This text is an integral part of the *EPPO Study on bark and ambrosia beetles associated with imported non-coniferous wood* and should be read in conjunction with the study

Pest information sheet
Bark beetle

ACANTHOTOMICUS SP. FROM CHINA[1] (COLEOPTERA: SCOLYTINAE)

sweetgum inscriber

EPPO Lists: Not listed. This information sheet is based on very few publications available to date on this species, which was recently found on *Liquidambar styraciflua* in China. The assessment of potential risks in this information sheet is not based on a full PRA for the EPPO region, but on an assessment of the limited information for that species used to prepare the information sheet.

PEST OVERVIEW

Taxonomy

The specimens of *Acanthotomicus* sp. collected in the Shanghai area, China, on *Liquidambar styraciflua* were identified to the genus level, and some evidence indicates that it may be a yet undescribed species (Gao *et al.*, 2017a). *Acanthotomicus* spp. are true bark beetles, and the genus contains 94 described species (Hulcr *et al.*, 2015). *Acanthotomicus*, like *Ips*, are part of the tribe Ipini (Wood and Bright, 1992).

Associated fungi

In infested *L. styraciflua* in China, there was no obvious sign of a fungal pathogen (absence of wood staining) (Gao *et al.*, 2017a). However, three fungal species were identified from galleries, larvae and adults: *Geosmithia* sp., *Phaeoacremonium* sp. and *Trichoderma* sp.; their pathogenicity has not been determined to date (Gao *et al.*, 2017b).

Morphology and biology (all information is from Gao *et al.*, 2017a)

The *Acanthotomicus* sp. found mass-attacking *Liquidambar* in Shanghai area (China) appears to be polygynous and to have two to three generations per year. It overwinters as mature larvae, pupae, and adults in the phloem. All life stages seem to be associated with the phloem (see also photos in Gao *et al*., 2017a). Infestations were observed on trees of a diameter at breast height (DBH) in the range 5-25 cm. Attacks are mostly on the trunk, but can also occur on branches. Most attacked trees did not display any apparent prior stress. There were no obvious symptoms of associated pathogenic fungi (no wood staining). Some beetles drown in the abundant resin produced by the attacked *L. styraciflua* trees, but the accumulation of attackers may eventually exhaust tree defenses. Mortality caused by *Acanthotomicus* sp. in China is the first report of apparently healthy *L. styraciflua* trees killed by bark beetle attacks.

No information was found on the size of adults, but they are presumably minute as exit holes measure about 1 mm.

Spread biology

Both males and females fly (Gao *et al.*, 2017a). No details were found on the dispersal capacity, but the development of the outbreak in China was quite rapid and affected non-adjacent nurseries throughout Shanghai (Gao *et al.*, 2017a).

Nature of the damage

Attacks by *Acanthotomicus* sp. may lead to the decline and death of trees. No staining of the wood was observed (Gao *et al.*, 2017a).

[1] This species was known as *Acanthotomicus* sp. at the time of the Study (and this name is used throughout), but has more recently recognized as a new species, *Acanthotomicus suncei* (Gao and Cognato, 2018).

Detection and identification

- *Symptoms.* Abundant resin exudates from the wounds of attacked *L. styraciflua*. Successful reproduction can be detected by the presence of large numbers of small circular exit holes (ca. 1 mm). Infested trees retain dead leaves until winter, and there is no budding or any signs of life in the following spring (Gao *et al.*, 2017a).
- *Trapping*. No information is available.
- *Identification. Acanthotomicus* spp. are morphologically similar to *Ips* spp. There may have been one case of misidentification in the 1980s in China (see below). The specimens collected in recent years were identified to genus using Wood's (1986) key to Scolytidae genera (Gao *et al.*, 2017a).

Distribution

Acanthotomicus sp. was described from the Shanghai area in China (Gao *et al.*, 2017a). Its distribution in the rest of China or Asia is not known (Susaeta *et al.*, 2017). Gao *et al.* (2017a) hypothesise that the same species may have caused an outbreak in the 1980s in Jiangsu province (adjacent to Shanghai), but this is unconfirmed as no thorough identification of the insect was conducted. These previous observations lead them to suggest that the species may be native to China.

Host plants

Acanthotomicus sp. was first found on the North American species *Liquidambar styraciflua* (Altingiaceae), then on the Asian native species *L. formosana*. *L. styraciflua* appears to be highly susceptible to this bark beetle. In its native range (North and Central America), *L. styraciflua* is 'highly resistant to pathogens and insects' (Gao *et al.*, 2017a). A number of species are reported attacking *L. styraciflua* in the present study [EPPO study on bark and ambrosia beetles], and in China *Cnestus mutilatus* and *Xylosandrus crassiusculus* are often found in logs of *L. styraciflua* attacked by *Acanthotomicus* sp. (Gao *et al.*, 2017a).

In the EPPO region, *L. styraciflua* and *L. formosana* are used mainly as ornamentals (see *Establishment*). *Acanthotomicus* sp. has probably passed onto *L. styraciflua* (Gao *et al.*, 2017a), and other *Liquidambar* may be or become hosts, such as the Asian *L. acalycina* and the *L. orientalis* native to the EPPO region (see *Establishment*).

It is not known if *Acanthotomicus* sp. have other hosts, but the host range of bark beetles is generally limited. Only one or very few host plants are listed for described *Acanthotomicus* covered in Wood and Bright (1992).

Known impacts and control in current distribution

L. styraciflua was introduced into Shanghai, China, at the end of the 20th century as an ornamental tree, and since then it has been widely planted in eastern and central China, and is a valued landscape tree (Gao *et al.*, 2017a). In the Shanghai area, over 10 000 *Liquidambar styraciflua* trees of various diameters have been killed in 7 nurseries in 2013-2016. The economic loss was estimated to at least 4 million USD, based on a minimal market price of 400 USD per tree. There has not been a comprehensive survey in the area and this report related to 7 infested nurseries (out of 13 surveyed). Additional damage may have been caused in other nurseries and private gardens. A few individual Chinese sweetgums, *L. formosana*, were also found attacked by *Acanthotomicus* sp. in Shanghai (Gao *et al.*, 2017a).

Concerns were raised for *L. styraciflua* in the USA (Susaeta *et al.*, 2017, Walker, 2017). *L. styraciflua* is an ecologically and economically (wood production, biomass) important species in the USA, and is also common in urban forests (Susaeta *et al.*, 2017). Potential losses to plantations in Southern USA in case of introduction of *Acanthotomicus* sp. were estimated, through modelling and a worse-case scenario taking account of timber production only, at 151.9 million USD (4.6 million USD annually) (Susaeta *et al.*, 2017).

Control: No information was found.

POTENTIAL RISKS FOR THE EPPO REGION

Pathways

Entry

According to the limited information available, life stages of *Acanthotomicus* sp. are associated with the phloem, and the insect is associated with material of various diameters. *Acanthotomicus* sp. could therefore be associated with *Liquidambar* wood with bark. Gao *et al.* (2017a) mention 'logs of *L. styraciflua'* attacked by *Acanthotomicus* sp. (in which *C. mutilatus* and *X. crassiusculus* are also often found). The wood of *L. styraciflua* is used worldwide, but it is probably produced mostly in the Americas. In China, *L. styraciflua* appears to be used mostly as an ornamental. No information was found on possible planting for wood production in China. It is not known if the wood of the other known host, *L. formosana*, is traded. Chinese scientists mentioned that the probability of accidental introduction of *Acanthotomicus* sp. into North America is small, as "It is nearly impossible to import [American Sweetgum] to North America from China." (Walker, 2017). This is not the case for the EPPO region, where there is no specific regulation on the import of plants or wood of *Liquidambar*. No data was sought on the trade of *Liquidambar* wood into the EPPO region. Regarding other wood commodities, it is not clear if *Liquidambar* wood is used. Susaeta *et al.* (2017) mention that the occurrence of American and Chinese *Liquidambar* in wood packaging material production in Asia should be investigated. Processes applied to produce wood commodities may destroy some individuals (even if *Acanthotomicus* sp. is very small). The wood would also degrade and may not be able to sustain development of the pest. The likelihood of entry on wood chips, hogwood and processing wood residues would be lower than on round wood, as individuals would have to survive processing and transport, and transfer to a suitable host is less likely. Finally, *Liquidambar* bark on its own could carry the pest, but no data was found on whether it is used and traded.

Acanthotomicus sp. was found in nurseries and is therefore associated with plants for planting of *L. styraciflua* in China. Plants for planting are subject to a degree of control during production, during which attacked plants may be detected and discarded. It is unclear from Gao *et al.* (2017a) how rapidly after the attacks the trees show symptoms. *Acanthotomicus* sp. is presumably minute (see *Morphology*) and may not be detected. Entry on cut branches is less likely, as they are normally used indoors and the pest is unlikely to be able to transfer to a suitable host. It is also not known if *Liquidambar* cut branches are traded.

Summary of pathways (uncertain pathways are marked with '?'):

- *Liquidambar wood (round or sawn, with bark, incl. firewood)*
- *Liquidambar plants for planting (except seeds)*
- *wood packaging material if not treated according to ISPM 15*
- *non-coniferous wood chips, hogwood, processing wood residues (except sawdust and shavings)*
- *Liquidambar bark?*
- *Liquidambar cut branches?*

Spread (following introduction, i.e. within EPPO region)

No information on spread in China is available, apart from the mention of 'epidemic spread' in Gao *et al.* (2017a), and the fact that nurseries all across Shanghai were contaminated. It is expected that both natural spread and human-assisted spread would occur if *Acanthotomicus* sp. was introduced to the EPPO region. However, spread would also depend on the host range. If only *Liquidambar* spp. are attacked, spread would probably be limited.

Establishment

There is not enough information on the distribution and biology of *Acanthotomicus* sp. to fully assess its climatic requirements. However, according to the climate classification of Köppen Geiger (see Annex 6 of the study), Shanghai is situated within the climate type Cfa[2], which is present in part of the EPPO region, such as the Black Sea, Northern Italy and part of the Balkans. It is not known if *Acanthotomicus* sp. would be able to establish under other climatic conditions. For example, the native *L. orientalis*,

[2] **Cfa**: warm temperate climate, fully humid, hot summer; **Csa**: warm temperate climate, dry and hot summer

which may be or become a host, occurs in an area of climate type Csa[2] (i.e. dry summers instead of fully humid for Cfa).
Regarding hosts, *L. styraciflua* was introduced to Europe in the 19th century (Hsu and Andrews, 2004) and is a popular ornamental tree with many varieties available, also in the EPPO region (general Internet search). It is a subtropical and tropical species 'not known to temperate foresters' (McCarter and Hughes, 1984). The Asian *L. formosana* (host) and *L. acalycina* are also used as ornamentals (Hsu and Andrews, 2004). Finally, *L. orientalis* is native to Rhodos and Turkey (limited part of the south-east), where it occurs in riparian habitats; it is also used as ornamental in other parts of the region (Hsu and Andrews, 2004; Euforgen, 2018, including map). The full host range of *Acanthotomicus* sp. is not known.
Host plants and suitable climatic conditions may allow establishment in part of the EPPO region.

Potential impact (including consideration of host plants)
The known hosts *L. styraciflua* and *L. formosana* are probably used mostly as ornamentals in the EPPO region. Impact would result from death of trees, such as in nurseries, parks, gardens and urban environments. Similar impacts would occur where *L. orientalis* is used as ornamentals. In the area where *L. orientalis* is present in the wild/native, its oil provides a key source of income for local populations, as well as good quality firewood (the wood is not used for construction) (Euforgen, 2018). Attacks by *Acanthotomicus* sp. may therefore result in social impact locally.

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