and 25 cm in depth) were extracted every 42 days. The soil cores were hand-sorted, earthworm abundance and biomass (fresh and dry) were calculated.

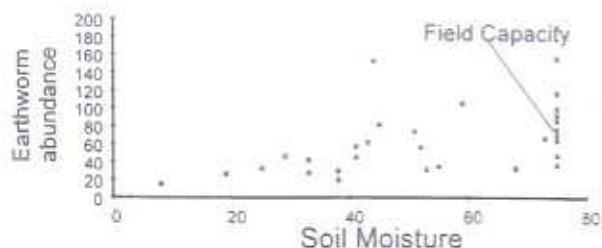


Figure 1. Earthworm abundance (per/m²) versus soil moisture (cm, 75 cm = field capacity).

40 earthworms/m² is associated with soils at or close to field capacity (Figure 1).

Conclusion

The average rainfall for the region is 870 mm and there is a marked summer incidence in its distri-

Results and Discussion

The results show that there are low numbers of earthworms (mean density 68 earthworms/m²) which range in density from 4 to 265 earthworms/m² over the four years. There was a strong positive correlation ($r = 0.89$) between rainfall over April to October and earthworm abundance, but a weak positive correlation for rainfall falling in summer (November to March) and earthworm abundance ($r = 0.27$).

It is quite clear that high numbers of earthworms can only be maintained if there is a regular input of rainfall, which means that not only is the quantity an issue but its distribution. Even in the event of even rainfall over summer, with most months recording 100 mm, earthworm numbers will not be maintained if there is not consistent follow up rainfall events during autumn and winter of at least 50 mm/month. There is a significant positive regression between soil moisture and earthworm abundance ($r^2 = 0.205$, $P = 0.008$), with a strong indication that earthworm abundance of greater than

40 earthworms/m² is associated with soils at or close to field capacity (Figure 1). In 1973/74 when earthworm numbers peaked at around 105/m² the annual rainfall was 1084 mm (56% in the summer months and the remainder fairly evenly distributed over April to October). This suggests that only under extremely favourable soil moisture conditions (at or near field capacity), especially in autumn, will earthworms proliferate and reach significant densities.

References

- King, K. L. and Hutchinson, K. J. (1976). The effects of sheep stocking intensity on the abundance and distribution of mesofauna in pastures. *Journal of Applied Ecology* 13: 41-55.
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