Dendroctonus valens **System:** Terrestrial

Kingdom	Phylum	Class	Order	Family
Animalia	Arthropoda	Insecta	Coleoptera	Curculionidae

Common name

Synonym *Dendroctonus rhizophagus* ,Thomas & Bright
Dendroctonus beckeri , Thatcher

Similar species *Dendroctonus beckeri, Dendroctonus terebrans, Ips emarginatus, Ips mexicanus, Ips paraconfusus, Ips pini, Ips plastographus*

Summary Timber imports into China in the 1980s probably translocated the North American pest *Dendroctonus valens* (red turpentine beetle) into the country. It has since established itself vast tracts of ecologically and economically valuable pine forest in northern China, threatening reforestation and forest protection programmes in the country. The Chinese State Forestry Administration ranks the red turpentine bark beetle as the second most important national forest pest.

view this species on IUCN Red List

Species Description

The 1 mm long eggs of *Dendroctonus valens* are white, shiny and ovoid cylindrical in shape. The grub-like legless larvae are off-white with a brown head capsule and hind end. Small, pale-brown tubercles are evident in rows along each side of the body. The larva grows to a length of up to 12 mm. The pupae are slightly shorter than the larva and white. They develop into a beetle about the size of a grain of rice. At first the beetle is tan and is called a callow adult. It then rapidly darkens to a reddish brown (Smith 1971). The red turpentine beetle's color is similar to that of bark giving it good camouflage (Yan *et al*. 2005).
Bark beetles have strong mandibles for chewing; antennae are elbowed with the outer segments enlarged and club-like; when viewed from above, the head is partly or completely hidden by the *pronotum* (Seybold Paine & Dreistadt 2008). The *pronotum* is the upper surface of the prothorax; the shape of the pronotum is often important in identification of beetles.
Identification: Pitch Tubes & Frass (Smith 1971; Randall 2006; Seybold, Paine & Dreistadt 2008): Beetle mining activity produces a mix of resin and sawdust-like frass. This mass of congealed resin oozes out of the boring hole and forms what is known as a pitch tube on the bole of the tree. These are usually found up to a height of two or three meters above the ground. Pitch tubes vary in size, texture and color, depending on the kind of tree and the relative amounts of bark borings and frass embedded in the resin. The resin is usually white to yellow and the borings are red. The pitch tube may vary in colour from white to light pink to reddish brown. The pitch tube may be as large as 5 cm in diameter. On fir or spruce, which produce little resin, pitch tubes are small or absent, but pitch pellets may be found on the ground at the tree base in the form of small white granules. Frass accumulates in bark crevices or drops to the ground or into spider webs. Small emergence holes in bark indicate the possibility of bark beetles. Bark should be removed to inspect signs of dead and degraded inner bark and new adult beetles that have not emerged. Red turpentine beetles usually pack their egg-laying galleries with granular, reddish, pitchy borings or frass (whereas engraver beetles maintain clean open galleries). Galleries vary from 13 mm to 25 mm in diameter and from a few centimeters to a meter or more in length and are generally vertical. Stressed trees often exhibit crown symptoms which are usually the direct result of associated attacks by other bark beetles. Symptoms include: shorter needles, poor needle retention resulting in tufts of foliage, a thin crown, off-color chlorotic foliage fading to yellow or sorrel/copper-red, slow height growth and/or dead or dying branches.

Notes

In parts of China where temperatures reach below -18 degrees C *Dendroctonus valens* may survive over-winter in pine roots (but not tree boles) (Wu *et al*. 2002, in Yan *et al*. 2005); this may be an important survival strategy of the beetle in Chinese forests (Miao *et al*. 2001, Wu *et al*. 2002, in Yan *et al*. 2005).

Lifecycle Stages
The rate of development of *Dendroctonus valens* is largely dependent on temperature (Smith 1971). In most areas there is at least one generation of *D. valens* per year. In southern areas at low elevations, there may be as many as three per year (Smith 1971, Vite *et al*. 1964, Zhang *et al*. 2002, in Yan *et al*. 2005; Randall 2006). In northern areas and at high elevations, two years may be required for one generation (Randall 2006). For a time-line of red turpentine beetle showing the overlap in life stages please see Randall. 2006. *Red Turpentine Beetle Ecology and Management*. Forest Health Protection and State Forestry Organizations (pg 2).
The following description of life cycle stages is primarily from Smith (1971):
Adult colonisation: In spring beetles locate suitable plant host by detecting chemicals such as ethanol, monoterpenes (eg: alpha pinene and beta pinene) and pheromones (Byers 1995, LUBIES 2004). The female bores a hole in the bole of the tree and is soon joined by a male. Resin and frass pitch tube are formed on the bark or drop to the ground in pellets. Boring may exceed 2.5cm per day and the gallery may be extended to the larger roots. One or two pairs of beetles may be found per gallery. Beetles remain in their pine for several months, enlarging their galleries laterally.
Egg stage: 2 weeks in California, USA 1 to 2 weeks in China (Yan *et al*. 2005). The female red turpentine beetle oviposits (lays its eggs) within the phloem of trees or fresh stumps. Eggs are laid in an elongate mass along the side of the gallery.
Larval stage: Length = 8 weeks in California, USA; 8 to 10 weeks in China (Yan *et al*. 2005). Larvae live in groups in communal chambers within the phloem. A unique feature of the beetle is that the larvae are *gregarious* whereas most other bark beetle larvae maintain separate feeding tunnels. Gregarious insects live and feed in communities (of the same kind). The larvae tunnels appear as irregularly-margined fan-shapes.
Pupa stage: Length = 1 week in California, USA; 1 to 2 weeks in China (Yan *et al*. 2005). As larvae complete their feeding they scoop out bits of wood or bark to make separate pupation cells. In the pupal, or resting stage, the wings, legs and antennae are held against the body. Pupation of over-wintering larva begins in early June, and *eclosion* (emergence) begins in early July; adults can be detected from May to October (Miao *et al*. 2001 in Yan *et al*. 2005).
Adult emergence & flight: Length of young adult stage = 1 week (Yan *et al*. 2005). Within a few days to several months warm Spring weather induces emerged beetles to bore out, take flight and disperse in the search for a suitable new host. Flight temperature ranges have been recorded from 19 degrees C to 23 degrees C. In relatively warmer regions emergence and new attacks may occur at nearly any time of the year. In colder regions winter hibernation of the adult or larva may occur, often taking place under root bark (Britton and Sun 2002, Wu *et al*. 2002, in Yan *et al*. 2005). (Pupae and eggs rarely overwinter.)

Habitat Description
Dendroctonus valens is found in coniferous and mixed coniferous forests in North and Central America where it colonises stressed pines (Erbilgin Nadir & Raffa 2002; Yan *et al*. 2005; Cai *et al*. 2008). It is a common pest of forest and park trees of pole-size or larger; in North America the beetle may attack freshly cut stumps and trees that are injured or weakened by roadbuilding, construction, logging, drought, fire or other insects (Smith 1971). The most heavily attacked forests in China are located in mountains ranges in the Shanxi province from 600 to 2000 meters elevation (Zhang *et al*. 2002, in Yan *et al*. 2005). *P. tabuliformis* is a major reforestation species widely planted on degraded land; this increases tree stress and predisposes it to *D. valens* attack (Li *et al*. 2001 Yan *et al*. 2005). Mature and over-mature *P. tabuliformis* forests are infested, while younger forests are seldom attacked (Miao *et al*. 2001, in Yan *et al*. 2005).
D. valens occurs within a climatic region of China described as “warm temperature semi-moist” (Wu and Feng 1994, in Yan *et al*. 2005). Precipitation in northern China is generally lower than in other regions, especially from October to May (Sun *et al*. 2002, Yan *et al*. 2005), which may create favourable conditions for *D. valens*. High humidity and consecutive rainfall disrupts the growth of larvae and eggs of *D. valens* (Miao *et al*. 2001, in Yan *et al*. 2005). Parts of Northern China are becoming drier, hotter and plagued by drought leaving the primary pine host *P. tabuliformis* stressed and contributing to the current outbreak of *D. valens* (Sun & Shuqing *et al*. 2002, Li *et al*. 2001, Miao *et al*. 2001, in Yan *et al*. 2005). Winter temperatures, in particular, have been warmer than in previous years and appear to be a critical factor for beetle survival (Xu *et al*. 1986; Li *et al*. 2001).

Reproduction
Dendroctonus valens may lay over a hundred eggs (Yan *et al*. 2005).

Nutrition
Bark beetles mine wood, gaining nutrition from the inner bark (the phloem-cambial region) of twigs, branches, trunks and roots of host trees or woody plants (Seybold, Paine & Dreistadt 2008). Red turpentine bark beetles mine the lower trunk and upper root system only. Red turpentine beetle adults bore through the corky outer layer (bark) to the surface of the wood. Larvae emerge to feed on the inner bark tissue between the outer dry bark and the wood; larvae chambers are within the phloem and do not expand significantly into the sapwood (Smith 1971).

General Impacts
Bark beetles (family: Scolytidae) are common pests of conifers, especially pine (Seybold Paine & Dreistadt 2008). The red turpentine beetle has been recorded on at least 40 species of conifer (Liu *et al*. 2006). *Dendroctonus valens* has a high intrinsic capacity for adaptation with new hosts compared to other species of *Dendroctonus* (Sturgeon & Mitton 1982, Kelley & Farrell 1998, in Erbilgin *et al*. 2007).
D. valens attacks all pine species, and occasionally spruce and larch, within its range in North America (Yan *et al*. 2005). Major *Pinus* spp. affected are *P. ponderosa*, *P. contorta*, *P. jeffreyi*, *P. lambertiana*, *P. monticola*, *P. radiata*, *P. strobes*, *P. resinosa*, *P. rigida*, *P. echinata* and *Pinus banksian* (Yan *et al*. 2005). Damage to *Pinus armandi* and *Picea meyeri* is unconfirmed (Zhang *et al*. 2002, in Yan *et al*. 2005). *P. ponderosa* is reported as the tree most frequently infested with *D. valens* and *P. radiata* as the tree most frequently killed by *D. valens* infestations (Smith 1971). In China *D. valens* primarily attacks *P. tabuliformis* and *P. bungeana*. Occasional hosts include *Picea meyeri* and *P. sylvestris* (Yan *et al*. 2005). *P. sylvestris* var. *mongolica* is a rare pine species found in Shanxi province and it has occasionally been attacked by *D. valens*. The oleoresin compositions of *P. massoniana* and *P. armandi* are so similar to *P. tabuliformis* that they are presumed hosts. However, it is believed that all Asian pine are potentially at risk of *D. valens* infestation (Yan *et al*. 2005). In China *D. valens* will colonise both stressed and healthy pines rather than only stressed pines as is the case in North America. The enormous damage caused *D. valens* in China is thought to be facilitated by drought conditions, degradation of pine sites, the presence of fungal associates and the use of monocultures (Li *et al*. 2001, in Yan *et al*. 2005). Logging and farming activities may also contribute to the spread of the beetle (Furniss & Carolin 1977; Miao *et al*. 2001).The red turpentine beetle is spreading throughout four Chinese provinces. In these provinces it has infested and killed more than 6 million *P. tabulaeformis*, covering an area of half a million hectares of ecologically and economically valuable forest (Cognato *et al*. 2005; Liu & Dai 2006). In northern China the land is very dry, the watershed is low and soil conservation is paramount. Billions of tons of agricultural and other soils are annually washed down the Yellow River. Reforestation and forest protection programs, begun in the 1900s, have since involved the planting of *P. tabulaeformis* and *P. armandi* pine to reforest the land and prevent soil erosion. The status of these reforestation programs is currently threatened by *D. valens* infestations. The potential damage inflicted by *D. valens* to reforested and naturally forested lands in northern Chinis enormous (LUBIES 2004). The interaction between *D. valens* and native pine-infesting diseases, beetles and insects (including two congeners *D. Kugelann* and *D. armandi*) is unknown (Yan *et al*. 2005). Secondary bark beetles such as *D. valens* may vector root disease organisms (Joseph *et al*. 2001). In the United States *D. valens* is known to carry the virulent fungus *Leptographium terebrantis* which infects ponderosa pine and may contribute to host pine mortality (LUBIES 2004; Yan *et al*. 2005). It is unknown what fungal species may be associated with *D. valens* in its range in China.

Management Info
Preventative measures: Quarantine restrictions in northern China prevent the unauthorised movement of infested material including trees, logs and wood products (Yan *et al*. 2005). Cargo is currently checked by hand. To avoid over-sights improved equipment and methods are needed (Yang 1993, in Liu & Dai 2006).
Pine plots in China are inspected in the summer and the fall for indicators of *D. valens* attack, such as the presence of pitch tubes or boring material (Yan *et al*. 2005). Flight traps, funnel traps and pitfall traps are all used to monitor beetle numbers (Erbilgin Nadir & Raffa 2002). Lower stem flight traps have been shown to catch relatively high numbers of *D. valens* (Yan *et al*. 2005).
Chemical: Bark beetles are good candidates for semiochemical-based control methods (Borden 1997, in Rappaport Owen & Stein 2001). The use of ecologically-selective semiochemicals are environmentally friendly and non-toxic (Carmona Undated). Research on bark beetle response to pine host volatiles and beetle pheromones in China and North America is on-going. Anti-aggregation pheromones such as verbenone repel red turpentine beetles. Verbenone acts as a chemical message to *D. valens* that host food resources are limited. Release rates of the pheromone must be carefully controlled as low release rates of verbenone will actually increase *D. valens* response to host attractant molecules.Pine monoterpenes are highly attractive to bark beetles (Liu & Dai 2006) and have applications in the monitoring and trapping of beetles. (+)-3-carene and the standard North American *D. valens* lure of a 1:1:1 ratio of (+) alpha-pinene & beta-pinene (+)-3-carene are effective in attracting *D. valens* (Erbilgin *et al*. 2007). The standard lure was used in a mass-trapping program in the Guandi Mountains (west of Shanxi province, China). The proportion of infested forest decreased by 64.4% and the average number of attacks per tree decreased by 59.2% (Guo *et al*. 2003, in Yan *et al*. 2005). Ethanol attracts various scolytid beetles including *D. valens* when released at relatively low or medium concentrations (Yan *et al*. 2005). A 1:1 ration of ethanol:turpentine captured 60 times more *D. valens* than turpentine alone (Klepzig et al. 1991, in Yan *et al*. 2005). 4-Allylanisole (4AA), released by some pines, may prove useful in protecting high-value logs or individual trees by it ability to reduce bark beetle attraction to ethanol (in combination with alpha-pinene & beta-pinene) (Jospeh *et al*. 2001).
Insecticides: Fumigation or injection of beetle galleries or spraying of basal tree trunks with insecticides may result in 90 to 98% beetle mortality (Shanxi Forestry Bureau Unpub. Data). Fumigation is costly and difficult and is not effective at controlling beetle populations over large areas. It can result in environmental contamination and decreased natural enemy populations.
Biological: Research from the Université Libre de Bruxelles showed that *Rhizophagus grandis* is able to successfully complete its life-cycle with *D. valens*. *R. grandis* responds to attractants produced by *D. valens*, enters *D. valens* galleries and oviposits a relatively high number of eggs. (LUBIES 2004). *Steinernema ceratophorum*, a nematode isolated from Jilin province in northeast China, has also produced high infection rates of *D. valens* larva, causing a larval mortality rate of 90% (Jian *et a*l. 2002).
Please follow this link for detailed information on the management of the Red turpentine beetle (*Dendroctonus valens*).

Pathway
Bark beetles (Coleoptera: Scolytidae) are particularly liable to bypass quarantine undetected in wood articles (Smith 1971). Bark beetles are most often intercepted in dunnage and solid wood packing material at US ports of entry (Haack 2001, in Cognato *et al*. 2005). The quantity of imported timber is increasing rapidly with the economic development of China. Longicorn beetles, bark beetles and termites are important timber pests that may be introduced by importing timber. These organisms are a considerable threat to Chinese forestry (Liu & Dai 2006). Bark-covered conifer logs shipped from the western US to Shanxi during the 1980s are thought to be origin of the current infestation of the red turpentine beetle in China (Cai *et al*. 2008). Humans facilitate the spread of *D. valens* between otherwise widely separated pine strands. Pine material with intact bark may harbor *D. valens*. The harvesting of dying, infested trees and logs facilitates *D. valens* spread through China (Yan *et al*. 2005). Such materials are considered to be high risk goods as they are suitable habitat material for *D. valens*. The harvesting of pine trees and logs is considered to be a high risk activity (Yan *et al*. 2005).

Principal source:

Compiler: IUCN/SSC Invasive Species Specialist Group (ISSG) with support from the Forestry Division (Council Of Agriculture) Taiwan

Review:

Pubblication date: 2009-02-13

ALIEN RANGE

[6] CHINA

BIBLIOGRAPHY

49 references found for **Dendroctonus valens**

Managment information

BeetleBlock - Verbenone a Repellent Pheremone Product for Control of the Mountain Pine Beetle *Dendroctonus ponderosae*, Western Pine Beetle *Dendroctonus brevicomis* And Southern Pine Beetle *Dendroctonus frontalis.*

Summary: Available from: http://www.semiochemical.com/BeetleBlock_Verbenone_2007.label.pdf [Accessed 14 November 2008]

Cognato, Anthony I., 2003. Population genetics of *Dendroctonus valens* LeConte introduced to China. This presentation is part of : Ten-Minute Papers, Section A. Systematics, Morphology, and Evolution, Wednesday, 29 October 2003 - 8:36 AM 0837.

Summary: Abstract: The red turpentine bark beetle, *Dendroctontus valens* LeConte, is a native of North America and is distributed from Central America, Mexico, western US, Canada and northeastern US. Mostly dead or dying *Pinus*, *Picea* and *Abies* are hosts but unhealthy live trees are sometimes killed. Recently epidemic populations of this species have been discovered in Shaxi, Shaaxi, Hebei and Henan Provinces, China. So far over half million hectares of drought stressed, *Pinus tabuliformis* have been infested. Biology and ecology of the red turpentine bark beetle varies within its native range thus biological control (e.g. parasitoids and pheromones) must tailored to each population. Unknown origin(s) of the Chinese beetles hampers the implementation of biological control. This study uses a portion of the mitochondrial cytochrome oxidase I gene as a molecular marker to identify potential origin(s), size and occurrence of introduction(s) to China. Thirty-four DNA haplotypes were observed among 65 D. valens individuals from eight western US populations and four haplotypes were found in China. Ten parsimony informative characters were observed among the haplotypes. Parsimony analysis resulted in 8800 trees and the strict consensus of these trees was mostly unresolved. These data and analysis do not pinpoint the exact origin of the infestation. However the results suggest that the likely origin is the Pacific Northwest of North America. Also the occurrence of multiple haplotypes in China suggests that the population did not derive from one ancestor. Either multiple families arrived with one introduction of infested wood or several introductions of infested wood occurred.
Available from: http://esa.confex.com/esa/2003/techprogram/paper_10424.htm [Accessed 14 November 2008]

Erbilgin, N., S. R. Mori., J. H. Sun., J. D. Stein., D. R. Owen., L. D. Merrill., R. Campos Bola�os., K. F. Raffa., T. M�ndez Montiel., D. L. Wood and N. E. Gillette., 2007. Response to Host Volatiles by Native and Introduced Populations of *Dendroctonus valens* (Coleoptera: Curculionidae, Scolytinae) in North America and China. Journal of Chemical Ecology. Volume 33, Number 1 / January, 2007

Fettig, Christopher J.; Borys, Robert R; Dabney, Christopher P.; McKelvey, Stephen R.; Cluck, Daniel R.; Smith, Sheri L., 2005. Disruption of red turpentine beetle attraction to baited traps by the addition of California fivespined ips pheromone components. Canadian Entomologist. 137(6). NOV-DEC 2005. 748-752.

Summary: Abstract: The red turpentine beetle, *Dendroctonits valens* LeConte (Coleoptera: Scolytidae), is a common bark beetle species found throughout much of North America. In California, *D. valens* and the California fivespined ips, *Ips paraconfusus* Lanier (Coleoptera: Scolytidae), are sympatric and often colonize the same tree. In an unrelated study, we observed that *I. paraconfusus* attack densities in logging debris were inversely related to *D. valens* attacks on freshly cut stumps. In this study, we test the hypothesis that allomonal inhibition occurs between these two species. Components of the aggregation pheromone of I. paraconfusus (racemic ipsenol, (+)-ipsdienol, and (-)-cis-verbenol) inhibited the response of *D. valens* to attractant-baited traps. Substitution of racemic ipsdienol for (+)-ipsdienol did not alter this effect. Doubling the release rate did not enhance inhibition. Racemic ipsdienol was not attractive to *I. paraconfusus*. *Temnochila chlorodia* (Mannerheim, 1843) (Coleoptera: Trogositidae), a common bark beetle predator, was attracted to the *I. paraconfusus* aggregation pheromone. These results could have important implications for the development of an effective semiochemical-based management tool for *D. valens*.

Fettig, Christopher J.; Borys, Robert R.; McKelvey, Stephen R.; Dabney, Christopher P., 2008. Blacks Mountain Experimental Forest: bark beetle responses to differences in forest structure and the application of prescribed fire in interior ponderosa pine. Canadian Journal of Forest Research. 38(5). MAY 2008. 924-935.

Summary: Abstract: Mechanical thinning and the application of prescribed fire are commonly used tools in the restoration of fire-adapted forest ecosystems. However, few studies have explored their effects on subsequent amounts of bark beetle caused tree mortality in interior ponderosa pine, *Pinus ponderosa* Dougl. ex P. & C. Laws. var. *ponderosa*. In this study, we examined bark beetle responses to creation of midseral (low diversity) and late-seral stages (high diversity) and the application of prescribed fire on 12 experimental units ranging in size from 76 to 136 ha. A total of 9500 (5.0% of all trees) *Pinus* and *Abies* trees died 2 years after treatment of which 28.8% (2733 trees) was attributed to bark beetle colonization. No significant difference in the mean percentage of trees colonized by bark beetles was found between low diversity and high diversity. The application of prescribed fire resulted in significant increases in bark beetle caused tree mortality (all species) and for western pine beetle, *Dendroctonus brevicomis* LeConte, mountain pine beetle, *Dendroctonus ponderosae* Hopkins, *Ips* spp., and fir engraver, *Scolytus ventralis* LeConte, individually. Approximately 85.6% (2339 trees) of all bark beetle caused tree mortality occurred on burned split plots. The implications of these and other results to sustainable forest management are discussed.

Fettig, Christopher J.; Dabney, Christopher P.; McKelvey, Stephen R.; Huber, Dezene P. W., 2008. Nonhost angiosperm volatiles and verbenone protect individual ponderosa pines from attack by western pine beetle and red turpentine beetle (Coleoptera : Curculioniclae, Scolytinae). Western Journal of Applied Forestry. 23(1). JAN 2008. 40-45.
Summary: Abstract: Nonhost angiosperm volatiles (NAV) and verbenone were tested for their ability to protect individual ponderosa pines, *Pinus ponderoso* Dougl. ex. Laws., from attack by western pine beetle (M), *Dendroctonus brevicomis* LeConte, and red turpentine beetle (M), *Dendroctonus valens* LeConte (Coleoptera: Curculioniclae, Scolytinae). A combination of (-)-verbenone and eight NAVs [benzyl alcohol, benzaldehyde, guaiacol, nonanal, salicylaldehyde, (E)-2-hexenal, (E)-2-hexen-1-ol, and (Z)-2-hexen-1-ol] (NAVV) significantly reduced the density of WPB attacks and WPB successful attacks on attractant-baited trees. A significantly higher percentage of pitchouts (unsuccessful WPB attacks) occurred on NAVV-treated trees during two of three sample dates. In addition, significantly fewer RTB attacks were observed on NAVV-treated trees during all sampling dates. The application of NAVV to individual ponderosa pines significantly reduced tree mortality, with only 4 of 30 attractant-baited trees dying from hark beetle attack while 50% mortality (15/30) was observed in the untreated, baited control. To our knowledge, this is the first report establishing the effectiveness of NAVs and verbenone for protecting individual ponderosa pines from WPB attack.
Gillette, Nancy E., John D . Stein., Donald R . Owen., Jeffrey N . Webster., Gary O . Fiddler., Sylvia R . Mori and David L . Wood., 2006. Verbenone-releasing flakes protect individual *Pinus contorta* trees from attack by *Dendroctonus ponderosae* and *Dendroctonus valens* (Coleoptera: Curculionidae, Scolytinae) Agricultural and Forest Entomology (2006) 8, 243�251
Joseph, Gladwin., Rick G. Kelsey., Robert W. Peck and Chris G. Niwa., 2001. Responses of some scolytids and ther predators to Ethanol and 4-Allylanisole in Pine forests of Central Oregon. Journal of Chemical Ecology, Vol. 27, No. 4, 2001
Liu HaiJun, Luo YouQing, Wen JunBao, Zhang ZhiMing, Feng JiHua, Tao WanQiang., 2005. Pest risk assessment of *Dendroctonus valens*, *Hyphantria cunea* and *Apriona swainsoni* in Beijing area. Journal of Beijing Forestry University, 2005 (Vol. 27) (No. 2) 81-87
Summary: Abstract: According to the international methods of pest risk analysis and characteristics of urban forestry in Beijing, a quantitative risk assessment system in Beijing for the main non-indigenous pests was proposed. This system was used to analyze three non-indigenous species, *Dendroctonus valens*, *Hyphantria cunea* and *Apriona swainsoni*. The results show that the risk of these three species in the Beijing area is 2.46, 2.30 and 2.02, all highly risky. Based on the result and extensive risk communications combined with the management experience of the Beijing Forest Protection Station, the authors proposed that effective control measures are adopted to prevent these three pests from entering Beijing area.
Liu, Y. and Dai, H. 2006. Application of bark beetle semiochemicals for quarantine of bark beetles in China. 6pp. Journal of Insect Science 6:41, available online: insectscience.org/6.41
Summary: Available from: http://insectscience.org/6.41/i1536-2442-2006-41.pdf [Accessed 14 November 2008]
Liu, Zhudong; Zhang, Longwa; Sun, Jianghua., 2006. Attacking behavior and behavioral responses to dust volatiles from holes bored by the red turpentine beetle, *Dendroctonus valens* (Coleoptera : Scolytidae). Environmental Entomology. 35(4). AUG 2006. 1030-1036.
Lutte Biologique et Ecologie spatiale (LUBIES) 2004 Current projects Lutte Biologique et Ecologie Spatiale. Biological control of *Dendroctonus valens* in China
Summary: Available from: http://www.ulb.ac.be/sciences/lubies/dvalens.html [Accessed 14 November 2008]
Miao ZhenWang, Zhang ZhongNing, Wang PeiXin, Guo YuYong, Sun JiangHua., 2004. Response of the red turpentine beetle, *Dendroctonus valens* LeConte (Coleoptera: Scolytidae) to host semiochemicals and its implication in management. Acta Entomologica Sinica, 2004 (Vol. 47) (No. 3) 360-364
Summary: Abstract: The red turpentine beetle (RTB), *D. valens*, an invasive pest from the United States became a major forest pest in its invading areas since its first outbreak in Shanxi Province, China in 1999. As an exotic pest, effective detection and monitoring is top priority in containing its further damage. The response of RTB to its host semiochemicals was explored in Shanxi Province using Lindgren funnel trap. The results indicated that 3-carene was found to be the most attractive host monoterpene tested, and it attracted significantly more beetles than did any other single or ternary blend, which was distinctly different from the previous reports conducted in its native range, west coast of the United States. The mechanism for this regional variation of RTB response to host volatiles was discussed. Increase of (-)-�-pinene did not result in any increase of beetles trapped while adding limonene which is another main component in volatile profile of *Pinus tabulaeformis*, to the standard lure used in North America (a 1:1:1 blend of (+)-a-pinene, (-)-�-pinene, and 3-carene) significantly decreased RTB response. The effect of release rate on RTB response was tested by using the standard blend at 110 mg/day, 150 mg/day, 180 mg/day and 210 mg/day, and 150 mg/day was found to be the most optimum release rate for RTB in terms of both attractiveness and economic efficiency. Thus, this effective RTB lure can be used in RTB monitoring and control.
Raffa, K. F & Smalley E. B., 1988. Host resistance to invasion by lower stem and root infesting insects of pine: response to controlled inoculations with the fungal associate *Leptographium terebrantis*. Canadian journal of forest research. 1988, vol. 18, no6, pp. 675-681 (3 p.)
Randall, Carol Bell . 2006. Red Turpentine Beetle Ecology and Management. Forest Health Protection and State Forestry Organizations
Summary: Available from: http://www.fs.fed.us/r1-r4/spf/fhp/mgt_guide/red_turpentine/red%20turpentine%20beetle.pdf [Accessed 14 November 2008]
Rappaport, Nancy Gillette, Donald R. Owen and John D. Stein. 2001. Interruption of Semiochemical-Mediated Attraction of *Dendroctonus valens* (Coleoptera: Scolytidae) and Selected Nontarget Insects by Verbenone. Environmental Entomology Article: pp. 837�841
Schweigkofler, Wolfgang; Otrosina, William J.; Smith, Sheri L.; Cluck, Daniel R.; Maeda, Kevin; Peay, Kabir G.; Garbelotto, Matteo., 2005. Detection and quantification of *Leptographium wageneri*, the cause of black-stain root disease, from bark beetles (Coleoptera : Scolytidae) in Northern California using regular and real-time PCR. Canadian Journal of Forest Research. 35(8). AUG 2005. 1798-1808.
Seybold, S. J., T. D. Paine and S. H. Dreistadt., 2008. Pest Notes Publication 7421. Integrated Pest Management for Home Gardeners and Landscape Professionals. Produced by UC Statewide IPM Program, University of California, Davis, CA 95616
Summary: Available from: http://www.ipm.ucdavis.edu/PDF/PESTNOTES/pnbarkbeetles.pdf [Accessed 14 November 2008]
Smith, Richard H., 1971. Red Turpentine Beetle. Forest Pest Leaflet 55. U.S. Department of Agriculture Forest Service Revised May 1971
Summary: Available from: http://www.barkbeetles.org/rtb/redturp.pdf [Accessed 14 November 2008]
Sun, Jianghua., Zhengwan Miao., Zhen Zhang., Zhongning Zhang and Nancy Gillette., 2004. Red Turpentine Beetle, *Dendroctonus valens* LeConte (Coleoptera: Scolytidae), Response to Host Semiochemicals in China. Environmental Entomology Volume 33, Issue 2 (April 2004) pp. 206�212

[Walker, K. 2008. Red turpentine beetle (*Dendroctonus valens*) Pest and Diseases Image Library.]
Summary: Available from: http://www.padil.gov.au/viewPestDiagnosticImages.aspx?id=305 [Accessed 14 November 2008]
Wallin, Kimberly F.; Kolb, Thomas E.; Skov, Kjerstin R.; Wagner, Michael., 2008. Forest management treatments, tree resistance, and bark beetle resource utilization in ponderosa pine forests of northern Arizona. Forest Ecology & Management. 255(8-9). MAY 15 2008. 3263-3269
Zhang, Long-wa; Gillette, Nancy E.; Sun, Jiang-hua., 2007. Electrophysiological and behavioral responses of *Dendroctonus valens* to non-host volatiles. Annals of Forest Science. 64(3). APR-MAY 2007. 267-273.
Summary: Abstract: Non-host volatiles (NHVs) that are often reported as being disruptive to coniferophagous bark beetles were tested for both electrophysiological and behavioral effects on the red turpentine beetle, *Dendroctonus valens* LeConte (Coleoptera: Curculionidae: Scolytinae), which was accidentally introduced into China in the mid-1980 s. All NHVs tested elicited dose-dependent antennal responses by *D. valens*. In Y-tube olfactometer trials, *D. valens* were repelled by NHVs tested. When NHVs were added to a kairomone blend, responses of *D. valens* were significantly inhibited. Further field trapping experiments showed that attraction of *D. valens* to kairomone baited traps was reduced by all individual NHVs, with reductions ranging from 26.3 to 70%. 1-Octen-3-ol, (Z)-3-hexen-1-ol, and (E)-2-hexen-1-ol were the three most effective NHVs, significantly reducing *D. valens* to kairomone-baited traps by 69.5, 68.3 and 66.0%, respectively. In the development and implementation of a semiochemical-based management programme for *D. valens*, NHVs may have considerable potential for disrupting the beetle s ability to locate suitable hosts.
Zhang, Longwa., Jianghua Sun., and Stephen R. Clarke., 2006. Effects of Verbenone Dose and Enantiomer on the Interruption of Response of the Red Turpentine Beetle, *Dendroctonus valens* LeConte (Coleoptera: Scolytidae), to Its Kariomones. Environmental Entomology Volume 35, Issue 3 (June 2006)

General information

Byers, J.A. 1995. Host tree chemistry affecting colonization in bark beetles, in R.T. Card� and W.J. Bell (eds.). Chemical Ecology of Insects 2. Chapman and Hall, New York, pp. 154-213.
[CABI Forestry Compendium., 2006. *Dendroctonus valens* Leconte]
Summary: Available from: http://www.cabicompendium.org/NamesLists/FC/Full/DENCVA.htm [Accessed 14 November 2008]
Cai, Yan-Wen., Xin-Yue Cheng., Ru-Mei Xu., Dong-Hong Duan., Lawrence R. Kirkendall., 2008. Genetic diversity and biogeography of red turpentine beetle *Dendroctonus valens* in its native and invasive regions. Insect Science Volume 15 Issue 4 , Pages 291 - 380 (August 2008) (p 291-301).
[Carmona, Dora. Undated. Aggregation pheromones: behavior modifying for insect management]
Summary: Available from:https://www.msu.edu/user/miller20/carmona.htm [Accessed 14 November 2008]
Cognato, Anthony, I., Jiang-Hua Sun, Miguel A. Anducho-Reyes and Donald R. Owen., 2005 Genetic variation and origin of red turpentine beetle (*Dendroctonus valens* LeConte) introduced to the People s Republic of China. Agricultural and Forest Entomology Volume 7 Issue 1, Pages 87 - 94
Erbilgin, Nadir & Kenneth F. Raffa., 2002. Association of declining red pine stands with reduced populations of bark beetle predators, seasonal increases in root colonizing insects, and incidence of root pathogens. Volume 164, Issues 1-3, Pages 1-311 (1 July 2002) Pages 221-236
Gao, B.; Wen, X; Guan, H.; Knizek, M.; Zdarek, J., 2005. Distribution and attack behaviour of the red turpentine beetle, *Dendroctonus valens*, recently introduced to China. Journal of Forest Science (Prague). 51(4). APR 05. 155-160.
Summary: Abstract: The red turpentine beetle, *Dendroctonus valens* LeConte (Coleoptera: Scolytidae), was found for the first time in China in Yangcheng and Xinshui counties, Shanxi province in 1998, and in Hebei province in 1999. The beetle mostly attacks the oil pine *Pinus tabulaeformis* Carriere. By 2003 the beetle was found in 85 counties of three provinces in north China and the area of infested pine forests covered more than 700,000 ha. The elevation above sea level of forests infested is more than 800 m. The beetles most frequently attack trees on hilltops and at the forest edge, fewer attacks occur in the centre of the stand. This correlates with the damage done to the trees by wind or man. Weak and dying trees are more vulnerable to attack than healthy ones. The most attractive breeding sites are fresh stumps. The population density of the beetles is higher in the forests on northern slopes than on southern slopes. Most of the bores in the trunk are less than 0.5 m above ground; the galleries are found also on roots.
[Gregoire, J C.; Baisier M; Drumont A; Dahlsten D L; Meyer H; Francke W., 1991. Volatile Componuds in the Larval Frass of *Dendroctonus valens* and *Dendroctonus micans* Coleoptera Scolytidae in Relation to Oviposition by the Predator *Rhizopagus grandis* Coleoptera Rhizophagidae. Journal of Chemical Ecology. 17(10). 1991. 2003-2020.]
Summary: Available from: http://www.cabicompendium.org/NamesLists/FC/Full/DENCVA.htm [Accessed 14 November 2008]
Hoebeke, E. Richard., 1994. New records of immigrant bark beetles (Coleoptera: Scolytidae) in New York: Attraction of conifer-feeding species to ethanol-baited trap logs. Entomological News. 105(5). 1994. 267-276
Summary: Abstract: A 1993 survey for the recently detected pine shoot beetle, *Tomicus piniperda*, in New York, conducted by Division of Plant Industry field personnel, New York State Department of Agriculture and Markets, has yielded specimens of two other non-indigenous bark beetles (Scolytidae). Trap logs of *Pinus sylvestris* and *P. resinosa*, baited with 95% ethanol, were placed at 100 sites across New York state, particularly in high risk areas. Pine shoot beetle was collected at 12 sites in 5 counties of western New York. *Pityogenes bidentatus*, a Palearctic species first detected in North America in New York in 1989, was trapped at two new localities in western New York. The European *Hylastes opacus*, known previously in North America from a single locality on Long Island, New York, was trapped at 32 sites in 22 counties throughout the state. Localities for all new records are listed and plotted on distribution maps. North American interception records, native distribution, economic importance, and diagnostic features for *H. opacus* are provided, and an existing key to North American *Hylastes* is modified to include this new adventive member of the fauna, Data on relative abundance are provided for other species of conifer-feeding bark beetles that were trapped, which included: *Dendroctonus erebrans*, *Dendroctonus valens*, *Dryocoetes autographus*, *Gnathotrichus materiarius*, *Hylastes porculus*, *Hylurgops rugipennis pinifex*, *Ips grandicollis*, *Ips pini*, *Orthotomicus caelatus*, *Pityophthorus* sp. prob. *puberulus*, and *Polygraphus rufipennis*.

[ITIS (Integrated Taxonomic Information System), 2008. Online Database *Dendroctonus valens* LeConte, 1860]
Summary: An online database that provides taxonomic information, common names, synonyms and geographical jurisdiction of a species. In addition links are provided to retrieve biological records and collection information from the Global Biodiversity Information Facility (GBIF) Data Portal and bioscience articles from BioOne journals.
Available from: http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=114924 [Accessed 14 November 2008]
Klepzig, Kier D.; Smalley, Eugene B.; Raffa, Kenneth F., 1995. *Dendroctonus valens* and *Hylastes porculus* (Coleoptera: Scolytidae): Vectors of pathogenic fungi (Ophiostomatales) associated with red pine decline disease. Great Lakes Entomologist. 28(1). 1995. 81-87.
Summary: Abstract: A study was conducted to determine whether *Dendroctonus valens* and *Hylastes porculus* could vector their commonly associated fungi to red pine. Field collected adult *D. valens* transmitted *Leptographium terebrantis*, *Leptographium procerum* and *Ophiostoma ips* into 45%, 30%, and 5%, respectively of the wounded red pine roots onto which they were caged. Field collected *H. porculus* transmitted *L. terebrantis*, *L. procerum* and *O. ips* into 55%, 40%, and 5%, respectively, of the wounded red pine roots onto which beetles were caged. None of the control roots, which were mechanically wounded only, were found to contain *O. ips*, whereas only one control root contained *L. terebrantis* and only one control root contained *L. procerum*. This work demonstrates that *D. valens* and *H. porculus* can vector their associated Leptographium fungi to red pine trees ana that these organisms are likely involved in red pine decline disease.
Liu, Zhudong; Zhang, Longwa; Shi, Zhanghong; Wang, Bo; Tao, Wan Qiang; Sun, Jiang-hua., 2008. Colonization patterns of the red turpentine beetle, *Dendroctonus valens* (Coleoptera: Curculionidae), in the Luliang Mountains, China. Insect Science, Volume 15, Number 4, August 2008 , pp. 349-354(6)
Morehouse, K.; Johns, T.; Kaye, J.; Kaye, A., 2008. Carbon and nitrogen cycling immediately following bark beetle outbreaks in southwestern ponderosa pine forests. Forest Ecology & Management. 255(7). APR 20 2008. 2698-2708.
Nowak, David J. and Joe R. McBride., 1992. Differences in Monterey pine pest populations in urban and natural forests. Forest Ecology and Management, 50 (1992) 133-144.
Owen, D.R.; Wood, D.L.; Parmeter, J.R., Jr. 2005. Association between *Dendroctonus valens* and black stain root disease on ponderosa pine in the Sierra Nevada of California. Canadian Entomologist. 137: 367-375.
Summary: Abstract: The host-colonization behavior of the red turpentine beetle, *Dendroctonus valens* LeConte (Coleoptera: Scolytidae), was investigated in stands of ponderosa pine,*Pinus ponderosa* P. & C. Lawson (Pinaceae), with black stain root disease in the central Sierra Nevada of California. By felling live trees, we found that trees with pitch tubes produced during the initiation of tunneling by *D. valens* had a significantly higher incidence of black stain root disease, caused by *Leptographium wageneri* var. *ponderosum* (Harrington *et* Cobb), than trees without pitch tubes. Trees with the most *D. valens* pitch tubes had the greatest likelihood of being diseased. Additionally, observations over a 3-year period revealed that trees with *D. valens* pitch tubes had a significantly higher mortality rate than trees without pitch tubes. Infection by *L. wageneri* was confirmed for most of the trees that died, and death typically did not occur without mass attacks by the western pine beetle, *D. brevicomis* LeConte, and (or) the mountain pine beetle, *D. ponderosae* Hopkins. Trees with the most *D. valens* pitch tubes had the highest mortality rate. An experiment was conducted to compare the attraction of *D. valens* and other insects to wounded-diseased, wounded-symptomless, and unwounded trees. More *D. valens*, *Spondylis upiformis* Mannerheim (Coleoptera: Cerambycidae), and *Hylastes* spp. (Coleoptera: Scolytidae) were attracted to wounded trees than to unwounded trees. Catches of these beetles on wounded-diseased trees were not significantly different from catches on wounded-symptomless trees.
Perusquia, O J., 1978. Pine Bark Beetle *Dendroctonus* spp.Taxonomy and Distribution. Boletin Tecnico Instituto Nacional de Investigaciones Forestales Mexico.(55). 1978. 1-31.
Summary: Abstract: Pine bark beetles, *Dendroctonus* spp., constitute one of the most important forest pests in Mexico. The 1st description of the genus was made by Latreille (1802) under the name of *Tomicus*, with *Dermestes piniperda* L. as the type species. Because of an error in identification the genus *Tomicus* was associated with the genus *Ips*; it was not until 100 yr later that the error was discovered, when the name *Dendroctonus* (Erichson, 1864) was widely used. Because of the insect s great economic and biological importance Wood (1961) petitioned the International Commission of Zoological Nomenclature, asking the name *Dendroctonus* be retained, with *Bostrichus micans* Kugelmann as the type species. Among the species known in Mexico are *D. mexicanus* Hopk., *D. frontalis* Zim., *D. adjunctus* Blandf., *D. brevicomis* Lec., *D. rhizophagus* T. et B., *D. valens* Lec. and *D. paralellocollis* Chap. The host species recorded, in order of importance, are *Pinus leiophylla*, *P. oocarpa*, *P. hartwegii*, *P. pringlei*, *P. douglasiana*, *P. teocote*, *P. michoacana*, *P. montezumae*, *P. herrerai*, *P. patula*, *P. pinceana*, *P. pseudostrobus*, *P. rudis*, *P. durangensis*, *P. engelmanni* and *P. onderosa* var. *contorta*.
Rabaglia, Robert. J., 2003. Annotated list of the bark and ambrosia beetles (Coleoptera: Scolytidae) of Maryland, with new distributional records. Proceedings of the Entomological Society of Washington. 105(2). April 2003. 373-379.
Summary: Abstract: A total of 110 species of Scolytidae are reported from Maryland. Thirty species reported new to Maryland are: *Hylastes opacus* Erichson, *Dendroctonus valens* LeConte, *Tomicus piniperda* (L.), *Phloeotribus dentifrons* (Blackman), *Carphoborus bicornis* Wood, *Polygraphus rufipennis* (Kirby), *Hylocurus flaglerensis* Blackman, *Micracisella opacicollis* (LeConte), *Ips avulsus* (Eichhoff), *Dryocoetes affaber* (Mannerheim), *D. autographus* (Ratzburg), *D. granicollis* (LeConte), *Lymantor decipiens* (LeConte), *Trypodendron betulae* Swaine, *T. lineatum* (Olivier), *T. retusum* (LeConte), *T. scabricollis* (LeConte), *Ambrosiodmus obliquus* (LeConte), *Xyleborus planicollis* Zimmermann, *Xylosandrus crassiusculus* (Motschulsky), *Cryphalus rubentis* Hopkins, *Pityoborus commatus* (Zimmermann), *Pityophthorus balsameus* Blackman, *P. cariniceps* LeConte, *P. confusus* Blandford, *P. liquidambarus* Blackman, *P. opaculus* LeConte, *P. puberulus* (LeConte), *Pseudopityophthorus asperulus* (LeConte), and *Corthylus punctatissimus* (Zimmermann). Of the 110 species reported in the state, 19 are not native to North America.
Roques, Alain., Jiang-Hua Sun., Marie-Anne Auger-Rozenberg and Ouyang Hua., Potential invasion of China by exotic insect pests associated with tree seeds. Biodiversity and Conservation Volume 12, Number 11 / November, 2003
Stephen, F. M. and J.C. Gr�goire., Introduction and Establishment of Exotic Bark Beetles. In An International Online Workshop to reduce movement of forest pests with a minimal impact on trade held April 16-29, 2001.
Stephen, F. M. and J.C. Gr�goire. Undated. Introduction and Establishment of Exotic Bark Beetles. Exotic Forest Pests Online Symposium

Walker, R. F; Fecko, R. M.; Frederick, W. B.; Johnson, D. W.; Miller, W. W., 2007. Forest health impacts of bark beetles, dwarf mistletoe, and blister rust in a Lake Tahoe Basin mixed conifer stand. Western North American Naturalist. 67(4). DEC 2007. 562-571.
Summary: Abstract: Interactions between forest health variables and mensurational characteristics in an uneven-aged eastern Sierra Nevada mixed conifer stand were examined. The stand was located in the Lake Tahoe Basin on a site featuring a coarsely textured granitic soil and numerous rock outcrops. Its composition was dominated by California white fir (*Abies concolor* var. *iowiana* [Gord.] Lemm.), with Jeffrey pine (*Pinus jeffreyi* Grev. & Balf) and sugar Pine (*Pinus lambertiana* Dougl.) less prominent and incense-cedar (*Libocedrus decurrens* Turn) and mountain alder (*Alnus tenuifolia* Nutt.) the most minor constituents. The majority of saplings and seedlings were white fir. The stand exhibited no evidence that its development had been influenced 1)), fire and, overall, it consisted of numerous small trees accruing little radial growth. Nearly one-quarter of all standing stems pole size or larger were dead, with mortality concentrated in white fir. Forest-floor fuel accumulations were excessive, and coarse debris was especially prominent. A fir engraver beetle (*Scolytus ventralis* LeConte) epidemic in white fir contrasted against apparent endemic population levels of the jeffrey pine (*Dendroctonus jeffreyi* Hopkins) and red turpentine (*Dendroctonus valens* LeConte) beetles in Jeffrey pine and of the mountain pine beetle (*Dendroctonus ponderosae* Hopkins) in sugar pine. The severity of fir engraver attack on white fir was weakly related to overall tree size and to the proportion of composition consisting of this host species, while in Jeffrey pine and sugar pine, bark beetle attacks were strongly correlated with the individual proportions of these 2 hosts. Across all species, basal area explained a substantial proportion of the variation in overall attack severity We found light infestations of true fir dwarf mistletoe (*Arceuthobium abietinum* Engelm. ex Munz f. sp. *concoloris*) in white fir and western dwarf mistletoe (*Arceuthobium campylopodum* Engelm.) in Jeffrey pine, plus an early stage of infection by the white Pine blister rust (*Cronartium ribicola* J.C. Fischer) in sugar pine. Collectively, this case study characterized and quantified many of the conditions, symptoms, and causative agents inherent in a decadent mixed conifer stand in the eastern Sierra Nevada.
WIlliams, Kelly., Joel D. McMillin, Tom E. DeGomez, Karen M. Clancy, And Andy Miller., 2008. Influence of Elevation on Bark Beetle (Coleoptera: Curculionidae,cScolytinae) Community Structure and Flight Periodicity in Ponderosa Pine Forests of Arizona, *Environ. Entomol. 37*(1): 94-109
Xu, Haigen., Sheng Qiang, Zhengmin Han, Jianying Guo, Zongguo Huang, Hongying Sun, Shunping He, Hui Ding, Hairong Wu and Fanghao Wan., 2006. The status and causes of alien species invasion in China. Biodiversity and Conservation Volume 15, Number 9 / August, 2006
Yan, Zhengliang., Jianghua Sun., Owen Don and Zhongning Zhang., 2005. The red turpentine beetle, *Dendroctonus valens* LeConte (Scolytidae): an exotic invasive pest of pine in China. Biodiversity and Conservation Volume 14, Number 7 / June, 2005
Zhang Long-Wa; Lu Ming; Liu Zhu-Dong; Sung Jiang-Hua., 2007. Progress on invasion biology and chemical ecology of red turpentine beetle, *Dendroctonus valens*. Chinese Bulletin of Entomology. 44(2). Mar 2007. 171-178.
Summary: Abstract: The red turpentine beetle, *Dendroctonus valens* LeConte, native in North America, is a destructive exotic pest of pines in China. Since its first large outbreak in 1999 in Shanxi Province, *D. valens* has spread rapidly to the adjacent provinces Hebei, Henan and Shaanxi, and has infested over 500 000 bra of Chinese pine stands, killing more than 6 million trees to date. Here, we report the recent progress, principally results of our researches on the *D. valens*, including the origin of introduction, the response to host monoterpenes, the pheromone identification, the potential repellents, the relationship of the invasion with the fungal symbionts. Historic records and molecular data support the hypothesis that the introduction of *D. valens* to China was recent and originated from the Pacific North west of the U. S. A. The studies on the response to host volatiles by native and introduced populations showed that (+)- 3 - Carene was the most attractive monoterpene for the native and Chinese populations of *D. valens*, and (+)- 3 - Carene is thus broadly applicable for monitoring *D. valens* in both China and North America. Relatively little is known of its pheromone biology. Our recent work, using gas chromatographic and mass spectral (GC-MS) analysis of hindgut volatiles, revealed the presence of Trans-verbenol, Cis-verbenol, Myrtenol, Myrtenal, and Verbenone, and the bioactivity of these oxygenated monoterpenes to *D. valens* were confirmed. Although the appropriateness of classifying these compounds as pheromones is still uncertain, these compounds clearly have potential for use in management of this important invasive beetle. Verbenone, an antiaggregant for many bark beetles, has been shown to be effective in interrupting the response of *D. valens* to host volatiles and has a dose-dependent effect in its interruption. All of these results indicate that Verbenone functions as a multipurpose pheromone for *D. valens*. In the studies of responses of *D. valens* to non-host volatiles (NHVs) 1-Octen-3-ol, (Z)-hexen-1-ol, and (E)-2-hexen-1-ol were the three most effective NHVs, significantly reducing *D. valens* to kairomone-baited traps. In the development and implementation of a semiochemical-based management programme for *D. valens*, NHVs and Verbenone may have considerable potential for disrupting the beetle s ability to locate suitable hosts. A novel lure release device, Sun vial, devised and patented in China, was broadly applied in the management on the *D. valens*. At present, studies on the fungal symbionts of *D. valens* in both China and North America and the chemical communication relationships of *D. valens* with native bark beetles are well underway. The aims of these studies are to determine the importance of behavioral chemistry and fungal associates in the invasiveness and aggressiveness of *D. valens* and to test our hypothesis What goes around and what comes around.