

## **Part 1 Stages of Peach Fruit Moth, *Carposina niponensis* WAL-SINGHAM and Yellow Peach Moth, *Conogethes punctiferalis* (GUENÉE) Which May be Present on/in 'Fuji' Apples at Harvest**

### **Introduction**

There are many reports of studies of plant quarantine treatments against internal fruit feeders of Lepidoptera like codling moth, *Cydia pomonella* (L.) in cherries (ANTHON et al., 1975, 1977; GAUNCE et al., 1981), unshelled walnuts (NELSON et al., 1983; TEBBETS et al., 1986), nectarines (YOKOYAMA et al., 1987a, 1988, 1990a, 1990b; WADDELL et al., 1989), apples (MOFFITT, 1971; MORGAN et al., 1974; GAUNCE et al., 1980), and pears (MACKIE et al., 1939), and oriental fruit moth, *Grapholitha molesta* (BUSCK) in nectarines (JOHNSON et al., 1942; YOKOYAMA et al., 1987b), respectively. And methyl bromide fumigation is widely recommended as a quarantine treatment against internal fruit feeders (MONRO, 1969; STOUT, 1983; California Department of Food and Agriculture, 1983; BOND, 1984; USDA, 1985).

The experimental process in these reports was mainly used that stages of codling moth and oriental fruit moth which might be present on/in fruit at harvest are determined and then large-scale mortality tests are conducted to confirm if the stages could be completely killed by disinfestation standards established.

Our objectives were to determine stages of two pests, peach fruit moth, *Carposina niponensis* WALSINGHAM and yellow peach moth, *Conogethes punctiferalis* (GUENÉE), on the basis of information on their life history, their seasonal occurrence and the fruit's harvest time.

#### **1. Major Production Areas and Harvest Time of 'Fuji' Apples in Japan**

In Japan, 'Fuji' apples are produced mainly for the domestic market in the Tohoku area, which include such prefectures as Aomori and Iwate, a high-quality cultivar, is currently on the rise (Statistics and Information Department, MAFF, 1990). 'Fuji' apples are cultivated by 'bagged' and 'unbagged' methods. 'Bagged Fuji' apples are wrapped with paper bags when they are still small and remain covered until harvest, while 'Unbagged Fuji' are those grown without bags. 'Bagged Fuji' apples are harvested from late October to mid-November in the Tohoku area (Tsugawa, 1984).

#### **2. Life History and Seasonal Occurrence of The Two Pests in Major Apple Production Areas**

##### **Peach fruit moth**

This insect, which only infests the fruit, can be a serious pest of apples in Japan. While it is commonly found in unsprayed orchards and private gardens, it has not been reported to have caused much damage in commercial orchards due to the introduction of

fruit bagging in Aomori Prefecture and through pest control.

The life cycle of peach fruit moth in the Tohoku area is shown in Figure 1-1. The adult are normally found once or twice a year in the Tohoku area, although it occurs as many as three times in some parts of southwestern Japan.

It overwinters as the fifth instar larva, forming a winter cocoon underground. Following diapause, the larva crawls out of the winter cocoon and forms a summer cocoon, closer to the surface of the ground, for pupation. Eggs are oviposited in dents on the surface of the fruit and newly hatched larvae eat into the fruit. Mature larvae crawling out of the fruit form either summer cocoons or winter cocoons deeper in the ground for diapause (NARITA, 1986a).

The seasonal occurrence of male adults caught in pheromone traps are shown in Figure 1-2 (Entomology Section, Aomori Apple Experiment Station, 1986, 1987) and Figure

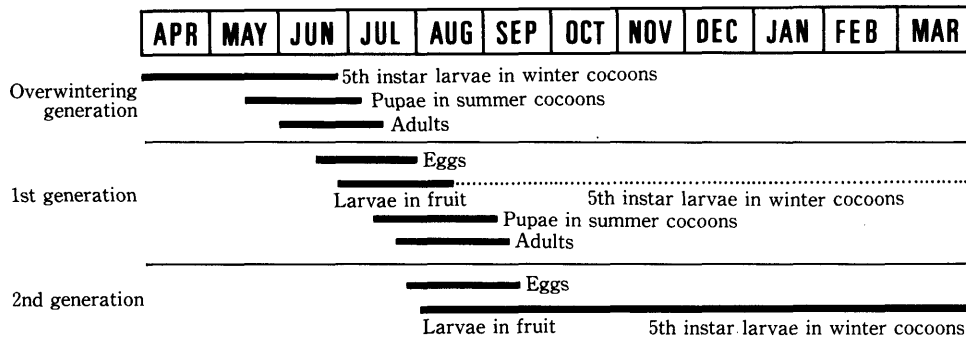


Fig. 1-1. Life cycle of the peach fruit moth, *Carposina niponensis*, on apples in Akita Prefecture, Japan (modified from NARITA, 1986).

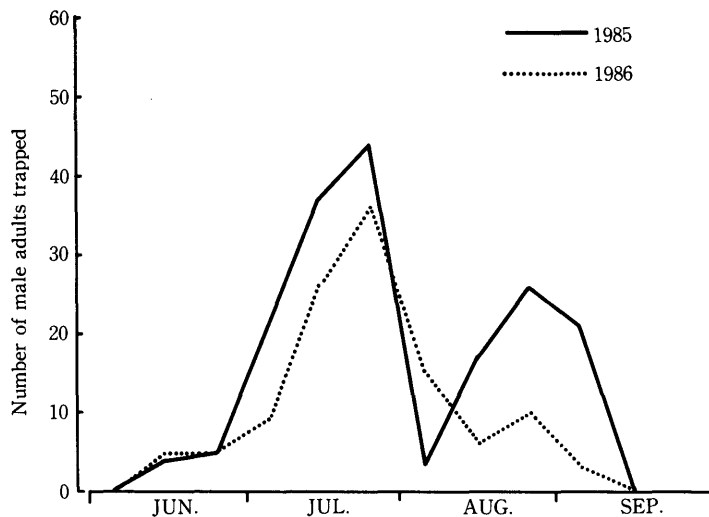


Fig. 1-2. Seasonal Occurrence of male adults of the peach fruit moth, *Carposina niponensis*, caught in pheromone traps in Aomori Prefecture in 1985-86 (modified from Aomori Apple Experimental Station, Entomology section, 1986, 1987).

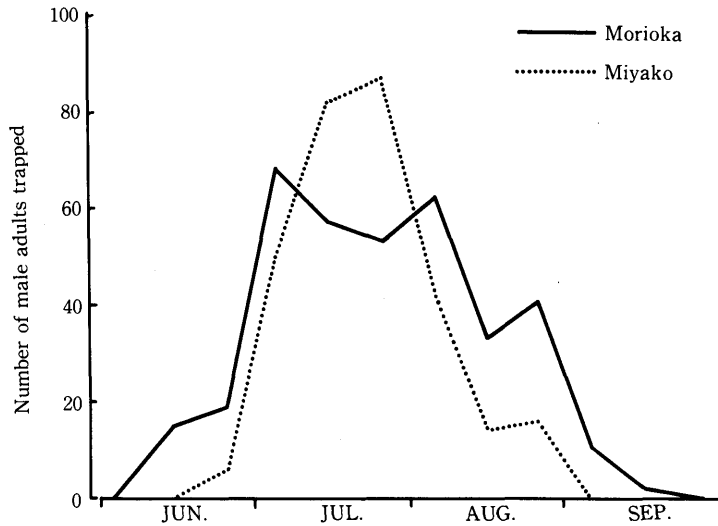


Fig. 1-3. Seasonal Occurrence of male adults of the peach fruit moth, *Carposina niponensis*, caught in pheromone traps in Iwate Prefecture in 1982 (modified from CHIBA & KOBAYASHI, 1985).

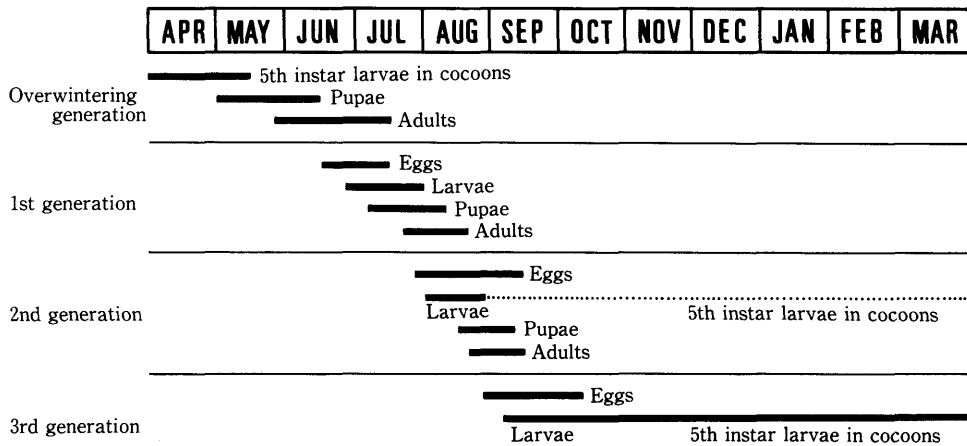


Fig. 1-4. Life cycle of the yellow peach moth, *Conogethes puncriferalis*, on peaches and chestnuts in Ibaraki Prefecture, Japan (modified from SEKIGUCHI, 1986).

1-3 (CHIBA & KOBAYASHI, 1985) in Aomori and Iwate Prefecture, respectively. From the results of the pheromone trap surveys in the Tohoku areas, it appears that the adults occur continuously from early June to mid-September, through the period of emergence. While the larva the fruit by July form summer cocoons and emerge within that year, those that larva the fruit after September from winter cocoons for overwintering.

**Yellow peach moth**

This species is a serious pest of fruits such as peaches, plums, persimmons, and chestnuts. However, it is rarely known to cause injury to apple fruit (KADOI & KANEDA, 1990) under normal conditions. The adults are found two to three times per year in the

northern Kanto, a major production area of such commodities as peach and chestnuts (Figure 1-4). The mature larvae overwinter as prepupae, forming cocoons under tree bark and pupating in May. The adults occur intermittently from late May through September. Only one egg is oviposited on the surface of each fruit and a newly hatched larva eat into the fruit. Although larvae that mature by the end of August pupate and emerge within that year, those that do not mature until early September or later overwinter in cocoons. Occasionally the larva will feed in the fruit until November (SEKIGUCHI, 1986).

### **3. Stages of The Two Pests That May be Present on/in 'Fuji' Apples at Harvest**

Since 'Fuji' apples are harvested from late October through late November, it can be determined from the life cycles of the two pests that the stages most likely to be present on/in the fruit is mature larva of both species, and that there normally will be no young larvae or eggs at harvest time. However, since the occurrence of the insects varies from year to year, the possibility of finding eggs and young larvae on/in apples harvested early in the season cannot be ruled out. Therefore, it can be concluded that the stages of both species that may be present on/in 'Fuji' apples at harvest are eggs of all ages and first through fifth instar larvae, and that fifth instar larvae would be those developing to the diapause condition (diapause larvae).