EPPO Datasheet: *Hyphantria cunea*

Last updated: 2017-08-07

IDENTITY

Preferred name: *Hyphantria cunea*
Authority: Drury
Taxonomic position: Animalia: Arthropoda: Hexapoda: Insecta: Lepidoptera: Erebidae
Common names: American white moth, fall webworm
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EPPO Categorization: A1/A2 (formerly)
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EPPO Code: HYPHCU



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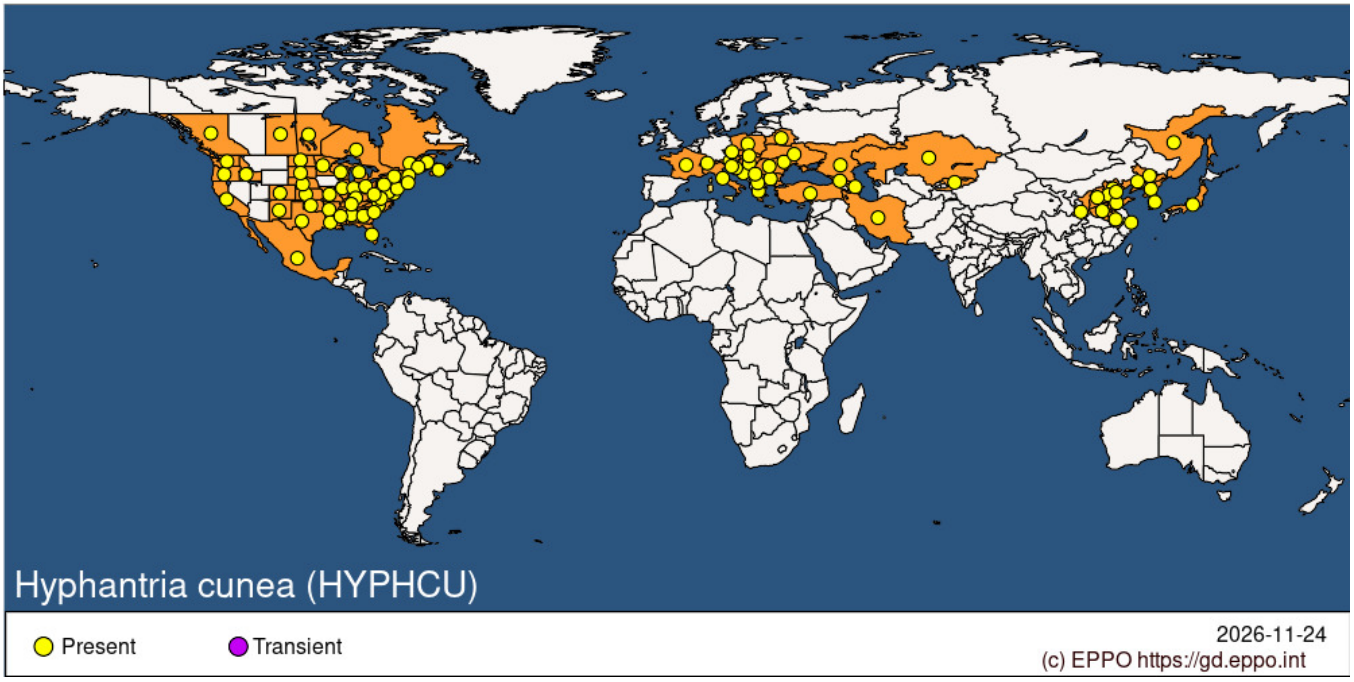
HOSTS

H. cunea attacks a wide range of forest and fruit trees. Some 250 species of host plant have been recorded. Those most favourable for development are mulberries, *Acer negundo* and *A. platanoides*, apples, pears, cherries (*Prunus cerasus* and *P. avium*), and plums. Less favourable are walnuts, grapes, *Ailanthus altissima* and hops. These hosts are widely grown in the EPPO region.

Host list: *Acer negundo*, *Acer platanoides*, *Acer*, *Ailanthus altissima*, *Corylus avellana*, *Corylus colurna*, *Humulus lupulus*, *Juglans regia*, *Malus domestica*, *Malus sieversii*, *Malus*, *Morus alba*, *Morus*, *Pinus palustris*, *Prunus avium*, *Prunus cerasus*, *Prunus domestica*, *Prunus*, *Pyrus communis*, *Pyrus*, *Quercus palustris*, *Vitis vinifera*, *woody plants*

GEOGRAPHICAL DISTRIBUTION

H. cunea is native to North America and spread to the EPPO region (Hungary, then Austria and Yugoslavia) immediately after the Second World War.



EPPO Region: Austria, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, France (mainland), Georgia, Greece (mainland), Hungary, Italy (mainland), Kazakhstan, Kyrgyzstan, Moldova, Republic of, North Macedonia, Poland, Romania, Russian Federation (Far East, Southern Russia), Serbia, Slovakia, Slovenia, Switzerland, Türkiye, Ukraine
Asia: China (Anhui, Beijing, Hebei, Henan, Jilin, Liaoning, Shaanxi, Shandong, Shanghai, Shanxi, Tianjin), Iran, Islamic Republic of, Japan (Honshu), Kazakhstan, Korea, Democratic People's Republic of, Korea, Republic of, Kyrgyzstan
North America: Canada (British Columbia, Manitoba, New Brunswick, Nova Scotia, Ontario, Québec, Saskatchewan), Mexico, United States of America (Alabama, Arkansas, California, Colorado, Connecticut, Delaware, Florida, Georgia, Idaho, Illinois, Indiana, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Virginia, Washington, West Virginia, Wisconsin)

BIOLOGY

In the Krasnodar region of Russia (Yaroshenko, 1975), emergence from overwintered pupae began in late April or early May, and was completed in 4-6 weeks. Mass flight lasted for 7-10 days at average temperatures above 18°C, and activity was greatest at 20-28°C. Flight ceased at temperatures of 15°C and below. The sex ratio was usually 1:1, females living for 4-8 days and males for 1-2 days less. Adults emerged in the evening and rested initially on branches, twigs and leaves before flying to preferred food plants. They were able to fly several kilometres. *H. cunea* is sensitive to moisture and, at 50-60% RH and 25°C, laid fewer eggs and adults died prematurely (RH of 70-80% and temperatures not exceeding 22-25°C are most favourable). Females each laid 293-1892 eggs, mostly during 1-2 days, on the lower surface of the leaves on the upper and outer parts of trees; even heavy rain did not dislodge the eggs. In the south-west (Kuban), there were two generations annually, and occasionally a partial third. Mulberry was the most favourable host for female fecundity and larval development; however, most larval nests of the first generation were found on *Acer negundo*, and those of the second generation on fruit trees. In Romania, it was demonstrated that, although *H. cunea* is polyphagous, normal development will occur only on the preferred food plants, viz. mulberries, apples, cherries and plums (rather than grapes, strawberries, roses or *Tilia*).

In Hungary, there are two generations per year and the larvae pass through seven instars. Optimum sunshine hours are 1950-2050 annually, with average temperature 17°C during the vegetative period and RH 65-70%, with 300-350 mm precipitation; 9°C is considered the threshold for development. Once accumulated temperatures above this level exceed 280 degree days, larvae will hatch (and accurate forecasts can be made to within 1-2 days). In Russia,

hatching of eggs occurs mainly during the morning (07.00-11.00) and evening (17.00-01.00) (Fedosov, 1989). Pupae are cold-resistant if well hidden in bark, where 82-84% of them hibernate. Others overwinter in the soil to a depth of 10 cm.

In Korea, adults generally emerge between 15.00 and 24.00, the peak being 19.00-20.00. Copulation occurs only once a day, for a few minutes, before sunrise. Eggs are laid in groups of about ten. Larvae can withstand up to 15 days starvation, although the resultant reproductive capacity of the adult will be adversely affected.

In Nova Scotia (Canada), females lay about 500 eggs, all in one mass, on leaves of deciduous trees and shrubs. Larvae construct a colonial web and feed together within it. Diapause is facultative and depends on climate. There is a complex interaction between the webworm and its parasites (Morris, 1976). On average, males live for about 8 days. In Alabama (USA), there are two generations per year, one generation in spring and one in the late summer, and the species passes through 11 larval instars (Williams *et al.*, 1987). For more information, see Chalcote & Gentry (1973), Yaroshenko (1975), Boehm (1976).

DETECTION AND IDENTIFICATION

Symptoms

Woven silk nests enclosing a number of leaves are conspicuous. Rapid defoliation of forest and fruit trees occurs. For additional information, see OEPP/EPPO (1957), Boguleanu et al. (1976).

Morphology

Larva

Brownish-grey, attains 40 mm when fully developed, and has 12 small warts surmounted by characteristic tufts of hair.

Pupa

Bears 12 characteristic appendages at the posterior end.

Adult

Moth with a wingspan of 25-30 mm; forewings are white or have black spots arranged in a number of rows; hindwings are also white with a small black spot on the leading part.

Detection and inspection methods

The sex pheromone obtained from female H. cunea is used in traps to monitor the organism (Uchakina & Kalyuzhnyi, 1985); light traps are also used due to the nocturnal activity of the moths (Jarfas & Viola, 1986).

PATHWAYS FOR MOVEMENT

The pest can spread by natural adult flight and this has certainly been the main mode of spread within countries where the pest was introduced. International trade can facilitate movement to new areas. *H. cunea* is liable to be carried on vegetative host-plant material as well as on packing materials and in vehicles. The facility of the larvae to withstand starvation for up to 2 weeks means that they can easily be transported on vehicles to different areas and survive to initiate new infestations. Mass migrations due to exhausted food plants or the search for new sites often end up in urban areas where the pest invades wood piles, houses, roads and vehicles (which can transport it to new and uninfested areas) (Giovanni *et al.*, 1986). Transportation of the pest also occurs relatively often in wood logs where it inhabits cracks or holes in the bark (Shu & Yu, 1984). There is a certain risk of entry as eggs and larvae imported by amateur entomologists.

PEST SIGNIFICANCE

Economic impact

H. cunea larvae are rapid defoliators of forest and fruit tree species. Experiments showed that sixth-instar larvae of H. cunea can consume a daily average of 435 mm2 of fresh ash foliage while seventh-instar larvae brought it to an average of 814 mm2 (Jarfas & Miklos, 1986). Their colonial habit (nests of silk enclosing the leaves) is particularly damaging to individual trees.

Control

Both mechanical (destroying nests) and chemical means are used in control. In Russia, diflubenzuron gave adequate control of H. cunea (Sazonov et al., 1984) as well as fenvalerate, cypermethrin and permethrin which induced 100% larval mortality in laboratory experiments (Sikura et al., 1988). However, chemical control with insecticides is not without problems. In Italy, where mulberry is the preferred host of H. cunea (Montermini & Oliva, 1984), the application of insecticides as well as Bacillus thuringiensis to the trees killed Bombyx mori, the silkworm, which is fed with mulberry leaves (Ferrari & Trevisan, 1987). There has been much research also on biological control. The most used and researched antagonistic organisms are subspecies of Bacillus thuringiensis. Preparations of B.t. kurstaki were reported to be most effective in Hungary and Korea (Jasinka, 1984; Choi et al., 1986). Other pathogenic organisms are the fungi Beauveria bassiana (Jasinka, 1984) and B. globulifera and the egg parasite Trichogramma dendrolimi (Shu & Yu, 1985). Entomogenous nematodes can be also used to reduce H. cunea populations (Yamanaka et al., 1986).

Phytosanitary risk

H. cunea is an A2 quarantine organism for EPPO (OEPP/EPPO, 1980) and is also of quarantine significance for IAPSC. Its quarantine status is partly historical: the species was introduced fairly recently into Europe and was initially seen as a very serious threat. After 40 years' experience, it may be useful to re-evaluate the position. In the EPPO region at present, this pest is important in Bulgaria, Romania, Russia and Yugoslavia. It has recently become more important in Italy. Although the levels of infestation are tending to decrease in Hungary, it is still considered a threat to orchards there. The pest is present but causes no significant damage in Austria (OEPP/EPPO, 1974).

It was considered in 1953 that H. cunea would spread from Hungary to Germany, and become a major pest there. However, this did not occur, largely because of the temperature requirements of the species for overwintering (Braasch, 1976). Temperatures do not permit the insect to reach the stage necessary for diapause; only a very few specimens succeed in overwintering. A mass outbreak might occur in the year of introduction of larvae from outside, but they would not be able to survive the winter.

So, it does not seem that H. cunea is liable to spread further or cause much more damage in the EPPO region than it does at present. The insect has not shown any particular tendency to become more important on species of greater significance to the region (major forest trees, fruit trees) and its future quarantine status may be debatable.

PHYTOSANITARY MEASURES

Plants, plant products, accompanying packing materials and vehicles from countries where *H. cunea* occurs should be thoroughly inspected for the presence of larvae and other stages, since all may be present at any time of year.

Fumigation with HCN or methyl bromide will destroy adults, larvae or pupae, even if hidden in cracks. Vehicles may also be treated (OEPP/EPPO, 1990).

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