Tremex fuscicornis

Scientific Name

Tremex fuscicornis (Fabricius)

Synonyms:
Sirex fuscicornis Fabricius (Latreille)
Sirex camelogigas Christ
Sirex struthiocamelus Villers
Tremex juxicernis Walker
Urocerus fuscicornis Latreille
Xyloecematium fuscicornis Heyden
Xyloterus fuscicornis Boie
Tremex simulacrum Takeuchi

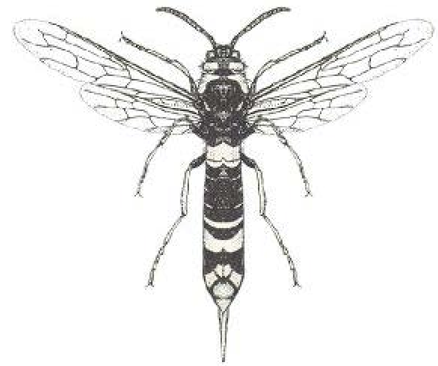

Fig. 1. Line drawing of *Tremex fuscicornis*
[Image from CSIRO, www.ento.csiro.au/aicn/sysstem/c_2267.htm]

Common Names

Tremex woodwasp

Type of Pest

Woodwasp, phloem feeder

Taxonomic Position

Kingdom: Animalia, **Phylum:** Arthropoda **Order:** Hymenoptera, **Family:** Siricidae, **Subfamily:** Tremecinae

Reason for inclusion in manual

Exotic Forest Pest Information System – classified as a very high risk pest with the potential to attack oaks
CAPS Priority Pest (FY 2008 – FY 2013)

Pest Description

Adults: *Tremex fuscicornis* is morphologically similar to *T. columba* and other siricids that occur in North America (Benson 1943). Closely related genera and species may be easily confused. Smith and Schiff (2002) provide a key to the genera of siricids of eastern North America. In Chile, where *T. fuscicornis* is exotic, the insect is most commonly confused with *Urocerus gigas* (Baldini 2001). In general, the genus *Tremex* is distinguishable from other siricids based on six morphological characters. Members of *Tremex* have (a) one apical spur on the hind tibia; (b) 14-15 segments per antenna; (c) no genal carina (i.e., a ridge in a space on the head behind the eyes; Fig. 2); (d) an ovipositor that is shorter than the length of the forewing; (e) an anal cell in the hindwing; and (f) a body without long golden hairs (Smith and Schiff 2002). Coloration is one of the characteristics used to distinguish woodwasp species, but colors vary considerably within a species, especially among males (Smith and Schiff 2002).

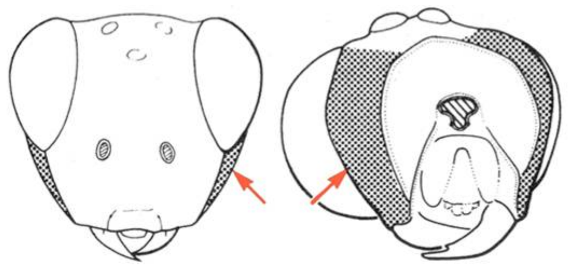

Fig. 2. Generalized line drawing of the gena, shaded areas indicated by arrows
[Image from www.hymatol.org/glossary/Pictures/occiput.jpg]

Benson (1943) distinguished between *T. fuscicornis* and *T. columba* by comparing three ratios which he considered to be diagnostic: 1) the ratio of the distance between the posterior ocelli (simple eyes) (POL) and the distance between a compound eye and the nearest posterior ocellus (OOL), 2) the ratio of the length of the ovipositor (measured from second valvifer or oblong plate base) to the length of the forewing (measured from tegula apex), and 3) the ratio of the length of the sawsheath, the apical portion of the ovipositor sheath, to the length of the ovipositor (measured as previously described). *Tremex fuscicornis* has a POL:OOL ratio of 1.2 (Benson 1943). The average length (to the nearest 0.5 mm) of the ovipositor is 18 mm, of the forewing is 21.5 mm, and of the sawsheath (from the apical tip of the ovipositor to the basal plate) is 7.5 mm. Consequently, the ovipositor: forewing ratio is 0.84, and the sawsheath: ovipositor ratio is 0.42 (Benson 1943). According to Benson (1943), these ratios provide more reliable taxonomic characters for the separation of species than the length of the ovipositor, ovipositor sections, or abdominal segments alone; these three characters are highly variable and can change as a result of desiccation. The values reported here reflect corrections to the original values reported by Benson (1943) who appears to have reported the inverse of each ratio. Witmond (1999) noted the error for the POL:OOL ratio.

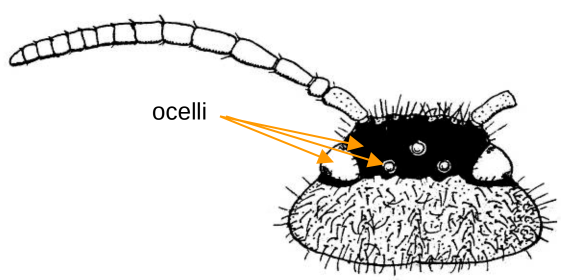

Fig. 3. Head of *Tremex fuscicornis*
[Image reproduced from Benson (1943)]

The ocelli are farther apart for *T. fuscicornis* (POL:OOL is ca. 2) than for *T. columba* (POL:OOL < 1.5) (Benson 1943). We encourage caution with the use of this character. Witmond (1999) noted that the reported ratios of POL:OOL did not match the verbal description of the distance between the ocelli. We presume Benson's verbal account is correct but that the ratios were in error; consequently, we have corrected the ratios to match his verbal descriptions and line drawings.

Witmond (1999) suggests that postocellar distance is unreliable to separate species and recommends other characters such as the length of the setae (on head) and characteristics of the second recurrent vein (wing). Witmond (1999) provides the following description of a single female specimen: "... measures 23 mm from head apex of cornus.... The distances between the posterior ocelli (POL), between the anterior and a posterior ocellus (OL), between an eye and the nearest posterior ocellus (OOL), the diameter of the anterior ocellus, the length and width of the posterior ocelli are in the proportion of 25:11:10:10:13:10 [Fig. 3]). The antennae are 6 mm long, slightly swollen in the middle, with 14 segments. The forewing is 17 mm long. ... Brown setae cover head, thorax, trochanters and femora. ... The specimen is rather dark apparently, as both the head, except for a brown patch on the gena, and the thorax are black .... Antennae black, but segments 3, 4, and 14 more or less brown. The coxae, trochanters and femora are, with the exception of the distally brownish front femora, entirely black. All tibiae are yellow proximally, and brownish distally, the tarsi are either yellow or brownish. The first abdominal segment is entirely black, all the other segments black and yellow [Fig. 4]." Other authors have noted that a maximum body length of 40 mm and that the head and thorax are rust-colored (Witmond 1999).

Fig. 4. Female (left) and male (right) *Tremex fuscicornis*, not to scale.
[Images from: P. Parra S, www.infor.cl/webinfor/publicaciones/Documentos_2005/presentacion_silvotecnia.pdf]

Current species within *Tremex* have been described by Cameron (1889), Smith (1978), and Lee et al. (1998). *T. fuscicornis* has also been described by Precupetu and Negru (1961), and Lee et al. (1998).

Biology and Ecology

The biology of *T. fuscicornis* is poorly described, primarily because this pest is often concealed inside a host plant (reviewed in Drooz 1985, Smith and Schiff 2002, reviewed in Ciesla 2003). For this reason, it is difficult to specify a life span for this pest. The closely related *T. columba* may require 2 or more years from the time an egg is laid to complete development and begin to reproduce (Drooz 1985, Smith and Schiff 2002, reviewed in CAB 2006). In Chile, the number of generations per year is not known; however, larvae emerge in the fall from eggs laid in the summer (Gallegos Céspedes 2005).

As with other siricids, members of the genus *Tremex* are associated with basidiomycetous wood decay fungi (Drooz 1985, Smith and Schiff 2002). In North America, *Tremex columba* (see 'Pest Description') is associated with *Cerrena* (=*Daedalea*) *unicolor* (Drooz 1985, Smith and Schiff 2002). The same fungus was isolated from *Tremex longicollis* (Tabata and Abe 1995). In this symbiotic relationship, the fungus is carried to new tree hosts in specialized mycangia of the adult female, and then deposited under the bark or cambial layer when the female inserts her ovipositor into the tree to lay eggs. The fungus breaks down cellulose in the tree host with digestive enzymes and provides a source of nutrition for developing larvae. Whether the developing siricids actually feed on the digested wood products or solely on the fungus is not well understood (Morgan 1968, Smith and Schiff 2002). The larvae progressively tunnel into the wood of the host as they feed and develop over a period of 1-3 years (Smith and Schiff 2002). Pupation occurs close to the bark surface (Baldini 2001). Adult woodwasps emerge through circular shaped exit holes during summer and fall (reviewed in Drooz 1985, Smith and Schiff 2002, reviewed in Ciesla 2003). In Region V and the Área Metropolitana within Chile, adults emerge from October to January (spring-summer in South America) with maximum emergence occurring in the second and third week of November (Parra Sanhueza 2005). Adults have been observed into the fall (May) (Gallegos Céspedes 2005). Following a period of heavy attacks on poplar in Chile, it was estimated that a single poplar could produce 2000 adults (reviewed in Ciesla 2003). The male:female sex ratio is slightly female-biased as females comprise 55% of the population (Parra Sanhueza 2005).

See 'Known Hosts' for a listing of the plants that can be attacked by *T. fuscicornis* and 'Pest Importance' for a discussion of its potential economic impact.

Damage

Symptoms of infection by *T. fuscicornis* and associated fungi are similar to those caused by other siricids: branch and crown dieback; reduced growth; yellowing leaves; wilted leaves; leaf and trunk necroses; tyloses formation; loosened bark; sapwood discoloration; and structural weakening (Drooz 1985, Smith and Schiff 2002, reviewed in Ciesla 2003).

The only strong evidence for the presence of *T. fuscicornis* is the presence of exit holes (5-6 mm diameter) in the trunk (Gallegos Céspedes 2005). It is generally not possible to detect infestation in trees that were only recently attacked (Baldini 2001). Occasionally, a portion of the female ovipositor will remain in a tree (Baldini 2001).

Fig. 5. Exit holes produced as adults emerge from the main stem of a tree.
[Images from: P. Parra S, www.infor.cl/webinfor/publicaciones/Documentos_2005/presentacion_silvotecnia.pdf]

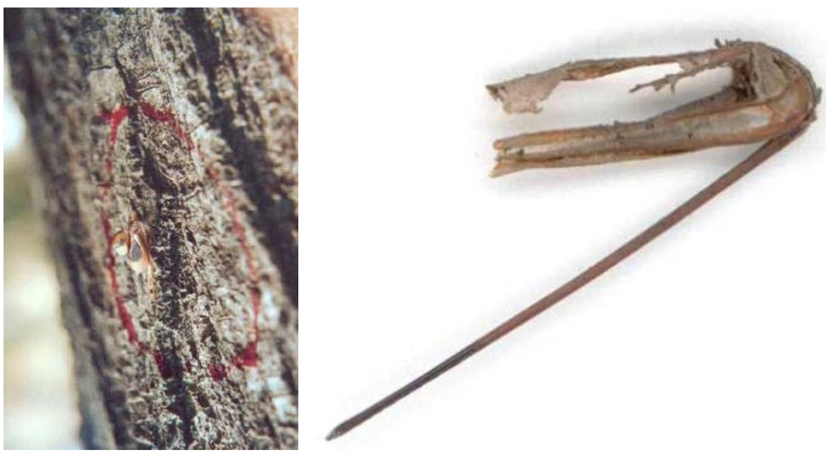

Fig. 6. Detached ovipositor protruding from a tree (left) and close up (right). [Images from: P. Parra S, www.infor.cl/webinfor/publicaciones/Documentos_2005/presentacion_silvotecnia.pdf]

Pest Importance

Like other siricids, *Tremex fuscicornis* is known to attack dead or declining trees but may also attack apparently healthy trees (Smith 1978, reviewed in Ciesla 2003). The economic impact of *T. fuscicornis* is difficult to measure especially because it can occur with other primary and secondary pests (Drooz 1985, Smith and Schiff 2002). However, in Chile, the insect seems to be particularly damaging to trees belonging to the genera *Salix* and *Populus* (Parra Sanhueza 2005). *Salix* is less affected than *Populus*, but the cumulative economic impacts are significant (reviewed in NAPPO 2006). The damage caused by symbiotic wood decay fungi may be more important than the damage caused solely by the insect. Fungi vectored by siricids are pathogenic; economic losses result from tree death, reduced growth, and reduced quality (Morgan 1968, Manion 1991, reviewed in NAPPO 2006). According to Smith (1978), *Tremex* spp. are generally not considered economically significant. Within its native range, *T fuscicornis* has not been reported as a pest; however, it has become a significant pest in new areas where it was accidentally introduced.

Risks associated with the introduction of *T. fuscicornis* into North America have been evaluated previously. Ciesla (2003) considered the potential for establishment, spread, and economic harm to be high. As a result, the overall, relative degree of risk was considered very high, but this assessment was very uncertain because the ability of this insect to compete with other established siricids in North America was (and remains) unknown (Ciesla 2003).

Known Hosts

Tremex fuscicornis attacks a wide range of deciduous tree species:

Hosts	**References**
Acer platanoides (Norway maple)	(Smith 1978, Lee et al. 1998)
Acer negundo (boxelder)	(Smith 1978, Lee et al. 1998)
Alnus japonica (Japanese alder)	(Smith 1978, Lee et al. 1998)
Alnus sp. (alder)	(Smith 1978, Lee et al. 1998)
Betula sp. (birch)	(Precupetu and Negru 1961, Smith 1978, Lee et al. 1998)
Betula pendula (common silver birch)	(CAB 2006)
Betula pubescens (downy birch)	(CAB 2006)
Carpinus betulus (European hornbeam)	(Smith 1978, Lee et al. 1998)
Celtis sinensis (Chinese hackberry)	(Smith 1978, Lee et al. 1998)
Fagus sylvatica (=*F*. "*silvatica*") (European beech)	(Precupetu and Negru 1961, Smith 1978, Lee et al. 1998)
Fagus sp. (beech)	(Smith 1978, Lee et al. 1998)
Juglans regia (English walnut)	(Smith 1978, Lee et al. 1998)
Juglans sinensis (Chinese walnut)	(Lee et al. 1998)
Populus alba (silver leaf or white poplar)	(CAB 2006)
Populus deltoides (Eastern cottonwood)	(CAB 2006)
Populus nigra (=*P. pyramidalis, P. nigra* var. *italica*) (Lombardy or black poplar)	(Precupetu and Negru 1961, Smith 1978, Lee et al. 1998)
Populus tremula (European aspen)	(Smith 1978, Lee et al. 1998)
Populus sp. (aspen/poplar)	(Precupetu and Negru 1961, Lee et al. 1998)
Prunus serrulata var. *spontanea* (Japanese flowering cherry)	(Lee et al. 1998)
Prunus ×*yedoensis* (pro sp.) (*subhirtella* × *speciosa*) (=*P. yedoensis*?) (chokecherry)	(Smith 1978, Lee et al. 1998)
Prunus sp.	(Smith 1978, Lee et al. 1998)

Hosts	References
Pterocarya stenoptera (Chinese wingnut)	(Smith 1978, Lee et al. 1998)
Quercus sp. (oak)	(Smith 1978, Lee et al. 1998)
Robinia pseudoacacia (black locust)	(Smith 1978, Lee et al. 1998)
Salix sp. (willow)	(Smith 1978, Lee et al. 1998)
Salix babylonica (weeping willow)	(CAB 2006)
Salix humboldtiana (Humboldt's willow)	(CAB 2006)
Ulmus davidiana var. *japonica* (=*U. japonica, U. propinqua*) (Japanese elm)	(Smith 1978, Lee et al. 1998)
Ulmus sp. (elm)	(Smith 1978, Lee et al. 1998)
Zelkova serrata (Japanese Zelkova)	(Smith 1978, Lee et al. 1998)
Zelkova sp.	(Smith 1978, Lee et al. 1998)

Known Distribution

Tremex fuscicornis has been reported from:

Asia: Armenia, China (including Taiwan), Iran, Japan, Korea, and Russia; **Europe:** Austria, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Latvia, Netherlands, Norway, Poland, Romania, Slovakia, Spain, Sweden, Switzerland, and Ukraine; **Oceania:** Australia; **South America:** Argentina and Chile.

(EPPO n.d., Precupetu and Negru 1961, Smith 1978, Midtgaard et al. 1994, Lee et al. 1998, Witmond 1999, Stoyanov and Ljubomirov 2000, Ciesla 2003, CSIRO 2004, CAB 2006, CABI 2010, Landi 2011, USDA 2012).

Pathway

This species has only been intercepted once at U.S. ports of entry. It was intercepted on wood product originating from France (AQAS 2013, queried January 30, 2013).

Immature stages can be moved through international trade of wood products. It is believed that the Chilean introduction occurred through movement of wooden crates infested with larvae and pupae from China. Localized spread could occur through flight of adults or human mediated dispersal through infested fuelwood, tree trimmings, or other wooden products (Ciesla 2003).

Potential Distribution within the United States

Tremex fuscicornis is a Palearctic species, native to Asia and Europe. The species has successfully invaded New South Wales, Australia and the Área Metropolitana, Region V and Region VI of Chile. The insect was presumably introduced to Chile in infested wood packing materials from China. A coarse analysis of the worldwide distribution of this insect suggests it is most closely associated with temperate-broadleaf-and-mixed forests. This biome occurs in the northeastern United States and accounts for 28% of the area within the contiguous United States.

A recent risk analysis by USDA-APHIS-PPQ-CPHST shows the relative risk of establishment of this pest based on host availability and climate is low throughout the United States.

Survey

CAPS-Approved Method*:
Visual survey is the approved survey method for *T. fuscicornis*.

*For the most up-to-date methods for survey and identification, see Approved Methods on the CAPS Resource and Collaboration Site, at http://caps.ceris.purdue.edu/.

Literature-Based Methods:
Few tools are available to aid surveys for *T. fuscicornis*. No sex pheromones or other chemical attractants have been identified. The insect is not known to be preferentially attracted by any colors. As a result, surveys must rely on visual inspections of the main stem of potential host trees for adult wasps, remnant ovipositors (rare), or emergence holes (reviewed in NAPPO 2006). Alternatively, bark can be removed to inspect for larvae or pupae, but this is not recommended if exit holes are not present. Intact trees or bolts of infested wood can be wrapped in aluminum screening to trap adults as they emerge from logs. Trees with drought stress or damaged by fire may be particularly predisposed to infestation (Parra S., unpublished).

Smith (2002) reported success in collecting siricids with a Malaise trap, which essentially is a large, open tent with a “roof” that slopes upwards into a collection vessel. Numerous versions of Malaise traps have been developed (Southwood 1966). Adult siricids are not commonly collected with such traps. They can be effective if adults are active and abundant (Smith and Schiff 2002).

Key Diagnostics

CAPS-Approved Method*:
Confirmation of *T. fuscicornis* is by morphological identification.

*For the most up-to-date methods for survey and identification, see Approved Methods on the CAPS Resource and Collaboration Site, at http://caps.ceris.purdue.edu/.

Easily Confused Pests

T. fuscicornis can be confused with *T. columba* (present in the United States) and *Urocerus gigas* (not present in the United States).

References

AQAS. 2013. *Tremex* sp. interceptions. Agricultural Quarantine Activity Systems. Accessed January 30, 2013 from: https://aqas.aphis.usda.gov/aqas/.

Baldini, A. 2001. *Tremex fuscicornis*: triple threat. Chile Forestal: 28-30.

Benson, R. B. 1943. Studies in Siricidae, Especially of Europe and Southern Asia (Hymenoptera, Symphyta). Bulletin of Entomological Research 34: 27-51.

CAB. 2006. Forestry Compendium. CAB International. Available on-line at: http://www.cabicompendium.org/fc/home.asp. Accessed 12 July 2006.

CABI. 2012. *Tremex fuscicornis*. Crop Protection Compendium. Accessed January 30 2013 from: http://www.cabi.org/cpc.

Cameron, P. 1889. A monograph of the British phytophagous Hymenoptera (*Tenthredo*, *Sirex*, and *Cynips*, Linné). The Ray Society, London.

Ciesla, W. 2003. *Tremex fuscicornis*. North American Forest Commission Exotic Forest Pest Information System (NAFC-ExFor).

CSIRO. 2004. Systematic Names: *Tremex fuscicornis* (Fabricius). Commonwealth Scientific and Industrial Research Organisation and Australian Government Department of Agriculture, Fisheries and Forestry. Available on-line at: http://www.ento.csiro.au/aicn/system/c_2267.htm. Accessed 18 August 2006.

Drooz, A. T., Ed. 1985. Insects of Eastern Forests, Miscellaneous Publication No. 1426. U.S. Department of Agriculture, Forest Service, Washington, D.C.

EPPO. No date. Forest pests on the territories of the former USSR. European and Mediterranean Plant Protection Organization. 05/12249. 177 pp.

Gallegos Céspedes, L. 2005. Descripción y Manejo de Plagas y Enfermedades del Arbolado Urbano en la Comuna de la Reina, Departamento de Manejo de Recursos Forestales. Universidad de Chile, Facultad de Ciencias Forestales, Escuela de Ciencias Forestales, Santiago.

Landi, L., C. Braccini, and A. Roig Alsina. 2011. Primer registro de *Tremex fuscicornis* (Hymenoptera: Siricidae) para la Argentina en una plantación de álamos en Buenos Aires. Rev. Soc. Entomol. Argent. 70(3-4): 383-387.

Lee, J. W., S. M. Ryu, and D. K. Chung. 1998. Taxonomy of the genus *Tremex* Jurine (Hymenoptera: Siricidae) from Korea, with descriptions of one new species and one unrecorded species. Korean Journal of Biological Sciences 2: 297-302.

Manion, P. 1991. Tree Disease Concepts. Prentice-Hall, Englewood Cliffs.

Midtgaard, F., J. N. Stokland, and A. Sverdrup-Thygeson. 1994. *Tremex fuscicornis* (Fabricius) (Hymenoptera, Siricidae) a new woodwasp for the Norwegian fauna. Fauna Norvegica Series B 41: 43.

Morgan, F. D. 1968. Bionomics of Siricidae. Annual Review of Entomology 13: 239-256.

NAPPO. 2006. *Tremex fuscicornis* Fabricius. Established populations recently discovered in Chile. North American Plant Protection Organization. Available on-line at: http://www.pestalert.org/viewArchPestAlert.cfm?rid=55&keyword=Tremex. Accessed 2006.

Parra Sanhueza, P. 2005. Integrated management of *Tremex fuscicornis* Fabricius. Chile Forestal Corporación Nacional Forestal: 40-43.

Precupetu, A., and S. Negru. 1961. Contribution to the knowledge of the wood wasps (Hymenoptera, Siricidae) of the Rumanian People's Republic fauna. Revue de Biologie Bucharest 6: 81-89.

Smith, D. R. 1978. Hymenopterus Catalogus. Dr. W. Junk B.V., The Hague.

Smith, D. R., and N. M. Schiff. 2002. A review of the Siricid woodwasps and their Ibaliid parasitoids (Hymenoptera: Siricidae, Ibaliidae) in the eastern United States, with emphasis on the mid-Atlantic region. Proceedings of the Entomological Society of Washington 104: 174-194.

Southwood, T. R. E. 1966. Ecological Methods with particular reference to the study of insect populations. Chapman & Hall, London.

Stoyanov, I., and T. Ljubomirov. 2000. Notes on woodwasp families Siricidae, Xiphydriidae and Orussidae (Insecta: Hymenoptera) from Bulgaria. Acta Zoologica Bulgarica 52: 37-39.

Tabata, M., and Y. Abe. 1995. *Cerrena unicolor* isolated from the mycangia of a horntail, *Tremex longicollis*, in Kochi prefecture, Japan. Mycoscience 36: 447-450.\

USDA. 2012. New Pest Response Guidelines. Tremex Wood Wasp (*Tremex fuscicornis*). United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine. 102 pp.

Witmond, L. 1999. *Tremex fuscicornis*: a new species for the fauna of the Netherlands (Hymenoptera: Siricidae). Entomologische Berichten 59: 138-140.