Biological Control of Coconut Scale in Fiji*

SUCCESSFUL INTRODUCTION OF A COCCINELLID BEETLE

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MR. T. H. C. TAYLOR has recently prepared a lengthy paper describing biological methods of controlling the scale insect *Aspidiotus destructor* in Fiji. From the economic point of view, this pest causes extensive damage in Fiji to coconuts, bananas, 'yagona' and avocado. The present paper deals more especially with the insect in relation to the copra industry, of which it is a most serious enemy.

It is not known how, or exactly when, the scale insect became introduced into Fiji; but it was already a pest in the year 1912. Neither chemical nor mechanical methods of control for insects attacking coconuts can be satisfactorily employed in the islands on account of labour being expensive and relatively scarce. Furthermore, the coconut estates are not sufficiently localised to allow of a power sprayer being used without incurring excessive costs for transportation. Attempts were made to control the *Aspidiotus* in 1920, when certain parasites were introduced from Tahiti, notably the species *Aphelinus chrysomphali* and *Aspidiotiphagus citrinus*. In 1927, other parasites and also certain predators were imported from Java, but neither of these schemes of parasite introduction proved productive of appreciable economic results.

It was not until 1928, when several species of predators were obtained from Trinidad and introduced into Fiji, that a solution of the problem was obtained. The fact that certain Coccinellid beetles had been observed to be important factors in the repression of the *Aspidiotus* in Trinidad led to five species of the family being introduced into Fiji. The metamorphosis and biology of these insects are carefully described and figured. Of these, *Cryptognatha nodiceps* proved far superior as a controlling agent to any of the other four species, and attention was mainly centred upon it.

As a means of controlling the *Aspidiotus*, *C. nodiceps* proved to be a remarkable and spectacular success. Only nine months after the shipment was landed in Fiji, and liberations made, the scale insect was brought under control in all the more important islands of the group. After a further nine months, the scale was not only controlled on every single island, but also became so rare in many localities where it formerly abounded that living batches could only be found after much searching. Up to the time of writing his paper (July, 1934), Mr. Taylor states that the Coccinellid has not only reduced the appearance of the scale to negligible proportions, but is also apparently maintaining a permanent effective check upon it.

The complete success of the introduction of *C. nodiceps* is attributable to a combination of facts. First, it breeds continuously with a high rate of multiplication throughout the year in Fiji. It is a voracious predator, both as larva and adult, and in the latter phase it is long lived. Secondly, it has remarkable powers of dispersal. Thirdly, it has no serious natural enemies in Fiji. Finally, the *Cryptognatha* is able to survive even when the *Aspidiotus* has become reduced to a condition of great scarcity. In this connexion, the fact that it has an alternative host in another scale insect, namely, *Diaspis pentagona*, which is not a serious pest in Fiji, is important.

When a parasite or predator is introduced into a new country, where the *Aspidiotus* is rampant and occurring in outbreak form, it must be capable of multiplying and dispersing sufficiently rapidly to 'overtake' the pest in the worst outbreak. Also, having repressed the scale to an economically negligible condition, it must be capable of maintaining such a phase. It appears that none of the parasites previously introduced is capable of fulfilling these conditions and was consequently foredoomed to failure. Each individual parasite can only destroy one individual pest and none is capable of greater multiplication than the latter. It is only an insect like *C. nodiceps*, of quite exceptional voracity and with a very high multiplication rate, which can possibly control the outbreaks in question. Each individual *nodiceps* is capable of destroying hundreds of scale insects, in all stages, during its life and of bringing about a far greater destruction rate than that achieved by any of the parasites. Whereas the latter, theoretically at least, are capable of maintaining the scale in a non-outbreak condition, their biological attributes are such that they are inherently incapable of bringing about that condition in the first place.

* "The Campaign against *Aspidiotus destructor*, Sign. in Fiji." By T. H. C. Taylor (with three sections by R. W. Paine). *Bulletin of Entomological Research*, **26**, 1–102, with 40 text-figures; 1935.