SMALL HIVE BEETLE, *AETHINA TUMIDA* (MURRAY) (COLEOPTERA: NITIDULIDAE) IN NEW SOUTH WALES

P. Gillespie[1], J. Staples[1], C. King[1], M.J. Fletcher[1], and B.C. Dominiak[2]

[1] Orange Agricultural Institute, NSW Agriculture, Forest Road, Orange NSW 2800, Australia
[2] NSW Agriculture, Locked Bag 21, Orange NSW 2800, Australia
Email: peter.s.gillespie@agric.nsw.gov.au

Summary

A survey for *Aethina tumida* (Murray) in beehives in New South Wales from October 2002 to January 2003 found 120 positive detections of the species out of more than 1000 samples received. This pest was found mainly in the west of the Sydney basin around Richmond and parts of the lower Blue Mountains but other satellite infestations were found in the Cowra area and around Stroud in the Hunter Valley. Small numbers of several other insects including a native species of Nitidulidae, *Brachypeplus* sp. was also found in hives widely across New South Wales.

Keywords: survey, distribution, bee hive pest, *Aethina tumida*, Small hive beetle

INTRODUCTION

Small hive beetle (SHB), *Aethina tumida* was identified in the western Sydney basin, New South Wales, in October 2002 (Fletcher and Cook 2002). The species originates in southern Africa where it is regarded as a minor pest, causing little damage to bee hives. On the African continent, it has been reported in Nigeria, Ethiopia, Kenya, Zimbabwe and, since 2000 in Egypt (Mostafa and Williams 2002).

In 1998 the beetle was found in Florida (Sanford 1998a) although there is some evidence that it had been in South Carolina since 1996 (Mostafa and Williams 2002). *A. tumida* has now spread through 15 States in eastern United States of America (Anon 2003) where it has had a significant and destructive impact on American bee-based industries. It has also been recorded in Canada (White 2002). It has become a pest of both Africanised and European honeybees although the hive damage is quite different (Mostafa and Williams 2002). Following detection in New South Wales, it was feared that SHB would become an economically significant pest to Australian beekeepers.

Adult beetles (Figure 1) are strongly attracted to bees and particularly to hives, honey and pollen. Adult beetles enter and lay eggs within the hive but usually out of the way of bees. The eggs hatch within six days. Larvae (Figure 2) feed on pollen, honey and brood. The majority of damage is done by larvae burrowing through the hive wax, contaminating honey with excrement, causing fermentation and reducing the harvest of marketable product. Damage to honey 'supers' being stored before processing can be particularly severe since they lack the protection of bees. Bees may abandon a badly fermented hive. After about three weeks the mature larvae, attracted by light, exit the hive. Pupation usually occurs in the top 20 cm of soil adjacent to the hive. Adult beetles usually emerge within 60 days and fly readily. Adult beetles may disperse with swarming bees or be inadvertently transported with infested hives by beekeepers (Fletcher and Cook 2002).

This paper reports on the findings of a survey for this pest conducted between October 2002 and January 2003, and gives an initial assessment of the distribution of this pest.

MATERIALS AND METHODS

Following the first confirmed identification of the beetle in the Sydney basin in October, an exotic 'disease' outbreak was declared and a Disease Control Centre was activated by NSW Agriculture at Orange to co-ordinate the State-wide response. A Local Disease Control Centre was established by NSW Agriculture at Richmond to co-ordinate activities in the Sydney basin.

The search for infested hives had two distinct phases. The first phase was to ascertain the extent of the incursion of this pest. Regulatory staff from NSW Agriculture examined the history of movements of infested hives and scrutinised any hives associated with these movements. All commercial and feral hives (where identified) within 3 km of a confirmed infestation were also inspected and commercial apiaries up to 10 km could be included in this search, dependent on environment and location of these commercial apiaries (Ian Bell pers. comm.).

In the second phase, about 3200 registered beekeepers throughout New South Wales were

Figure 1. Adult Small Hive Beetle (Length approx. 8 mm)

Figure 2. Mature larvae Small Hive Beetle (length approx. 14 mm)

mailed a survey form and asked to check their own hives. They were asked to return the survey form indicating "no beetles found" or submit suspect samples to Orange Agricultural Institute (OAI) for identification. All identifications, positive and negative, were recorded on a central database and reported to both Control Centres. This database was interrogated in January 2003, and data on positive and negative detections were mapped using a computer based geographic information system. Some sites had Global Positioning System coordinates but where these were not available the nearest town co-ordinates were mapped.

RESULTS

There were 1059 reports on the database, with 120 positive detections. 12 of these positive detections were in feral hives. Survey findings by inspectors are given in Figure 3. Small hive beetles were found in hives throughout the Sydney basin. Two other foci of infestation at Cowra/Binalong and at Stroud in the Hunter Valley occurred through the movement of infested hives from Sydney to these areas. Infested feral hives were found throughout the Richmond area, within 2 km of the Blue Mountains National Park, along The Bells Line of Road and as far as Blaxland on the Great Western Highway.

The results for the beekeepers survey showed that 864 beekeepers returned "no beetles found" forms giving a response rate of about 27 percent. Ten beekeepers returned suspect beetle samples but only one was confirmed as *A. tumida*. Low numbers of many other species of insects, apart from *A. tumida*, were submitted. These included several species of beetles *Hippodamia variegata* (Goeze) (Coccinellidae), undetermined species of scarabs (Melononthinae: Scarabaeidae), darkling beetles (Tenebrionidae), click beetles (Elateridae) and leaf beetles (Chrysomelidae). Interestingly, a related species of nitidulid, an undetermined native species in the genus *Brachypeplus*, was commonly found in hives. This species was collected in bee hives in various locations from Broken Head in northern New South Wales to Narooma in the south and Narrandera in the west. Larvae of this species were found in hives at Narrandera. The extent to which this species damages hives is not yet clear. Insects from other Orders found in the survey included Blattodea (cockroaches), larvae of the wax moth, *Galleria mellonella* (Linneaus) (Lepidoptera: Pyralidae) and some unidentified dipterous pupae usually in low numbers.

DISCUSSION

It is unknown how long the SHB was present in New South Wales before its initial detection in October 2002. It seems likely that it has established and spread locally around Richmond and has been inadvertently transported to Cowra/Binalong, Stroud and Queensland by beekeepers seeking blossom for their hives. Given this degree of spread and establishment, it would seem that this species is likely to have been in New South Wales for at least six months prior to its discovery. The apparent 'rapid' spread of this pest through southern United States during and immediately after its discovery in 1998 has been tempered by more recent evidence that it may have been there for at least two years prior to its discovery (Hood 2000, Mostafa and Williams 2002). The high number of negative beekeeper reports, the relatively low number of infestations detected (Figure 3) and the low numbers of beetle in infested hives (White 2002) may have been the result of restricted movement of hives and limited bee movements due to the severe prevailing drought conditions (Somerville 2002).

Anderson (2002) reported DNA tests indicated that the Australian SHB appears to be identical to the

Figure 3. Map showing the results of Regulatory Officer inspections of hives in the 'known infection zones' within New South Wales.

strain from Durban in South Africa, and is not the same as the American strains. This is consistent with reports to date that, compared to damage reports from the United States (Sanford 1998b, Mostafa and Williams 2002) there has been no significant damage to hives in Australia caused by the beetle (White 2002).

Strategies for management of SHB have been promoted to the beekeeping industry. These include the treatment of soil with pesticide below hives to kill larvae as they burrow into the soil for pupation. Alternatively, larval traps may be positioned below the entrances to catch larvae before they reach the soil (Fletcher and Cook 2002).

Hives should be examined for beetles and contaminated hives should not be moved into uncontaminated areas. Strong hives protect against the beetles and any management techniques that encourage and maintain strong hive health would be useful. Weak hives should be combined or re-queened (Fletcher and Cook 2002). Until reliable information on the power of dispersal of SHB is available healthy hives should not be placed within ten kilometres of known infested areas.

ACKNOWLEDGMENTS

The efforts of the many NSW Agriculture staff who manned the two Disease Control Centres at Orange and Richmond are acknowledged. The cooperation of bee keepers in New South Wales is also acknowledged. The map was provided by David Freckelton (NSW Agriculture: Resource Information). Lee Cook and Murray Spicer commented on earlier versions of this paper.

REFERENCES

Anderson, D. (2002). Research needs for the small hive beetle in Australia. *Honeybee News.* **6:** 10-11.

Anon (2003). National Agricultural Pest Information System (NAPIS), http://www.ceris.purdue.edu/napis/pests/shb/

Fletcher, M.J. and Cook, L.G. (2002). *Small hive beetle*. Agnote DAI-288. NSW Agriculture. pp 3.

Hood, M. (2000). Small Hive Beetle - Entomology Insect Information Series http://entweb.clemson.edu/cuentres/eiis/apic/ap2.pdf

Mostafa, A.M. and Williams, R.N. (2002). New record of the small hive beetle in Egypt and notes on its distribution and control. *Honeybee News.* **6:**16-19.

Sanford, M.T. (1998a). *Aethina tumida: A New Beehive Pest In The Western Hemisphere.* APIS **16**:1-3 http://apis.ifas.ufl.edu/apis98/apjul98.htm#1

Sanford, M.T. (1998b). *Aethina tumida* hive damage images http://apis.ifas.ufl.edu/apis98/aethina/aethina1.htm

Somerville, D. (2002). Bees & Drought. *Honeybee News.* **6:** 20-21.

White, B. (2002). Discovery of the Small Hive Beetle in Australia. *Honeybee News.* **6:** 8-9.

This page left blank intentionally.