

Dendrolimus punctatus

Scientific Name

Dendrolimus punctatus

Synonyms:

Dendrolimus baibarana Matsumura

Dendrolimus innotata Walker

Dendrolimus kantozana Matsumura

Dendrolimus pallidiola Matsumura

Dendrolimus punctata

Eutricha punctata Felder

Metanastria punctata Walker

Oeona punctata Walker

Common Names

Masson pine moth, pine caterpillar

Type of Pest

Moth

Taxonomic Position

Class: Insecta, **Order:** Lepidoptera,

Family: Lasiocampidae

Reason for Inclusion

CAPS Target: AHP Prioritized Pest List for FY 2012

Pest Description

Eggs: “Eggs are rose to light brown in color and deposited in rows on pine needles” (Ciesla, 2001).

Larvae: “The mature larva is 55–70 mm long [2.17 to 2.76 in]. Abdominal and thoracic segments have alternating patterns of light gray and black bands. The black bands contain a series of orange markings. The larvae are covered with fine hairs (setae) that have urticating properties and can cause skin and eye irritation” (Ciesla, 2001).

“The larvae have two colour forms: brownish-red and black. The scale-like setae on the body may be white or golden-yellow. The head is brownish-yellow. The frontal and adfrontal areas are dark brown. The adfrontal border is not smooth. There are distinct poisonous setae on the dorsal surfaces of the meso- and metathorax. Each abdominal segment has subdorsal anterior scale-like setae with serrate tips. The scale-like setae on the eighth abdominal segment are most



Fig. 1. Mature larva of *D. punctatus* (Image courtesy of William M. Ciesla, Forest Health Management International, Bugwood.org)

distinct. There are abundant white setae on the lateral sides of the body. There is a pair of longitudinal bands from the head to the last abdominal segment. A white spot exists on the posterior upper of the spiracles in segments from the mesothorax to the eighth abdominal segment. Below the longitudinal band, a short oblique spot extends to the ventral surface at the anterior of each segment” (CABI, 2010).

Pupae: “The male pupae are 19-26 mm [0.74 to 1.02 in] long. The female pupae are 26-33 mm [1.02 to 1.30 in] long. The end of the anal hook varies from a closed circle to being slightly curved upwards” (CABI, 2010).

Adults: “The adult has a wingspan of ca 50-80 mm [1.97 to 3.15 in] with females being somewhat larger than the males. Color of wings is typically a medium, dull gray or brown. The front (mesothoracic) wings have two dark lines” (Ciesla, 2001).

Biology and Ecology

In Vietnam, *D. punctatus* has four generations per year; the first occurs from March to May, the second from June to July, the third from August to September, and the fourth from October to March (Billings, 1991). In more northern latitudes, fewer generations are completed (Billings, 1991). Depending on latitude, China has anywhere from 1 to 5 generations per year (Zhang et al., 2003) whereas Taiwan has 3 generations a year (Ying, 1986).

Females lay an average of 300-400 eggs (Speight and Wylie, 2001). Once hatched, larvae can disperse by ‘ballooning’ or travelling by wind on silk threads (Speight and Wylie, 2001). Larvae feed openly on host needles (Speight and Wylie, 2001). During low populations, larvae prefer to feed on older needles (Billings, 1991). *D. punctatus* goes through a total of 6 instars and the mature larvae measure around 7 cm (2.76 in) in length (Billings, 1991).

Hibernation occurs in the larval stage, although *D. punctatus* can be active year round in some coastal areas of Vietnam (Billings, 1991). Pupation



Fig. 2. Defoliation damage on *Pinus kesiya* (Khasia pine) caused by *D. punctatus* (Image courtesy of William M. Ciesla, Forest Health Management International, Bugwood.org)

occurs in cocoons that can be attached to either the needles or small branches (Ciesla, 2001).

Emergence of adults occurs at dusk; mating and oviposition occur during the night. *D. punctatus* adults are strong fliers and are able to migrate up to 20 km (approximately 12.5 miles) (Speight and Wylie, 2001).

Pest Importance

This species is considered a very serious pine defoliator in southeast Asia (Billings, 1991) and has become the most economically damaging insect pest of forests in southern China in recent years (Zhang et al., 2003). It is also a pest in Vietnam and Taiwan (Billings, 1991; Ying, 1986). At one point, over 56,000 ha (138,000 acres) of pine plantations in Vietnam were affected by defoliation caused by *D. punctatus* (Billings, 1991).

Zhang et al. (2003) states that damage due to *D. punctatus* can be so severe that forests appear to be burned. Heavy defoliation can lead to reduced growth rates and tree mortality (Ciesla, 2001) as well as loss of resin production (Speight and Wylie, 2001). Heavily infested trees can take several years to recover (Ge et al., 1988).

D. punctatus can also serve as a health risk to individuals who come in contact with the larvae or cocoons of pupae. The hairs of *D. punctatus* cause reactions in individuals that can include rashes, headaches, dizziness, and localized arthritis if hairs come in contact with exposed skin (Lawson et al., 1986). This disorder is called pinemoth caterpillar disease (Lawson et al., 1986).

Symptoms

Volume growth and resin production may be reduced when defoliation is severe (Billings, 1991). Tree mortality may occur with repeated defoliation (Billings, 1991). First instar larvae feed on the edges of needles and can cause needles to curve and turn yellowish while second instar and older larvae feed on whole leaves (CABI, 2010). Older larvae may also feed on the middle of needles causing them to break (CABI, 2010).

Recovery usually occurs if defoliation only happens once to trees (Billings, 1991). In Vietnam, this pest is most likely to attack 7-15 year old plantations (Billings, 1991). Outbreaks are common in young, pure pine stands and plantations (Ciesla, 2001).

Populations can be difficult to detect when low (Zhang et al., 2003).

Known Hosts

Pinus massoniana (masson pine) is the main host of *D. punctatus* (Zhang et al., 2003).

Host	Reference
<i>Pinus armandii</i> (Armand's pine)	(CABI 2010)
<i>Pinus caribaea</i> (Caribbean pine)	(Billings 1991)
<i>Pinus echinata</i> (shortleaf pine)	(Chang and Sun 1984)
<i>Pinus ellottii</i> (swamp pine)	(Chang and Sun 1984, Ying 1986, Zhang et al. 2003, Ji et al. 2005)
<i>Pinus kesiya</i> (Khasi pine)*	(Billings 1991)
<i>Pinus latteri</i> (Tenasserim pine)	(CABI 2010)
<i>Pinus luchuensis</i> (luchu pine)	(Chang and Sun 1984, Ying 1986)
<i>Pinus massoniana</i> (masson pine)	(Chang and Sun 1984, Ying 1986, Billings 1991, Zhang et al. 2003, Ji et al. 2005)
<i>Pinus merkusii</i> (Sumatran pine)	(Billings 1991)
<i>Pinus oocarpa</i> (oocarpa pine)	(Billings 1991)
<i>Pinus parviflora</i> (Japanese white pine)	(Chang and Sun 1984)
<i>Pinus tabulaeformis</i> (Chinese hard pine)	(Ji et al. 2005)
<i>Pinus taeda</i> (loblolly pine)	(Chang and Sun 1984, Zhang et al. 2003)
<i>Pinus taiwanensis</i> (Taiwan pine)	(Chang and Sun 1984)
<i>Pinus thunbergii</i> (black pine)	(Zhang et al. 2003)

*These may be attacked by they tend to sustain less defoliation (Billings 1991).

Known Vectors

This pest is not currently known to vector any pathogens or other associated organisms but attacked trees may attract secondary pests that can further damage already weakened trees (Ying, 1986). Ciesla (2001) states that weakening of trees caused by *D. punctatus* may lead to increased susceptibility to bark beetle attack.

In southern China, root rot infection of *Pinus ellottii* plantations have been linked to *D. punctatus* (Speight and Wylie, 2001).

This pest can cause health risks to individuals who come in contact with the larvae or pupae. The hairs of *D. punctatus* can cause reactions that can include rashes, headaches, dizziness, and localized arthritis if hairs come in contact with exposed skin. This disorder is called pinemoth caterpillar disease.

Known Distribution

This species is endemic to Southeast Asia (Zhang et al., 2003).

Location	Reference
Asia	
China	(Billings 1991)
Taiwan	(Billings 1991)
Vietnam	(Billings 1991)

Potential Distribution within the United States

The main host, *P. massoniana* (masson pine) is not currently present in the United States. Although the main host is not present, it may be able to attack pine species that are either found in or native to the United States.

Some hosts in *D. punctatus*' endemic range are present in the United States, including *P. echinata*, *P. elliotii*, and *P. taeda* (all found throughout the southeast), and *P. thunbergii* (found in part of the east coast) (USDA-NRCS, 2011).

If introduced into the United States, this species may be able to utilize other pine species not present in its native range. Ciesla (2001) states that this pest is most likely to establish in the southeastern portion of the United States as the climate is similar to the natural range of *D. punctatus* and many known pine hosts are found throughout this region.

Pathway

This particular species has not been intercepted at United States ports of entry in the past ten years; neither has any members of the genus (AQAS, queried 3-22-2011).

Adults can fly several kilometers with or without the help of air currents; early instar larvae may also disperse with the help of air currents (Ciesla, 2001). It may be possible for egg masses or early instar larvae to move through planting material; however, these stages are easily detected and conspicuous (Ciesla, 2001).

Survey

CAPS-Approved Method*:

Trap and lure. The approved trap is the wing trap (See Figure 3). The lure is effective for 21 days (3 weeks).

Either of the following Trap Product Names in the IPHIS Ordering Database may be used for this target:

- 1) Wing Trap Kit, Paper
- 2) Wing Trap Kit, Plastic

The Lure Product Name is *Dendrolimus punctatus* Lure.

IMPORTANT: Do not place lures for two or more target species in a trap unless otherwise recommended.

Lure Placement: The lure type is a rubber septum. The lure should be placed inside a lure holder, which is usually included with the trap. The lure holder should be stapled to the underside of the top of the trap on a non-sticky area.

Trap Spacing: When trapping for more than one species of moth, separate traps for different moth species by at least 20 meters (65 feet).

*For the most up-to-date methods for survey and identification, see Approved Methods on the CAPS Resource and Collaboration Site, at <http://caps.ceris.purdue.edu/>.



Fig. 3. Wing trap (Image courtesy of John Crowe, USDA-APHIS-PPQ).

Literature-Based Methods:

Trapping:

Previously, the adults were surveyed for using light traps (Billings, 1991). Black light traps were typically used, but drawbacks included lack of species specificity and difficulty in finding power sources for lights (Zhang et al., 2003). Population monitoring in Vietnam was done through permanent survey plots (100m²) that were surveyed once per generation for insect abundance. In addition, 1m² excrement traps were placed beneath samples trees for 10 day periods to collect larval frass and estimate larval populations per tree (Billings, 1991).

A synthetic sex pheromone has since been developed to use in surveying for this pest. Traps baited with a 25:10:28 ratio of Z5,E7-12:Ac; Z5, E7-12:Pr, and Z5,E7-12:OH (over 97% pure) were used in Qianshan County, China to survey for *D. punctatus* males with positive results (Zhang et al., 2003). The trap used was a two-layer plastic cymbiform sticky trap which is both waterproof and allows for pheromone release in all directions (Zhang et al., 2003). Trapping results from 1999 showed that lower traps (<5.5 m; 18 ft) in *P. massoniana* stands caught significantly more male *D. punctatus* when populations were at low levels (Zhang et al., 2003). This information agrees with results obtained by Chen (1990) who found that females preferred laying eggs on younger and shorter *P. massoniana* versus older and taller trees (Zhang et al., 2003).

Survey site and selection:

In its native range, outbreaks are common in young, pure pine stands and plantations ranging from 8 to 15 years (Ciesla, 2001). Planting stock may also be targeted for survey.

Time of year to survey:

Depending on climate, this species can be found throughout the year. In southern China, the first generation moth flight peaks in early to mid-August (Zhang et al., 2003).

Trap Placement:

Zhang et al. (2003) found that traps that were lower than 5.5 m (18 feet) in *P. massoniana* canopies caught significantly more *D. punctatus* males than traps placed higher during surveys for the overwintering generation and for the first generation flight periods.

Key Diagnostics

CAPS-Approved Method*:

Morphological. Genitalia dissection is required to get to the genus level. Identification to species level requires confirmation by Lepidoptera specialist.

*For the most up-to-date methods for survey and identification, see Approved Methods on the CAPS Resource and Collaboration Site, at <http://caps.ceris.purdue.edu/>.

Easily Confused Pests

This species is similar to *Dendrolimus punctatus tabulaeformis* (CABI 2010) as well as other *Dendrolimus* species. There are no other *Dendrolimus* species present in the United States.

Commonly Encountered Non-targets

This genus is not found in North America (Ciesla, 2001).

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