Farm Production & Practice

Ministry of Agriculture and Fisheries

Beekeeping Wax Moths

Life History and Control

Keywords: **comb, control, honey bees, pest wax, wax moths.**

Wax moths are a serious pest of the beekeeping industry, causing damage to bee combs, comb honey and other bee products.

Distribution

There are two species of wax moths in New Zealand; the greater, ***Galleria mellonella,*** and the lesser, ***Achroia grisella.*** Neither are native to this country, but were probably imported accidentally with bees.

The distribution of both wax moth species is controlled largely by climatic factors. Serious damage caused by the greater wax moth occurs in most of the North Island and warmer parts of the South Island. The lesser wax moth appears to have more tolerance to cold and is distributed throughout New Zealand.

Life cycle

Although the greater wax moth is by far the more destructive, the two species are similar in habits and control measures are the same.

Female moths lay about 300 eggs on bee combs, or in cracks in the hive woodware. Eggs are small, white, and very difficult to see. These eggs hatch in about a week outside the hive, but this period is shortened to a few days in the warmer conditions of the hive.

Larvae are white, and about 1 mm long. They take their first meal of honey or pollen, and then start to burrow from the surface of the comb down to the midrib. There they tunnel through the comb, feeding on honey, pollen, beeswax, and the general debris which remains in the comb after brood rearing.

As larvae burrow through the comb, the resulting tunnels become lined with silk and spotted with faecal pellets. Damage to the comb is rapid and it becomes criss-crossed with silken tunnels. Ultimately the entire substance of the comb may be reduced to a mass of frass and debris.

The length of time spent in the larval stage varies considerably with prevailing conditions. In cold conditions, and when there is a shortage of food, it may be as long as 6 months. In warm conditions and with abundant food, larvae may become fully grown in as little as 4 weeks. It is in such conditions that the damage done to combs is greatest.

When fully grown, greater wax moth larvae may be up to 28 mm long. At this stage they move to a wooden part of the hive to pupate. Bee spaces, especially at the end or top bars of frames, are most often chosen. Before pupation, greater wax moth larvae gnaw a shallow depression in the wood which, if repeated many times, may seriously weaken frame end bars.

Pupation takes place in a silken cocoon with many cocoons clustered together. The pupal stage of this species lasts about 10 days in warm conditions.

Lesser wax moth larvae also pupate in silk cocoons, but singly rather than in the large congregations of the greater wax moth. Pupal cocoons of the lesser wax moth may be found throughout the hive, especially in flax hive mats where these are present. Pupation takes about 16 days in warm conditions.

Situations in which wax moths may cause damage

Hives: Wax moths are never a problem in beehives which are inhabited by a strong colony of bees. Most colonies tolerate a low population of wax moth, but do not let numbers increase to a point where much damage occurs. The Italian race of honey bee is less tolerant of wax moth infestation in the hive than is the black or European honey bee.

If a colony is weakened or dies out through loss of the queen, starvation, disease, or insecticide poisoning, then wax moths will be free to multiply and infest the hive. In warm weather an empty hive may be destroyed in as little as 2–3 weeks.

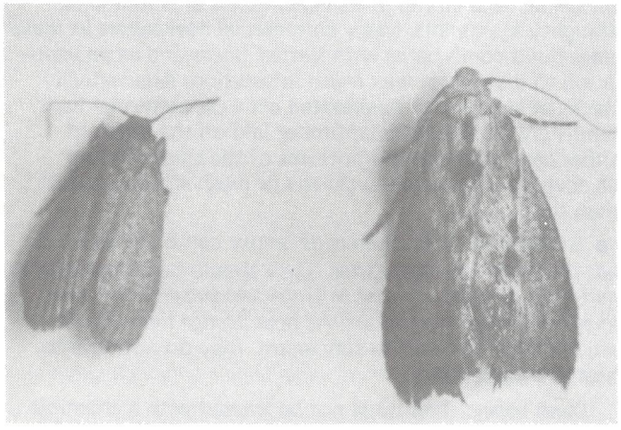

Fig. 1: Lesser wax moth male (left) and greater wax moth female.

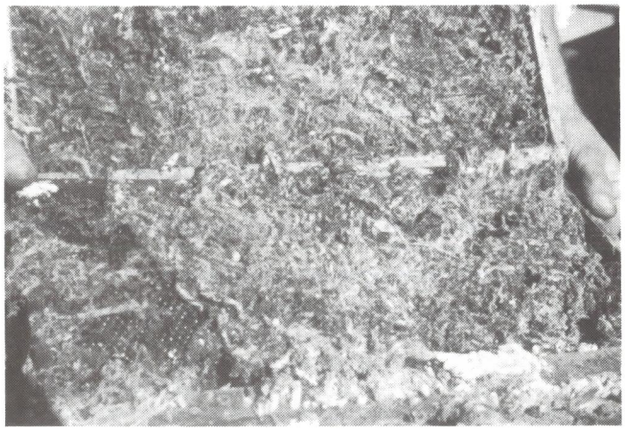

Fig. 2: Destruction of bee combs by wax moths.

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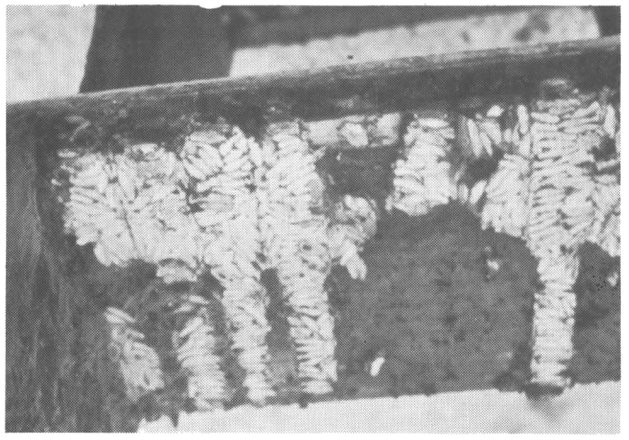

Fig. 3: Pupal cocoons of the greater wax moth, located in the end bee space of a super.

Stored combs: After honey is extracted at the end of the season, combs are stored through the winter and spring, to be put back on the hives next summer. Stored combs are not protected by the bees so they may be damaged by wax moths, particularly in warmer parts of the country.

Combs culled because of damage, excess drone cells, or pollen clogging, and which are awaiting processing are readily infested by wax moths.

Comb honey for human consumption: Although comb honey will seldom have active larval infestation when packed, eggs may be present. After packaging, and when placed in a warm environment such as a kitchen cupboard or shop shelf, these eggs may hatch and the larvae will damage the product. It will then be quite unacceptable from the consumer's point of view.

Feed honey: Frames of honey from a season's crop may be stored to be used as bee feed next spring. These combs may suffer wax moth infestation while in storage.

Pollen: Bee-collected pollen is very readily infested by wax moth, often while still in the pollen trap before being harvested by the beekeeper. If left untreated, total destruction of the pollen can occur.

Control measures

Hives: The best defence against wax moths in apiaries is to ensure that all colonies remain strong. Any hives which die out should either be restocked with bees or taken into storage and dealt with in one of the methods outlined below. First ensure the cause of death was not American foulbrood (AgLink FPP 124).

Stored combs: There are four methods for protecting stored combs from wax moth infestation. The first two involve killing all wax moth present when combs are stored and then preventing subsequent reinfestation. The third method relies on natural climatic factors to retard the development of wax moth which are present, while the fourth method relies on the bees themselves.

Because of the feeding habits of wax moths, it is good practice to stack combs into three categories. This separates areas of risk, and contains infestations which may occur. The categories are:

- Clean, white combs in which no brood has been reared and no pollen is stored.
- Combs which have been used for brood rearing, and may contain pollen.
- Cull combs waiting to be melted down.

Supers of comb should be placed in stacks, with division boards or hive lids forming a seal top and bottom. Queen excluders should be placed in the stack every three or four supers to contain rodent damage should these pests gain entry. Rodent poison should be laid around the area where combs are stored.

Any cracks or holes in supers which could admit moths should be sealed with gummed paper or masking tape. Combs should be evenly spaced in each super.

The four methods of wax moth control are:

- Freezing: Place honey combs (and supers) in a freezer for 24—48 hours. This kills all stages of wax moth, including eggs. Then store the supers in stacks, sealed off top and bottom. This sealing can be achieved with sheets of newspaper inside division boards, or hive lids, or with hive top ventilation screens. Any cracks or holes in supers which could admit moths should be sealed as described above.

Alternatively, supers may be stored in plastic bags. If care is taken to prevent reinfestation, this technique provides an easy and effective method for wax moth control on a small scale.

- Fumigation: The only chemical readily available to domestic beekeepers, as well as being easy and safe to use, is paradichlorobenzene (PDB). This white crystalline substance slowly gives off fumes which kill active stages of wax moth. It does not kill eggs.

Sort boxes of combs and place them in stacks as described above. Separate supers with sheets of newspaper, and place a tablespoon of PDB at the top of each super. This is quite important, as the fumes given off are heavier than air.

Because PDB does not kill eggs, a repeat fumigation is necessary after a fortnight or so. Thereafter, examine combs at about monthly intervals throughout the winter, and add more crystals as necessary. Air combs for a day or two before putting them out on hives.

PDB is sold by bee equipment stockists as 'moth crystals'. It should not be confused with common moth balls or naphthalene used for household moth protection. Naphthalene is similar to PDB in appearance and odour, but must not be used for the bee combs as it is readily absorbed by wax.

A widely-used practice among commercial beekeepers is the fumigation of stacks of empty supers under polythene sheets with a toxic gas. Further information on this practice is available from MAF apicultural advisory officers.

Other chemicals have been used for fumigating stacks of supers. However, none of these highly toxic chemicals actually kill wax moth eggs, and some form inflammable and/or explosive mixtures with air.

Do not use 'pest strips' in or near comb storage areas, as the insecticide given off (dichlorvos) is readily absorbed by wax and kills bees when the combs are used on hives. This warning also applies to borer bombs and aerosol insecticides.

- Use of natural climatic factors: In inland North Island districts and all but the warmer parts of the South Island, winter temperatures can be used to protect stored combs. If this method is used, combs should be sorted into different categories and stored in a shed which is as cold and as draughty as possible. Many commercial beekeepers in these areas build comb barns with slatted floors and extra ventilation to discourage wax moth infestation. Alternatively, stacks of supers may be elevated off a conventional floor simply by using lengths of timber laid on the floor. In either case, the tops and bottoms of the stacks should be covered with queen excluders or mesh screens, rather than solid covers.

- Storage on hives: Supers of empty comb can easily be left on hives over the winter. They should be placed over a half-mat, or escape board with the bee escapes removed, to allow limited bee access. As bees do not heat the air around them in order to stay warm, they do not have to heat this extra space.

Comb honey: This must not be treated with a chemical fumigant such as PDB, as this would taint the honey. For

treating comb honey on a large scale contact MAF about the range of gaseous fumigants available.

Freezing is an ideal method for protecting comb honey against wax moths. Supers of comb honey can be placed in a deep freeze for 24—48 hours and then packed in the normal way. No wax moth damage can occur subsequently, as all stages present have been killed. Supers of comb honey must either be processed immediately, or stored in moth-proof stacks with newspapers between supers, to prevent re-infestation.

Feed honey: The same constraints on the treatment of comb honey also apply to honey being kept for bee feed. Freezing should be used if possible, and gaseous fumigation is available for commercial beekeepers.

Pollen: This should be harvested from the traps at least twice-weekly to prevent wax moth infestation in the pollen. It should then be placed in a freezer for at least 24 hours, or until needed. Pollen may also be fumigated with food-grade carbon dioxide. The pollen should be placed in a plastic bag and the air displaced with the gas.

A. G. Matheson
Apicultural Advisory Officer
Advisory Services Division
Nelson