

## 1 INTRODUCTION

With the passing of time, natural communities change. Old fields of today become forest of tomorrow; weedy fields in the steppe country revert to stable grassland. This succession or gradual change from one community to another is characterized by a progressive change in species structure, an increase in biomass and organic matter accumulation, and an gradual balance between community production and community respiration. This change is brought about by the organisms themselves. As they exploit the environment, their own life activities make the habitat unfavourable for their own survival. But, in doing so, they create an environment for a different group of organisms. Eventually, however, an equilibrium, or steady state with the environment, is more or less achieved. This climax stage is self-maintaining and usually long-lived, as long as it is free from disturbance.

But relatively few communities are free from disturbance, and the greatest cause of disturbance is man himself. He has greatly modified natural communities the world over. To provide food for himself, man has cleared away natural vegetation and replaced it with simple, highly artificial communities of cultivated species, adapted to grow on disturbed sites. Such vegetation cannot survive or perpetuate itself without constant interference and assistance from man. Because of the very simple and homogeneous ecosystem involved, tillage brings with it new pests which, in many instances, spread rapidly and are destructive to both cultivated and natural vegetation. Tillage also disturbs the structure of

the soil by mixing the upper strata and by exposing it to erosion. Erosion, leaching, destructive biological processes and crop removal bring about loss of fertility.

In an attempt to reduce unwanted organisms, man introduced poisons, but quickly discovered that pesticides are non-selective and also kill forms of life other than their pest targets. In addition to the killing of beneficial organisms, excessive use of insecticides is creating other problems such as toxic residues in soil and human foods, and the development of resistance by pests themselves. As it became apparent that chemical control of pests can not be the only answer, a renewed interest in biological control developed. It is clear that biological control can not be effective in intensive agriculture where crop has a high unit value, but there are excellent possibilities for biological control or combination of biological and chemical control in orchards, forage crops and others where unit value is lower. This was also the approach at Zebediela Estate and, therefore, in the present study, a biological control plot was selected for soil sampling and for purposes of comparison with other plots on which the citrus trees were subjected to the chemical control programme.

The environment for life in the soil differs radically from that above the surface. But, because of their abundance, feeding habits, and ways of life, the small organisms constituting the soil biota, cannot help but have an important influence on the other world a few inches above them. The interrelations of the organisms living in the soil is very complex, but within the upper layers energy flows through a

series of trophic levels similar to those of surface communities. Changes in species composition in the soil mesofauna are, however, apparently independent of changes in the above-ground system.

The primary source of energy in the soil community is the dead plant, animal matter and faeces from the ground layer above. These are broken down by the microbial life - bacteria, fungi, protozoons. The latter two in particular digest food extracellularly and absorb dissolved sugars. These organisms are those which are well supplied with the enzymes necessary for the breakdown of cellulose into usable food. Upon this base rests a phytophagous consumer layer, which obtains its nourishment from assimilable substances of living plants, as do parasitic nematodes and root-feeding insects; from fresh litter as earthworms do; and from the exploitation of the soil microflora. Some members of this latter group, such as some protozoa and free-living nematodes, feed selectively on the microflora. Others, including most earthworms, potworms, millipedes, and small soil arthropods, ingest large quantities of organic matter and utilize only a small fraction of it, chiefly the bacteria and fungi, as well as any protozoa and small invertebrates, contained within the material. On the next trophic level are the predators - the turbellaria, which feed on nematodes and potworms, the predacious nematodes and mites, insects and spiders. In such a manner does the community in the soil operate on an energy source supplied by the unharvested organic material of the world above.

Organisms present in the soil, like all other animal populations, reflect their environment. Their abundance and faunal composition depend upon the nature of the soil, its nutrient status and the vegetation present, and the ability of the plants to return nutrients to the soil. The present study forms part of a large project concerning the fauna associated with citrus trees, and is mainly concerned with the nature, seasonal fluctuations in numbers and biomass, and the vertical distribution of the microarthropods inhabiting the upper 16 cm. of the soil in citrus orchards. Since, from an ecological point of view, it is important to compare the faunal composition of cultivated soil with that of a nearby natural community, samples were also taken regularly from undisturbed soil adjacent to the citrus orchard. Within the citrus orchard complex plots were selected to study the effect of agricultural practices on the soil mesofauna.

There are two aspects to any study of the energetics of soil communities viz. the field survey and the laboratory experiment. This division has led to two separate approaches to the problem which are ultimately dependent upon each other for the final answer. The laboratory study focus's attention upon the life history, physiology and population dynamics of selected species under controlled conditions. The results of these investigations give information about the various efficiencies of which the species is capable. A field survey (such as the present study), on the other hand, employs numerous methods to ascertain the density of each population present in the area. Such a study relies heavily upon literature

for information about the physiology and life history of various animals and plants in the community. Knowing the food habits of an animal is of prime importance to an analysis of ecological efficiency. The literature on the feeding behaviour of the soil arthropods is indeed scant and extremely diffuse. Many times on the basis of one observation of one species a whole family has been assigned a particular food habit. This practise is deplorable, but often, as is the case in the present study, leaves no alternative.

The food web of the community is one of the more important concepts of community organization, and its complete qualitative and quantitative description should be the ultimate goal of the community ecologist. The food web of the soil community is poorly understood. The role of the soil arthropods in this food web should be studied therefore because these organisms hold the key position in the soil community.