

Tremex fuscicornis

IDENTITY

Name: *Tremex fuscicornis*

Pest Authorities: (Fabricius)

Taxonomic Position: Insecta: Hymenoptera: Siricidae

Sub-specific Taxon:

Pest Type: Insect

Common Name(s):

Avispa taladradora de la madera (Spanish)

Tremex wasp (English)

Synonym(s):

Sirex camelogigas Christ

Sirex fuscicornis Fabricius

Sirex struthiocamelus Villers

Tremex juxicornis (!) Walker

Tremex simulacrum Takeuchi

Urocerus fuscicornis Latreille

Xyloecematium fuscicornis Heyden

Xyloterus fuscicornis Boie

RISK RATING SUMMARY

Numerical Score: 9

Relative Risk Rating: Very High Risk

Uncertainty: Very Uncertain

Uncertainty in this assessment results from: The ability of *Tremex fuscicornis* to compete successfully with the complex of wood boring insects native to North America, especially the pigeon tremex, *T. colomba*, which could be an ecological counterpart, is not known.

RISK RATING DETAILS

Establishment Potential Is High Risk

The relevant criteria chosen for this organism are:

- Organism has successfully established in location(s) outside its native distribution
- Suitable climatic conditions and suitable host material coincide with ports of entry or major destinations.
- Organism has demonstrated ability to utilize new hosts
- Organism has active, directed host searching capability or is vectored by an organism with directed, host searching capability.
- Organism has high inoculum potential or high likelihood of reproducing after entry.

Justification: *Tremex fuscicornis* is established in Australia and Chile. It would find suitable climatic conditions and hosts in most North American ports of entry. This insect has also demonstrated an ability to utilize new hosts including several species indigenous to North America (e.g. *Acer negundo*, *Populus deltoides*, *Robinia pseudoacacia*). Provided that it is able to compete successfully with the native complex of wood boring insects, it is expected to have a high likelihood of reproducing after entry.

Spread Potential Is High Risk

The relevant criteria chosen for this organism are:

- Organism is capable of dispersing more than several km per year through its own movement or by abiotic factors (such as wind, water or vectors).
- Organism has demonstrated the ability for redistribution through human-assisted transport.
- Organism has a high reproductive potential
- Potential hosts have contiguous distribution.
- Newly established populations may go undetected for many years due to cryptic nature, concealed activity, slow development of damage symptoms, or misdiagnosis.
- Eradication techniques are unknown, infeasible, or expected to be ineffective.
- Organism has broad host range.

Justification: Adults are strong fliers capable of dispersing several km per year in search of suitable hosts. This insect also has a demonstrated ability to be transported in wood used in international trade. It has a high reproductive potential and a broad host range. Many suitable hosts have contiguous distributions across large regions of North America.

Economic Potential Is High Risk

The relevant criteria chosen for this organism are:

- Organism attacks hosts or products with significant commercial value (such as for timber, pulp, or wood products).
- Organism directly causes tree mortality or predisposes host to mortality by other organisms.
- Damage by organism causes a decrease in value of the host affected, for instance, by lowering its market price, increasing cost of production, maintenance, or mitigation, or reducing value of property where it is located.
- Organism may cause loss of markets (domestic or foreign) due to presence and quarantine significant status.
- No effective control measure exists.

Justification: *Tremex fuscicornis* confines its attacks to dead and dying trees within its natural range. However, in places where it has been introduced, it has caused severe damage to trees of importance in agriculture, arboriculture and forestry. Boring by larvae causes severe degrade of wood, in many cases attacks are so heavy to render the wood useless. In addition, the fungus associated with *T. fuscicornis* causes wood decay. In Chile, this insect has killed trees in parks and urban areas and has also killed windbreak plantations resulting in reduced crop yield (CONAF n.d.)

Environmental Potential Is High Risk

The relevant criteria chosen for this organism are:

- Organism is expected to cause significant direct environmental effects, such as extensive ecological disruption or large scale reduction of biodiversity.

Justification: Because of its wide host range, this insect could cause significant ecological disruption and loss of biodiversity in natural forests, parks and urban areas.

HOSTS

Tremex fuscicornis attacks various species of broadleaf trees.

Recorded hosts are Beech, *Fagus* sp., *Fagus sylvatica*; Poplars, *Populus* sp., *Populus tremula*, *Populus nigra*, *Populus nigra* Italica (= *Populus pyramidalis* = *Populus italica*); elm, *Ulmus* sp., *Ulmus propinqua*, *Ulmus japonica*; alder, *Alnus* sp., *Alnus japonica*, *Alnus japonica* var. *arguta*; wingnut, *Pterocarya stenoptera*; Persian walnut, *Juglans regia*; birch, *Betula* sp.; maple, *Acer negundo*, *Acer platanoides*, black locust, *Robinia pseudoacacia*; willow, *Salix* sp.; oak, *Quercus* sp.; hackberry, *Celtis sinensis*; *Zelkova* sp., *Zelkova serrata*; *Prunus* sp., *Prunus yedoensis*; hornbeam, *Carpinus betulus* (Smith 1978).

In Australia, where it was introduced after 1996, hosts are poplars, *Populus* spp. and willow, *Salix* spp. In Chile, where it has recently become established, *Tremex fuscicornis* attacks white poplar, *Populus alba*, eastern cottonwood, *Populus deltoides*, black poplar, *Populus nigra*, weeping willow, *Salix babylonica*, Humboldt willow, *Salix humboldtiana*, Box elder, *Acer negundo* and black locust, *Robinia pseudoacacia* (CONAF n.d., Baldini U. 2002).

GEOGRAPHICAL DISTRIBUTION

Asia:

Tremex fuscicornis is widely distributed in Asia and occurs in China, Japan, Korea, Asian Russia (Kamchatka, Kurile Islands, Sakhalin and Siberia) and Taiwan (Smith 1978).

Australasia & South Pacific:

In December 1996, a local outbreak of *Tremex fuscicornis* was detected between Tamworth and Sydney, New South Wales, Australia. It is believed that the infestation had been present for 10-15 years prior to its discovery (CSIRO 2000).

Europe:

This insect is reported from Austria, Czech Republic, Denmark, Finland, France, Germany, Hungary, Italy, Latvia, Norway, Poland, European Russia, Armenia and the Ukraine (Smith 1978). It was recently detected in Norway (Midtgaard et al. 1994).

South America:

Tremex fuscicornis was detected in Chile in February 2000 in the V Region and the Region Metropolitana (Santiago). It is believed to have been established for at least two years prior to its discovery (Baldini U. 2002).

BIOLOGY

Tremex fuscicornis is a woodwasp of the family Siricidae. Woodwasp larvae bore in the wood of trees and live in a symbiotic relationship with wood decay fungi to partially break down the cellulose before the larvae can use it for food. The genus *Tremex* consists of several species of woodwasps indigenous to Asia, Europe and North America that infest broadleaf trees. One species, the pigeon tremex, *T. colomba* is found in North America, where it is widely distributed in Canada and the U.S. and infests dead or weakened broadleaf trees. This insect is considered the most abundant member of the family Siricidae in North America (Drooz 1985, Smith and Schiff 2002).

Relatively little is known of the life history and habits of *Tremex fuscicornis* in its native habitat. One report from Finland suggests that the symbiotic fungus associated with this insect as "*Bjerkandera fumosa?*" (FUNET n.d.). However, some biological data is available from Chile (Baldini U. 2002. CONAF n.d.). Females use their long ovipositor to deposit eggs in the cambium layer of host trees. A phytotoxic mucus and a fungus, believed to be a species of *Cerrena*, are simultaneously inoculated into the tree by the female. When the first instar larvae hatch, they feed exclusively on the hyphae of the developing fungus. Later the larvae construct longitudinal, semicircular galleries, which can run either upward or downward. Total gallery length averages about one m. and gradually increases in diameter as the larvae grow. Pupation occurs inside the wood at a depth of about 4 cm. from the bark surface. Adult emergence occurs over an extended period from summer to fall (October through May). Because of the prolonged period of adult emergence, it is possible to encounter all life stages during much of the growing season. The number of generations per year in Chile has not yet been established.

By comparison, the North America species, *Tremex columba*, which also infests broadleaf species, is believed to have 1 generation per year over most of its range but in New Brunswick, Canada, it has a minimum of a 2 year life cycle. The fungus associated with *T. colomba* is *Daedalea (=Cerrena) unicolor* (Drooz 1977, Smith and Schiff 2002).

Natural enemies of *Tremex fuscicornis* include several parasitoides: *Ibalia drewseni*, *I. leucospoides* (Kierych 1973), *I. jakowlewi* (Hymenoptera: Ibalidae) and *Megarhyssa percellus* (Hymenoptera: Ichneumonidae) (Pfeffer 1983).

PEST SIGNIFICANCE

Economic Impact: In their native habitats, the larvae of woodwasps bore into weakened and dying trees and are considered of minor importance except for decreasing the value of lumber (Smith and Schiff 2002). In its natural range, populations of *Tremex fuscicornis* are typically low and difficult to observe (Baldini U. 2002).

In Chile weakened or damaged trees or trees that have recently been cut are preferred. However, apparently vigorous trees of some hosts, such as *Acer negundo*, are also subject to attack. On vigorous trees, first attacks occur on branches, which causes dieback and weakening of the tree. Brood adults emerging from branches subsequently infest the main bole. All trees that are attacked are killed (Baldini U. 2002). To date, extensive damage has occurred to windbreak and shelterbelt plantings (CONAF n.d.). Attacks are typically so heavy that a single poplar can produce 2000 individual brood adults (Baldini U. 2002). Therefore the wood is impossible to use for lumber or other wood products. Moreover, the rate of decay of infested wood is accelerated because of the action of the symbiotic fungi associated with *Tremex fuscicornis* (CONAF n.d.). Another significant impact has been the loss of poplar windbreak plantings around agricultural crops and fruit orchards. This exposes the orchards to high winds resulting in reduced crop yields (Baldini U. 2002).

A major concern in South America is that since beeches, *Fagus* spp., are hosts within this insect's natural range, southern beeches, *Nothofagus* spp., are potential hosts. Several species of *Nothofagus* are important components, both economically and ecologically, of about 12 million ha. of natural forests in central and southern Chile (CONAF n.d.). A similar situation exists in the Andean region of central and southern Argentina.

Environmental Impact: Since *Tremex fuscicornis* is relatively uncommon within its natural range, ecological impact is negligible. In conjunction with its symbiotic fungus, it is probably a minor factor in the decomposition of dead trees. In Chile, attacks have, to date, been primarily confined to plantations of exotic species and plantings in parks and gardens have been affected (Anon. n.d.). Should this insect become established in natural forests and is able to adapt to *Nothofagus*, major ecological disruptions and loss of biodiversity could occur.

Control: Direct control methods are not presently available for this insect. In Chile, an integrated approach using a combination of cutting and destroying infested trees plus introduction of natural enemies is under development. Low-level populations can be detected by establishing trap trees, which are made attractive to adult *Tremex fuscicornis* by injection with a weak herbicide. Two parasitoids, *Ibalia leucospoides* and *Megarhyssa percellus* (Hymenoptera: Ichneumonidae) are being evaluated as biological control agents. *M. percellus* apparently arrived in Chile concurrently with *T. fuscicornis*. The use of parasitic nematodes, which is an effective control for the woodwasp, *Sirex noctilio*, is also being considered (Baldini U. 2002).

DETECTION AND IDENTIFICATION

Symptoms: Symptoms of attack by *Tremex fuscicornis* include host trees with thin or chlorotic foliage and the occurrence of dying or dead trees. Trees in which this insect has completed its life cycle contain round exit holes 5-6 mm in diameter.

Morphology: The mature larvae average 3 cm in length, however some individuals can reach 4 cm. They are creamy white in color. Larvae have short antennae, distinct mandibles and 3 pairs of rudimentary legs about 0.5 mm long.

The pupal stage averages 3 cm in length and is white in color after it first forms, becoming darker prior to adult development. Pupae have distinct antennae and fully developed legs.

Adult males are totally black in color, including the antennae and legs. The wings are amber colored and much darker than the wings of the female. The females are larger than males with a dark head and thorax. The abdomen has bands of alternating black and amber with a long ovipositor on the last abdominal segment (CONAF n.d.).

Testing Methods for Identification: Examination of adults by a taxonomist with expertise in the family Siricidae is required for positive identification.

MEANS OF MOVEMENT AND DISPERSAL

Adult Siricidae are strong fliers and capable of flying distances of several km in search of suitable hosts. Immature stages are easily transported via international trade in wood products. The Chilean introduction of *Tremex fuscicornis* is believed to be the result of wooden crates infested with larvae and pupae, probably originating from China (Baldini U. 2002, CONAF n.d.). More localized human assisted dispersal of this insect could be via infested fuelwood, tree trimmings and other wood products.

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