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Data Sheets on Quarantine Pests

Ips typographus

IDENTITY

Name: *Ips typographus* (Linnaeus)
Synonyms: *Dermestes typographus* Linnaeus
Bostrichus octodentatus Paykull
Ips japonicus Niijima
Taxonomic position: Insecta: Coleoptera: Scolytidae
Common names: Eight-toothed spruce bark beetle (English)
Buchdrucker, grosser 8-zähniger Fichtenborkenkäfer (German)
Typographe, grand scolyte de l'épicea (French)
Granbarkbille (Norwegian)
Bayer computer code: IPSXTY
EU Annex designation: II/B

HOSTS

Picea abies (Norway spruce) is the main host of *I. typographus* in Europe but other species of *Picea* (e.g. *P. orientalis*, *P. yezoensis*) serve as hosts in Asia. Occasionally it will breed in species of *Pinus* or *Abies*.

GEOGRAPHICAL DISTRIBUTION

EPPO region: Austria, Belgium, Bosnia-Herzegovina, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Italy (mainly in the north), Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Romania, Russia (northern Russia, central Russia, western Siberia, eastern Siberia, Far East), Slovakia, Slovenia, Sweden, Switzerland, Tajikistan, Turkey, Ukraine, UK (found but not established in Scotland), Yugoslavia. Common throughout the entire natural range of *P. abies* in Europe. Also occurs in plantations in western Europe, outside the natural range of the host.
Asia: Trans-Palaearctic distribution; occurs throughout northern Asia including China (Heilongjiang), Japan (Hokkaido, Honshu), where it occurs as *I. typographus* var. *japonicus*, Korea Democratic People's Republic, Korea Republic; also Georgia, Russia (Siberia, Far East), Tajikistan, Turkey.
EU: Present.
Distribution map: See CIE (1976, No. 359).

BIOLOGY

Spring flight occurs when the air temperature rises to about 20°C (Annila, 1969; Bakke *et al.*, 1977a). Depending on latitude and altitude, this generally occurs during April-June in different parts of its range. After a period of dispersal flight (Botterweg, 1982), the beetles search for suitable breeding material on which males make initial or 'pioneer' attacks.

Volatile substances from the host tree may guide the beetles to areas containing breeding materials.

The major components of the aggregation pheromone released by the boring male are (S)-cis-verbenol and 2-methyl-3-buten-2-ol. Ipsdienol, which is shared by most *Ips* spp., also occurs but seems to play a minor role (Bakke *et al*., 1977b; Birgersson *et al*., 1984; Schlyter *et al*., 1987). Two components inhibit the response to the aggregation pheromone, and act as an anti-aggregation pheromone. These are verbenol and ipsenol (Bakke, 1981). They are released after the females have entered the gallery and seem to regulate gallery density and cause the shift to boring in new bark areas or in neighbouring trees. During non-outbreak periods, the beetles breed in wind-felled trees, slash and logs. During outbreaks the beetles kill healthy trees (Schwerdtfeger, 1955; Thalenhorst, 1958; Svihra, 1973). There are two reasons for this ability. The beetle has an effective aggregation pheromone and also carries a load of spores of several blue-stain fungi which contaminate the phloem and cambium and play an active role in killing the tree (Christiansen & Horntvedt, 1983).

Parent beetles may leave successfully attacked host trees after a short period of time to produce a second, sister brood in other trees. Parents re-emerge sooner when gallery density is high (Anderbrant, 1986). Whereas only one annual generation is produced at high altitude and latitude, the species has generally two generations in the lowlands of central Europe and even three generations per year at warmer sites. The flight for the second generation generally takes place in July/August. In northern areas, beetles of the new generation emerge from July to October, depending on time of brood establishment, microclimate and weather. In central Europe emergence of the second generation may take place as late as November.

The beetles generally hibernate in the adult stage, mainly in the forest litter, close to the tree where they developed. They may also overwinter under the bark of the host tree. Larvae and pupae have supercooling points of -13 and -17°C, respectively, while adults can tolerate winter temperatures close to -30°C (Annila, 1969).

DETECTION AND IDENTIFICATION

Symptoms

Usually three but sometimes also two or four female galleries run from a nuptial chamber under the bark of spruce. Length may vary with gallery density, but 10-12 cm is an average length. Blue-stain fungi are normally transferred with the beetle and grow into the wood around the gallery (Chararas, 1962).

Morphology

The beetle is 4-5 mm long and dark brown. Both sexes have four spines at each side of the elytral declivity.The third is the largest and is capitate. The declivity surface is dull and finely punctate (Balachowsky, 1949; Grüne, 1979).

MEANS OF MOVEMENT AND DISPERSAL

Laboratory experiments have shown that adult *Ips* spp. can fly continuously for several hours. In the field, however, flight has only been observed to take place over limited distances and then usually downwind. Beetles have been found in the stomach of trout in lakes 35 km from the nearest spruce forest, probably carried by the wind (Nilssen, 1978). Dispersal over longer distances depends on transportation under the bark of logs.

PEST SIGNIFICANCE

Economic impact

I. typographus is the most destructive species of the genus *Ips*, and probably the most serious pest on spruce in Europe. There are records of outbreaks dating from the eighteenth century. The losses in million cubic metres of wood that occurred during some of these outbreaks were as follows (Wellenstein, 1954; Schwerdtfeger, 1955; Worrell, 1983; Christiansen & Bakke, 1988):

Germany	1857-1862	4.0
Germany	1868-1875	4.0
Germany	1917-1923	1.5
Germany	1940-1941	1.0
Germany	1944-1948	30.0
Sweden	1976-1979	2.0
Norway	1970-1981	5.0

Outbreaks have also occurred in Italy (Lozzia, 1993), Poland, Czech Republic (Pfeffer & Skuhravy, 1995) and in Japan (Hokkaido) in the early 1950s (Inouye & Yamaguchi, 1955).

Though *I. typographus* is the most damaging of all the European *Ips* spp. and the one which is sometimes reported to behave as a primary pest, it is nevertheless most often a secondary pest, attacking and killing trees which are already stressed for other reasons (Schwenke, 1996), or damaged by storms (Forster, 1993).

Control

I. typographus is the only European *Ips* species important enough to be subject to control. The most effective measure is to remove infested trees from the forest before the new generation of adult beetles emerges. Forest management is recommended in order to increase the stability and vitality of forest stands (Thalenhorst, 1958; Christiansen & Bakke, 1988; Eidmann, 1992). Mass trapping with pheromone-baited traps or trap trees has also been successfully used to suppress beetle populations and prevent outbreak conditions (Bakke *et al*., 1977b; Zumr, 1983; Bakke, 1985; Furuta *et al*., 1985; Weslien *et al*., 1989; Raty *et al*., 1995). There is currently a debate in Germany whether *I. typographus* should be controlled, or simply be left to act naturally; Dengler (1995) concludes that control is essential.

Phytosanitary risk

I. typographus has not been considered to be a quarantine pest by EPPO but is listed by OIRSA. It has caused concern when intercepted in the USA. In the EPPO region, *I. typographus* is already common throughout the natural range of its hosts and has probably reached the natural limits of its distribution. Though it can be a serious pest, in epidemic form, from time to time, especially on trees which are stressed for other reasons, this does not qualify it as a quarantine pest. It does, however, present a certain risk to the islands of Great Britain and Ireland where *P. abies* does not naturally occur and where this and other *Picea* spp. have been widely planted. The probability of natural spread to these islands remains low, so that phytosanitary measures could be justified. In recent discussions within EPPO, this risk was recognized but too few countries were concerned for EPPO to add *I. typographus* to its A2 list.

PHYTOSANITARY MEASURES

Debarking of logs before export is the best and may be the only efficient way to prevent *I. typographus* from being introduced into isolated new areas. The EPPO Specific Quarantine

Requirements for *Ips amitinus* (OEPP/EPPO, 1990) offer countries the choice of prohibiting import of bark of conifers from countries where the species occurs or of demanding an appropriate treatment. Wood of conifers should be debarked, kiln-dried or subjected to another appropriate treatment.

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