EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANIZATION
ЕВРОПЕЙСКАЯ И СРЕДИЗЕМНОМОРСКАЯ ОРГАНИЗАЦИЯ ПО КАРАНТИНУ И ЗАЩИТЕ РАСТЕНИЙ
ORGANIZATION EUROPEENNE ET MEDITERRANEENNE POUR LA PROTECTION DES PLANTES

00/8481
P PM Point 8.6

PEST RISK ASSESSMENT SCHEME

Organism:	***Dendrolimus sibiricus* Tschetverikov (Lepidoptera: Lasiocampidae)**
Assessor(s):	**EPPO Secretariat & EPPO Panel on Quarantine Pests for Forestry**
Date:	**13 – 14 January 2000 & 9 February 2000**
Approximate time spent on the assessment	**17 hours**

PEST RISK ASSESSMENT

STAGE 1: INITIATION **Identify pest** *This section examines the identity of the pest to ensure that the assessment is being performed on a real identifiable organism and that the biological and other information used in the assessment is relevant to the organism in question.*		
1. Is the organism clearly a single taxonomic entity and can it be adequately distinguished from other entities of the same rank? *if yes go to 3* *if no go to 2*	**Yes**	? - Many Russian scientists believe that there exists a species *Dendrolimus superans* with two subspecies: *Dendrolimus superans sibiricus* Tschetverikov widely spread in continental Russia and *Dendrolimus superans albolineatus* Matsumura which occurs on Sakhalin and Kunashir islands. But, according to the main international opinion, *Dendrolimus superans sibiricus* corresponds to the species *Dendrolimus sibiricus*, and *Dendrolimus superans albolineatus* to the species *Dendrolimus superans*.
2. Attempt to redefine the taxonomic entity so that the criteria under 1 are satisfied. Is this possible? *if yes go to 3* *if no go to 22*	Not applicable	
The PRA area *The PRA area can be a complete country, several countries or part(s) of one or several countries*		
3. Clearly define the PRA area. *go to 4*		The PRA area is the European part of the EPPO region
Earlier analysis *The pest, or a very similar pest, may have been subjected to the PRA process before, nationally or internationally. This may partly or entirely replace the need for a new PRA.*		
4. Does a relevant earlier PRA exist? *if yes go to 5* *if no go to 7*	**No**	
5. Is the earlier PRA still entirely valid, or only partly valid (out of date, applied in different circumstances, for a similar but distinct pest)? if entirely valid End if partly valid go to 6 if not valid go to 7	Not applicable	
6. Proceed with the assessment, but compare as much as possible with the earlier assessment. *go to 7*		

STAGE 2: PEST RISK ASSESSMENT **Section A: Pest categorization (qualitative criteria of a quarantine pest)**		
Geographical criteria *This section considers the geographic distribution of the pest in the PRA area.*		
7. Does the pest occur in the PRA area? *if yes go to 8* *if no go to 9*	**Yes**	
8. Is the pest of limited distribution in the PRA area? *Note: "of limited distribution" means that the pest has not reached the limits of its potential range either in the field or in protected conditions; it is not limited to its present distribution by climatic conditions or host-plant distribution. There should be evidence that, without phytosanitary measures, the pest would be capable of additional spread.* *if yes go to 18* *if no go to 22*	**Yes**	In the PRA area, the pest is limited to the north eastern and east central parts of European Russia. Available evidence suggests that it is continuing to spread.
Potential for establishment *For the pest to establish, it must find a widely distributed host plant in the PRA area (do not consider plants which are accidental/very occasional hosts or recorded only under experimental conditions). If it requires a vector, a suitable species must be present or its native vector must be introduced. The pest must also find environmental conditions suitable for survival, multiplication and spread, either in the field or in protected conditions.*		
9. Does at least one host plant grow to a substantial extent in the PRA area, in the open, in protected conditions or both? *if yes go to 10* *if no go to 22*	**Yes**	Many host plants of *D. sibiricus* are grown in the PRA area including many species of *Abies*, *Pinus*, *Larix*, *Picea*, *Tsuga* and some other coniferous trees.
10. Does the pest have to pass part of its life cycle on a host plant other than its major host (i.e. obligate alternate host plant)? *if yes go to 11* *if no go to 12*	**No**	
11. Does the alternate host plant also occur in the same part of the PRA area as the major host plant ? *if yes go to 12* *if no go to 22*	Not applicable	
12. Does the pest require a vector (i.e. is vector transmission the only means of dispersal)? *if yes go to 13* *if no go to 14*	**No**	

13. Is the vector (or a similar species which is known or suspected to be a vector) present in the PRA area or likely to be introduced. If in doubt, a separate assessment of the probability of introduction of the vector (in section B1) may be needed? *if yes go to 14* *if no go to 22*	Not applicable	
14. Does the known geographical distribution of the pest include ecoclimatic zones comparable with those of the PRA area? *if yes go to 18* *if no go to 15*	**Yes**	Because of climatic conditions in its area of present distribution, the pest is most likely to establish in northern and central countries of Europe where its host plants are important forest trees.
15. Is it probable, nevertheless, that the pest could survive and thrive in a wider ecoclimatic zone that could include the PRA area? *if yes go to 18* *if no go to 16*	Not applicable	
16. Could the ecoclimatic requirements of the pest be found in protected conditions in the PRA area? *if yes go to 17* *if no go to 22*	Not applicable	
17. Is a host plant grown in protected conditions in the PRA area? *if yes go to 18* *if no go to 22*	Not applicable	
Potential economic importance		
Economic impact principally concerns direct damage to plants but may be considered very broadly, to include also social and environmental aspects. The effect of the presence of the pest on exports from the PRA area should also be allowed for. *In deciding whether economically important damage or loss to plants may occur, it is necessary to consider whether climatic and cultural conditions in the PRA area are conducive to damage expression, which is not always the case even if both host and pest survive under these conditions.* *Note: when performing a PRA on a pest that is transmitted by a vector, consider also any possible damage that the vector may cause.*		
18. With specific reference to the host plant(s) which occur(s) in the PRA area, and the parts of those plants which are damaged, does the pest in its present range cause significant damage or loss? *if yes go to 21* *if no go to 19*	**Yes**	*D. sibiricus* significantly damages more than 20 species of *Abies*, *Pinus*, *Larix*, *Picea* and *Tsuga* in Russia (centre and north of European Russia and practically all Asian Russia except the extreme north), Kazakhstan, northern China, Korea and northern Mongolia.
19. Could the pest, nevertheless, cause significant damage or loss in the PRA area, considering ecoclimatic and other factors for damage expression? *if yes go to 21* *if no go to 20*	Not applicable	

20. Would the presence of the pest cause other negative economic impacts (social, environmental, loss of export markets)? *if yes go to 21* *if no go to 22*	Not applicable	
21. This pest could present a risk to the PRA area **Go To Section B**		
22. This pest does not qualify as a quarantine pest for the PRA area and the assessment can stop *However, if this is the first time that the decision-making scheme has directed you to this point, it may be worth returning to the question that led you here and continuing through the scheme in case the remaining questions strongly indicate categorization as a possible quarantine pest. In this latter case, seek a second opinion to decide whether the answers which led you to this point could be given a different reply.*		
Section B: Quantitative evaluation *The second part of the risk assessment process firstly estimates the probability of the pest being introduced into the PRA area (its entry and establishment) and secondly makes an assessment of the likely economic impact if that should happen. From these two aspects, it should be possible to consider the level of "pest risk" presented by the pest; this can then be used in the pest risk management phase to decide whether it is necessary to take phytosanitary measures to prevent the introduction of the pest, or if the measures chosen are appropriate for the level of risk. The questions in this section require an evaluation from minimum probability or impact (1) to maximum probability or impact (9). This must be done by an expert who can make an estimate according to the information provided (following the format of the check-list of EPPO (OEPP/EPPO, 1993a) and also according to comparison with other pests.* *Answer as many of the following questions as possible, insofar as they are relevant to the pest concerned. If you cannot answer a particular question, do not give any score. Note whether this is because of lack of information or because the question is irrelevant to the pest concerned.* *Questions marked with an asterisk (*) are to be considered as more important than the others in the same section.*		
1. Probability of introduction *Introduction, as defined by the FAO Glossary of Phytosanitary Terms, is the entry of a pest resulting in its establishment.*		
Entry		
List the pathways that the pest could be carried on. *Note: a pathway can be any form of human activity that could transport the pest from a particular origin: e.g. plants and plant products moving in trade, any other traded commodity, containers and packing, ships, planes, trains, road transport, passengers, mail, etc. Note that similar means of pest transport from different origins can present greatly different probabilities of introduction, depending on the concentration of the pest in the area of origin. The pathways given should be only those already in operation, or proposed.*		*D. sibiricus* can spread with flights of the adult moths (up to 100 km per year). All stages of the life cycle can be transported on plants moving in trade particularly plants for planting and cut branches (including Christmas trees). During outbreaks especially, eggs and larvae may be associated with wood containing bark and may be hitchhikers on other products. In decreasing order of risk, pathways for *D. sibiricus* may be: 1. Natural spread with flights of the adult moths 2. Host plants for planting and cut branches 3. Untreated wood with bark, dunnage and packing material 4. Ships, planes, trains, road transports

1.1 How many pathways could the pest be carried on? *few = 1* *many = 9* (type species for 9 – *Globodera* spp.)	**5**	
1.2 For each pathway, starting with the most important pathway identified above (i.e. that which carries the greatest trade or which is most likely to act as a means of introduction) and then in descending order of importance, answer questions 1.3 – 1.13. If one of the questions 1.3a, 1.5a, 1.7a or 1.12a is answered by 'no', the pathway could not act as a means of entry for the pest, and the scheme will return directly to this point, omitting later questions. Use expert judgement to decide how many pathways to consider. ***Go to 1.3***		
1.3a Could the pest be associated with the pathway at origin? *Note: does the pest occur in the area of origin? Is the pest in a life stage which would be associated with commodities, containers, or conveyances?* *if yes go to 1.3b* *if no go to 1.2*	**Yes** **Yes** **Yes**	Host plants for planting and cut branches Untreated wood with bark, dunnage and packing material Ships, planes, trains, road transports
1.3b How likely is the pest to be associated with the pathway at origin? [i.e. are all areas infested or highly infested; will every consignment or part of it be infested?] *not likely = 1* *very likely = 9* (type species for 9 – *Botrytis cynerea*)	**5** **2** **2**	Host plants for planting and cut branches Untreated wood with bark, dunnage and packing material Ships, planes, trains, road transports
1.4 Is the concentration of the pest on the pathway at origin likely to be high? [i.e. will there be many individuals associated with the consignment?] *not likely = 1* *very likely = 9*	**5** **2** **1**	Host plants for planting and cut branches Untreated wood with bark, dunnage and packing material Ships, planes, trains, road transports
1.5a Could the pest survive existing cultivation or commercial practices? *Note: these are practices mainly in the country of origin, such as pesticide application, removal of substandard produce, kiln-drying of wood.* *if yes go to 1.5b* *if no go to 1.2*	**Yes** **Yes** **Yes**	Host plants for planting and cut branches Untreated wood with bark, dunnage and packing material Ships, planes, trains, road transports
1.5b How likely is the pest to survive existing cultivation or commercial practices? *not likely = 1* *very likely = 9*	**9** **7** **7**	Host plants for planting and cut branches Untreated wood with bark, dunnage and packing material Ships, planes, trains, road transports

1.6 How likely is the pest to survive or remain undetected during existing phytosanitary procedures? <u>Note</u>*: existing phytosanitary measures (e.g. inspection, testing or treatments) are most probably being applied as a protection against other (quarantine) pests; the assessor should bear in mind that such measures could be removed in the future if the other pests were to be re-evaluated.* *The likelihood of detecting the pest during inspection or testing will depend on a number of factors including:* • *ease of detection of the life stages which are likely to be present. Some stages are more readily detected than others, for example insect adults may be more obvious than eggs;* • *location of the pest on the commodity. Surface feeders are more readily detected than internal feeders;* • *symptom expression - many diseases may be latent for long periods, at certain times of the year, or may be without symptoms in some hosts or cultivars and virulent in others;* • *distinctiveness of symptoms - the symptoms might resemble those of other pests or sources of damage such as mechanical or cold injury;* • *the intensity of the sampling and inspection regimes;* • *distinguishing the pest from similar organisms.* *not likely = 1* *very likely = 9* (type species for 9 – *Bursaphelenchus xylophilus* on wood)	**7** **8** **6**	For most of these pathways, inspection is the only phytosanitary measure likely to be consistently applied. Host plants for planting and cut branches Untreated wood with bark, dunnage and packing material Ships, planes, trains, road transports
1.7a Could the pest survive in transit? <u>Note</u>*: consideration should be given to:* • *speed and conditions of transport;* • *vulnerability of the life-stages likely to be transported;* • *whether the life cycle is of sufficient duration to extend beyond time in transit;* • *the number of individuals likely to be associated with a consignment.* *Interception data can be used to estimate the ability of a pest to survive in transit.* *if yes go to 1.7b* *if no go to 1.2*	**Yes** **Yes** **Yes**	Host plants for planting and cut branches Untreated wood with bark, dunnage and packing material Ships, planes, trains, road transports
1.7b How likely is the pest to survive in transit? *not likely = 1* *very likely = 9*	**7** **4** **4**	Host plants for planting and cut branches Untreated wood with bark, dunnage and packing material Ships, planes, trains, road transports
1.8 Is the pest likely to multiply during transit? *not likely = 1* *very likely = 9*	**1** **1** **1**	Host plants for planting and cut branches Untreated wood with bark, dunnage and packing material Ships, planes, trains, road transports

1.9 How large is movement along the pathway? [i.e. how much trade?] *not large = 1* *very large = 9* (type commodity for 9 – grain)	**1** **7** **8**	Host plants for planting and cut branches Untreated wood with bark, dunnage and packing material Ships, planes, trains, road transports
1.10 How widely is the commodity to be distributed throughout the PRA area? *Note: the more scattered the destinations, the more likely it is that the pest might find suitable habitats.* *not widely = 1* *very widely = 9*	**1** **8** **5**	Host plants for planting and cut branches Untreated wood with bark, dunnage and packing material Ships, planes, trains, road transports
1.11 How widely spread in time is the arrival of different consignments? *Note: introduction at many different times of the year will increase the probability that entry of the pest will occur at a life stage of the pest or the host suitable for establishment.* *not widely = 1* *very widely = 9*	**2** **9** **9**	Host plants for planting and cut branches Untreated wood with bark, dunnage and packing material Ships, planes, trains, road transports
1.12a Could the pest transfer from the pathway to a suitable host? *Note: consider innate dispersal mechanisms or the need for vectors, and how close the pathway on arrival is to suitable hosts.* *if yes go to 1.12b* *if no go to 1.2*	**Yes** **Yes** **Yes**	Host plants for planting and cut branches Untreated wood with bark, dunnage and packing material Ships, planes, trains, road transports
1.12b How likely is the pest to be able to transfer from the pathway to a suitable host? *not likely = 1* *very likely = 9*	**6** **3** **1**	Host plants for planting and cut branches Untreated wood with bark, dunnage and packing material Ships, planes, trains, road transports
1.13 Is the intended use of the commodity (e.g. processing, consumption, planting, disposal of waste) likely to aid introduction? *Note: consider whether the intended use of the commodity would destroy the pest or whether the processing, planting or disposal might be done in the vicinity of suitable hosts.* *not likely = 1* *very likely = 9*	**7** **2** **1**	Host plants for planting and cut branches Untreated wood with bark, dunnage and packing material Ships, planes, trains, road transports
Establishment		
1.14 How many host-plant species are present in the PRA area? *one or very few = 1* *many = 9*	**8**	Almost all host plants of *D. sibiricus* are present in the PRA area, including *Abies*, *Pinus*, *Larix*, *Picea*, *Tsuga* and some other coniferous trees.
1.15 How extensive are the host plants in the PRA area? *rare = 1* *widespread = 9*	**8**	Host plants of *D. sibiricus* are widely distributed in the PRA area in forests and parks.

1.16 If an alternate host is needed to complete the life cycle, how extensive are such host plants in the PRA area? *rare = 1* *widespread = 9*	Not applicable	
1.17 *1If a vector is needed for dispersal, how likely is the pest to become associated with a suitable vector? *Note: is the vector present in the PRA area, could it be introduced or could another vector be found?* *not likely = 1* *very likely = 9*	Not applicable	
1.18 Has the pest been recorded on crops in protected conditions elsewhere? (Answer this question only if protected cultivation is important in the PRA area.) *no = 1* *often = 9*	Not applicable	
1.19 How likely are wild plants (i.e. plants not under cultivation, including weeds, volunteer plants, feral plants) to be significant in dispersal or maintenance of populations? *not likely = 1* *very likely = 9*	Not applicable	Suitable host species are widely present in the PRA area and maintain themselves by natural regeneration.
1.20 *How similar are the climatic conditions that would affect pest establishment in the PRA area and in the area of origin? *Note: the climatic conditions in the PRA area to be considered may include those in protected cultivation.* *not similar = 1* *very similar = 9*	**7**	Centre and north of Europe have similar climatic conditions to the area of origin and present distribution of the pest.
1.21 How similar are other abiotic factors in the PRA area and in the area of origin? *Note: the major abiotic factor to be considered is soil type; others are, for example, environmental pollution, topography/orography.* *not similar = 1* *very similar = 9*	**9**	In general, abiotic factors would not be a constraint to successful establishment of *D. sibiricus*.
1.22 How likely is the pest to have competition from existing species in the PRA area for its ecological niche? *very likely = 1* *not likely = 9*	**8**	The native defoliators of coniferous have only temporarily high level of their populations on the same host plants and it is unlikely that they would pose significant competition to *D. sibiricus*.

[1] Questions marked with an asterisk are to be considered as more important than the others in the same section.

1.23 How likely is establishment to be prevented by natural enemies already present in the PRA area? *very likely = 1* *not likely = 9*	**7**	Generalist natural enemies, such as hymenopterous parasitoids, predatory beetles and birds could have an influence on *D. sibiricus* populations, but could not prevent its spread and establishment.
1.24 *If there are differences in the crop environment in the PRA area to that in the area of origin, are they likely to aid establishment? *Note: factors that should be considered include time of year that the crop is grown, soil preparation, method of planting, irrigation, whether grown under protected conditions, surrounding crops, management during the growing season, time of harvest, method of harvest, etc.* *not likely = 1* *very likely = 9*	**5**	Any differences in forestry practices are unlikely to influence establishment
1.25 Are the control measures which are already used against other pests during the growing of the crop likely to prevent establishment of the pest? *very likely = 1* *not likely = 9*	**7**	Measures carried out against insects attacking host plants of *D. sibiricus* in the PRA area could not prevent its spread and establishment.
1.26 *Is the reproductive strategy of the pest and duration of life cycle likely to aid establishment? *Note: consider characteristics which would enable the pest to reproduce effectively in a new environment, such as parthenogenesis/self-crossing, duration of the life cycle, number of generations per year, resting stage, etc.* *not likely = 1* *very likely = 9* (type species for 9 – aphids)	**3**	
1.27 How likely are relatively low populations of the pest to become established? *not likely = 1* *very likely = 9* (type species for 9 – aphids)	**4**	
1.28 How probable is it that the pest could be eradicated from the PRA area ? *very likely = 1* *not likely = 9*	**9**	The experience of *D. sibiricus* control in its present area shows that it is very difficult to eradicate this pest.
1.29 How genetically adaptable is the pest? *Note: is the species polymorphic, with, for example, subspecies, pathotypes? Is it known to have a high mutation rate? This genotypic (and phenotypic) variability facilitates the pest's ability to withstand environmental fluctuations, to adapt to a wider range of habitats, to develop pesticide resistance and to overcome host resistance.* *not adaptable = 1* *very adaptable = 9*	**7**	*D. sibiricus* is widespread in its present range and is found in ecologically different areas. It is considered that the region of origin of the pest is Siberia and that it then spread westwards to the European part of Russia. The pest continues to increase its distribution area in Europe at a rate that has been variously estimated as 12 km per year or 40-50 km per year. This shows the adaptability of the pest and its capacity to spread.

1.30 *How often has the pest been introduced into new areas outside its original range? *Note: if this has happened even once before, it is important proof that the pest has the ability to pass through most of the steps in this section (i.e. association with the pathway at origin, survival in transit, transfer to the host at arrival and successful establishment). If it has occurred often, it suggests an aptitude for transfer and establishment.* *never = 1* *often = 9*	**4**	Although there are no documented data on the introduction of *D. sibiricus* into new areas, the pest has nevertheless spread extensively from its original range and it is probable that human activity has contributed to this spread.
2. Economic Impact Assessment *Identify the potential hosts in the PRA area, noting whether wild or cultivated, field or glasshouse. Consider these in answering the following questions. When performing a PRA on a pest that is transmitted by a vector, consider also any possible damage that the vector may cause.* *According to the pest and host(s) concerned, it may be appropriate to consider all hosts together in answering the questions once, or else to answer the questions separately for specific hosts.* *Note that, for most pest/crop/area combinations, precise economic evaluations are lacking. In this section, therefore, expert judgement is asked to provide an evaluation of the likely scale of impact. Both long-term and short-term effects should be considered for all aspects of economic impact.*		
2.1 *How important is economic loss caused by the pest within its existing geographic range? *little importance = 1* *very important = 9*	**9**	*D. sibiricus* is the most important defoliator of coniferous trees in the region of its present distribution. It attacks both stressed and healthy trees of different ages. Its outbreaks occur throughout enormous areas (many thousands of hectares) and often lead to the death of forests.
2.2 How important is environmental damage caused by the pest within its existing geographic range? *Note: environmental damage may be impact on ecosystem health, such as effects on endangered/threatened species, keystone species or biodiversity.* *little importance = 1* *very important = 9*	**Difficult to give a value**	*D. sibiricus* causes the death of forests over large areas, either directly or by leaving the forest susceptible to subsequent attack by other forest pests, and/or by predisposing the forest to forest fires. The reforestation of these areas is often very complicated and takes much time. This results in serious changes of environment over large areas.
2.3 How important is social damage caused by the pest within its existing geographic range? *Note: social effects could be, for example, damaging the livelihood of a proportion of the human population, or changing the habits of a proportion of the population (e.g. limiting the supply of a socially important food).* *little importance = 1* *very important = 9*	**8**	The death of forests caused by *D. sibiricus* on large territories has a big social influence on the people living in damaged areas. Large scale pesticide treatments influence the social value of forest berries and mushrooms.

2.4 *How extensive is the part of the PRA area likely to suffer damage from the pest? *Note: the part of the PRA area likely to suffer damage is the endangered area, which can be defined ecoclimatically, geographically, by crop or by production system (e.g. protected cultivation).* *very limited = 1* *whole PRA area = 9*	**6**	The endangered part of the PRA area covers primarily northern and central parts of Europe (Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Latvia, Lithuania, Netherlands, Norway, Poland, Slovakia, Sweden, Switzerland, UK) as well as mountain areas of some other countries. Within that area susceptible host plants occur throughout.
Spread potential is an important element in determining how fast economic impact is expressed and how readily a pest can be contained.		
2.5 *How rapidly is the pest liable to spread in the PRA area by natural means? *very slowly = 1* *very rapidly = 9*	**7**	Natural spread by means of adult flight is rather fast for this pest. Moths are good flyers.
2.6 How rapidly is the pest liable to spread in the PRA area by human assistance? *very slowly = 1* *very rapidly = 9*	**6**	The pest can be transported and spread with planting material, wood and wood products and by transport means.
2.7 How likely is it that the spread of the pest could be contained within the PRA area? *Note: consider the biological characteristics of the pest that might allow it to be contained in part of the PRA area; consider the practicality and costs of possible containment measures.* *very likely = 1* *not likely = 9*	**7**	Once established, it would be quite difficult to contain the spread of the pest.
2.8 *Considering the ecological conditions in the PRA area, how serious is the direct effect of the pest on crop yield and/or quality likely to be? *Note: the ecological conditions in the PRA area may be adequate for pest survival but may not be suitable for significant damage on the host plant(s). Consider also effects on non-commercial crops, e.g. private gardens, amenity plantings.* *not serious = 1* *very serious = 9*	**6**	Considering the similarity of ecological conditions, the direct damage in the PRA area should be not much less than in the present area of the pest.
2.9 How likely is the pest to have a significant effect on producer profits due to changes in production costs, yields, etc., in the PRA area? *not likely = 1* *very likely = 9*	**6**	Similar to the present area of the pest.

2.10 How likely is the pest to have a significant effect on consumer demand in the PRA area? *Note: consumer demand could be affected by loss in quality and/or increased prices.* *not likely = 1* *very likely = 9*	**4**	Similar to the present area of the pest.
2.11 How likely is the presence of the pest in the PRA area to affect export markets? *Note: consider the extent of any phytosanitary measures likely to be imposed by trading partners.* *not likely = 1* *very likely = 9*	**6**	Other parts of the world (e.g. North America) may, in future, decide to take phytosanitary measures against *D. sibiricus*.
2.12 How important would other costs resulting from introduction be? *Note: costs to the government, such as research, advice, publicity, certification schemes; costs (or benefits) to the crop protection industry.* *little importance = 1* *very important = 9*	**5**	
2.13 How important is the environmental damage likely to be in the PRA area? *little importance = 1* *very important = 9*	**Difficult to give a value**	Considering the similarity of ecological conditions and forest practices, the environmental damage in the PRA area should be not much less than in the present area of the pest.
2.14 How important is the social damage likely to be in the PRA area? *little importance = 1* *very important = 9*	**6**	The death of forests caused by *D. sibiricus* on large territories may have a social influence on the people living in damaged areas. This point also concerns the social value of forest berries and mushrooms influenced by pesticide treatments.
2.15 How probable is it that natural enemies, already present in the PRA area, will affect populations of the pest if introduced? *very likely = 1* *not likely = 9*	**8**	It could be assumed that specialised natural enemies present in the existing range of *D. sibiricus* are not yet present in the PRA area. Some polyphagous predators and parasitoids may nevertheless reduce insignificantly pest populations.
2.16 How easily can the pest be controlled? *Note: difficulty of control can result from such factors as lack of effective plant protection products against this pest, occurrence of the pest in natural habitats or amenity land, simultaneous presence of more than one stage in the life cycle, absence of resistant cultivars).* *easily = 1* *with difficulty = 9*	**8**	The practice of *D. sibiricus* control in its present area shows that it is very difficult to control or eradicate it and that control measures are usually very expensive due to the very large territories infested.
2.17 How likely are control measures to disrupt existing biological or integrated systems for control of other pests? *not likely = 1* *very likely = 9*	**5**	

2.18 How likely are control measures to have other undesirable side-effects (for example on human health or the environment)? *not likely = 1* *very likely = 9*	**5**	Control measures on large territories risk having undesirable side-effects on water pollution, human health and forest environment; elsewhere such measures could have effects on the environment.
2.19 Is the pest likely to develop resistance to plant protection products? *not likely = 1* *very likely = 9*	**1**	No information on this or related species is available
After completing this section, the assessor should comment on whether sufficient information exists to trust the answers given; or if he/she knows of other relevant factors that have not been considered in this evaluation		Information on *D. sibiricus* in its present range is very considerable. The conclusions of the PRA can, therefore, be considered to be rather reliable

3. Final Evaluation

At the end of the procedure, the assessor will have at his disposal:
(1) one or several sets of replies (1-to-9 scores) to questions 1.1-1.13, for one or several pathways (if no pathways have been retained, the probability of introduction will be zero);
(2) one set of replies (1-to-9 scores) to questions 1.14-1.30;
(3) one or several sets of replies (1-to-9 scores) to questions 2.1-2.19, for single, grouped or separate hosts (according to the manner of answering which has been chosen).

The assessor should first consider the quality and quantity of the information used to answer the questions, and give an overall judgement of how reliable the pest risk assessment can be considered. If other relevant information is available that has not been considered, this should be noted.

By the means of his choice, the assessor should attempt to make a separate estimate of the probability of introduction of the pest and its probable level of economic impact. As explained in the introduction, these estimates cannot, on the basis of the procedure used in the scheme, be expressed in absolute units. The numerical scores may be combined, weighted and averaged in appropriate ways that may enable the assessor who uses them consistently to make useful comparisons between pests, pathways and hosts. No particular mode of calculation is specifically recommended by EPPO. Certain questions have been identified as more important than others, and the assessor should take due account of this.

The assessor may then combine his estimates of probability of introduction and probable economic impact to formulate a single estimate of pest risk. This may usefully be compared with one or several reference levels of risk to decide whether the pest should be considered to be a quarantine pest, so that phytosanitary measures should be taken against it.

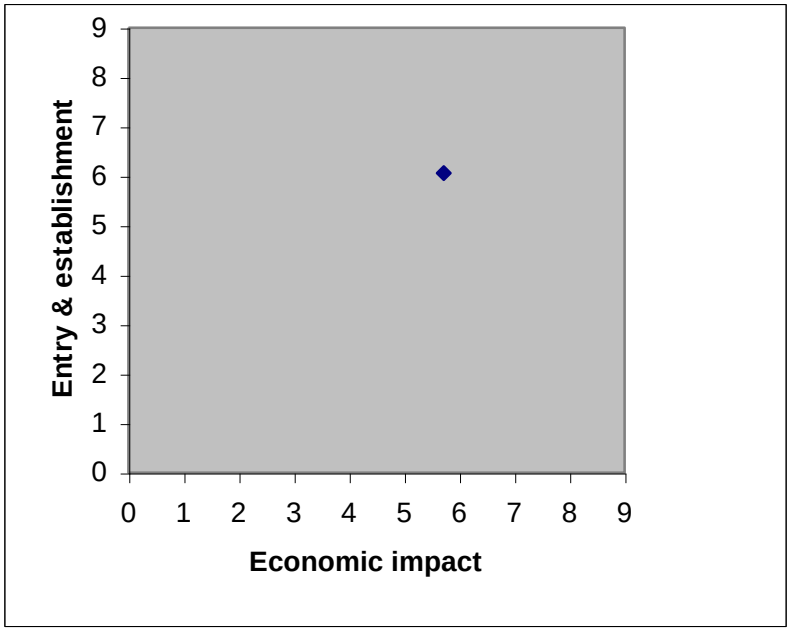
Finally, the scores given in answer to the different sections (particularly that on pathways) may be used again in pest risk management.

Conclusions

The results of the assessment show that the probability of the entry of the *D. sibiricus* to the PRA area (European part of the EPPO region) is most likely by natural spread with flights of adult moths and with untreated wood with bark, dunnage or packing material (a mean score of 4.82) and less likely with host plants for planting and cut branches (4.64) and with means of transport (4.09). The probability of establishment is very high (a score of

6.62), particularly in a part of the PRA area; the endangered is primarily northern and central parts of the European EPPO region (Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Latvia, Lithuania, Netherlands, Norway, Poland, Slovakia, Sweden, Switzerland, UK) as well as mountain areas of some other countries. The potential impact within the endangered area is also high (a score of 6.06) including both the direct damage to coniferous plantations and forests (mainly *Abies*, *Pinus*, *Larix*, *Picea*) resulting in wood losses, environmental damage to natural forests resulting in their death on large areas, and social damage to people living in damaged areas.

The overall comparative risk is shown on the graph below (which plots the probability of introduction with host plants for planting and cut branches against the potential economic impact).



Summary quantitative risk assessment for *Dendrolimus sibiricus*

Questions in EPPO scheme	Evaluation of the probability of introduction by pathways:			Establishment		Impact	
	Untreated wood with bark	Host plants for planting and cut branches	Ships, planes, trains, road transports	Questions in EPPO scheme	Evaluation	Questions in EPPO scheme	Evaluation
1.1	5			1.14	8	2.1*	9
1.3b	2	5	2	1.15	8	2.2	-
1.4	2	5	1	1.16	-	2.3	8
1.5b	7	9	7	1.17*	-	2.4*	6
1.6	8	7	6	1.18	-	2.5*	7
1.7b	4	7	4	1.19	-	2.6	6
1.8	1	1	1	1.20*	7	2.7	7
1.9	7	1	8	1.21	9	2.8*	6
1.10	8	1	5	1.22	8	2.9	6
1.11	9	2	9	1.23	7	2.10	4
1.12b	3	6	1	1.24*	5	2.11	6
1.13	2	7	1	1.25	7	2.12	5
Total	**53**	**51**	**45**	1.26*	3	2.13	-
Average	**4.82**	**4.64**	**4.09**	1.27	4	2.14	6
				1.28	9	2.15	8
				1.29	7	2.16	8
				1.30*	4	2.17	5
				Total	**86**	2.18	5
				Average	**6.62**	2.19	1
						Total	**103**
	5.72					**Average**	**6.06**