

PROJECT SUMMARY



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Varroa jacobsoni: a new pest of European honeybees

Dr John Roberts,
Dr Denis Anderson
and Dr Wee Tek Tay



Apis cerana nurse bee becomes infested with *Varroa jacobsoni* mites when feeding an emerging drone – image courtesy Denis Anderson

The issue

Varroa jacobsoni is a parasitic mite that has emerged as a serious pest of European honeybees (*Apis mellifera*) following a recent jump from its natural host, the Asian honeybee (*Apis cerana*).

In 2008, a bee pathogen survey in Papua New Guinea (PNG) found populations of *V. jacobsoni* (of the Java haplotype) reproducing for the first time on the drone and worker brood of the local *A. mellifera* and causing colony losses.

This new *V. jacobsoni* 'strain' was widespread in PNG, but not yet in neighbouring Papua (Indonesian province of western New Guinea) or Solomon Islands (east of PNG), where *V. jacobsoni* (of the Java haplotype) also reproduces on *A. cerana*. But interestingly, very small numbers of mites were found in Papua and Solomon Islands that were reproducing only on *A. mellifera* drone brood.

Australia is one of the last remaining places in the world not to have Varroa mites of bees, so it's important to learn more about this mite in PNG and understand the risk to *A. mellifera* in Australia and around the world.

Outcomes

The research project summarised here, *Genetic variation of Varroa jacobsoni and pathology of microbial pathogens*, (completed in November, 2013), was a genetic study of *V. jacobsoni* in PNG and potential viruses associated with this mite. It compared the genetic relatedness of mite populations on different hosts and examined *V. jacobsoni* on *A. mellifera* in PNG for known and unknown honeybee viruses.

Mites now reproducing on *A. mellifera* in PNG appear unable to still reproduce on *A. cerana*, as there was no apparent genetic mixing between mite populations on the different hosts. The adaptations required of mites to parasitise *A. mellifera* appear to be permanent and prevent reproduction on *A. cerana*.

Multiple mite populations appear to have switched hosts to *A. mellifera* and new populations may have started to switch. Two genetically different populations were found on *A. mellifera* in PNG and the small numbers of mites found in Papua and Solomon Islands reproducing only on *A. mellifera* drone brood were also genetically different to mites in PNG.

Mites reproducing on *A. mellifera* in PNG were not carrying any known honeybee viruses, but three new viruses were discovered. It is not yet known whether they infect honeybees, but one of these viruses appears distantly related to other honeybee viruses.



Implications

Varroa jacobsoni reproducing on *A. mellifera* in PNG is an important biosecurity threat to Australia's honeybee and pollination-dependent industries.

Being restricted to *A. mellifera* will likely limit the natural spread of this new mite to Australia. No swarms of *A. mellifera* have been intercepted at Australian ports in the last 10 years, whereas *A. cerana* swarms are intercepted frequently from this region. Future movements of managed *A. mellifera* in PNG will be the main way for this mite to spread, so greater monitoring and understanding of these pathways will be important for minimising the risk of a mite incursion.

Mites currently only reproducing on *A. cerana* are a potential serious threat should they become established in Australia. Multiple genetically different populations of *V. jacobsoni* (all the Java haplotype) have switched hosts and others are partially reproducing at low levels on *A. mellifera* drone brood in Papua and Solomon Islands. If introduced to Australia, mites of this haplotype could become established in the invasive *A. cerana* population in North Queensland and may adapt to Australian *A. mellifera*. Existing and enhanced quarantine regulations and border security will remain important for keeping Australia free of parasitic mites.

Varroa jacobsoni is likely capable of spreading and activating viruses in honeybees. Despite no known honeybee viruses being found in these mites, several new viruses were found that might infect honeybees. Further work is needed to better understand the threat of viruses to Australia.

Future needs

More information on the reproductive biology and virulence of *V. jacobsoni* on *A. mellifera* and *A. cerana* is essential for Australia's biosecurity preparedness.

Ongoing monitoring of *V. jacobsoni* still restricted to *A. cerana* in the Asia-Pacific region, which appear to be continuously attempting to reproduce on *A. mellifera* if it is present nearby and could become new threats to Australia.

Ongoing surveillance on the spread of *A. cerana* from the Cairns region of North Queensland is also recommended. This will allow proper assessment of the potential establishment of *V. jacobsoni* in that population from future incursions of *A. cerana* infested with mites.

Investment in genomic studies of *V. jacobsoni* to uncover the genetic basis of switching hosts and use this knowledge to development novel management strategies.

Further investigation of viruses associated with *V. jacobsoni* by testing greater numbers of mites and bees and direct assessment of virus transmission by mites.



For more information

John Roberts, CSIRO, John.Roberts@csiro.au can be contacted for more information about the project.

A scientific journal article about the project is expected to be published in 2014.

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Varroa jacobsoni on *Apis cerana* pupa

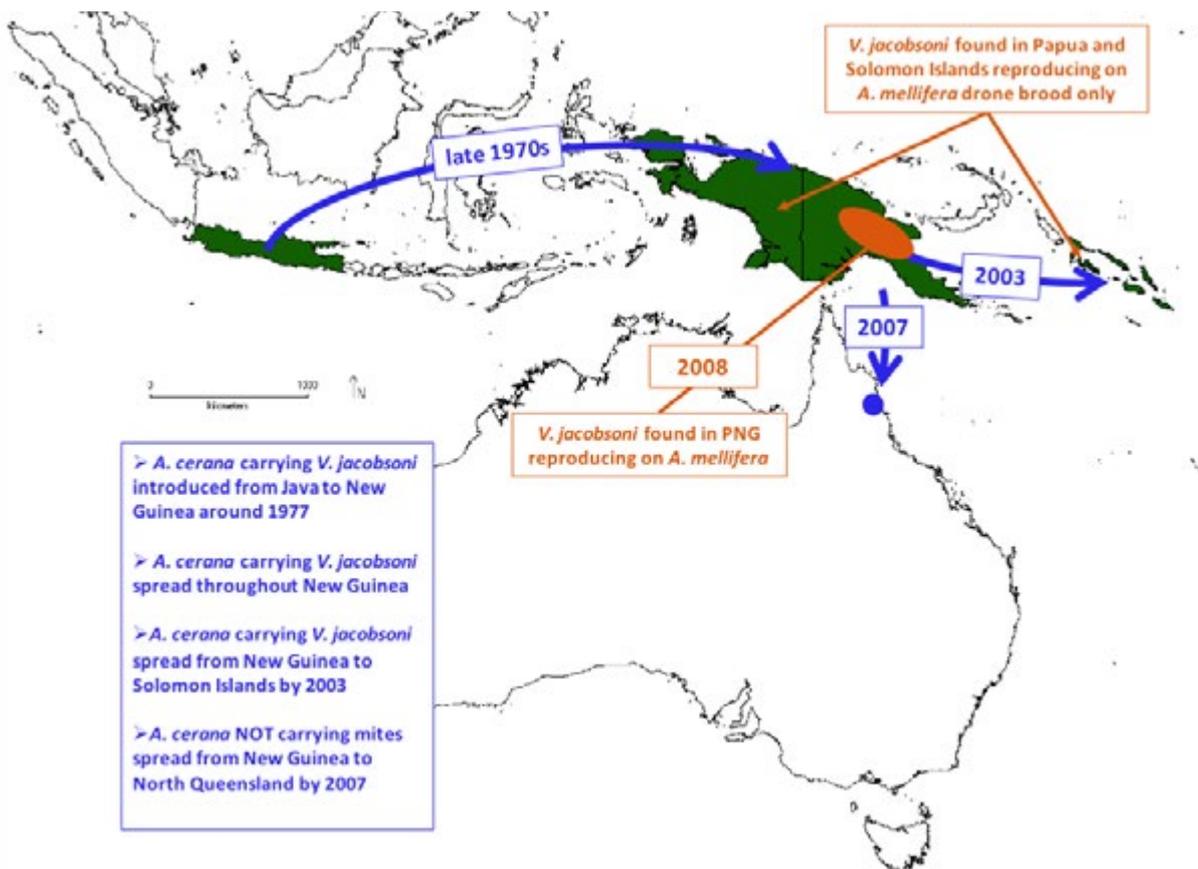


Figure 1. Distribution of *Varroa jacobsoni* (Java haplotype) on *Apis cerana* is highlighted in green. Spread of *A. cerana* from Java to New Guinea and then to Solomon Islands and Australia is highlighted in blue. *Varroa jacobsoni* reproducing on *A. mellifera* is highlighted in orange.