

## Biological Control of *Harrisia* Cactus, *Eriocereus martinii*, in Central Queensland by the Mealybug, *Hypogeococcus festerianus*, Nine Years After Release

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### Abstract

*Harrisia* cactus, *Eriocereus martinii*, is a major weed in central Queensland. A mealybug from Argentina, *Hypogeococcus festerianus*, first released in 1975, showed early promise and has been spread widely throughout the range of the plant reducing cactus cover from 50% to <1%. A slight resurgence varying seasonally is now occurring. The present situation is discussed.

### Lutte Biologique Entre le Cactus du Genre *Harrisia*, *Eriocereus martinii*, au Centre du Queensland au Moyen de la Cochenille *Hypogeococcus festerianus* Neuf Ans Après son Introduction

Le cactus *Eriocereus martinii* est une des principales plantes nuisibles du centre du Queensland. Une cochenille d'Argentine, *Hypogeococcus festerianus*, semblait d'abord prometteuse au moment de sa première introduction en 1975 et elle a été vastement disséminée dans toute l'aire de distribution de la plante, réduisant ainsi la proportion du couvert végétal occupé par ce cactus de 50% à moins de 1%. À l'heure actuelle, il y a de légères réapparitions saisonnières du cactus. Le rapport traite de la situation présente.

### Introduction

*Harrisia* cactus, *Eriocereus martinii* Lab. (Cactaceae), is a major weed of rangelands in central Queensland, with infestations present over an area of  $3 \times 10^6$  ha (McFadyen and Tomley 1978) (Fig. 1).

A mealybug, *Hypogeococcus festerianus* (Lizer y Trelles) (Hemiptera: Pseudococcidae), first released in 1975, established readily and after showing early promise, became the basis of a biological control programme which superseded chemical and mechanical control methods in 1979 (McFadyen and Tomley 1981a). This programme has been continued with large-scale releases of field-collected mealybugs over most of the area infested, and successful biological control is considered to have been achieved (McFadyen and Tomley 1981b). It is now nine years since mealybugs were first released. Detailed measurements of the ground covered by cactus and the number and size of the plants remaining are a guide to what is happening.

Three separate study sites are maintained. In the early stages (1975-78), a stem-borer, *Alcidion cereicola* Fisher (Coleoptera: Cerambycidae), which destroys the woody stem tissue, was also involved, but is no longer present because it requires older stems which are not now available.

### Evaluation Methods

Initially plant cover at the three sites was measured by setting out 10 fixed-line transects 20 m long in each study area (McFadyen and Tomley 1981a) and these measurements of percent cover were adequate to show changes in the plant population while cover exceeded 10%.

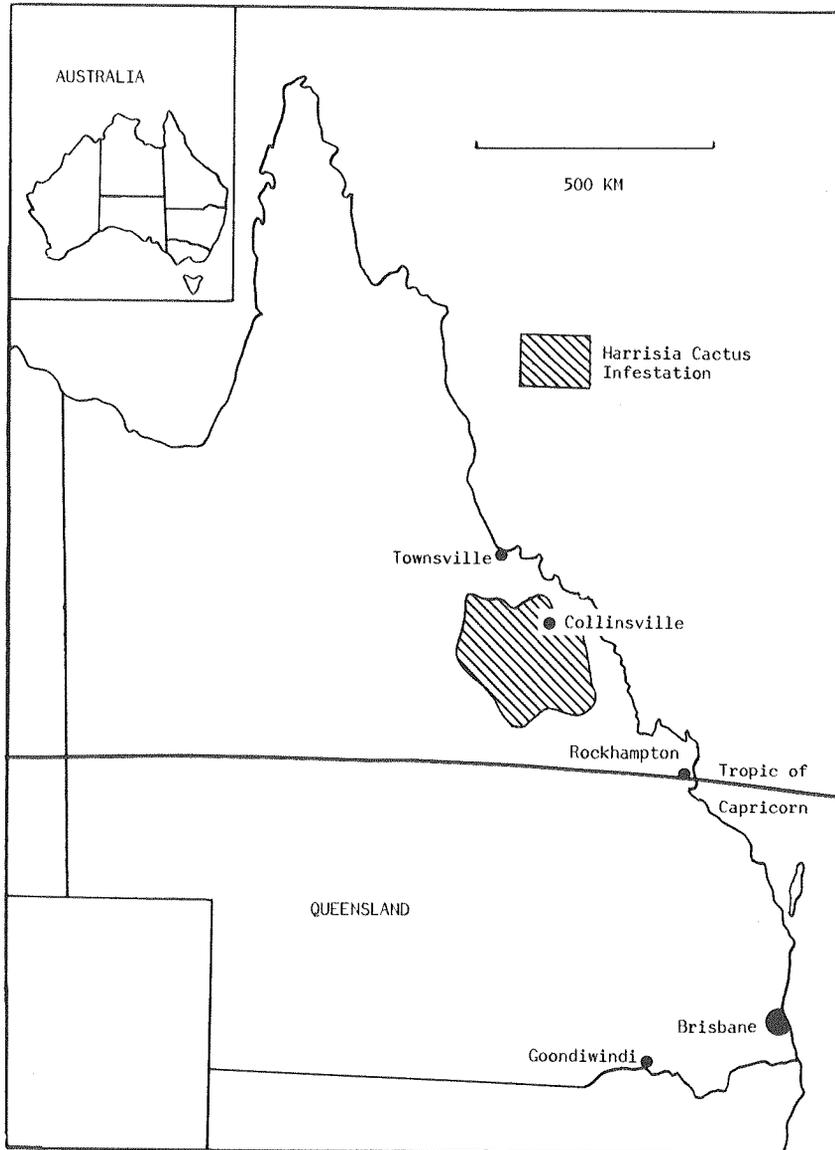


Fig. 1. Main area of *Harrisia cactus* (*Eriocereus martinii* Lab.) in Queensland.

After 3–4 yrs, the mealybugs had reduced the ground covered by cactus to < 10% (Fig. 2). Permanent 10 × 10 m quadrats were set out using the original transects as baselines, and the number and size of plants in the quadrats was also recorded.

Measurements of *Harrisia cactus* growth rates were not made in the Collinsville area prior to release of the insects, and no suitable site free from insect attack is now

available. However since 1978 measurements of cactus density have been made at Goondiwindi in southern Queensland in areas free of mealybug.

As counts of mealybug are not practicable, only their presence or absence on plants was recorded.

## Results and Discussion

At the experimental sites, the dramatic and continued reduction in percent ground covered by *Harrisia* cactus is shown in Fig. 2. Fig. 3 shows cactus populations as plants  $\text{ha}^{-1}$  and starts when percent cover was reduced below 10%. Site A lags about 3 yrs behind the other two sites because the mealybugs reached the area by natural spread in 1978, 3 yrs after they were released at the other sites.

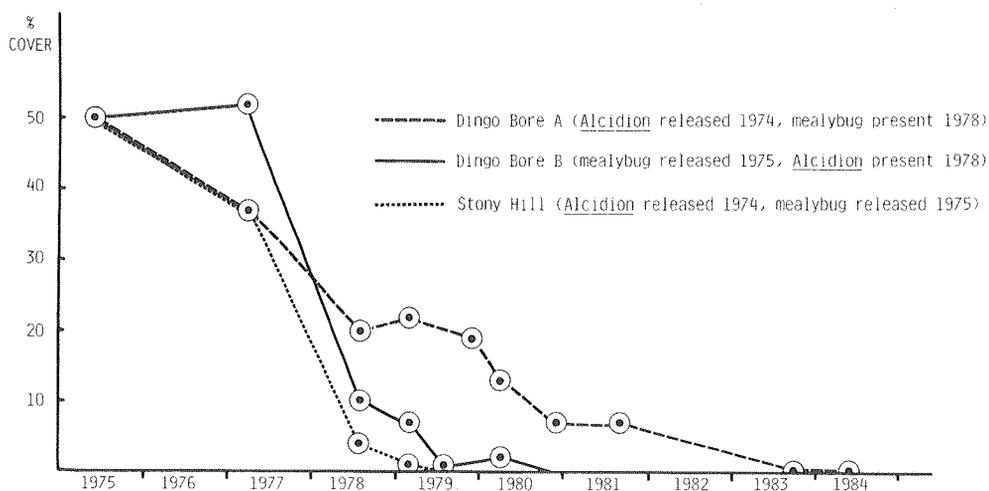


Fig. 2. Changes in percent cover by *Harrisia* cactus (*Eriocereus martinii* Lab.) at three sites in Collinsville, Qld.

Since 1979, when use of chemical sprays was abandoned in favour of large-scale spreading of the mealybug, infestations of cactus affecting thousands of ha have been successfully controlled by the mealybug, with cactus populations reduced to a very low level. However, very dry conditions since 1980 have reduced mealybug survival and possibly affected results. *Harrisia* cactus plants have a well-developed underground tuber system, which in suitable conditions readily produces new stems if top growth is removed. Normally, continued feeding by mealybugs on new stems destroys the tuber system by draining all reserves. However, in dry conditions regrowth from tubers is reduced or delayed, and in the absence of living stems, the mealybug may die out locally before all tubers have been completely killed. When rain does fall, small shoots grow up from the remaining tubers, and these may be free of mealybug. In May 1984, at Site B, mealybug was present on only 1 plant out of 158 in a total area of 0.1 ha, while at Site A, the majority of the 161 plants in the 0.1 ha area had mealybug still present.

Very few seedlings are now found at the study sites; new growth is almost entirely from tubers. Seed viability of *Harrisia* cactus is very low after 4–5 yrs (G. Diatloff, pers. comm.) and field observations showed that very few fruits were produced in the study areas since 1977–79.

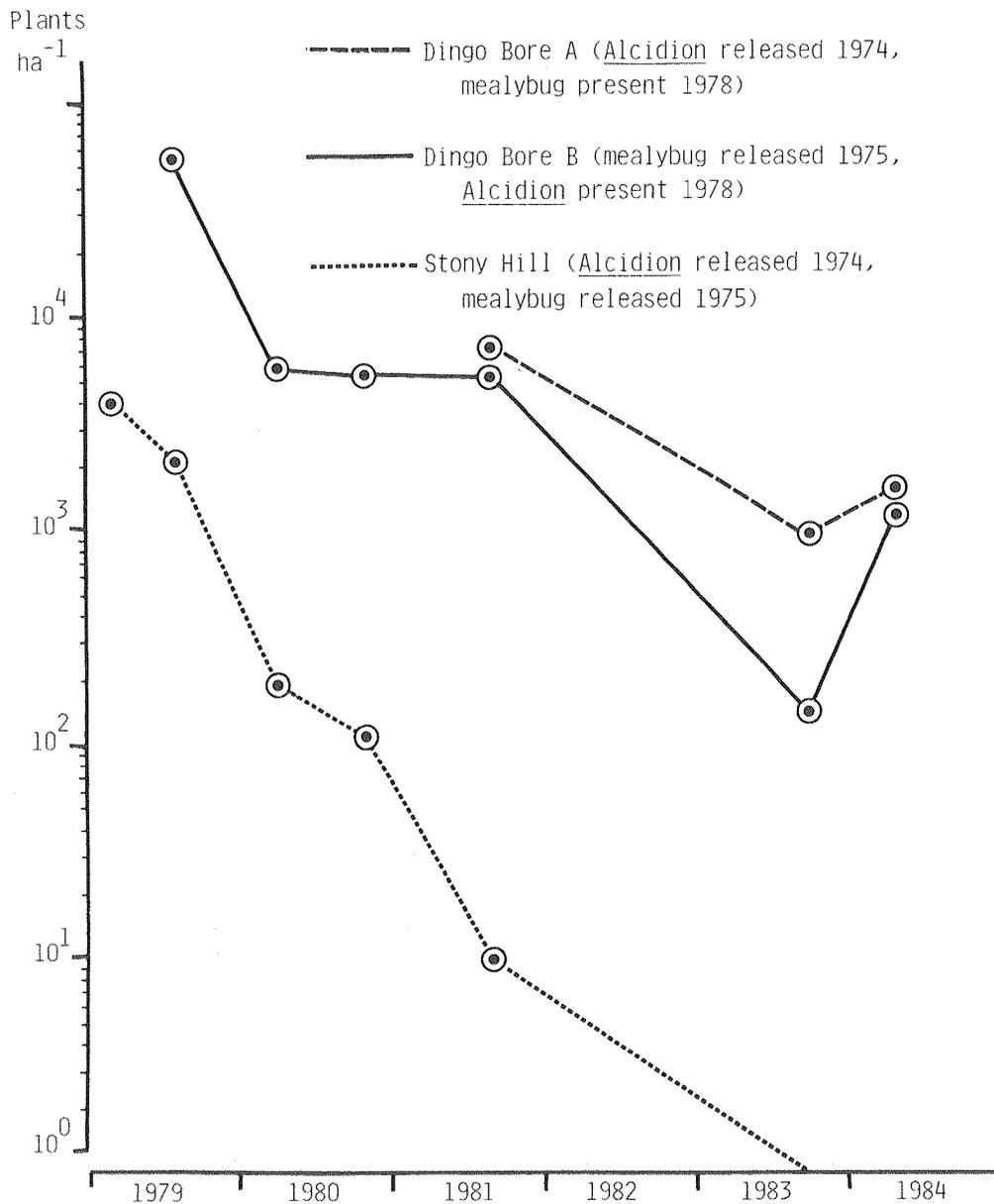


Fig. 3. Reduction in *Harrisia* cactus (*Eriocereus martinii* Lab.) plant density at three sites in Collinsville, Qld.

At the plant densities now found, death of small plants from causes other than insects (e.g. dehydration, trampling, marsupial feeding), is becoming increasingly significant as described by Crawley (1983). As a result, seasonal variation which was previously ignored, has become significant. In autumn (March–May) after summer rains, there may be numerous small plants and shoots, most of which will not survive the dry winter and spring, and thus would not be present in early summer. Extent and duration of this seasonal variation will have to be taken into account in future. Results from

Goondiwindi (Fig. 4) show that even without mealybug attack, annual increase in cactus density is very variable, and may even be negative in dry years. Monitoring progress of a biocontrol agent in such a plant must therefore be a long-term project.

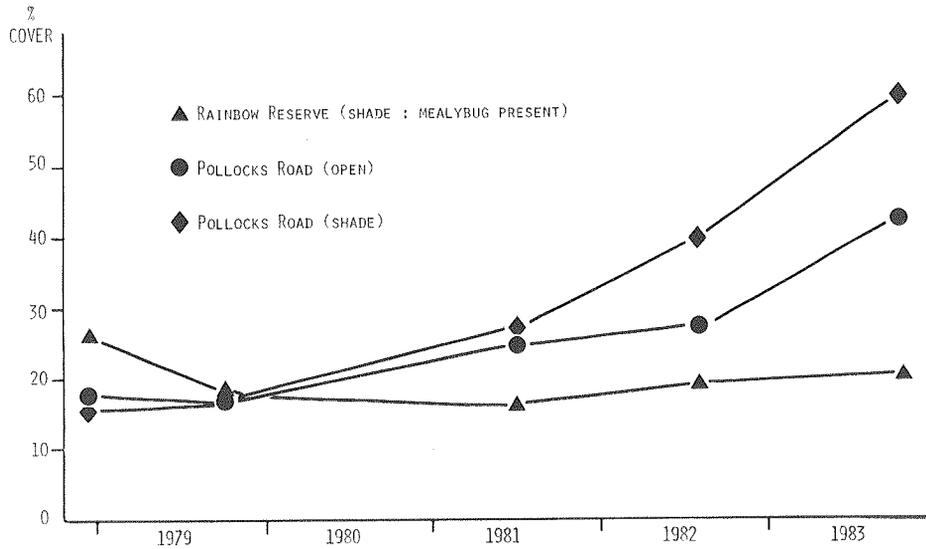


Fig. 4. Changes in percent cover by *Harrisia cactus* (*Eriocereus martinii* Lab.) at three sites at Goondiwindi, Qld.

### Conclusions

Though after 9 yrs an equilibrium level has still not been reached, indications are that final plant density will be very low, such that it no longer interferes with rangeland grazing. Occasional re-distribution of mealybug colonies should be the only control measure required.

### References

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