CAPS Datasheets provide pest-specific information to support planning and completing early detection surveys.

# *Thaumetopoea processionea*

## Scientific Name

*Thaumetopoea processionea* (Linnaeus, 1758)

**Synonym(s):**

*Cnethocampa processionea* (Linnaeus, 1758)
*Liparis processionea* (Linnaeus, 1758)
*Phalaena (Bombyx) processionea* Linnaeus, 1758
*Thaumetopoea luctifica* Staudinger and Rebel, 1901

**Figure 1**. Adult *Thaumetopoea processionea* (Photo courtesy of Steve Covey)

## Common Name

**Oak processionary moth,** oak processionary caterpillar

## Type of Pest

Moth, defoliator

## Taxonomic Position

**Class:** Insecta, **Order:** Lepidoptera; **Family:** Notodontidae

## Pest Recognition

*This section describes characteristics of the organism and symptoms that will help surveyors recognize possible infestations/infections in the field, select survey sites, and collect symptomatic material. For morphological descriptions, see the Identification/Diagnostic resources on the AMPS pest page on the CAPS Resource and Collaboration website.*

### Pest Description

Adults: Adults are nocturnal (Blaser et al., 2022) and mostly found on and around oak trees (Forestry Commission, 2022). They have yellowish-grey forewings with three blackish-grey transverse lines and an indistinct, crescent shaped marking (Fig. 1). These transverse lines are distinct on males and indistinct on females (Townsend, 2008). The forewing measures ~$^{1}/_{2}$ - $^{3}/_{4}$ in. long (Gilligan et al., 2014). The wingspan ranges between $1^{1}/_{4}$-$1^{1}/_{2}$ in. (Wall, 2024). Hindwings are whitish with diffuse grey markings towards the apex. Males are hairy with feathered antennae (Gilligan et al., 2014).

There is some color variation between *T. processionea* populations; moths from southeastern Europe and the Middle East have forewings that are typically lighter than those from Western Europe (see images in Groenen (2010)).

Eggs: Eggs are oblong, approximately 1 mm in diameter (Blaser et al., 2022) and are laid in masses on branches of one to two-year old twigs (Fig. 2A) (Forest Research, n.d.; Stigter et al., 1997). Egg masses are covered with hairs from the female (LIFE Project OPM, 2025; Stigter et al., 1997).

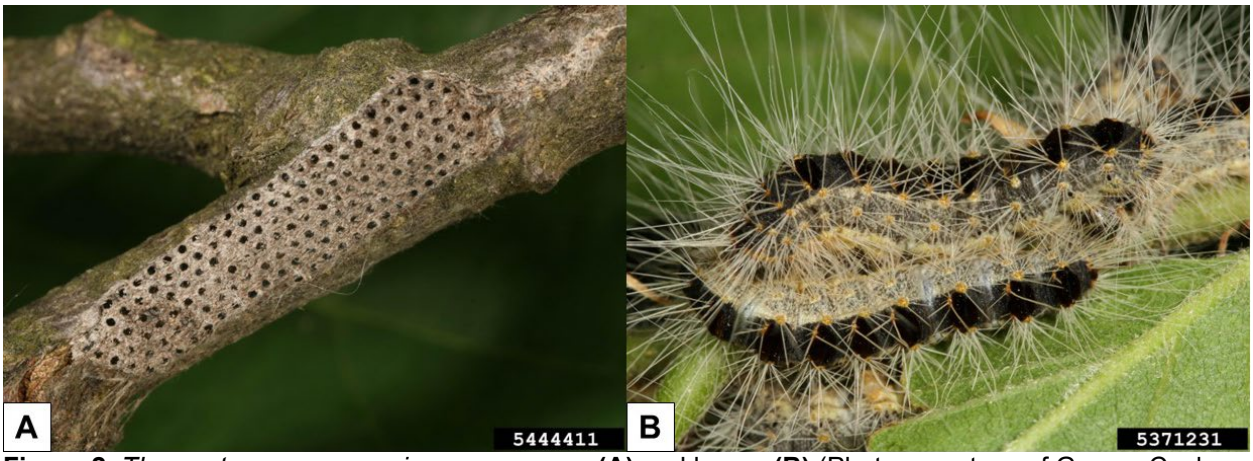


**Figure 2.** *Thaumetopoea processionea* egg mass **(A)** and larvae **(B)** (Photos courtesy of Gyorgy Csoka, Bugwood.org, CC BY-NC 3.0 US)

Larvae: Newly hatched larvae are about 2 mm long with a brown body and a dark head (Forestry Commission, 2022). They lighten in color as they mature with a gray body and dark head and are about 1 $^{1}/_{2}$ in. long when fully mature (Blaser et al., 2022; Forestry Commission, 2022). From the third instar onward, larvae are covered with microscopic urticating (irritating) hairs (Fig. 2B) (LIFE Project OPM, 2025; Stigter et al., 1997). These hairs contain a toxin (thaumetopoein) that can cause health hazards (skin, eye, or lung irritation or allergic reaction) in humans and animals (Townsend, 2008). The larvae are found hiding inside leaves and twigs spun together or inside nests during the day and are active from dusk through the night (Fig. 3C) (Pascual, 1988; Stigter et al., 1997).

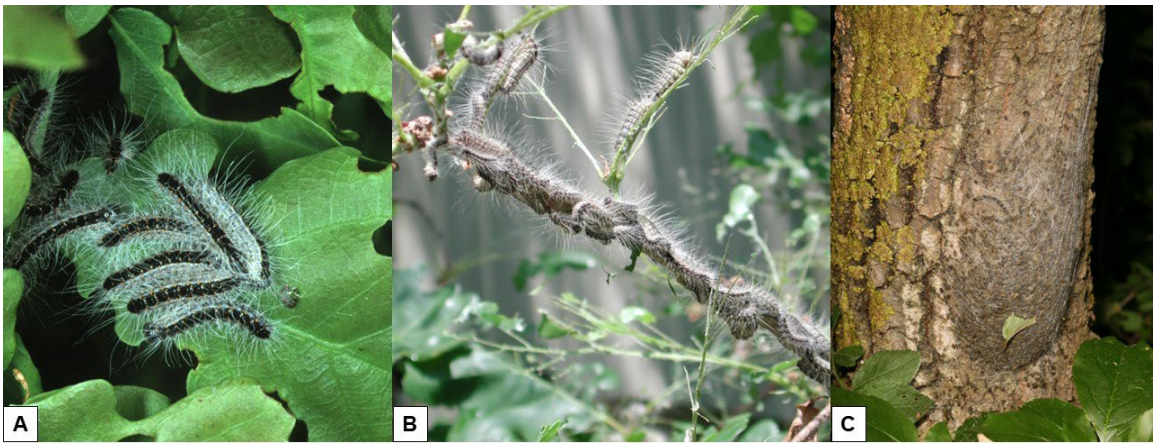


**Figure 3**. *Thaumetopoea processionea* larval damage to the oak tree: Larval feeding on the oak leaves **(A)**; Leaves stripped down to mid-vein after larval feeding **(B)**; Nest on the tree trunk **(C)** (Photos courtesy of (A and B) Louis-Michel Nageleisen, Bugwood.org; (C) Gyorgy Csoka, Bugwood.org; all images CC BY-NC 3.0 US)

Pupae: Mature larvae pupate inside firm cocoons made up of webs and hairs. The cocoons are often built close together inside the nest (Stigter et al., 1997).

## Signs

**Note:** Visual surveys for larvae are not an approved method and cannot be used to report negative data, but we are including some visual guidance to help surveyors who may observe larvae or signs of infestation.

Signs of infestation include:

- **Feeding damage:** *Thaumetopoea processionea* larvae feed on oak leaves (Fig. 3A), where they cause visible damage on foliage and new buds (Pascual, 1988; Townsend, 2008). Feeding damage occurs from the oak bud-burst phase in spring until summer (Forestry Commission, 2022). Larvae strip each leaf to the mid-vein and lateral veins, which usually stay intact (Fig. 3B). Patches of stripped leaves are often seen among healthy leaves (Pascual, 1988; Townsend, 2008). Severe infestations and outbreaks can completely defoliate trees (Stigter et al., 1997).

- **Conspicuous larvae:** *Thaumetopoea processionea* larvae are gregarious, living in groups on host trees (Pascual, 1988). Groups of caterpillars are visible on branches, trunks, leaves or inside nests constructed from their silk. When moving, the caterpillars travel together in a distinct procession, with one or a few caterpillars in the lead and the rest following after them (Fig. 4A) (Pascual, 1988; Stigter et al., 1997).

- **Nests:** Larvae build silken nests anywhere from 3–65 feet above the ground (Townsend, 2008), on the trunk, branches, or partially buried between leaves and soil (Fig. 4B) (Pascual, 1988). The nests can be conspicuous and typically consist of a whitish silken mass attached to the host tree, often full of shed skins, frass, and caterpillars (Pascual, 1988). Nests may remain on trees for up to a year following infestation (Townsend, 2008) and should not be touched as they are often full of the caterpillars' urticating hairs.

The visibility of these signs on infested oak trees is dependent on how long the pest has been present. New infestations will have small nests, larvae will be difficult to spot, and defoliation will be limited. Conspicuous nests, aggregations, and significant or complete defoliation of host trees may occur within two to three years of establishment (Stigter et al., 1997).

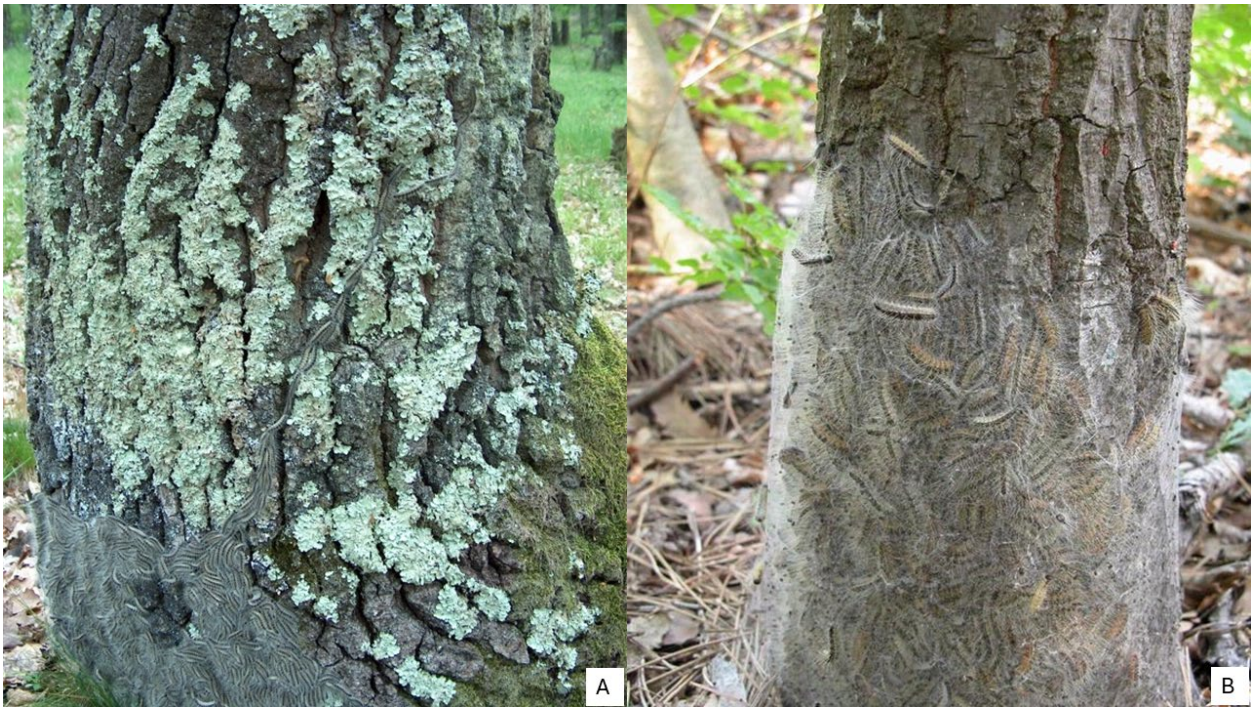


**Figure 4.** *Thaumetopoea processionea* larvae moving in a long procession **(A)** and nest containing insect hairs, cast skins, etc. **(B)** (Photos courtesy of (A) Haruta Ovidiu, Bugwood.org; (B) Ferenc Lakatos, Bugwood.org; all images CC BY-NC 3.0 US)

## Easily Mistaken Species

*Thaumetopoea processionea* adults and larvae are easily mistaken for other species within the Notodontidae. The adults are distinguished morphologically based on species-specific wing patterns and the shape of the head projection found between their antennae (Gilligan et al., 2014). This pest may be confused with *Thaumetopoea pityocampa* and *T. pinivora,* neither of which are currently present in the United States (Fig. 5) (Gilligan et al., 2014).

*Thaumetopoea pityocampa* (Fig. 5A) feeds primarily on *Pinus* spp. and *Cedrus* spp., while *T. pinivora* (Fig. 5B) primarily feeds on *Pinus sylvestris*, and occasionally on *P. nigra* and *P. mugo* (Battisti et al., 2015).

Other notodontids that are present in the United States and could be mistaken for *T. processionea* include *Ceolodasyns unicornis, Heterocampa biundata, H. guttivitta, H. lunata, Ianassa lignicolor, Lochmaeus bilineata, Misogada unicolor,* and *Schizura ipomoeae* (Gilligan et al., 2014); however, these are unlikely to be attracted to the *T. processionea* pheromone and are immediately distinguishable by having a proboscis (Gilligan et al., 2014).


**Figure 5.** Adults of similar *Thaumetopoea* species: *Thaumetopoea pityocampa* **(A)** and *T. pinivora* **(B)** (Photos courtesy of (A) of Paolo Mazzei, iNaturalist.org; (B) Michał Brzeziński, iNaturalist.org; both images CC BY-NC 3.0 US)

**Note:** While surveys should focus on trapping adults, we are including easily mistaken larval species in case suspect larvae are found.

The larvae of the oak processionary moth resemble those of fall webworm (*Hyphantria cunea*), eastern tent caterpillar (*Malacosoma americanum*), and forest tent caterpillar (*M. disstria*) (Fig. 6). These three species are native to the United States and can be found feeding on oak trees. *Hyphantria cunea* and *Malacosoma disstria* are distributed throughout the United States (Hauze, 2021; Stehr and Cook, 1968) and *Malacosoma americanum* is distributed throughout the eastern and central United States to the Rocky Mountains (Martinez et al., 2011). Both native tent caterpillars and *T. processionea* are communal and construct nests in trees; however, nesting locations vary among species and only *T. processionea* constructs nests on the main trunk or branches (Fig. 7) (Bessin, 2019; Hoover, 2001; Swier, 2016).


**Figure 6**. Larvae that look similar to T. processionea: *Hyphantria cunea* **(A)**, *Malacosoma americanum* **(B)**, and *Malacosoma disstria* **(C)** (Photos courtesy of (A & C) James B. Hanson, USDA Forest Service, Bugwood.org (B) David Cappert, Bugwood.org; all images CC BY-NC 3.0)

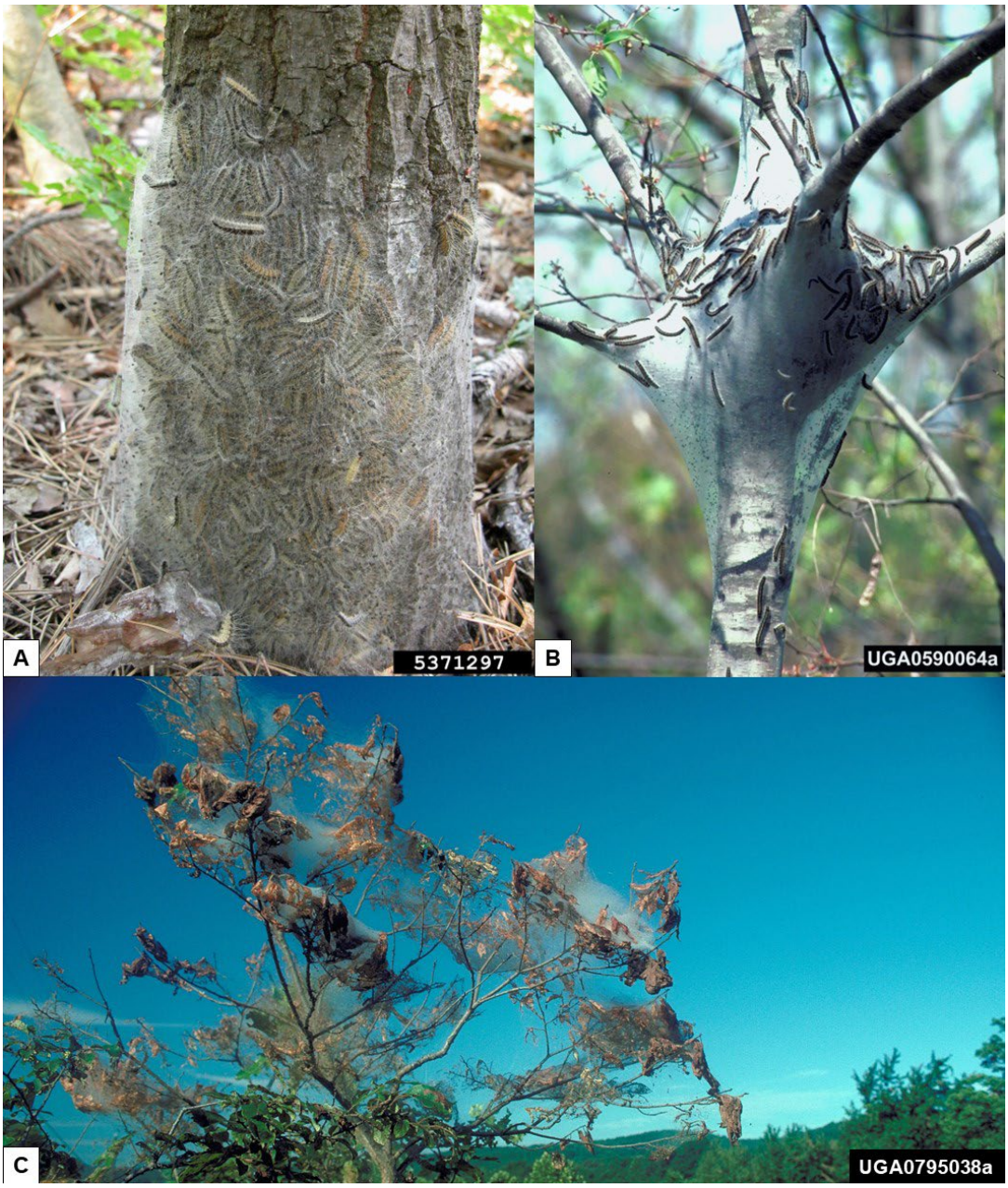


**Figure 7**. Nests of some native tent caterpillars in comparison to *T. processionea*: *T. processionea* nest on the main trunk **(A)**, *Malacosoma americanum* **(B)**, and *Hyphantria cunea* **(C)** (Photos courtesy of (A) Ferenc Lakatos, University of Sopron, Bugwood.org; (B) Robert L. Anderson, USDA Forest Service, Bugwood.org; (C) Ronald F. Billings, Texas A&M Forest Service, Bugwood.org; all images CC BY-NC 3.0)

## Commonly Encountered Non-targets

The approved survey method is pheromone trapping using the *Thaumetopoea processionea* lure (Z11Z13-16Ac [(Z, Z)-11,13- Hexadecadienyl acetate]). Commonly encountered non-targets attracted to this lure that are present in the United States include *Amyelois transitella* and *Notodonta torva* (El-Sayed, 2024; Gordon et al., 2023; Rutherford, 2020).

## Biology and Ecology

In Europe, *T. processionea* has one generation per year (Pascual, 1988). Females lay their eggs all at once in a single mass near the site of emergence in mid-August (Moussa et al., 2021; Pascual, 1988). Oviposition usually occurs on 1- to 2-year-old twigs and each egg mass contains 100-200 eggs (Pascual, 1988; Stigter et al., 1997).

First larval instars overwinter within the egg (Meurisse et al., 2012). Hatching coincides with the sprouting of oak buds and leaves in the spring, which the larvae feed on (Wagenhoff et al., 2013). Once the larvae reach the third instar, they build communal nests on the trunk, bough, or main stem (Fig. 3C) (Townsend, 2008). Typical nests are dense webs containing molted skins, hairs, and excrement (Stigter et al., 1997). While a small number of caterpillars may start in a nest, separate colonies may unite to create large nests capable of housing thousands of caterpillars (Stigter et al., 1997). Larvae leave their nests in the evening or the early hours of night to feed and return back to the nest during early hours of the morning in a long larval procession (Fig.4A) (Pascual, 1988).

As the larvae grow larger, they use their silk to spin bigger nests and eventually pupate within the nest in June or July. Larvae produce firm cocoons before they pupate and the nest tends to grower tougher and more brown in color, full of cast skins and shed hairs (Fig. 4B) (Stigter et al., 1997). Larval development takes two to three months while pupal development takes 35–45 days (Breuer et al., 2003; Pascual, 1988).

Adults emerge from late July to mid-September (Forest Research, 2022) and live for 1–4 days (Pascual, 1988). Females emit pheromones that attract males, and they mate. Females have a maximum fecundity of 200 eggs (Pascual, 1988; Stigter et al., 1997).

Eggs containing first-instar larvae are dormant in winter and survive in colder regions of Europe. The experimental lower lethal temperature for eggs is -1°F and for larvae is 7°F (Meurisse et al., 2012). High temperatures appear to limit the expansion of this pest in southern Europe, and only moth populations occurring at high altitudes persist in southern locations (Halperin and Sauter, 1999).

## Pathogens or Associated Organisms Vectored

This species is not known to be associated with pathogens or other organisms.

## Known Hosts

*The host list below includes cultivated and wild plants that 1) are infested by the pest under natural conditions, 2) are frequently described as major, primary, or preferred hosts, and 3) have primary evidence for feeding and damage documented in the literature. Plants are highlighted in bold if they are commercially produced and the pest causes economically significant damage.*

*Thaumetopoea processionea* primarily infests oak (*Quercus* spp.), and *Quercus* and *Fagus* are the only genera on which the pest can complete its development (Stigter et

al., 1997). It occasionally infests acacia (*Acacia* spp.), beech (*Fagus* spp.), birch (*Betula* spp.), hawthorn (*Crataegus* spp.), and locust (*Robinia* spp.) when outbreaks are severe (Forest Research, 2022; Stigter et al., 1997). Although not a preferred host, *T. processionea* can also infest *Pistacia terebinthus* (Papazova et al., 2022).

**Table 1.** Preferred hosts of *Thaumetopoea processionea*

| Scientific Name | Common Name | Presence in the US* | Type/Use | Reference |
|---|---|---|---|---|
| *Fagus* spp. | beech | Present | Wild | (Stigter et al., 1997) |
| *Quercus* spp. | deciduous oak | Present | Wild | (Roversi, 2008; Stigter et al., 1997) |
| *Quercus cerris* | European turkey oak | Present | Wild | (Roversi, 2008; Williams and Jonusas, 2019) |
| *Quercus coccifera= Q. calliprinos* | kermesek | Absent | Wild | (Demolin and Nemer, 1999) |
| *Quercus castaneifolia* | chestnut-leaf oak | Absent | Wild | (Rix and Kirkham, 2009) |
| *Quercus dalechampii* | dalechamps oak | Absent | Wild | (Kalapanida and Petrakis, 2012) |
| *Quercus frainetto* | Italian oak | Absent | Wild | (Fransen et al., 2008) |
| *Quercus ilex* | evergreen oak | Present | Wild | (Agenjo, 1941) |
| *Quercus infectoria = Q. boissieri* | Asian holly oak | Absent | Wild | (Demolin and Nemer, 1999; Halperin and Sauter, 1999) |
| *Quercus ilex* | evergreen oak | Present | Wild | (Agenjo, 1941) |
| *Quercus infectoria = Q. boissieri* | Asian holly oak | Absent | Wild | (Demolin and Nemer, 1999; Halperin and Sauter, 1999) |
| *Quercus ithaburensis* subsp. *macrolepis= Q. macrolepis* | valonia oak | Absent | Wild | (Kalapanida and Petrakis, 2012) |
| *Quercus petraea = Q. sessiliflora* | sessile oak | Absent | Wild | (Damestoy, 2019) |
| *Quercus pubescens* | downy oak | Present | Wild | (Kalapanida and Petrakis, 2012) |
| *Quercus robur = Q. pedunculata* | common oak | Present | Wild | (Damestoy, 2019; Wagenhoff et al., 2013) |
| *Quercus robur* subsp. *pedunculiflora= Q. pedunculiflora* | Pedunculate oak | Absent | Wild | (Kalapanida and Petrakis, 2012) |

| Scientific Name | Common Name | Presence in the US* | Type/Use | Reference |
|---|---|---|---|---|
| *Quercus rubra* | northern red oak | Present | Wild | (Williams and Jonusas, 2019) |
| *Quercus trojana* | Macedonian oak | Absent | Wild | (Kalapanida and Petrakis, 2012) |

*Presence in the U.S. confirmed by USDA-NRCS (2024)

## Known Distribution

**Table 2.** Countries where *Thaumetopoea processionea* is known to occur

| Region/Continent | Country | Reference |
|---|---|---|
| Europe | Albania | (Beshkov et al., 2020) |
| Europe | Austria | (Hoch et al., 2008) |
| Europe | Belgium | (De Prins, 2016) |
| Europe | Bulgaria | (Mirchev et al., 2011) |
| Europe | Croatia | (Ožura et al., 2022) |
| Europe | Czech Republic | (Groenen, 2010) |
| Europe | France | (Damestoy, 2019) |
| Europe | Germany | (Wagenhoff and Veit, 2011) |
| Europe | Greece | (Groenen and Meurisse, 2012; Kalapanida and Petrakis, 2012) |
| Europe | Hungary | (Csóka et al., 2018) |
| Europe | Italy | (Marziali et al., 2011) |
| Europe | Luxembourg | (Groenen and Meurisse, 2012) |
| Europe | North Macedonia | (Groenen, 2010) |
| Europe | Montenegro | (Groenen and Meurisse, 2012) |
| Europe | Netherlands | (Stigter et al., 1997) |
| Europe | Poland | (Blaik et al., 2011) |
| Europe | Romania | (Stancă-Moise, 2020) |
| Europe | Serbia | (Gagić-Serdar et al., 2018) |
| Europe | Slovakia | (Groenen and Meurisse, 2012) |
| Europe | Slovenia | (Jurc, 2006) |
| Europe | Spain | (Pascual, 1988) |
| Europe | Switzerland | (Blaser et al., 2022) |
| Europe | United Kingdom | (Suprunenko et al., 2021) |
| Middle East | Cyprus | (Groenen and Meurisse, 2012) |
| Middle East | Israel | (Halperin and Sauter, 1999) |
| Middle East | Jordan | (Groenen, 2010) |
| Middle East | Lebanon | (Moussa et al., 2021) |
| Middle East | Syria | (Groenen and Meurisse, 2012) |

| Region/Continent | Country | Reference |
|---|---|---|
| Middle East | Turkey | (Groenen and Meurisse, 2012) |

*Thaumetopoea processionea* has been reported from Portugal (Groenen and Meurisse, 2012) and a limited number of male specimens have been found in Denmark and Sweden (Lövgren and Dalsved, 2005; Palmqvist, 2011; Skule and Vihelmsen, 1997). We could not find any evidence that the pest is currently established in these countries. A small population of oak processionary caterpillars was found on four oak trees in Ireland in 2023 and was declared eradicated in 2025 (DAFM, 2023; EPPO, 2025).

## Pest Importance

*Thaumetopoea processionea* is a defoliator of oak in Europe (Forest Research, 2022). Although not usually fatal, it can progressively weaken host trees over several years, making them more susceptible to other stressors such as drought or pathogens (Townsend, 2008).

The severity of infestation depends on how long the pest has been present. The nests will mostly be small during the first one to two years after settling, but larger nests can develop within two to three years. At the end of this phase smaller or larger nests can be found on almost every oak tree and some branches may be completely defoliated (Stigter et al., 1997). In subsequent years, when infestation levels are relatively high, there is complete defoliation of oaks, with continuous processions of larvae and mass flights of moths.

*Thaumetopoea processionea* also has the potential to harm humans and animals. Hairs on the larger larvae (3$^{rd}$ instar or older) contain a defensive toxin (thaumetopoein) that can cause allergic reactions, skin rashes, conjunctivitis, and respiratory problems (Lamy, 1990; Lamy et al., 1986). Allergic reactions can occur even if larvae are not handled as the irritating hairs break off easily and can be dispersed by wind (Forestry Commission, 2022; Stigter et al., 1997). As *T. processionea* populations grow and become abundant, caterpillars may become a severe nuisance. As caterpillars spread to urban trees, forest edges, and easily accessible woodlands, people are more likely to encounter the urticating hairs and may experience more severe reactions from larger caterpillar populations (Townsend, 2008).

*Quercus* spp. are important environmental and ornamental trees in the United States, used to produce furniture, wine, whiskey barrels, commercial charcoal, and firewood (Jerome et al., 2017; Kartesz, 2015). Of the 91 species of oak native to the United States, 16 species are considered vulnerable, endangered, or critically endangered (Jerome et al., 2017).

*Thaumetopoea processionea* is listed as a harmful organism in the European Union and the United Kingdom, where it is also present. It is also listed as a harmful organism in Japan and South Korea (USDA PCIT, 2024). There may be trade issues with these countries if this moth becomes established in the United States.

## Pathway

*Thaumetopoea processionea* can move to new areas through infested planting material (i.e., oak nursery stock) and timber (Townsend, 2008). Depending on the season, the planting material may have eggs (from August to April) or larvae and pupae (from April to August) (Forest Research, n.d.). The eggs, unlike larvae and pupae, are difficult to detect on the infested tree (Evans, 2007). Evidence suggests that *T. processionea* was accidentally imported into the United Kingdom as egg masses on infested oak trees from the Netherlands planted at the site of the initial detection (Townsend, 2008).

*Thaumetopoea processionea* can also disperse naturally and their dispersal is likely aided by strong winds and other weather events (Stigter et al., 1997). Males are strong fliers and are reported to disperse between 31 and 62 miles from July to September. Females are less likely to travel long distances and can disperse 3-12 miles per year under favorable weather conditions (Stigter et al., 1997). During the outbreak phase of infestations, mass flight of moths can be observed when females migrate to new sites for colonization (Stigter et al., 1997).

Use the **Agricultural Commodity Import Requirements(ACIR) manual** to determine 1) if host plants or material are allowed to enter the United States from countries where the organism is present and 2) what phytosanitary measures (e.g., inspections, phytosanitary certificates, post entry quarantines, mandatory treatments) are in use. These requirements are updated regularly.

## Potential Distribution within the United States

Based on the known distribution of *T. processionea* and comparing those climates to Global Plant Hardiness Zones (Takeuchi et al., 2024), we expect that it could establish in plant hardiness zones 4-10.

*Quercus* spp. are present throughout the continental United States (USDA-NRCS, 2024). A likelihood of establishment map has been developed for *T. processionea* (SAFARIS, 2025). Based on this map, the majority of the United States, excluding the hottest areas in Arizona, California, and Nevada and small portions of Montana and North Dakota have suitable conditions for the establishment of *T. processionea*.

## Survey and Key Diagnostics

**Approved Methods for Pest Surveillance*:**

For the current approved methods and guidance for survey and identification, see Approved Methods for Pest Surveillance (AMPS) pest page on the CAPS Resource and Collaboration website, at https://approvedmethods.ceris.purdue.edu/.

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USDA-APHIS-PPQ-ST staff developed this datasheet. Cite this document as:

PPQ. 2025. Cooperative Agricultural Pest Survey (CAPS) Pest Datasheet for *Thaumetopoea processionea* (Linnaeus, 1708) (Notodontidae): Oak processionary moth. United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (PPQ), Raleigh, NC.

## Versions

May 2016: Datasheet completed (Version 1)

November 2025: Datasheet revised (Version 2)

- Created new **Pest Recognition** section by combining Pest Description and Damage/Signs and Symptoms
- Added **Easily Mistaken Species** section
- Added **Commonly Encountered Non-targets** section
- Updated **Biology & Ecology** section
- Updated **Known hosts** section
- Updated **Pest Importance** section
- Updated **Pathogens or Associated Organisms Vectored** section
- Updated **Known Distribution** section
- Updated **Pathway** section
- Updated **Potential Distribution within the United States** section
- Updated guidance for **Approved Methods** section
- Citations from EPPO, CABI in all sections have been replaced with original sources
- Updated **Endnote Library** for *Thaumetopoea processionea*

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