GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: ***Varroa destructor***

Varroa destructor **System:** Terrestrial

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Arachnida	Parasitiformes	Varroidae

Common name varroa mite (English)

Synonym

Similar species *Braula coeca*

Summary Varroa destructor is an external parasite found throughout most of the world that attacks all lifecycle stages of a broad range of honeybees. Varroa destructor sucks the blood from both the adults and the developing brood, weakening and shortening the life span of bees upon which they feed. Untreated infestations that are allowed to increase will destroy entire honeybee colonies. The movement of infested colonies of bees for pollination has led to the rapid local spread of this mite. Although Varroa destructor can only reproduce on honeybees, other insects may also assist in spreading it.

view this species on IUCN Red List

Species Description
Adult female mites are reddish-brown in colour, have eight legs and a flattened oval shape. Denmark *et al*. (2000) reports that the females measure 1.00-1.77mm long and 1.50-1.99mm wide. Their curved bodies fit into abdominal folds of the adult bee and are held there by the shape and arrangement of ventral setae (the stiff hairs on the abdomen). This protects them from the bee's normal cleaning habits. Adult males only occur in sealed brood and are yellowish with lightly tanned legs, a spherical body shape, and measure 0.75 - 0.91mm long and 0.71 - 0.88 wide. The male chelicerae (a pair of fanglike appendages near the mouth) are modified for transferring sperm.
Please see PaDIL (Pests and Diseases Image Library) Species Content Page *Non-insects: Varroa Mite* for high quality diagnostic and overview images.

Notes
Varroa jacobsoni is the old name for the varroa mite; the mite that is known to infest the *A.mellifera* colonies was found to be a different species and has been named *Varroa destructor*. Anderson and Trueman (2000), after studying mtDNA Co-I gene sequences and morphological characters of many populations of *V. jacobsoni* from different parts of the world, considered it to be a species complex and split it into two species *Varroa jacobsoni* s.s. infests *Apis cerana* F. in the Malaysia-Indonesia region. *Varroa destructor* Anderson & Trueman, 2000 infests its natural host *A. cerana* on mainland Asia and also *A. mellifera* L. worldwide.

Lifecycle Stages
Varroa is an external parasite that lives exclusively on honeybees, feeding on their haemolymph (blood). To breed, the adult female mite enters a brood cell just before the cell is capped over, where she remains in the brood food until the cell is sealed. She then feeds on the immature bee and begins to lay eggs. Mating between mite offspring (brother and sister) occurs within the cell. Mature female mites leave the cell when the host bee emerges. Males and any remaining immature females die, unable to survive outside the sealed cell. With heavy infestation, two or more female mites may enter the same cell to breed. Mites prefer to breed in drone brood, but are also well suited to infest worker cells of the European honeybee. In winter, when brood rearing is restricted, mites over-winter solely on the bodies of the adult bees within the winter cluster, until brood rearing commences the following spring (CSL, 2003).
Denmark *et al*. (2000) describes the life cycle of *V. destructor* as very much synchronized with that of its honeybee host. It is thought that the hormones or pheromones of honeybees are necessary for the mite to complete its development. CHBRC (UNDATED) found that the average life expectancy for *V. destructor* is about 50 days during the breeding season.In bees without brood, the adult female mites can survive several months, feeding on the adult bees.

Habitat Description
V. destructor is found on a range of honeybees, according to Denmark (2000), including the Asian honey bee species *Apis cerana* and *A. koschevnikovi*, and on all races of the European bee *A. mellifera*. In Florida, *V. destructor* has been found on flower feeding-insects *Bombus pennsylvanicus* and *Palpada vinetorum* but this association is probably incidental and contributes little, if anything, to the spread of this parasite. The mite is spread between colonies on live bees carrying mites.

Reproduction
According to Denmark *et al*. (2000) the female mite lays eggs in bee brood cells. The developing mites feed on developing honeybee larvae, with a distinct preference for drone brood according to Bessin (2001). Denmark et al. (2000) goes on to state that males and females copulate inside the cell. The male dies, but the pregnant females emerge from the cell along with their bee host. They then seek another cell to repeat the cycle. The length of the postcapping period in honeybees may be an important factor determining the speed of the mite population increase. The longer the postcapping time (the time after which honey seals, or caps, the honeycomb with wax), the more time is provided for female mites to develop.

Nutrition
According to CHBRC (UNDATED), adult mites are able to pierce both the soft skin of the honeybee larva and tougher integument between the thoracic segments of adult bees with their specialized mouthparts. Not only do the mites remove hemolymph (analogous to blood) from their host, but they also inject their own saliva, which like other arachnids, contains proteases (various enzymes that predigest the bee tissues). With digestion occurring externally, the mite simply slurps up the liquid meal.

General Impacts
The mite is devastating to beekeeping in most parts of the world if the mite population is not controlled. On the other hand, if it is, the impact is minor or nil. It is increasingly clear that the negative effects from the mite primarily is related to virus infections where the mite triggers replication of dormant infections that become overt. The mite also vectors these virus infections and introduces transmission patterns that were not there before. Deformed wing virus (DWV), acute bee paralysis virus (APV) and slow paralysis virus (SPV) are probably the most important types in this context - all RNA viruses that replicate upon injection in bee haemolymph (Fries, I., pers.comm., 2004).
It has been reported in Europe that weak colonies are subject to being robbed by stronger colonies and may die within three to four years from the lack of worker bees to manage the brood and gather nectar. In Florida, infested colonies have died within seven months, probably due to the weather conditions where bees rear brood throughout the year and, thus, provide a continous source for mite population development. The original host, *Apis cerana*, supports populations of mites without collapsing and *Apis mellifera scutellata* in South America (the Africanized honey bee) seems to have some resistance or tolerance to the mite, whereas this resistance is not found in the same bee race in Africa where the mite was recently introduced. *V. destructor* is beyond doubt the most serious pests currently known for *A. mellifera*, which is a widely domesticated honeybee (Denmark *et al*. 2000).
MAF, NZ summarises the damage to bee colonies as follows: In the absence of treatment, an infested bee colony typically dies when the varroa population reaches a certain level. This \"threshold\" level appears to vary between locations and seasons. The actual cause of colony death is uncertain, but is likely to be the cumulative effect of the following effects:
\r\ndecreased weight of adult bees;
\r\ndecreased life-span of adult bees;
\r\nvirus infections, transmitted by varroa feeding on pupae;
\r\ndeformed wings and abdomens, probably resulting from virus infestations; and
\r\nreduced numbers of drone bees, and increased drone infertility.
\r\nColony death often occurs during the autumn/winter period, when the effects of varroa combine with seasonal population decreases and other stress factors (MAF, NZ., 2003).
Pollination of many significant crop species in the horticulture, arable and pastoral sectors is dependent on honey bees. A reduction in pollination of horticultural and arable crops could result in decreased overall yields and crop quality.
The cost of varroa control per colony (estimated at between $20 to $50 per year in NZ), adds significantly to the operating costs of beekeepers.
Varroa is likely to have a significant impact on beekeepers producing certified organic products. While there are varroacidal agents that are acceptable to organic certification agencies, they are generally less effective than their synthetic equivalents. It is likely that some organic beekeepers will give up their organic status to simplify varroa management (MAF, NZ., 2003).

Management Info
Various management methods have been developed for the control of *V. destructor*, and researchers continue to search for additional effective methods. The simple way to monitor the mite is to investigate colony debris where dead adult mites can be found if present. This requires a screen bottom board so the colony debris is not cleaned out by the bees. Instant results can also be achieved by the ether roll method where adult bees are shaken in a jar with ether, and the mites dislodge and adhere to the glass wall.
For details on management options, please see *management information*.

Pathway
Farmers importing queen bees, did not realize the were also importing the *Varroa destructor* (Denmark *et al.* 2000)

Principal source: *Varroa Mite in Bees* Ministry of Agriculture and Forestry, New Zealand.
National Bee Unit Central Science Laboratory, UK.

Compiler: National Biological Information Infrastructure (NBII) & IUCN/SSC Invasive Species Specialist Group (ISSG)

Review: Ingemar Fries, Department of Entomology, Swedish University of Agricultural Sciences

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ALIEN RANGE

[1] AFRICA
[1] CANADA
[1] IRELAND
[2] NEW ZEALAND
[1] SOUTH AMERICA
[2] UNITED STATES
[1] ASIA
[1] EUROPE
[1] MIDDLE EAST
[1] SAINT LUCIA
[2] UNITED KINGDOM

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Summary: PaDIL (Pests and Diseases Image Library) is a Commonwealth Government initiative, developed and built by Museum Victoria s Online Publishing Team, with support provided by DAFF (Department of Agriculture, Fisheries and Forestry) and PHA (Plant Health Australia), a non-profit public company. Project partners also include Museum Victoria, the Western Australian Department of Agriculture and the Queensland University of Technology. The aim of the project is: 1) Production of high quality images showing primarily exotic targeted organisms of plant health concern to Australia. 2) Assist with plant health diagnostics in all areas, from initial to high level. 3) Capacity building for diagnostics in plant health, including linkage developments between training and research organisations. 4) Create and use educational tools for training undergraduates/postgraduates. 5) Engender public awareness about plant health concerns in Australia. PaDIL is available from : http://www.padil.gov.au/aboutOverview.aspx, this page is available from: http://www.padil.gov.au/viewPestDiagnosticImages.aspx?id=387 [Accessed 6 October 2006]

General information

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