



ARGOS RESEARCH NOTE: NUMBER 4, JUNE 2004

## Cicadas in Kiwifruit Orchards

### ARGOS's search for indicators

ARGOS is dedicated to helping kiwifruit growers produce fruit in ways that nurture a healthy orchard environment. To achieve this we need to measure the impact that different management systems have on the environment over both the short and longer term. There is a huge array of potential impacts and interactions and many organisms that could be affected. Initial research aims to identify 'focal species' of animals or plants on which to focus future work. Some will be pests, some may be very influential in the ecological community ('keystone species') and others may be particularly valued by the growers ('flagship species'). We cannot measure everything, so we will also monitor 'indicator species' that track key ecological features of the orchard ecosystem. Changes in indicator species are used as a simple way to monitor the underlying processes that are very complex and difficult to measure in their entirety.

Cicadas (Fig. 1) were chosen as a potential focal species and counted in our ARGOS orchards partly because they are classified as a minor pest and partly as a potential indicator species. The preliminary results showed some interesting differences and are used here to illustrate what needs to be considered when selecting focal species.

### *Cicadas as a pest*

Cicada adults can "spit" droplets of honeydew which give rise to fruit marking, and are a nuisance to orchard workers. As well cicadas insert their eggs into the wood of canes seriously weakening the canes so that they break when being tied down during winter pruning. Growers either have to use poorer alternative wood or have a gap. This leads to

fewer flowers and so fewer fruit the following season.

It makes sense to choose some pests as focal species because then monitoring would serve the dual purpose of improving control and indicating whether ecological or biodiversity values are being affected.

### *Cicadas as 'indicator species'*

Cicadas could be a useful indicator species. The shed pupal skins are easily seen and counted - ease of measurement is important for any indicator. However the grubs live in the soil, feeding on plant roots but not doing significant damage. Much has been said about potential differences between soil biodiversity and composition in organic and other orchards. Soil biodiversity is often difficult to sample, so an indicator species that is easy to measure and yet reflects changes in soil sustainability would be very valuable.



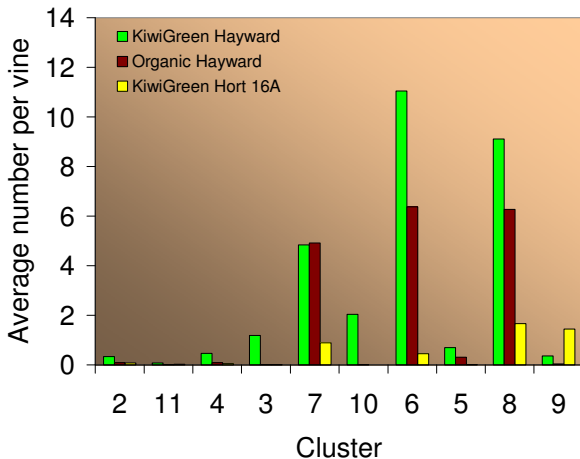
Fig. 1: Cicada moult skin on a kiwifruit trunk

## Counting cicada skins

All 10 clusters of ARGOS orchards in the Bay of Plenty were sampled in autumn 2004. There were 3 kiwifruit orchards per cluster: one organic Hayward, one KiwiGreen Hayward and one KiwiGreen Hort 16A. KiwiGreen is the integrated pest management (IPM) system used in New Zealand kiwifruit. We counted the number of cicada skins attached to all posts and vines in the central row of each sample block on each orchard.

## Results

The average number of cicada skins per vine was greatest in KiwiGreen Hayward, least in KiwiGreen Hort 16A and intermediate in organic Hayward orchards (Fig. 2). The pattern was consistent and bigger than could be explained by chance influences.



**Fig. 2: Average number of cicada skins in ARGOS orchards in the Bay of Plenty, autumn 2004.**

Fewer cicada skins were found on posts than on trunks of vines, regardless of orchard type. Lower numbers of cicadas occurred in KiwiGreen Hort 16A orchards on posts as well as vines, so trunk differences between varieties (such as size, age or roughness) does not explain the differences on vines.

Orchards that were sampled earlier and before harvest had more cicadas. Skins fall off or are knocked off over time. However the orchards sampled earlier were also at higher altitudes (the clusters in Fig. 2 are arranged in order of increasing altitude from left to right). So we may eventually find that cicadas are more prevalent at higher elevations. This type of information can identify orchards at risk.

Very few cicada skins were found above sticky bands used in some orchards against Fuller's rose weevil. This confirms that the bands are an effective barrier to crawling insects, but bands do not control cicadas, as these fly into the canopy after moulting.



**Fig. 3: Cicadas moulted below sticky bands.**

## Where to now with cicadas?

Our finding of significant differences in cicada numbers is the first sign that biodiversity is affected by how kiwifruit is grown. Different chemical inputs or fertilisers on Hayward and Hort16A, or between organic and KiwiGreen practices, may directly impact on the cicadas. It is also possible that complex changes in the food web in the soil have indirectly reduced cicada survival more in Hort 16A orchards. We now need to discover what cicada numbers are 'indicating' about the ecosystem. Cicadas are strong contenders for selection as a 'focal species' because strong and consistent differences were easily detected.

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