Rapid assessment of the need for a detailed Pest Risk Analysis for *Trichodorus cedarus* Yokoo, 1964

Disclaimer: This document provides a rapid assessment of the risks posed by the pest to the UK in order to assist Risk Managers decide on a response to a new or revised pest threat. It does not constitute a detailed Pest Risk Analysis (PRA) but includes advice on whether it would be helpful to develop such a PRA and, if so, whether the PRA area should be the UK or the EU and whether to use the UK or the EPPO PRA scheme.

STAGE 1: INITIATION

1.What is the name of the pest?

Trichodorus cedarus Yokoo, 1964 Trichodoridae Nematoda
Syn. *Trichodorus longistylus* Yokoo, 1964
Trichodorus kurumeensis Yokoo, 1966

2. What is the pest's status in the EC Plant Health Directive (Council Directive 2000/29/EC[1]) and in the lists of EPPO[2]?

Not listed in the EC Plant Health Directive, or any EPPO lists, i.e. the A1 and A2 Lists of pests recommended for regulation as quarantine pests; the EPPO Alert List or the EPPO Action List.

3. What is the reason for the rapid assessment?

This species had been intercepted four times between 2006 and 2007, with action taken on all occasions. An assessment is required to help inform decision making regarding any future interceptions.

STAGE 2: RISK ASSESSMENT

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

Trichodorus cedarus is probably native to the Far East, e.g. Japan, South Korea and China (Yokoo, 1964; Mamiya, 1969; Lee, 1976; Xu & Decraemer, 1995). It is suspected to have been spread to Spain (Pena Santiago *et al*. 1988; Decraemer, 1995) and Florida (Mead, 1974, one record not checked).

5. Is the pest established or transient, or suspected to be established/transient in the UK?

This species is not known to be established in the UK.

UK *Interception data*

Country of Origin	Host	Date received
Japan	*Ilex crenata*	05/04/2006
Japan	*Pinus parviflora*	26/01/2007
Japan	*Ilex crenata*	26/01/2007
Italy (origin unknown)	*Ilex crenata*	30/07/2007

[1] http://europa.eu.int/eur-lex/en/consleg/pdf/2000/en_2000L0029_do_001.pdf
[2] http://www.eppo.org/QUARANTINE/quarantine.htm

6. What are the pest's natural and experimental host plants; of these, which are of economic and/or environmental importance in the UK?
This is a migratory ectoparasite. Plant associations in Japan are *Cryptomeria japonica*, *Chamaecyparis obtuse*, *Larix leptolepis*, *Abies sachalinensis*, *A. homolepis*, *Picea jezoensis* v. *hondoensis*, *Pinus densiflora*, *P. sylvestris*, *P. strobes* and *P. resinosa* (Mamiya, 1969a) *Torreya nucifera*, *Pinus thunbergii*, *Carpinus tschonoskii*, *Quercus acutissima*, *Castanea crenata*, *Castaneopsis cuspidata*, *Zelkova serrata*, *Celtis sinensis*, *Cercidiphyllum japonicum*, *Magnolia obovata*, *Cinnamomum camphora*, *Neolitsea sericea*, *Kerria japonica*, *Prunus yedoensis*, *Rhus succedanea*, *Daphniphyllum macropodum*, *Camellia sinensis*, *C. japonica*, *Eurya japonica*, *Fatsia japonica*, *Cornus controversa*, *Rhododendron indicum* and *Callicarpa japonica* (Shishida, 1979) *Acer palmatum*, *Chaenomeles sinensis*, *Chamaecyparis pisifera*, *Cotoneaster horizontalis*, *Enkianthus perulatus, Euonymus japonicus, Juniperus chinensis* var. *Kaizuku &* var. *Sargentii, Pinus parviflora, Prunus mume, P. persica, Pyracantha angustifolia, Taxus cuspidate* var. *umbraculifera, Prunus incisa* (Hirata & Yuhara, 1986) and soybean, cabbage, apple and barley (Lee, 1976). In China it has been associated with Chinafir trees (*Cunninghamia lanceolata*), pear trees (*Pyrus pyrifolia*), peach trees (*Prunus persica*) apricot trees (*Prunus armeniaca*) and persimmon trees (*Diospyros kaki*) in Changrin, northern Zhejiang Province, with apple trees in Ganyu, northern Jiangsu Province and with peach trees in Wuxi, southern Jiangsu Province (Xu & Decraemer, 1995). It has been intercepted in trade associated with *Pinus pentaphylla* (Cadet & Van den Berg, 1992) and *Ilex crenata* (Fera records), both originating from Japan.

7. If the pest needs a vector, is it present in the UK?
N/A. This species is a soil borne migratory ecto-parasite.

8. What are the pathways on which the pest is likely to move and how likely is the pest to enter the UK? (*By pathway*):
Trade in small and large ornamentals from the Far East. The proposed likelihood is based on the infrequency of interception.

	Very unlikely		Unlikely		Moderately likely		Likely		Very likely	
Trade in ornamentals from Far East						**X**				

9. How likely is the pest to establish outdoors or under protection in the UK?
If the pest was to contaminate outdoor soil or be spread under protective cultivation by irrigation practices, establishment would depend on many biotic factors. Soil temperature data for the known geographical distribution is not comprehensive. Although one could consider using air temperature data, extrapolating it to represent soil temperature is a technique that has its disadvantages as discussed by Baker & Dickens (1993). Not only is soil temperature influenced by air temperature, but also by ground cover, soil texture, wetness, sun angle and day length. In addition, rainfall data often cannot be used because of the added complication of irrigation at monitoring sites (Hockland *et al*. 2006). The physical attributes of the soil are also significant. Pore space and moisture holding capacity are probably the most important features of a soil that determine whether or not it is a suitable habitat for nematodes (Decraemer, 1995). Trichodorids in general are not found in fine textured soils that contain much silt or clay and have a preference for coarser textured soils. In the UK, trichodorids are frequently found in the sandy-loams but not in clay or silt soils (Alphey & Boag, 1976). A national survey in Belgium showed that 40% of all samples with a sand fraction higher than 90% were infested with trichodorids compared with 6% for samples with a sand fraction lower than 80% (Decraemer, 1995). Soil acidity / alkalinity is also an important factor with trichodorids appearing to be more abundant in less acidic soils, e.g., in the UK only 6.5% of the soils with a pH lower than 5.5 were infested with trichodorids; 12.4% of the soils with a pH between 5.5 and 6.4 were infested, 16.9% of the soils with a pH of 6.5 or higher contained at least one trichodorid species (Alphey & Boag, 1976).

A related nematode, *Paratricodorus renifer* Siddiqi, 1974, has a tropical and sub-tropical distribution and was recorded for the first time in the UK in 1990 during a pre-export inspection of a consignment of pot-grown deciduous azaleas. Following a limited survey the nematode had appeared to become established outdoors and probably occurs commonly on azaleas in this country (Cotton & Hooper, 1991).

	Very unlikely	Unlikely	Moderately likely	Likely	Very likely
Outdoors:			X		
Under protection:				X	

10. How quickly could the pest spread in the UK?

The movement of nematodes in soil is influenced by the structure of the soil and by its water content. Natural drainage, water run-off and flood water can all have an effect on movement. However, spread with water would be very slow in comparison to movement of infested soil associated with plant material in trade and contaminated agricultural machinery to other suitable habitats. The nematode is a migratory ectoparasite, and consequently will not be spread with aerial parts of plants, e.g. seeds.

	Very slowly	Slowly	Moderate pace	Quickly	Very quickly
Natural spread:	X				
In trade:		X			

11. What is the area endangered by the pest[3]?

This species has been associated with a wide range of hosts, some of which are grown under protective cultivation. Given that establishment is more likely in protection (see 9.) the endangered area is that area where hosts are grown in protected conditions.

12. What is the pest's economic, environmental or social impact within its existing distribution?

Yokoo (1964) considered *Trichodorus cedarus* to be the cause of stubby-root in nurseries of black pine and cedar. No further data is available regarding the biology of this species.

Very small	Small	Medium	Large	Very large
		X		

13. What is the pest's potential to cause economic, environmental or social impacts in the UK?

The biology and virus-vector capability of this species has not been studied. It is an amphimictic species; the lifecycle of other amphimictic trichodorid species has been recorded around 40-45 days from egg to adult.

In general, newly established species may reduce biodiversity, disrupt ecosystems and stimulate the use of chemical control.

Very small	Small	Medium	Large	Very large
		X		

14. What is the pest's potential as a vector of plant pathogens?

[3] Endangered area: An area where ecological factors favour the establishment of a pest whose presence in the area will result in economically important loss (ISPM, No. 5)

A number of species of Trichodorid nematodes in Europe have been shown to vector tobraviruses; tobacco rattle (TRV); pea early-browning (PEBV) & pepper ringspot (PRV). However, the ability of many species occurring outside Europe to transmit virus has not been studied (Ploeg & Brown, 1997).

STAGE 3: PEST RISK MANAGEMENT

15. What are the risk management options for the UK?

Defining outbreaks, monitoring and surveillance would be challenging. The success of detecting infestations of nematodes can depend on the amount and intensity of sampling that can be conducted as well as the climatic conditions. In general, control measures against nematodes, such as crop rotation, green-manure cover crops and nematicides may reduce population levels but are not likely to prevent establishment.

As the pest is most likely to be intercepted associated with ornamentals, the most effective control of this endo-parasitic nematode is by thorough root washing and re-potting in sterile growing media. In the case of field infestations, years of bare fallow have been shown to decrease numbers of trichodorid species, although it did not eliminate them from the soil completely (Whitehead *et al*., 1970). Trichodorid nematodes are susceptible to physical damage and desiccation during cultivations and repeated intensive soil cultivation may affect population size. Crop rotation offers little prospect of practical control since trichodorids are usually polyphagous. Some crops such as oil radish and *Tagetes patula* appear to be poor hosts for trichodorids (Kuiper, 1977). *Crotalaria spectabilis* has been shown to be a non-host of trichodorids and when used as a cover crop reduced nematode densities (Rhoades, 1964). Crop damage by Trichodorids is often an ecological problem, associated with medium to course mineral soils with poor moisture retaining capacity. Soil improvement by adding organic material (which also encourages nematophagous fungi, predatory nematodes and other natural enemies) could perhaps offer a solution (Whitehead, 1997).

The numbers of common species of trichodorid in the soil can be quickly and greatly decreased by soil sterilization (Whitehead, 1997). Trichodorid nematodes associated with herbaceous and woody ornamentals may be controlled by soil sterilization with dichloropropene and mixtures and is generally effective on porous mineral soils (Southey, 1993). In a loamy soil moderately infested with *T. cedarus* on *Cryptomeria* seedlings the nematode was effectively controlled by applying a dichloropropane-dichloropropene mixture (Mamiya, 1969b). Taconis & Kuiper (1964) found D-D eliminated *Trichodorus primitivus* and *Paratrichodorus pachydermus* from soil 20 – 60 cm deep but did not kill all nematodes near the soil surface. Cooke & Draycott (1969) found D-D killed 95% or more of trichodorids in sandy soils in England. Soil sterilization may be effective, but is expensive and its effects may be often short lived - It has been demonstrated that trichodorid nematode post-treatment populations can multiply quickly and populations associated with sugarcane can increase dramatically to levels in excess of those present before sterilization (Martin, 1967; Roman, 1967; Harris, 1975; Cadet, 1979). More conveniently, and without risk of phytotoxicity, granular non-fumigant nematicides may be applied. However, In sandy soils leaching of nitrate (and non-fumigant nematicides) from the seedbed in a very wet spring may lessen response to treatment compared with dichloropropene mixtures (Cooke *et al.*, 1970). In a soil infested with *T. viruliferus*, sugar beet yields responded to a granular nematicide row treatment in a wet spring where the nematodes were abundant, but not where they were less numerous nor in a dry spring (Cooke, 1984).
Certain nematicides do not kill the nematodes but can control virus spread. Many chemical nematicides that were effective in controlling trichodorids in the past are now no longer available, but soil sterilisation and granular products (e.g. oxymyl) are still available.

16. Summary and conclusion of rapid assessment

Likelihood of entry is: moderately likely with moderate uncertainty. There have only been four interceptions in the UK. However it may have previously avoided detection.
Likelihood of establishment is: moderately likely outdoor and likely in protected conditions.
Economic impact is expected to be: moderate with high uncertainty. HOWEVER the biology

of this species has not been studied, consequently its virus-vector capability and potential economic impact in the UK is unknown.
*Endangered area:*ornamentals grown in protected conditions
Risk management: Options available for interceptions include destruction; re-export; and thorough root washing and repotting in sterile growing media, with the collection and treatment of washings. Granular treatments (e.g. oxymyl) are available for pest management in protected ornamentals.

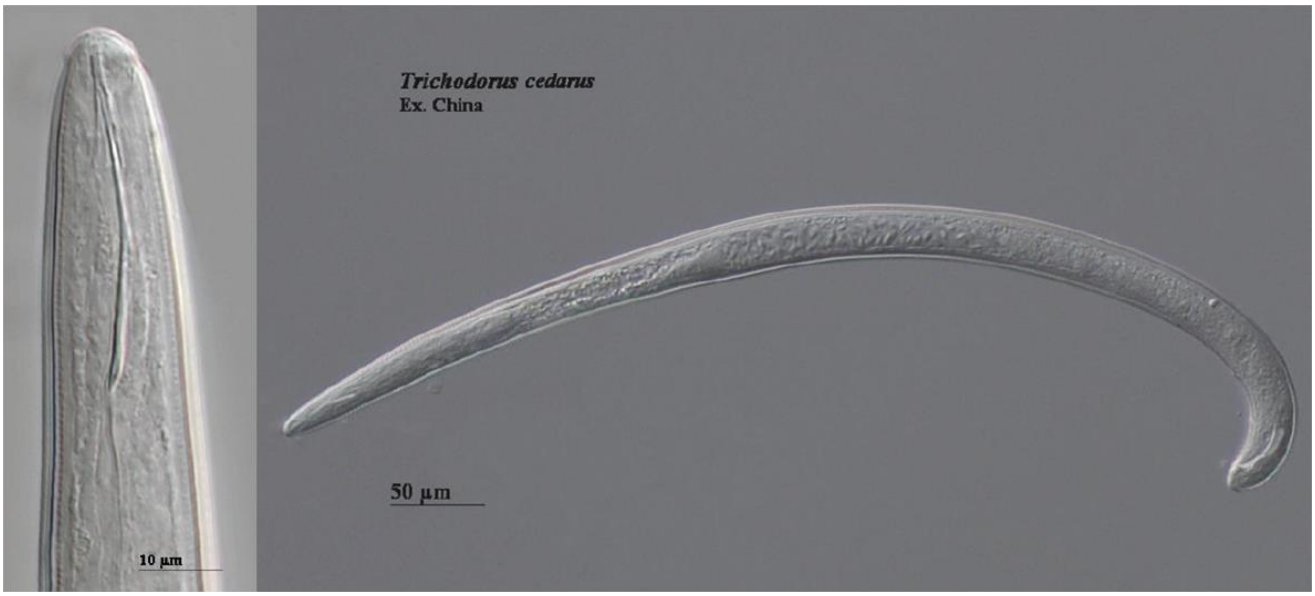
17. Is there a need for a detailed PRA? If yes, select the PRA area (UK or EU) and the PRA scheme (UK or EPPO) to be used.

No	**X**

We are unable to suggest further action due to lack of published information about this pest.

Yes		PRA area: UK or EU		PRA scheme: UK or EPPO	

18. IMAGES OF PEST



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Date of production: September 2011

Version no.: 2

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