9 COMPARISON OF THE CITRUS SOIL FAUNA WITH THE CITRUS TREE FAUNA DURING THE SAMPLING PERIOD

An investigation of the fauna associated with the citrus trees above the soil surface at Zebediela (Den Heyer in preparation) formed part of the present project. For purposes of comparison only plots D and E are suitable since they were the only plots also studied by Den Heyer. This chapter therefore deals with the differences between the citrus tree fauna and the citrus soil fauna.

9.1 THE FAUNA

The citrus tree fauna were dominated by the insect species Aonidiella aurantii (Mask.). All the arthropoda other than Acari were different from those recovered from the soil. Even the representatives of Thysanoptera, which was a numericaly important family in the citrus tree fauna, had entirely different genera and species in the soil community.

The following arthropods other than the Acari were represented in the citrus tree fauna of plots D and E.

Hemiptera

Coccidae : Coccus hesperidum (Linn.)
Xylocorus afer (Reuter.)
Gascardia sp.

Diaspididae	:	Aonidiella aurantii (Mask.)
Margodidae	:	Icerca sp.
Miridae	:	Reuteria sp.
Pseudococcidae	:	Pseudococcus citri (Risso.)
		Nipococcus sp.

Hymenoptera

Chalcididae	:	Aphytis sp.
Aphelinidae	:	Marietta sp.
Encyrtidae	:	Habrolepis rouxi (Comp.)

Coleoptera

Coccinellidae	:	Vedalia sp.
		Cydonia propinqua (Muls.)

Thysanoptera

Thripidae	:	Scirtothrips aurantii (Faure)
		Haplothrips sp.

Neuroptera

Chrysophidae	:	Chrysophia sp.
Coniopterygidae	:	Coniopteryx turneri (Kimmins)
		Simidales bifida (Kimmins)

Lepidoptera

Eucosmidae	:	Olethreutes leucotreta (Meyrick)
		Tortrix sp.

The insects found in the soil proved to be entirely different, in species composition. Where Aonidiella aurantii (Maskell) is the dominant species of the citrus tree fauna, Isotomina termophila (Axelson) is the greatest arthropod representative of the citrus soil fauna. The tree insect fauna had by far the greatest species of insects. A further interesting observation was that by far more insects occurred in the trees at the biological control plot, than on the adjacent routine plot. The first mentioned plot also had a bigger variety of insects.

The majority of citrus tree insects complete their whole life cycle in the citrus tree habitat, though some, as for instance certain Lepidoptera spend the pupal stage period in the soil beneath the tree. Unfortunately no adult or developmental stages of the tree insects were recorded form the soil samples.

The major citrus pests at Zebediela are Aonidiella aurantii (Maskell) the red scale and Scirtothrips aurantii (Faure), the citrus thrips. Red scale is one of the most important citrus pests in all semi-arid and subtropical regions of the world.

Other pests which also required attention from time to time were:

Coccus hesperidum (Linnaeus), the soft brown scale
Panonychus citri (McGregor), the red spider
Ascotis selenaria reciprocaria (Wlk.,) the citrus measuring worm

Olethreutes leucotreta (Meyrick), the false codling moth
Heliothis armigera (Hübner), the cotton boll worm
Pterandrus rosa (Karsch), the Natal fruit fly
Ceratitis capitata (Wiedemann), the mediterranean fruit fly
Planoccoccus citri (Risso), the citrus mealybug
Aphis citricidus (Kirkaldy), the citrus aphid
Aphis gossyphii (Glover), the cotton aphid
Papilio demodocus (Esper) and Papilio nireus lyaus (Doubleday), the orange dogs.

Searle St. L. (1963) gave an extensive list of Sourthern African citrus tree pests, together with their associated predators and parasites.

The factors that influence populations of tree fauna are somewhat different than those ruling in soil communities. Factors such as temperature, humidity and food availability, however, will affect population communities of citrus tree fauna, and soil communities, in a similar manner. Except perhaps for conditions in the biological control plot, where no chemical control are applied, there could be no question of a natural citrus tree community.

Pickett (1960) mentioned that studies of the factors responsible for maintaining populations of pest species at low densities are now underway because it is believed that this aspect of faunal management is not well understood Populations are usually studied when their densities are high and this may lead to erroneous conclusions as to the relative

importance of the control agents. The mentioned author noted that 73 pest species occur in the apple orchards of Nova Scotia and said that any or all these species may at times occur in outbreak numbers, yet only a few species are consistent pests of widespread occurrence. When the environmental restraints on any species are reduced sufficiently they increase in numbers and may become a pest. The studies in Nova Scotia strongly indicate that biotic control agents constitute the major portion of the environmental resistance to population increases in most species. It should be mentioned that the biotic control agents do not usually react quickly enough, following the discontinuance of destructive pesticides, to reduce the pest populations below the economic - injury level within the first year or two. Furthermore, there are some species of pests for which the biotic control agents are not sufficiently sensitive to changes in host density to allow them to keep the pest species below the economic-injury level at all times. It is for these reasons that insecticides in some form are indispensable in the highly competitive type of agriculture of today.

Intensive ecological studies of all potential pest species are thus necessary to determine the factors responsible for control at various density levels, for, unless this information is available, it is not possible to appraise pest problems properly and thereby recommend control policies. Although a good deal is known about the factors which tend to reduce pests in outbreak status, very little is known about the factors which maintain species at low density

levels. This is probably because there is little interest from an economic standpoint when the density of a species is low, and at low density it is very difficult to determine the factors responsible for this condition. This is particularly true if the species is controlled by predators.

9.11 The Acari

As in the "Other Arthropoda" faunal group of the citrus tree community, the Acarofauna were differently composed. The dominant acarine species of the tree fauna were seldom found in the soil populations.

9.111 Trombidiformes

The species which attained important numbers in the tree fauna investigation of Den Heyer were Brevipalpus californicus (Banks), Pronematus sp., and Aceria sheldoni (Ewing), thus entirely different from the soil community. Of the spider mites, which were so abundant on the citrus tree, only a few specimens of Brevipalpus obovatus (Donnadieu) were recorded in the soil habitat, and they probably fell from the trees. Pronematus sp. and Tydeus sp. were never found in the soil populations. Also, not a single specimen of the family Eriophyidae was recorded. The only trombidiform species that were found in both soil and citrus tree communities were: Anystis baccarum (Linn.), Tarsonemus sp. and Paralorryia sp.

The Trombidiformes found by Den Heyer were:

Tetranychidae	:	Panonychus citri (Mc. Gregor)
		Oligonychus sp.
Teniupalpidae	:	Brevipalpus californicus (Banks.)
		Dolychotetranychus sp.
Tydeidae	:	Paralorryia sp.
		Pronematus sp.
		Tydeus sp.
Eriophyidae	:	Aceria sheldoni (Ewing.)
Eupalopsellidae	:	Eupalopsellus sp.
Tarsonemidae	:	Tarsonemus sp.
Erythraeidae	:	Abrolophus bipilus (Meyer & Ryke)
Bdellidae	:	Spinibdella cronini (Baker & Balock)
Cunaxidae	:	Cunaxa setirostris (Hermann)

The species Anystis agilis Banks has been recorded as a predator of red spider mites by Geijskes (1938), Garman & Townsend (1938), Gilliat (1935) and Lord (1949). Representatives of Bdellidae, Cunaxidae and Cheyletidae were found to be predators of arthropods in general as well as on red spider mites specifically (Garman, 1948; Collyer, 1953).

9.112 Mesostigmata

The only family in this order recorded by Den Heyer was Phytoseiidae with the species Typhlodromus (Neoseius) sp. Considerable numbers of this predacious mite were found on the trees. In contrast, all the Phytoseiidae recovered during

the soil faunal investigation were Amblyseius usitatus (Van der Merwe).

9.113 Oribatei

The Oribatei recorded by Den Heyer were treated as a group. Though this order is more confined to soil communities, considerable numbers were nevertheless recovered from the citrus trees, and specifically from the two plots in Section 2. According to Den Heyer (personal communication) the specimens recorded belonged to the small mites Oppia nova (Oudem.), which were also extracted from plots D and E during the soil investigation. According to Garman (1948) the Oribatei on orchard trees are not thought to be of primary importance. Their food probably consists of dead wood and fungi.

9.114 Acaridiae

No Acaridiae was recorded from the citrus tree fauna. Garman (1948), however, mentioned that two Acaridiae species, Tyrophagus (Tyroglyphus) lintneri Osborn and Czenspinskia lordi Nesbitt were fairly common on apple leaves in Connecticut.

From the results obtained it is evident that none of the insect or Acari citrus pests used the soil habitat for feeding and breeding purposes. Citrus tree insects would merely make use of the soil habitat during their inactive pupal stages. Since there were only four sampling occasions during a period

of a year this problem of the soil/tree fauna needs further investigation.