Quick Identification Guide to Apple Postharvest Insect Damage: Codling Moth

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Codling moth (Cydia pomonella) has become a serious quarantine pest for apple exports. Some countries, such as Taiwan, require orchard or field bin sampling to ensure fruit is codling moth free prior to packing. Damage is caused by feeding of the larvae in fruit.

There are two types of damage: deep entries and stings. Deep entries occur when larvae bore to the center of the fruit and feed on seeds. Brown frass, or excrement, extrudes from the entry hole or a new hole destined to be an exit. Stings are shallow entries where the larvae died or gave up and tried another place. Both types of damage make the fruit unmarketable, but deep entries are a problem in stored fruit because bacteria and fungi in them lead to fruit rot.

**Figures 1 & 2:** These are examples of deep entry holes. The calyx and stem bowl must be checked carefully to detect holes.

**Figure 3:** “Stings” are unsuccessful entries defined as being under ½ inch deep; deeper holes are scored as “wormholes”.

**Figure 5:** CM larvae tunnel into the fruit to feed on the seeds at the core before exiting through the same or a new tunnel.

**Figure 6:** “Wormholes” are tunnels into the fruit made by feeding larvae. Codling moth larvae need to feed on the seeds to complete their development.

**Figure 4:** To check for internal larvae the fruit must be cut vertically from stem to calyx through the core. Fungal or bacterial growth are common side effects.
Quick Identification Guide to Apple Postharvest Insect Damage: Leafrollers & Other Caterpillars

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Two species of leafroller (LR) are common to the Pacific Northwest: **Oblique-banded leafroller** (*Choristoneura rosaceana*; OBLR) and **Pandemis** (*Pandemis pyrusana*). Unlike codling moth, leafroller larvae do not require fruit to complete their development. Leafroller larvae feed primarily on foliage, but they may attach leaves to an apple or use fruit clusters as sheltered feeding sites. Fruit damage can occur when the foliage touches the fruit. Fruit feeding damage can happen any time during the season.

Figures 1&2: Both are examples of early season feeding. Feeding at this time of year causes distortion of the fruit shape due to damaged tissue not expanding as fast as the surrounding tissue. This damage often appears as lattice-like scaring.

Figures 3&4: Mid- and late season leafroller feeding may cause either shallow holes or severe surface tunneling. Both types of damage occur where leaves were up against the fruit. Figure 3 shows shallow dis-continuous surface feeding or holes, often resembling codling moth stings produced by Pandemis mid- or late season. Figure 4 shows more severe damage caused by OBLR late season feeding.

The other common caterpillars that may cause feeding damage to apples are: **Fruitworms, Armyworms, Cutworms and Lacanobia**. Fruit injury is incidental to foliage feeding but can be quite severe in orchards where densities are high. More fruit damage can occur where clustered fruit is in close proximity to dense foliage or tall growing weeds, such as the lower center of apple trees. Larvae feed directly on fruit by excavating holes.

**Figure 5:** Shallow bowl type damage caused by Cutworm or Armyworm feeding.

**Figure 6:** Deep bowl type feeding caused by Fruitworm or Lacanobia feeding. This differs from a Codling Moth tunnel in that it is a more hollowed out area not extending into the seed core.
Quick Identification Guide to Apple Postharvest Insect Damage: Miscellaneous Insects Part 1
*Stink bug, Campylomma, Lygus bug and Thrips*

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**Stink bug vs. Bitter Pit**

One way to tell the difference between Stink bug feeding damage and bitter pit is by where on the fruit the damage occurs. Stink bug usually feed on the top half of the fruit (*Figure 1*). Bitter pit usually is more towards the bottom portion (*Figure 2*).

Another way to tell the difference is by making a wedge cut through the damage. Stink bug marks are more conical (*Figure 1, inset*) compared to the dark round marks caused by bitter pit (*Figure 2, inset*).

**Campylomma** is not a major source of fruit damage. However, for a relatively short period around bloom, it feeds on flower parts and developing fruitlets. Early fruit feeding produces a dark, raised, corky wart, often surrounded by a shallow depression (*Figure 3, inset*). Multiple stings on a fruit usually cause some degree of fruit deformity.

By harvest, the early damage has mostly grown out showing minimal distortion (*Figure 3*) or only small scars (*Figure 4*) except for extreme cases. Damage is more visible on lighter skinned cultivars.

**Lygus** early season feeding damage causes cat-facing, a growth distortion where the healthy tissue outgrows the area with damaged cells (*Figure 5*).

**Thrips** egg laying damage is called “Pansy spot” because it resembles the flower. The spots can appear as bleached tissue around a small dimple (*Figure 6*) or it may have a dark border around greenish depressions (Figure 6 inset).
Apple maggot is a strictly regulated quarantine pest in some parts of the state. Egg laying sites appear as small, often darkened, depressions in the fruit surface (Figure 5). Apple maggot larvae leave brown trails through the Apple flesh (Figure 6). When many maggots are present the flesh often becomes mushy developing into internal breakdown.

Woolly apple aphid (WAA) infestations produce a sugar-rich honeydew that gets on the fruit. Sooty mold may grow in the sticky residue causing blackened or russeted areas resulting in downgrading. WAA can infest the stem and calyx end of the apples. In varieties with an open calyx, aphids can also infest the apple core (Figure 1). Presence of an aphid, even dead, may cause export lot rejection.

Mealybug infestations also excrete a sticky honeydew substance. Fruit with honeydew are susceptible to sooty mold resulting in downgrading. Mealybug can also feed on the fruit, becoming a possible quarantine concern (Figure 2).

San Jose scale damage on red skinned fruit appears as darker pigmented areas around the feeding sites (Figure 3). On lighter colored fruit, the feeding sites are deep crimson (Figure 4). The discoloration is cause for downgrading the fruit. Scale may be found only in the stem bowl or calyx end if infestation is light or may cover the fruit with heavy infestations. Presence of scale can be an export issue.