European and Mediterranean Plant Protection Organization
Organisation Européenne et Méditerranéenne pour la Protection des Plantes

Data sheets on pests recommended for regulation
Fiches informatives sur les organismes recommandés pour réglementation

Hesperophanes campestris

Identity

Name: *Hesperophanes campestris* (Faldermann)
Synonyms: *Trichoferus campestris* (Faldermann), *Trichoferus turkestanicus* Heyden, *Trichoferus flavopubescens* (Kolbe), *Trichoferus rusticus* Ganglbauer
Taxonomic position: Insecta: Coleoptera: Cerambycidae
Common names: mulberry longhorn beetle, mulberry borer (English); тутовый усач (Russian)
EPPO code: HESOCA
Phytosanitary categorization: EPPO A2 list no. 343

Hosts

H. campestris preferentially attacks *Malus* (apple) and *Morus* (mulberry), but has also been recorded on *Betula*, *Broussonetia*, *Gleditsia*, *Salix*, *Sorbus* and various other fruit and deciduous trees (Plavilshchikov, 1940; Pavlovskii & Shtakelberg, 1955; Makhnovskii, 1966; Cherepanov, 1981; Krivosheina & Tokgaev, 1985; Ler, 1996). In Japan, it is said to be highly polyphagous (Ivata & Yamada, 1990). According to some observations, it may attack cut wood of *Picea* and *Pinus* and even structural timbers in buildings (Kostin, 1973).

Geographical distribution

EPPO region: Armenia, Kazakhstan (southern), Kyrgyzstan, Russia (south-east of European part, Transbaikalia, Eastern Siberia, Far East), Uzbekistan.
Asia: Armenia, China (northern), Japan, Kazakhstan (southern), Korea (People's Republic), Kyrgyzstan, Mongolia, Russia (Transbaikalia, Eastern Siberia, Far East), Tajikistan, Uzbekistan (Plavilshchikov, 1940; Pavlovskii & Shtakelberg, 1955; Makhnovskii, 1966; Kostin, 1973; Cherepanov, 1981; Danilevskii & Miroshnikov, 1985; Ivata & Yamada, 1990; Ler, 1996).
EU: Absent.
Note: *H. campestris* was detected in Armenia and the south-east of European Russia only recently (Danilevskii & Miroshnikov, 1985).

Biology

H. campestris lives in forests and orchards. Mass flight occurs from the end of June to the beginning of August. Beetles are active in twilight and at night, and are attracted by light. Females lay eggs on the bark of trunks and larger branches of trees (healthy, stressed or dying), or of cut wood. Under laboratory conditions, the pest infests, and develops in, branches 2.5–3.0 cm in diameter. The neonate larvae enter the bark and make galleries between the bark and the sapwood, then in the wood. According to some authors, there must be bark surrounding the xylem for larval development to occur (Ivata & Yamada, 1990). The xylem nearest the cambium is preferred by the growing larvae. As the larvae grow, the galleries reach a size of 5–12 mm. All the bark, except its upper layer, is destroyed. Larvae can bore, and develop successfully in, logs with a low water content. They overwinter under the bark or in pupation cells. The development cycle may take one or two years, according to some authors (Plavilshchikov, 1940; Pavlovskii & Shtakelberg, 1955; Makhnovskii, 1966; Kostin, 1973), or at least two years, according to others (Cherepanov, 1981; Danilevskii & Miroshnikov, 1985; Ler, 1996).

Detection and identification

Symptoms

The characteristic symptoms of infestation by *H. campestris* are: large entrance and emergence holes in trunks, peeling bark, waste from borings at the base of infested trees, tunnels made by large larvae. The leaves of attacked trees often show yellowing and wilting.

Morphology

Eggs
The egg of *H. campestris* is white, slightly elongated, narrowed and rounded at both ends, 1.9 mm long, and 0.6 mm wide. The chorion is matt, with thin sculpture (Cherepanov, 1981).

Larva
The larva of *H. campestris* is generally yellowish-white, up to 25 mm long, with slightly developed legs, and prominent skinny (non-sclerotized) ambulatory warts on abdominal segments I–VII (Fig. 1). The head is brown, up to 3 mm wide, slightly flattened dorso-ventrally, narrowed in the front part, strongly retracted into the prothorax, with three ocelli in transverse line on the vertex (Fig. 1). The epistoma is concave in the front part. The antennae are long, with 4 segments. The

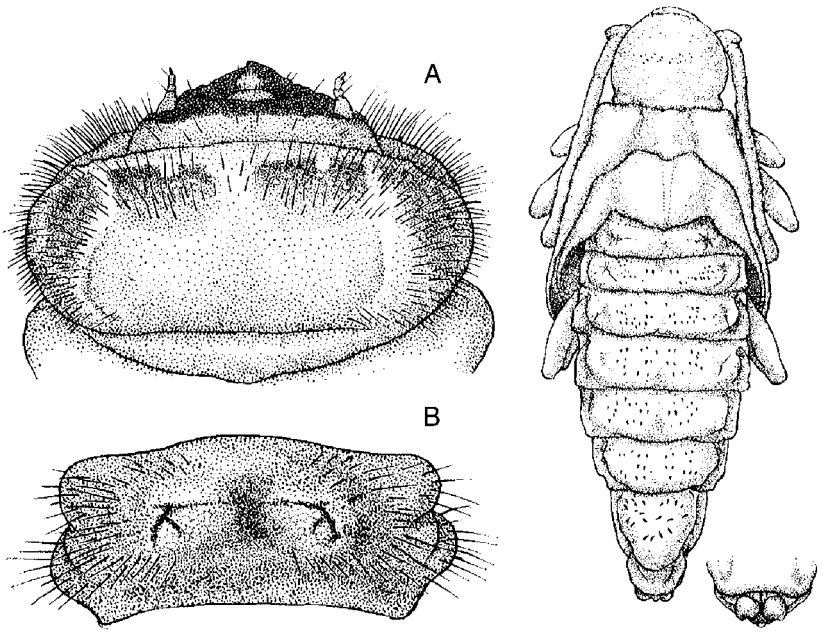

Fig. 1 *Hesperophanes campestris*: Left, larva (A) head and pronotum; (B) abdominal tergite with a dorsal ampulla (ambulatory wart)]; right, pupa (Cherepanov, 1981).

first antennal segment is thick, narrowed at the top, as long as the other 3 segments together. Clypeus short, much widened at the base. Mandibles massive, black, rounded at the top. The prothorax is slightly longer than the mesothorax and metathorax together. The pronotum is twice as wide as long, rounded and narrowed in the front part, covered with long light hairs on the lateral sides, with an orange transversal stripe broken in the middle. The scutum is prominent, without hairs. The prosternum is covered with orange hairs. The abdomen is narrowed at the top and covered with light hairs. Abdominal sternite VIII has matt lateral spots at the top. A large larva may weigh around 170 mg (Cherepanov, 1981).

Pupa

The pupa of *H. campestris* is white, 20 mm long and 4.5 mm wide (abdomen), elongated (Fig. 1). It is easily recognized by the transverse wrinkles on the vertex of the head and on the pronotum, and by the small acute thorns on abdominal tergites I–VI and large thorns on abdominal tergite VII. The head has no bristles. The antennae are curved. The pronotum is rounded in front, narrowed to the base, covered with small thorns forming a transverse stripe with a spot in front. The metanotum has a central longitudinal stripe. The thorns on abdominal tergites I–VI form 3 transverse rows: 4–8 thorns on each side of the central line in the back row, 2 thorns in the middle row and 3–5 thorns in the front row. The large thorns on abdominal tergite VII curve towards the centre of the disk. Abdominal tergite VIII is covered with several long bristles (Cherepanov, 1981).

Adult

The adult of *H. campestris* is elongated, with parallel-sided elytrae, 11–20 mm long (Fig. 2). The whole body, elytrae and legs vary in colour from dark brown to brownish-orange, the legs and antennae usually being lighter than the body. There are specific protuberances at the base of the antennae. The adult is easily recognized by the irregularly distributed hairs on elytrae, which form spots. The head is rather small, has a dense irregular punctuation and is covered with small hairs inclined toward the front and centre. The front has a deep longitudinal fissure. Antennae are long and covered with long cilia, reaching 2/3 (♀) or 3/4 (♂) of the length of the elytrae. The 3rd antennal segment is longer than the 4th and equal to the 5th. The pronotum is rounded at both ends, covered with dense punctuation, and has light hairs inclined towards the centre of the disk. The scutellum is rounded and covered with dense grey hairs. The rear femora do not reach the top of the elytrae, and the back tarsi are shorter than the tibiae (Plavilshchikov, 1940; Cherepanov, 1981; Danilevskii & Miroshnikov, 1985; Ler, 1996).

Pathways for movement

Natural spread of *H. campestris*, by flying adults, is rapid. Because larvae of *H. campestris* may be hidden in wood and therefore difficult to detect, they may easily be transported with bonsai plants, or wood products, of host plants moving in trade. They may in particular be carried in wood packaging because of their ability to colonize dry wood. Adults could also possibly be carried as contaminants of plants for planting.

Pest significance

Economic impact

H. campestris is able to attack healthy or slightly stressed trees of many important species. It prefers to attack mature trees and,

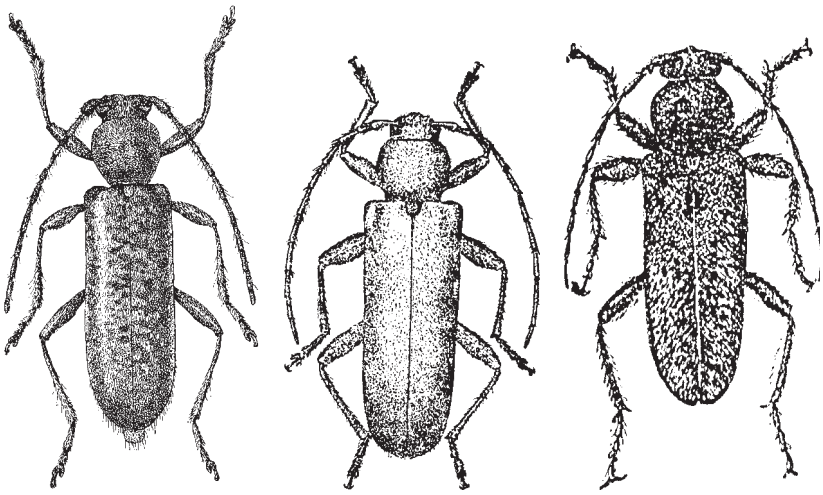

Fig. 2 Adults of *Hesperophanes campestris* (A) Cherepanov, 1981; (B) Kostin, 1973; (C) Makhnovskii, 1966).

even if it does not kill them, the infestation results in significant loss of vigour, of wood marketability (because of the boreholes) and of fruit yield in the case of orchards (Makhnovskii, 1955, 1966; Kostin, 1973; Krivosheina & Tokgaev, 1985). The pest also has the potential to damage amenity trees in cities. Nevertheless, the relative importance of *H. campestris* in damaging forest trees, trees in natural environments, orchard trees and amenity trees does not appear to have been evaluated in any detail, beyond the observation that the preferred hosts are fruit or amenity trees (*Malus* and *Morus*).

It is important also to note that *H. campestris*, because it is able to develop in very dry wood, is an important technical pest of wood in the area of its present distribution.

Control

In the area of its present distribution, *H. campestris* is controlled by sylvicultural and sanitary measures (improving the resistance of forests, cutting and elimination of all infested trees, felling and treatment of 'trap trees'). Treatments with chemical and biological preparations have been investigated (Makhnovskii, 1955) and studies on biological control have been conducted in China (Zhan, 1984).

Phytosanitary risk

H. campestris is an A1 quarantine pest for Canada, and also appears in the regulated pest list of New Zealand (with other *Hesperophanes* spp.). In the area of its present distribution, it is considered as a serious pest of forests and orchards, and especially of dry wood. It is most likely to establish in the southern countries of the EPPO region where climatic conditions favour large cerambycids and a wide range of host plants is available. It may be noted, however, that other *Hesperophanes* spp. [e.g. *Hesperophanes fasciculatus* Faldermann, *Hesperophanes griseus* (Fabricius), *Hesperophanes pallidus* (Olivier)] already occur on similar hosts in that region, without attracting great attention as pests. The main risk of entry is with wood packaging, since the pest is able to develop in dry wood. *H. campestris* is rather unlikely to be transported in small plants for planting (with the possible exception of bonsai plants), since it does not attack small branches, trunks or rootstocks. Large plants of its hosts are rarely traded.

Phytosanitary measures

H. campestris was added in 2007 to the EPPO A2 list and endangered EPPO countries are therefore recommended to regulate it as a quarantine pest. Wood packaging should respect ISPM no. 15 (ICPM, 2003). International movement of wood of the host plants seems relatively unlikely, but measures in that case could be debarking, plus grubhole freedom, or kiln drying, or other treatment.

Acknowledgement

This datasheet was prepared by Dr I M Smith (former Director General of EPPO).

References

Cherepanov AI (1981) *[Longhorn Beetles of Northern Asia (Cerambycinae).]* Nauka, Novosibirsk (RU) (in Russian).

Danilevskii ML & Miroshnikov AI (1985) *[Longhorn Beetles of the Caucasus (Coleoptera, Cerambycidae). Taxonomic Keys.]* Nauka, Krasnodar (RU) (in Russian).

ICPM (2003) *International Standards for Phytosanitary Measures* no. 15. *Guidelines for Regulating Wood Packaging in International Trade*. FAO, Rome (IT).

Ivata R & Yamada F (1990) Notes on the biology of *Hesperophanes campestris*, a drywood borer in Japan. *Material und Organismen*, **25**, 305–313.

Kostin IA (1973) *[Dendrophagous beetles of Kazakhstan (Buprestidae,*

Cerambycidae, Ipidae).] Izdadel'stvo Instituta Zoologii Academii Nauk Kazakhskoi SSR, Alma-Ata (KZ) (in Russian).

Krivosheina NP & Tokgaev TV (1985) [The formation of trunk insect complexes on irrigated lands in the Kopet-Dag foothills]. *Izvestiya Academii Nauk Turkmenskoi SSR, Biologicheskie Nauki*, **5**, 34–40 (in Russian).

Ler PA (ed.) (1996) *[Taxonomic Keys for Insects of Russian Far East. v. III, part 3, Coleoptera.]* Dal'nauka, Vladivostok (RU) (in Russian).

Makhnovskii IK (1955) *[Pests of Protected forest Plantations in Central Asia and their Control.]* Gosudarstvennoe Izdatel'stvo Uzbekskoi SSR, Tashkent (UZ) (in Russian).

Makhnovskii IK (1966) [Mulberry longhorn beetle *Trichoferus campestris*.] In: *Vrediteli Gornykh Lesov i bor'ba s nimi*, **pp**. 88–89. Lesnaya Promyshlennost', Moscow (RU) (in Russian).

Pavlovskii EN & Shtakelberg AA (Ed.) (1955) *[Forest pests. Guide]*. Izdatel'stvo Zoologicheskogo Instituta Akademii Nauk SSSR, Vol. 1, Moscow–Leningrad (RU) (in Russian).

Plavilshchikov NN (1940) [*Trichoferus campestris* (Fald.)]. In: *Fauna SSSR, Coleopterous insects, V. XXII; Longhorn beetles, Part 2*, pp. 69–71. Izdatel'stvo Akademii Nauk SSSR, Moskva-Leningrad (RU). (in Russian).

Zhan ZC (1984) [Preliminary studies on the braconid wasp, *Zombrus bicolor* (Enderlin).] *Natural Enemies of Insects* **6**, 53–56 (in Chinese).