Express PRA[1] for *Neonectria neomacrospora* – Occurrence –

Prepared by: Julius Kuehn-Institute, Institute for National and International Plant Health; Dr. Anne Wilstermann, Dr. Clovis Douanla-Meli, Dr. Gritta Schrader, Dr. Björn Hoppe; on: *15-04-2019 (replaces version of 03-04-2019) (updates highlighted in red and italics)* (translated by: Elke Vogt-Arndt)

Initiation: Occurrence on silver firs and grand firs in Lower Saxony

***Initiation for the revision**: agreement of the EU-Member States to renounce measures and update on the distribution of the harmful organism*

Express PRA	***Neonectria neomacrospora* (C. Booth & Samuels, 1981) Mantiri & Samuels**		
Phytosanitary risk for Germany	**high** ☒	**medium** ☐	**low** ☐
Phytosanitary risk for EU-Member States	**high** ☒	**medium** ☐	**low** ☐
Certainty of assessment	**high** ☒	**medium** ☐	**low** ☐
Conclusion	The fungus *Neonectria neomacrospora* is considered the causative pathogen for the complex canker of balsam fir. Mainly due to severe outbreaks of the disease in fir stands in Scandinavia since 2008, the fungus *was* considered as a new pest. However, previous studies and observations of experts indicated that the fungus has long been established in Europe, and is already widespread in Germany. *Subsequent investigations and communication with the Member States confirmed this evaluation.* A key factor for the complex disease is a preceding mass infestation with endemic balsam woolly aphids (*Adelges piceae*). Thus, the increasing occurrence of the disease might have climatic reasons as the balsam woolly aphid benefits from mild winters and precipitation deficits. Recent outbreaks have occurred in Denmark, Norway and Great Britain as well as a limited infestation of individual trees in Belgium, Finland and France. Severe outbreaks on firs in Norway lead to the listing in the early warning list of EPPO (2017). *The fungus has also established in Germany.* Since 2007, canker of balsam fir has been observed on white firs in Baden-Württemberg. *In 2013 and 2016, Abies concolor was affected by N. neomacrospora in Brandenburg.* In 2016, after a mass infestation with *Adelges piceae* in different locations in Lower Saxony the infestation with *N. neomacrospora* caused branch dieback of white firs (*A. alba)* and grand firs (*A. grandis).* Mainly, *N. neomacrospora* infests firs (genus *Abies*) but occasionally it was observed on spruce (*Picea abies)*, Douglas fir (*Pseudotsuga menziesii)* and Hemlock fir *(Tsuga heterophylla).* *Due to suitable climatic conditions, the fungus established*		

Express PRA	*Neonectria neomacrospora* (C. Booth & Samuels, 1981) Mantiri & Samuels
	outdoors in Germany and in North and Central Europe. Damage is to be expected wherever host plants are present and the climatic conditions are favourable for the endemic balsam woolly aphid. *The damaging effect is expected to increase as a result of more favorable climate conditions for the balsam woolly aphid.* Due to its high damage potential for forestry, mainly for the production of Christmas trees, *N. neomacrospora* presents a high phytosanitary risk for Germany and other EU-Member States. *The fungus is already widespread in Germany and in other Member States.* Thus, official eradication and containment measures do not seem appropriate. Furthermore, specific control strategies for the forestry sector are lacking. *In January 2019, the Standing Committee of the European Commission for Plants, Animals, Food and Feed discussed the risk of* N. neomacrospora*. Due to the wide distribution of the fungus in the Member States, the Member States agreed that the fungus does not fulfil the criteria as a quarantine pest.* Thus, *N. neomacrospora* is not classified as a potential quarantine pest and § 4a of the Plant Inspection Order does not apply. *Official control and notification of the pest is not necessary.* The destruction of infested material in Christmas tree plantings is recommended to lower the quantity of spores and to prevent the further spread in the stand.
Taxonomy[2]	Kingdom: Fungi, Phylum: Ascomycota; Order: Hypocreales; Family: Nectriaceae, Species: *Neonectria neomacrospora* (C. Booth & Samuels) Mantiri & Samuels
Common name	Tannen-Rindennekrose; canker of balsam fir
Synonyms	*Calonectria macrospora* Weese; *Nectria cucurbitula* var. *macrospora* (Wollenw.); *Nectria cucurbitula* var. *macrospora* Wollenw.; *Nectria fuckeliana* var. *macrospora* (Wollenw.) C. Booth; *Nectria macrospora* (Wollenw.) Ouell.; *Nectria neomacrospora* C. Booth & Samuels
Does a relevant earlier PRA exist?	No.
Biology	Obviously, the fungus enters the trees via sucking wounds caused by the balsam woolly aphid (*A. piceae)* and establishes there. It is not yet clear whether *A. piceae* is also a vector or only allows the entry of already present spores. The mass occurrence of *A. piceae* a key factor for the development of the

Express PRA	*Neonectria neomacrospora* (C. Booth & Samuels, 1981) Mantiri & Samuels
	fir bark-necrosis.
Is the pest a vector?[3]	No.
Is a vector needed?[4]	Possibly beetles and aphids are involved in the spread of the fungus. The outbreak of the complex disease canker of balsam fir is closely related to the mass occurrence of balsam woolly aphids (*Adelges piceae*).
Host plants	Plants of the genus *Abies* (firs), occasionally spruce (*Picea abies*), Douglas fir (*Pseudotsuga menziesii*) and Hemlock fir (*Tsuga heterophylla*).
Symptoms[5]	Dead shoots and branches, proliferations, intense resin flow. Under damp conditions, typical red fruit bodies develop on already dead plant parts (usually dead for more than 1 year) in the lower crown area near the stem (Fig. 1). In Denmark and Norway the dying of infested trees was documented (EPPO ALERT LIST, 2017).
Presence of the host plants in Germany[6]	*Abies* sp. is widespread in the Member States and very important in the forestry sector, the production of Christmas trees and as an ornamental.
Presence of the host plants in the Member States[7]	Widespread; see above.
Known infested areas[8]	Old reports on the occurrence of the fungus in Europe are available. Due to several changes of its name, the identity of these old findings is difficult to trace back. In a work of Ouellette, isolates were identified as *N. neomacrospora* (under the synonym *Nectria macrospora*) that were collected on *Abies* sp. in Norway (1961), Italy (1969) and France (1887) (OUELLETTE, 1972). Since 2007, canker of balsam fir was observed on silver firs in Baden-Württemberg (JOHN, 2011). The causing agent was not specified. *The suspect on an infestation with* N. neomacrospora *on damaged Colorado firs (*Abies concolor*) in 2013 and 2016 in Brandenburg was confirmed (HEYDECK et al., 2018).* In 2016, dieback symptoms on silver firs (*A. alba*) and grand firs (*A. grandis*) caused by *N. neomacrospora* (NW-FVA, 2016) were observed in different locations in Lower Saxony. Since the 1950's the fungus occurs sporadically in Great Britain and last, it occurred in England and Wales in forests, gardens and arboretums in 2015 (EPPO REPORTING SERVICE, 2017a). Since 2008, damage caused by *N. neomacrospora* occurs in Norway, but the species was already detected in 2002 (NORDÉN

Express PRA	*Neonectria neomacrospora* (C. Booth & Samuels, 1981) Mantiri & Samuels
	& JORDAL, 2015). Occurrences in Denmark (2011), South Sweden (2015), *and limited to individual trees in* Belgium (2017), Finland (2018) and France (2018) followed. Furthermore, the fungus occurs in North America (USA and Canada) and since 2014 also in China (Hubei) (EPPO, 2017b).
Pathways[9]	Plants for planting, Christmas trees, presumably seeds, eventually also cut twigs (EPPO ALERT LIST, 2017).
Natural distribution[10]	Presumably, ascospores are transmitted over long distances through the air and conidiospores (asexual spores) locally get on trees through direct contact or splash water (EPPO ALERT LIST, 2017). Possibly insects serve as a vector. Also seeds are supposed to be a pathway (FOREST RESEARCH, 2018)
Establishment to be expected in Germany[11]	*The fungus has established in Germany.* In future, the increasing favourable climatic conditions for mass reproduction of the balsam woolly aphid presumably will lead to frequent events of damage caused by canker of balsam fir.
Establishment and distribution to be expected in the Member States[12]	*The fungus is already established and widespread in North and Central Europe.*
Known damage in infested areas[13]	In Denmark and Norway, dying trees were detected in amenity plantings, plantings of Christmas trees and forests. The infestation of Christmas trees leads to aesthetic damage that precludes the marketing of the trees.
Limitation of the endangered area in Germany	Forest areas, plantings of Christmas trees, nurseries, amenity plantings, private gardens.
Damage to be expected in endangered area in Germany[14]	An outbreak in vast areas can lead to considerable economic losses in forestry, nurseries and the production of Christmas trees. Locally, total losses could occur in plantings of Christmas trees, as damaged trees are non-marketable.
Damage to be expected in endangered area in Member States[15]	An outbreak in vast areas can lead to considerable economic losses in forestry, nurseries and the production of Christmas trees.
Control measures[16]	No specific control measures against *N. neomacrospora* in forest stands are known. The actual knowledge on the success of sanitization measures in the crop is limited. If possible, a pruning up to healthy wood is recommended. Pruning tools have to be disinfected carefully. The destruction of infested

Express PRA	*Neonectria neomacrospora* (C. Booth & Samuels, 1981) Mantiri & Samuels
	trees and the treatment with fungicides are advised to producers of Christmas trees (FOREST RESEARCH, 2018).
Detection and diagnosis[17]	When typical symptoms occur, infestations can be detected by means of molecular biological methods.
Remarks	Three closely related fungi of the genus *Neonectria* are known from Europe (*N. ditissima, N. fuckeliana, N. neomacrospora*) which cause the same disease pattern. Meanwhile, *Cylindrocarpon cylindroides* is classified as another species. References that only use this name are not considered here.
Literature	EPPO ALERT LIST, 2017: *Neonectria neomacrospora* (anamorph: *Cylindrocarpon cylindroides*). https://www.eppo.int/ACTIVITIES/plant_quarantine/alert_list_fungi/neonectria_neomacrospora (accessed on: 27-09-2018) EPPO, 2017a: Update on the situation of *Neonectria neomacrospora* in the United Kingdom. EPPO Reporting Service no. 07-2017, Article 2017/139. https://gd.eppo.int/reporting/article-6107 (accessed on: 27-09-2018) EPPO, 2017b: *Neonectria neomacrospora* an emerging disease of fir trees in Northern Europe: addition to the EPPO Alert List. EPPO Reporting Service no. 06-2017, Article 2017/120. https://gd.eppo.int/reporting/article-6088 (accessed on: 27-09-2018) *EUROPEAN COMMISSION, 2019: Summary report of the Standing Committee on Plants, Animals, Food and Feed held in Brussels on 21-22 January 2019 (Section Plant Health). Health and Food Safety Directorate General, 5 S.* *https://ec.europa.eu/food/sites/food/files/plant/docs/sc_plant_health_20190121_sum.pdf (accessed on: 02-04-2019)* FOREST RESEARCH, 2018: Tools & Recources: Neonectria canker of *Abies*. https://www.forestresearch.gov.uk/tools-and-resources/pest-and-disease-resources/neonectria-canker-of-abies/ (accessed on: 27-09-2018) HEYDECK, P., R. MERKEL, C. DAHMN, K. HIELSCHER, 2018: Neuartige Krankheitserscheinungen an Kolorado-Tanne im Nordostdeutschem Tiefland. Tagungsband 61. Deutsche Pflanzenschutztagung- 11. Bis 14. September 2018- Universität Hohenheim, Julius-Kühn-Archiv, 461, 2018 S. 115. JOHN, R., 2011: Aktuelle Schäden in Baden-Württemberg- firs-Rindennekrose in Baumhölzern. AFZ- DerWald, **11**/2011, 30-33.

	NORDÉN, B., J. D. JORDAL, 2015: A checklist of Norwegian Sordariomycetes. Agarica **36**, 55-74. NW-FVA, 2016: Waldschutzinfo Nr. 5 / 2016. Nordwestdeutsche Forstliche Versuchsanstalt, Abteilung Waldschutz, 4 S. Stand 30.09.2018 https://www.nw-fva.de/fileadmin/user_upload/Abteilung/Waldschutz/Waldschutz-Infos_2016/Waldschutzinfo_05-2016-1.pdf (accessed on: 28-09-2018) OUELLETTE, G.B., 1972: Nectria macrospora (Wr.) Ouellette sp. nov. (=N. fuckeliana var. Macrospora): Strains, Physiology and Pathogenicity, and Comparison with N. fuckeliana var. Fuckeliana. Laurentian Forest Research Centra, Department of the Environment, Ste. Foy, Quebec, 11 S.

Fig. 1: Red fruit bodies of 0.3-0,5mm, and conidial stage of *Neonectria neomacrospora* on an infested tree that can be recognized as white mycelium spots (Photo: NW-FVA Göttingen, Department Forest Conservation)

Explanations

[1] Compilation of the most important directly available information allowing a first preliminary estimation of the phytosanitary risk. This short assessment is necessary for the decision on a notification to EU and EPPO as well as the preparation of a complete risk analysis, for the information of the countries and as a basis for the possible initiation of eradication measures. Regarding the phytosanitary risk especially the possibility of the introduction into and spread in Germany and the Member States as well as possible damage are taken into account.

[2] Taxonomic classification – also subspecies; in case that the taxonomical classification is uncertain the JKI-scientist initiates the taxonomic classification, as far as possible.

[3] If so, which organism (which organisms) is (are) transmitted and does it (do they) occur in Germany / the MS?

[4] If so, which organism serves as a vector and does it occur in Germany / the MS?

[5] Description of the pattern of damage and the severity of the symptoms/damage on the different host plants

[6] Presence of the host plants in protected cultivation, open field, amenity plantings, forest.
Where, in which regions are the host plants present and to which extent?
How important are the host plants (economical, ecological,..)? Possible origin

[7] Presence of the host plants in protected cultivation, open field, amenity plantings, forest, ...;
Where, in which regions are the host plants present and to which extent?
How important are the host plants (economical, ecological,..)? Possible origin

[8] f. e. acc. to CABI, EPPO, PQR, EPPO Datasheets

[9] Which pathways are known for the pest and how important are they for the possibility of introduction? Primarily the transport of the pest over long distances is meant, normally with infested traded plants, plant products or other contaminated articles. This does not comprise the natural spread resulting from introduction.

[10] Which pathways are known for the pest and of which relevance are they in respect of the possibility of spread? In this case the natural spread resulting from introduction is meant.

[11] under the given prevalent environmental conditions

[12] under the given prevalent environmental conditions (native areas and areas of introduction)

[13] Description of the economic, ecological/environmental relevant and social damage in the area of origin resp. areas of occurrence up to now

[14] Description of the economic, ecological/environmental relevant and social damage to be expected in Germany, as far as possible and required, differentiated between regions

[15] Description of the economic, ecological/environmental relevant and social damage to be expected in the EU/other Member States, as far as possible and required, differentiated between regions

[16] Can the pest be controlled? Which possibilities of control are given? Are plant health measures conducted in respect to this pest (in the areas of current distribution resp. by third countries)?

[17] Description of possibilities and methods for detection. Detection by visual inspections? Latency? Uneven distribution in the plant (sampling)?