

## *Thaumetopoea pityocampa*

**Other scientific names:** *Bombyx pityocampa* Denis & Schiffermüller; *Cnethocampa pityocampa*; *Thaumetopoea wilkinsoni* Tams

**Order and Family:** Lepidoptera: Thaumetopoeidae

**Common names:** pine processionary caterpillar

*Thaumetopoea pityocampa* Denis & Schiffermüller, 1775 is considered the most destructive forest insect pest throughout the Mediterranean Basin. It is a tent-making caterpillar that feeds gregariously and defoliates various species of pine and cedar. Note the taxonomic status of this pest is under review. In Cyprus for example, *Thaumetopoea wilkinsoni* is the preferred scientific name though it is considered an eastern Mediterranean form (race) of *Thaumetopoea pityocampa*.



Pine processionary caterpillars, *Thaumetopoea pityocampa*

### DISTRIBUTION

**Native:** Africa (North), Europe (southern), Near East. This pest is found in almost all the countries around the Mediterranean Sea with the exception of Egypt and Libyan Arab Jamahiriya.

**Introduced:** No records to date

### IDENTIFICATION

Eggs are laid in cylindrical egg masses that range in length from 4 to 5 cm and are covered in pale buff scales which conceal them and mimic the pine shoots (Dajoz, 2000).

The larvae develop through five instars, recognized by differences in head capsule size. First instar larvae have dull green bodies. After the second moult, the caterpillar assumes its definitive appearance and the paired reddish dorsal hair patches on each body segment are evident (EPPO/CABI, 1997). Typically, they are darker in colder areas varying from dull bluish-grey to black. Lateral hairs vary in colour from white to dark-yellow while dorsal hairs are yellow to dull orange. The average head width of the fifth instar caterpillar is 4.8 mm for males and 3.4 mm for females (EPPO/CABI, 1997). Mature larvae are about 40 mm in length with a black head capsule (EPPO/CABI, 1997).

Pupation takes place in oval, yellowish or white silken cocoons. Pupae are oval, approximately 20 mm in length, and pale brownish-yellow in colour that changes to dark reddish-brown (EPPO/CABI, 1997).

Adult female moths have a wing-span of 36 to 49 mm while males have a wing-span of 31 to 39 mm (EPPO/CABI, 1997). Both sexes have a hairy thorax, a stout abdomen and a tuft of large scales covering the last segments. Antennae are filiform in females and pectinate in males. Forewings are dull ashen-grey with darker veins, margins and three transverse bands. Hindwings are white, fringed with grey and have a characteristic dark spot in the anal region.

### HOSTS

*Pinus* and *Cedrus* species are primary hosts; *Larix decidua* is occasionally attacked. The rate of survival of this insect pest varies depending upon which species of plant it feeds, i.e. it is higher for *Pinus sylvestris* and *P. nigra*.

### BIOLOGY

The life cycle of the pine processionary caterpillar is typically annual but may extend over two years at high altitudes or in northern latitudes (EPPO/CABI, 1997). Daily average sunshine plays an important role in defining the northern limit of distribution. At northern latitudes and at higher altitudes, adults emerge earlier.

The day after emergence and mating, females oviposit on pines nearest to their pupation site although they can fly several kilometres in search of hosts thereby quickly increasing the extent of the outbreak (EPPO/CABI, 1997; Dajoz, 2000). Eggs are laid in masses containing 70 to 300 eggs typically near the tips of branches in the crown. The larvae hatch after 30 to 45 days and aggregate in colonies. There are five instars during which the larvae change location as host foliage is consumed (Dajoz, 2000). The larvae change colour at each moult and at the third instar urticating hair patches appear. They spin silken nests which are abandoned with each move until the fourth instar when the winter nest is built. The winter nest is a large silk bag up to 20 cm in length where the larvae spend the cold season (Dajoz, 2000).

Pupation processions occur at the end of the larval stage in late winter and early spring. A female is usually at the head of the procession which leads the colony in a file searching for a suitable site, typically a bright warm area near a host tree, to tunnel underground and pupate in the soil (EPPO/CABI, 1997; Dajoz, 2000). The processions occur at temperatures of 10 to 22 °C; at lower temperatures the colonies regroup and at higher temperatures they bury themselves wherever suitable soil conditions exist. The larvae burrow 5 to 20 cm below the ground where they weave a cocoon and pupate (Dajoz, 2000). The pupae enter diapause which breaks one month before adult emergence. The emergence period generally lasts less than one month for vigorous populations and approximately six weeks for weakened populations in regression (EPPO/CABI, 1997).

If environmental conditions are unfavourable, they can remain in the pupal stage for several years therefore resulting in moths from several generations emerging simultaneously when favourable conditions occur, causing severe outbreaks (Vega *et al.*, 1999).

### SYMPTOMS AND DAMAGE

Infestation by *Thaumetopoea pityocampa* can be detected by the presence of white silken nests and brown and yellowing needles of partially eaten twigs (EPPO/CABI, 1997). The caterpillars feed on the foliage of host trees during the cooler months of the year causing significant defoliation. Defoliation damage is extremely serious in young reforested areas and young plantations where it may lead to death of trees. Although mature trees are rarely killed by this species, reduced growth rates are observed resulting in significant production losses. Host trees become stressed which can make

them more susceptible to other agents including attack by secondary pest species. This insect is regarded as a major pest of Mediterranean pine forests because it can contribute to increment losses of approximately 30 percent.

*Thaumetopoea pityocampa* larvae have urticating hairs that can cause skin irritation, conjunctivitis, respiratory congestions and asthma in humans. Contact with dead larvae, cocoons, nests and debris from infested pine forests can also cause dermatitis and other symptoms throughout the year. This significant problem not only affects recreational and residential areas but also impacts silvicultural operations and grazing in forests (EPPO/CABI, 1997).



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*Damage caused by the pine processionary caterpillar to trees in Cyprus*

### DISPERSAL AND INTRODUCTION PATHWAYS

Adults are reasonably strong fliers and are thus capable of natural dispersal to new areas. Pupation processions may travel up to 37 m (EPPO/CABI, 1997). The movement of nursery stock and soil could transport *T. pityocampa* pupae.

### CONTROL MEASURES

Control measures targeting the pine processionary caterpillar should be applied when the pest is at its most vulnerable and when its predators are not as active (Dajoz, 2000). The period between larval hatching and building of winter nests is the most effective. Chemical and biological control treatments are typically applied aerially and the most effective insecticide is *Bacillus thuringiensis*. For small outbreaks or when population density is low, mechanical control by cutting and burning winter nests is also recommended (EPPO/CABI, 1997). Pheromone traps are also used for detection, monitoring and mass trapping.

There are a number of predators, parasitoids and diseases which play a role in the biological control of *Thaumetopoea pityocampa*. Eggs are attacked by the wasp parasitoids *Anastatus bifasciatus*, *Baryscapus servadeii*, *Oencyrtus pityocampae*, *Tetrastichus servadei* and *Trichogramma* sp. and the orthopteran predators *Barbitiste fischeri* and *Ephippiger ephippiger* (EPPO/CABI, 1997; Schmidt, Mirchev and Tsankov, 1997). Pine processionary larvae are attacked by the dipteran parasitoids *Phryxe caudata*, *Compilura concinnata* and *Ctenophora pavidata*, the hymenopteran parasitoids *Erigorgus femorator* and *Meteorus versicolor*, and the dipteran predator

*Xanthandrus comptus* (EPPO/CABI, 1997; Dajoz, 2000). Birds are also known to feed on these caterpillars. Pupae are attacked by the dipteran parasitoids *Villa brunnea* and *V. quinquefasciata*, the wasp parasitoids *Coelichneumon rudis*, *Ichneumon rudis* and *Conomorium eremita*, and the fungus *Beauveria bassiana* (EPPO/CABI, 1997; Dajoz, 2000). The most important diseases of *T. pityocampa* are caused by the viruses *Borrelina* sp. and *Smithiavirus pityocampae*, the bacteria *Bacillus thuringiensis* and *Clostridium* sp., and the fungi *Aspergillus flavus*, *Beauveria bassiana*, *Cordyceps* sp., *Metarhizium anisopliae*, *Paecilomyces farinosus*, *P. fumoso-roseus* and *Scopulariopsis* sp. (EPPO/CABI, 1997).

To avoid the accidental introduction of this pest into new areas, nursery stock, plants and trees, particularly *Pinus* and *Cedrus* species, should be examined for the presence of egg masses, caterpillar colonies and pupae (EPPO/CABI, 1997).