

PEST RISK ANALYSIS FOR *Monochamus sartor*

Summary

Monochamus sartor is a European wood-boring beetle that has been intercepted frequently in the UK, but has never established. It is found in mountain regions in central and eastern Europe and in the UK the most similar natural habitat where it might establish is the Scottish highlands. The beetle is a secondary pest whose larvae bore into the wood and it can cause damage to recently felled or salvaged timber, which may reduce the value, depending on end-use. *Monochamus sartor* is a potential vector for the pine wood nematode, although at present the distributions of beetle and nematode are widely separated and the two organisms are unlikely to come into contact.

STAGE 1: PRA INITIATION

1. What is the name of the pest?

Monochamus sartor (Fabricius, 1787)

(Coleoptera: Cerambycidae)
Sawyer beetle – a wood boring beetle.

There are unresolved taxonomic issues with *Monochamus sartor*. The beetle has been shown to have a strong genetic affinity with *Monochamus urussovii* (Fischer, 1806) and the two are mentioned by different sources as either vicariant or one a subspecies of the other. Both have independently been considered synonyms of *Monochamus rosenmuelleri* (Cesari, *et al.*, 2004; Danilevsky, 2007). *Monochamus sartor* and *Monochamus urussovii* are documented occupying different geographical locations, with little overlap (Bense, 1995) and for the purpose of this PRA they are treated as separate species, the focus being on *Monochamus sartor*, though with special mention to *M. urussovii* where comparison is relevant.

2. What is the pest's status in the Plant Health Directive (Council Directive 2000/29/EC¹)?

Monochamus sartor is native to Europe and is not listed in any part of the Plant Health Directive. However, all non-European *Monochamus spp.* are I A I listed. Their importance is as vectors of *Bursaphelenchus xylophilus* (pine wood nematode), which is a II A I listed pest.

3. What is the recommended quarantine status of the pest in the lists of the European and Mediterranean Plant Protection Organisation (EPPO)?

¹ http://europa.eu.int/eur-lex/en/consleg/pdf/2000/en_2000L0029_do_001.pdf

EPPO A1 regulated A2 regulated Action Alert
 List: pest list pest list list list

Monochamus sartor is native to Europe and does not occur on any EPPO recommended quarantine list. The nematode *Bursaphelenchus xylophilus* (pine wood nematode), and its vectors in the genus *Monochamus*, is listed as an A1 regulated pest (EPPO, 2007).

4. What is the reason for the PRA?

Records of *Monochamus sartor* being found in the UK date back to the 1800s (Forestry Commission, unpublished). There are no native beetles from the genus *Monochamus* in the UK, but species of this genus are found from time to time, probably originating from importations (Rejzek, 2007; Seymour, 1989). Both CSL and Forestry Commission have records of *M. sartor* finds over many years. However, between 24th May 2007 and 5th July 2007 *M. sartor* was detected and identified by CSL diagnosticians three times in the UK (CSL unpublished data, 2007). In response to this relatively frequent number of finds over a short space of time, and recognising that *M. sartor* has the potential to act as a vector of *Bursaphelenchus xylophilus*, a PRA was initiated.

5. What is the PRA area?

Monochamus sartor is a central European species. This PRA, therefore, considers the UK only.

STAGE 2: PEST RISK ASSESSMENT

6. What is the pest's present geographical distribution?

Monochamus sartor occurs across Europe, from eastern France to the Ukraine, and is mainly found in mountain regions (Kolk & Starzyk, 1996).

Table 1: Distribution of *Monochamus sartor*

North America:	No records – presumed absent
South America:	No records – presumed absent
Europe:	There are multiple records of <i>Monochamus sartor</i> in Albania, Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, France, Germany, Hungary, Italy, Lithuania, Poland, Romania, Serbia and Montenegro, Slovakia, Slovenia, Switzerland and the Ukraine. Mentions are also made of the beetles' presence in Belarus, Norway and Sweden, but are uncorroborated. Some sources also mentioned the beetles' presence in Latvia, but it does not appear in the checklist of Latvian species (Telnov, 2004). <i>M. urussovii</i> is documented in the Scandinavian and Baltic regions, particularly in Norway, Sweden and Finland (Bense, 1995).
Africa:	No records – presumed absent
Asia:	There are records in some papers of <i>Monochamus sartor</i> being present in Japan (Kojima, 1931; Kôno, 1938), but these are assumed to be <i>M. urussovii</i> , which is present in this region.
Oceania:	No records – presumed absent

References: Bense, 1995; Danilevsky, 2007; Escherich, 1917; Gwardjan, 2000; Hellrigl, 1971; Hoyer-Tomiczek & Tomiczek, 2005; Kolk & Starzyk, 1996; Migliaccio *et al.*, 2004; Pfeffer, 1932; Schimitschek, 1932; Slama, 2006; Stumpf, 2001; Svihra *et al.*, 1972; Telnov, 2004; Urek, 2004.

7. Is the pest established or transient² in the PRA area?

Although *M. sartor* has been captured in the UK on a number of occasions, the beetle is not known to be established or to maintain transient populations (Rejzek, 2007; Seymour, 1989). Amongst those records that provide additional information, the majority document the beetle as being associated with imported wood or timber yards (Day, 1927; Saunt, 1927; Fowler 1890; FC & CSL, unpublished data).

It is also noted by Hellrigl (1971) that findings in Belgium, Denmark and the Netherlands are, like the UK, considered transient and the pest is not believed to have established there.

8. Is there any reason to suspect that the pest is already established in the PRA area?

Monochamus sartor has been recorded in the UK, but is not known ever to have established.

9. What are the pest's host plants?

The main host of *Monochamus sartor* is *Picea abies* (Norway spruce), with minor hosts known to include *Pinus sylvestris* (Scots pine), *Pinus cembra* (Swiss pine), *Pinus mugo* (Mountain pine) and *Abies alba* (European silver fir) (Cesari *et al.*, 2004; Kenis & Hilszczanski, 2004). *M. sartor* is a secondary pest and develops in recently felled trees and large branches, and in nearly dead, highly stressed trees that have been weakened by root fungi, defoliation, fire, wind or snow. In exceptional circumstances the beetles may attack healthy trees, but only when populations have built up to very high densities following wide-scale forest damage caused by abiotic or biotic factors (Kolk & Starzyk, 1996; Kimoto & Duthie-Holt, 2006). *Monochamus sartor* is not a primary cause of tree mortality, but causes subsequent timber degradation (Evans *et al.*, 2004; Hellrigl, 1971; Kolk & Starzyk, 1996).

Female *Monochamus sartor* beetles lay their eggs singly in small holes in the bark of a tree and, on hatching, the larvae feed under the bark, in the phloem, cambium and outer sapwood. After feeding for a month the larvae bore tunnels, about 18 mm wide into the wood, to a depth of up to 14 cm and at the end of these tunnels the larvae construct pupal chambers. Adults emerge through oval exit holes, 7.5 – 10 mm in diameter. The generation time is one year and on occasion two years (Kolk & Starzyk, 1996) and there may be many beetle larvae in a piece of timber. In a recent interception of live *Monochamus sartor* beetles, the infested beam (6x4 inches by 6 feet long) had around 100 exit holes (CSL unpublished data, 2007).

² Transience: presence of a pest that is not expected to lead to establishment (ISPM 5)

10. What hosts are of economic and/or environmental importance in the PRA area?

All the pest's known host species are present in the UK, as well as a number of other *Picea*, *Pinus* and *Abies* species (Preston *et al.*, 2002; BSBI, 2000). *Picea abies* and *Pinus sylvestris* are both widespread species, with *Picea abies* being commonly grown for timber, pulping and Christmas trees and *Pinus sylvestris* being a forestry tree, particularly favoured in the north-east, where it is actively encouraged in the Caledonian forests to which it is native.

11. If the pest needs a vector, is it present in the PRA area?

No vector is required. This is a free-living organism.

12. Describe the pathway(s) considered by this PRA³.

Monochamus sartor is most likely to enter the UK with imported wood, wooden packaging or wood products, such as furniture. Detailed import data for specific host timber is not available. However, the economic value of wood product imports in 2006 was £6.1 billion, with two thirds being pulp and paper (which would not provide a pathway). 19% of wood imports were sawnwood, and 2% roundwood (i.e. logs) (Forestry Commission, 2007) Such data will include non-host wood derived from non-coniferous trees and would include imports from countries where *M. sartor* is absent. The value of coniferous sawn wood and roundwood imports originating in the insect's known range is estimated to be closer to £85 million of which £0.4million is roundwood (Roddie Burgess, pers comm.).

13. How likely is the pest to enter the PRA area⁴? (✓)

Very unlikely Unlikely Moderately likely Likely Very likely

As shown by old records, this beetle has entered the UK on numerous occasions, usually associated with timber or wood products, and it is likely that it will do so again in the future. UK findings in the past have come from places such as Carlisle, Nottingham, Coventry, London, Devonshire, Norfolk, the Cambridge Fens, Taunton and Manchester (Day, 1927; Saunt, 1927; Fowler, 1890). Recent interceptions have been made in Wiltshire, on a trading estate, in a van in Cardigan, a warehouse in Bedfordshire and a garden shed in Suffolk (CSL unpublished data, 2007).

Wood packaging material, typically manufactured from lower quality wood with which many of the interception records are associated, is now subject to international regulation based on ISPM No. 15. Current consideration is being given to extending the scope of regulation to use of WPM within the EU (and ISPM 15 compliant material is already being used on a voluntary basis within

³ A pathway description would typically identify a geographic origin, a host and what the intended use of the host is.

⁴ Pest entry includes an assessment of the likelihood of transfer to a suitable host (ISPM No. 11, FAO, Rome)

the Community). Such controls may very well be effective at reducing the number of beetles entering the UK in future.

14. How likely is the pest to establish outdoors in the PRA area? (✓)

Very unlikely Unlikely Moderately likely Likely Very likely

Despite being found in the UK on numerous occasions *M. sartor* has never established. The reason for this probably relates to its climatic and habitat requirements. It is a central and eastern European species adapted to a continental climate and is found mainly in mountainous regions. The climate and habitats available in the UK are different to those in its native area, especially at places in the UK where *M. sartor* has been found or intercepted.

15. How likely is the pest to establish in protected environments in the PRA area? (✓)

Very unlikely Unlikely Moderately likely Likely Very likely

Monochamus sartor is a forest insect and while some propagation of conifer trees may occur under protection the hosts of this beetle are older trees and would be only found outdoors.

16. How quickly could the pest spread⁵ within the PRA area? (✓)

Very slowly Slowly Moderate pace Quickly Very Quickly

There is no documentation of the spread of this pest. Areas of central Europe where it has been found recently for the first time may have low populations that had not shown up prior to recent investigations (Gwardjan *et al.*, 2000; Migliaccio *et al.*, 2004; Stumpf, 2001). *Monochamus* adult flight is generally quite short, (tens to hundreds of metres) this reduces its ability to disperse naturally, although longer flights up to 3km have been recorded (Evans *et al.*, 1996). In the UK, *Monochamus sartor* is unlikely to spread widely across the whole PRA area due to habitat and host plant distribution, but there are no known obstacles to the beetle spreading in an area such as the Caledonian forests. The life cycle of *Monochamus sartor* usually takes one year, occasionally two and while there are no figures on the numbers of eggs laid by the female, the related species *Monochamus galloprovincialis* can lay between 11 and 24 eggs (CSL unpublished data, 1997). This annual life-cycle and low reproduction rate will also limit the rate of spread compared to many insect pests.

⁵ ISPM No 5. defines spread as the expansion of the geographic distribution of a pest within an area. Note that just because an organism can move or be transported quickly, does not mean that it will spread quickly, i.e. it also has to establish.

17. Which part of the PRA area is the endangered area?

The area that would seem to be most suitable for the UK establishment of *Monochamus sartor* is the Scottish highlands and, in the Caledonian forests in particular, there is a wealth of potential hosts. There are no known records of a find or interception in this region.

18. What is the pest's economic, environmental or social impact within its existing distribution? (✓)

Very small Small Medium Large Very large

M. sartor is a secondary pest species that does not normally attack and kill healthy trees. Larval feeding damage results in timber degradation, but over most of its European range the economic impact of this species is minimal. The exception has been in the East Carpathian region of Romania, where very high populations of *M. sartor* and *M. sutor* developed in response to large quantities of standing damaged or fallen trees caused by wind and snow storms in November 1995 (Mihalciuc *et al.*, 2001). Beetle infestation affected 90,000 ha in the 1990s and, in these particular circumstances, *M. sartor* was found to attack weakened standing, as well as fallen trees (Evans *et al.*, 2004).

Monochamus sartor is also a potential vector of the pine wood nematode (see 20), although currently the only area in Europe where this organism is present is continental Portugal, notably around the Setúbal Peninsula on the Atlantic coast and the Coimbra region further north inland. The only known European vector is *Monochamus galloprovincialis*. Pine wood nematode is potentially highly damaging to pine forests in dry continental regions of Europe, especially in and around the Mediterranean (Evans *et al.*, 1996; National Eradication Programme for the Pinewood Nematode, 2007).

19. What is the pest's potential to have economic, environmental or social impacts in the PRA area? (✓)

Very small Small Medium Large Very large

Currently, there are no breeding populations of *Monochamus* species in the UK and so these wood-boring beetles would be an additional consideration for the forestry industry if they were to become established. However, although they might be difficult to eradicate if they did establish, most European countries where they are present do not consider them important pests and take no significant measures to reduce their populations (See 23), implying that the beetles are easily managed and the small losses that do occur can be withstood.

Monochamus sartor may pose a more serious threat if it is found to be a vector of PWN, although at present the known distributions of *M. sartor* and PWN are widely separated and the nematode is of greatest threat to trees

growing in dry continental regions and the Mediterranean area (Evans et al., 1996; Mota *et al.*, 1999).

20. What is the pest’s potential as a vector of plant pathogens?

High. The genus, *Monochamus*, is known to vector the pine wood nematode, *Bursaphelenchus xylophilus*, which is the causal agent of pine wilt disease. The nematode is native to North America and was introduced through the timber trade to Japan, China, Taiwan and Korea. It was detected in Portugal in 1999, at the Setúbal Peninsula on the Atlantic coast. It has since spread to the Coimbra region further north inland. PWN has found a native European host in the species *Monochamus galloprovincialis* (Mota, *et al.*, 1999; National Eradication Programme for the Pinewood Nematode, 2007).

Not all Asian and North American species of *Monochamus* are known to be vectors for the pine wood nematode and some known vectors appear to be more efficient than others, but other than their distribution and that of the nematode there are no known barriers to these beetles’ ability to vector the pest (Evans, et al., 1996). *Monochamus sartor* is not itself documented as a vector for this nematode pest, but its geographical distribution and that of the nematode do not currently coincide.

STAGE 3: PEST RISK MANAGEMENT

21. If not already present in the PRA area, how likely is the pest to continue to be excluded from the PRA area?

Outdoors: Very likely Likely Moderately likely Unlikely Very unlikely

It is very unlikely that *Monochamus sartor* will be entirely excluded from the PRA area as the larvae are difficult to detect in imported wood and the pest is not usually detected until the adult emerges from an exit hole. However, *Monochamus sartor* has been detected in the UK on a number of occasions, both in the recent and more distant past, and has never established. The reason for this may be unclear but it raises the chance of the pests’ exclusion from the UK.

In protection: Very likely Likely Moderately likely Unlikely Very Unlikely

Monochamus sartor is not a pest of protected crops (See 15).

22. If the pest enters or has entered the PRA area how likely are outbreaks to be eradicated? (✓)

Very likely Likely Moderately likely Unlikely Very unlikely

It has been noted before that *Monochamus spp.* do not seem to readily establish outside their natural ranges, indeed there are no known records of exotic *Monochamus spp.* having become established in new locations (Evans *et al.*, 1996). Most findings of *Monochamus sartor* in the UK have been in areas where wood or wood products have been brought in and up to now the beetle is not known to have established. This is most likely because of differences in climate and through being unable to find a suitable habitat. If *Monochamus sartor* were able to establish in the UK, then it is moderately likely that it could be eradicated, as it would be confined to damaged or weakened trees that are relatively easy to identify and remove, and the beetles are likely to have a slow rate of spread.

23. If eradication is not possible, what management options are available for containment and control?

In Europe, standard forestry procedures and good forest hygiene, e.g. removal of dead, dying and damaged trees are sufficient to keep *M. sartor* and its effects under control. Otherwise, monitoring by questionnaires and selective thinning are the only measures taken (Evans *et al.*, 2004). In Romania, where damage by *Monochamus spp.* has been more extensive, populations have been reduced by physical debarking of trees, forest sanitation, chemical spraying of felled trees and trapping out.

24. Conclusion

Monochamus sartor occurs in coniferous forests in mountainous regions of central and eastern Europe and there is a small chance that it might establish in the UK. Larvae of the beetle can cause damage to timber, primarily spruce, but over most of its European range it is considered a secondary pest and is controlled by good forest management. *Monochamus sartor* has been intercepted frequently in imported wood and at timber yards in the UK, but there is no evidence that it has ever established. On these grounds it is considered a very low risk to the UK and does not meet the criteria necessary for listing as a quarantine pest. This however, might need to be reassessed if *Monochamus sartor* is found to act as a vector for the pine wood nematode in Europe.

Further work that would reduce uncertainties

Area of PRA	Uncertainties	Further work that would reduce uncertainty
Taxonomy	There are uncertainties as to whether <i>Monochamus sartor</i> is sufficiently different from <i>M. urussovii</i> to make them separate species. If not then the range of this species would be considered to be much greater.	Further molecular study to determine the similarity between the two <i>Monochamus</i> .
Pathway	How much timber of host species is imported and from where?	More detail on the level of imports of timber and timber products.
Distribution	There are uncertainties with the distribution of <i>Monochamus sartor</i> in Scandinavia and the Baltic region.	Contact with these regions to determine whether <i>Monochamus sartor</i> is established or not.
Establishment	<i>Monochamus sartor</i> has undoubtedly been found in the UK on many occasions, but does not appear to have established.	More research into the limiting factors of establishment. Climate matching studies comparing central and eastern Europe and the UK.
Spread	There are uncertainties regarding the speed of spread.	More research into the life cycle of <i>M. sartor</i> .
Impact	How big an impact could the pine wood nematode have in the UK?	More research into its establishment in other areas of the world.
Management	There is little specific information on the management and control of <i>Monochamus sartor</i> , as this is not seen as the biggest threat of this genus in Europe.	Research into the potential parasitoids and predators of <i>Monochamus sartor</i> .

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Date: 19th October 2009