ECOLOGY OF SOIL-SURFACE LICHENS

IN

ARID SOUTH-EASTERN AUSTRALIA

by

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Appendices

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SUMMARY

Lichens on arid Australian soils have been neglected in the past. This study establishes the extent, composition and ecology of the lichen flora on arid and semi-arid soils in south-eastern Australia.

Lichens were sought at 345 locations scattered over 400,000 square miles. 227 of the sites studied had lichens on the soil surface. From the range of lichens encountered a total of 42 taxa were delimited, and a key to these taxa was prepared. Of the 227 locations with soil surface lichens 118 showed a more or less continuous lichen crust over the surface.

The community structure of the lichen floras was studied, including two computer-facilitated analyses (Principal Components Analysis, and Influence Analysis) which produced similar results, and five species-groups delimited. Two of these groups formed "background" floras. These floras occupied adjacent geographic regions with a small overlap; the remaining three species-groups were superimposed on these background floras to produce five separate geographic zones of lichen distribution.

Studies of climatic and soil variation indicated that species distribution was closely related to mean annual rainfall, and to seasonal rainfall incidence. Soil-extract pH and available soil calcium concentration were also closely related to species distribution. Most species were most frequent on crusted loamy soils.

Studies on the physiology of *Chondropsis semiviridis* (Nyl.) Nyl. demonstrated climatic control of its distribution. *C. semiviridis*, absent from areas with a summer rainfall pattern, was shown to be sensitive to normal summer atmospheric temperatures ($40^{o}C$) when wet. Adaptation for existence in an environment with repeated short cycles of wetting and drying was also demonstrated.

The effect of sheep stocking on species composition of lichen crusts around watering places was studied at two locations. It was shown that stocking pressure differentially modified the distribution of species, but no lichen species increased in frequency under stocking pressure as do some angiosperm species.

The world biogeographic implications of the new data are discussed. Predictions are made about distribution of crusts in parts of Australia not studied, and a map of probable past and present distributions of lichen crusts compiled. The role of the lichen crust in the ecosystem is considered with special reference to soil nitrogen status. The study has implications about the future of the pastoral industry, and these are examined.