

Screening of Emerging risks in Norway (ERIN). Judgments are preliminary and should not be considered as part of a final risk assessment:

## *Heterobasidion annosum* (Fr.) Bref, year

**1. Taxonomic position:** Bondarzewiaceae; Russulales; Agaricomycetes; Agaricomycotina; Basidiomycota

**Popular names:** Annosum root rot; fururotkjuke.

### 2a. Status in Norway:

Established <input checked="" type="checkbox"/>	Intercepted but not established <input type="checkbox"/>	Not intercepted <input type="checkbox"/>
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*Heterobasidion annosum* is very common on Scots pine and Norway spruce at the west coast of Norway, Rogaland, Hordaland and Sogn og Fjordane (Roll-Hansen 1940). Later it has been found on Norway spruce also in Møre og Romsdal (Heggertveit and Solheim 1998; Fjærli 2016), and a finding in Halså municipality at 63°10'N is the northernmost observation of *H. annosum* up to now (Fjærli 2016). The species is not common in southern and eastern part of Norway both on Scots pine (prefer) and Norway spruce, but have been found now and then. In eastern Norway it is found north to Dovre (61°58'N; ca 500 m asl), where a Scots pine stand on sandy soil was severely attacked.

**2b. If this species is already established in Norway and this assessment is limited to a part of Norway where it may expand, define this part area of Norway:** The pest free areas is the counties Sør-Trøndelag, Nord-Trøndelag, Nordland, Troms and Finnmark. In addition the fungus is not registered in the northernmost municipalities in Nordmøre, Tustna, Aure and Smøla.

### 3. Area of native distribution in the world and information about introductions, expansions and eradications:

This species is part of a species complex. In Europe the complex was divided into three separate types by Korhonen (1978), and later two new species were described (Nimelä and Korhonen 1998). The name *H. annosum* was conserved for the species found mainly on pine trees. Like this, earlier notes about findings cannot be trusted, and have to be read with caution. *Heterobasidion annosum* is native to Europe and found in all European countries, in Turkey and further east to the Central Asian countries (Korhonen 2004). It is uncertain how far east it is distributed, probably around the border to China and Mongolia. It is not spread all the way northwards in the boreal zone. The northernmost known finding may be in Halså, Nordmøre (63°10'N) (Fjærli 2016). In Finland the species was found at 64°N, but that was on timber which could have been transported from further south in Finland (Korhonen et al. 1998). In forest the northernmost finding in Finland is at 62°45' (Korhonen et al. 1998).

### 4. Sector in Norway expected to be impacted by the species (related to question 10 below):

Agriculture <input type="checkbox"/>	Forest(ry) <input checked="" type="checkbox"/>	Ornamental/park/garden <input type="checkbox"/>	Fruit orchard/garden <input type="checkbox"/>
Greenhouse/protected <input type="checkbox"/>	Other sector, or not relevant <input type="checkbox"/> Describe:		

### 5. Susceptible host(s) and/or type of environment(s) in Norway:

*Abies* spp, *Juniperus communis*, *Larix decidua*, *Picea* spp., *Pseudotsuga taxifolia*, *Tsuga heterophylla* and various broadleaf genera like *Alnus*, *Betula* and *Sorbus*, in addition *Empetrum* and *Calluna* are found as hosts of *H. annosum* at the west coast (Roll-Hansen 1940). Sinclair (1964) listed 150 host species, but that includes all different *Heterobasidion* species, also *Heterobasidion* species now only known from North-America where *H. annosum* is not present. *Picea abies* and *Juniperus communis* are very susceptible to *H. annosum*, while *Pinus contorta*, *Picea stichensis* and *Pseudotsuga menziesii*

are less susceptible. Among broadleaf trees *Betula pendula* are mentioned as susceptible (Korhonen et al. 1998).

## 6. Description of damage:

In plants *H. annosum* may cause death a year or two after infection (Greig 1998; Roll-Hansen 1940). However, this is not very common, but more common on pine than spruce. In older trees the situation is more chronic and depending on the host tree. In Norway spruce a rot column may go 10-15 m upwards, while in pines the rot is most often kept in the root system. The resin content in the heartwood of pines restrict the growth of the fungus in the stem, but it may grow in bark (Roll-Hansen 1940) and thus be more damaging, killing also older pine trees much quicker than spruces trees are killed. In a newly detected Scots pine stand in Dovre municipality severely affected by *Heterobasidion annosum*, some of the trees had a rot column 2-3 m up the stem.

### 7a. How is the overall probability of entry in Norway, or in a defined part of Norway?

0. not relevant <input type="checkbox"/>	1. very low <input type="checkbox"/>	2. low <input type="checkbox"/>	3. medium <input type="checkbox"/>	4. high <input checked="" type="checkbox"/>	5. very high <input type="checkbox"/>
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Level of uncertainty:	Low <input type="checkbox"/>	Medium <input checked="" type="checkbox"/>	High <input type="checkbox"/>
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### 7b. How is the overall probability of establishment in Norway, or in a defined part of Norway?

0. not relevant <input type="checkbox"/>	1. very low <input type="checkbox"/>	2. low <input type="checkbox"/>	3. medium <input type="checkbox"/>	4. high <input checked="" type="checkbox"/>	5. very high <input type="checkbox"/>
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Level of uncertainty:	Low <input type="checkbox"/>	Medium <input checked="" type="checkbox"/>	High <input type="checkbox"/>
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Short description of factors for the probability assessment:

Most spores of *Heterobasidion* spp have been detected near the source, and it is diluted with distance in open areas (Redfern and Stenlid 1998). However, spores of *H. annosum* have been trapped up to 300 km away from the likely nearest source (Rishbeth 1959). It is thus likely that spores from Nordmøre are able to reach Trøndelag. It is not easy to understand why the distribution of *H. annosum* northwards is far away from the distribution of Scots pine, which goes up to Porsanger in Finnmark county. Apart from possible temperature requirements Korhonen et al. (1998) mentioned that very few cuttings may be done in the warm part of the year, when infection on stumps take place, at least up to now. However, since *H. annosum* is not found further north than Nordmøre and ca 500 km south of the northernmost finding of *H. parviporum*, it is most likely some temperature requirements that determines the distribution northwards.

Beside natural spread by spores timber with *Heterobasidion* rot may be transported to the pest free area to be used as among others for energy timber. If such timber are not used immediate fruitbodies can be produced and spore be spread and more easily find a suitable substrate.

### 8. How fast is the pest expected to expand in Norway, or in a defined part of Norway?

< 0.3 km per year <input type="checkbox"/>	0.3 - 10 km per year <input checked="" type="checkbox"/>	10 - 30 km per year <input type="checkbox"/>	> 30 km per year <input type="checkbox"/>
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Level of uncertainty:	Low <input type="checkbox"/>	Medium <input type="checkbox"/>	High <input checked="" type="checkbox"/>
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Information about estimate:

Since we do not know exactly the distribution at the moment and also very little about factors which could expand the area with disease it is difficult to predict what will happen in the future. But climate change and change in forestry practice are most likely factors which could expand the disease northwards, especially along the coast with oceanic climate.

**9. How large percent of potential environment type in Norway, or in a defined part of Norway, is expected to be colonized?**

< 5 % <input checked="" type="checkbox"/>	5 - 10 % <input type="checkbox"/>	10 - 20 % <input type="checkbox"/>	20 - 40 % <input type="checkbox"/>	> 40 % <input type="checkbox"/>
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Level of uncertainty:	Low <input type="checkbox"/>	Medium <input type="checkbox"/>	High <input checked="" type="checkbox"/>
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Information about estimate:  
See points 7 and 8.

**10. How great a negative effect is the pest likely to have on economy including costs of control measures for the impacted sector in Norway, or in a defined part of Norway? Rate possible effects:**

0. not relevant <input type="checkbox"/>	1. minimal <input type="checkbox"/>	2. minor <input checked="" type="checkbox"/>	3. moderate <input checked="" type="checkbox"/>	4. major <input type="checkbox"/>	5. massive <input type="checkbox"/>
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Level of uncertainty:	Low <input type="checkbox"/>	Medium <input type="checkbox"/>	High <input checked="" type="checkbox"/>
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Short description of negative effects on economy:

If *H. annosum* will be established further north it will have an impact on production of timber. The main problems will occur in pine forests on sandy soil, calcareous soil and forests below the "marine grense" (). If *H. annosum* also should be able to establish north of the Arctic Circle planted spruce forests may be threatened in a similar way as we now can see at the west coast of Norway (Vestlandet).

**11. How important is the environmental impact likely to be in Norway, or in a defined part of Norway? Rate possible effects:**

0. not relevant <input type="checkbox"/>	1. minimal <input checked="" type="checkbox"/>	2. minor <input type="checkbox"/>	3. moderate <input type="checkbox"/>	4. major <input type="checkbox"/>	5. massive <input type="checkbox"/>
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Level of uncertainty:	Low <input type="checkbox"/>	Medium <input checked="" type="checkbox"/>	High <input type="checkbox"/>
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Short description of environmental impacts:

Since Heterobasidion root rot in Scots pine is not so problematic as in Finland and Sweden the impact will mainly be of economy and probably little on the environment.

**12. How important is social damage likely to be in in Norway, or in a defined part of Norway? Rate possible effects:**

0. not relevant <input checked="" type="checkbox"/>	1. minimal <input type="checkbox"/>	2. minor <input type="checkbox"/>	3. moderate <input type="checkbox"/>	4. major <input type="checkbox"/>	5. massive <input type="checkbox"/>
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Level of uncertainty:	Low <input type="checkbox"/>	Medium <input checked="" type="checkbox"/>	High <input type="checkbox"/>
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Short description of social damage:

**13. Priority in Norway versus EPPO and EU:**

*Heterobasidion annosum* is not on the EPPO list and is probably not on local country lists either. In Norway it is on Vedlegg 6, see pkt. 14.

**14. Specific questions for Norway:**

*Heterobasidion annosum* has by the Norwegian Food Safety Authority (Mattilsynet) been listed in "Forskrift om planter og tiltak mot planteskadegjørere Vedlegg 6. Planteskadegjørere som det i avgrensede områder kan fastsettes bestemmelser om bekjemping av". This was based on the fact that Heterobasidion root rot never has been observed north of the Arctic Circle and establishment in forests could lead to a dramatic increase in root rot. This was decided when only one species of *Heterobasidion* was known in Europe.

**15. Existing assessments:**

No assessments.

#### 16. Requested assessments:

It is not requested by The Norwegian Food Safety Authority, but as mentioned in pkt 14 the species is in Vedlegg 6. Planteskadejører som det i avgrensede områder kan fastsettes bestemmelser om bekjemping av.

#### 17. Recommended type of assessment:

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## References

Fjærli AF 2016. Råte i gran på Nord-Vestlandet. Masteroppgave, INA, NMBU.

Heggertveit, J. & Solheim, H. 1998. Stubberegistrering av råte i gran etter hogst i kommunene Molde, Nesset og Rauma. Rapport fra skogforskningen 16/98:1-13.

Korhonen, K., 1978. Intersterility groups of *Heterobasidion annosum*. Commun. Inst. For. Fenn. 94, 1–25.

Korhonen, K., Capretti, P., Karjalainen, R., Stenlid, J., 1998. Distribution of *Heterobasidion annosum* intersterility groups in Europe. In: Woodward, S., Stenlid, J., Karjalainen, R., Hüttermann, A. (Eds.), *Heterobasidion annosum: Biology, Ecology, Impact and Control*. CAB, International, pp. 93–104.

Rishbeth J 1959. Dispersal of *Fomes annosus* Fr. and *Peniophora gigantea* (Fr.) Masee Trans. Br. Mycol. Soc. 42: 243-260.

Roll-Hansen F 1940. Undersøkelser over *Polyporus annosus* Fr., særlig med henblikk på dens forekomst i Det snøfjellske Norge. Meddr norske SkogforsVes. 7: 1-100.

Sinclair WA 1964. Root- and butt-rot of conifers caused by *Fomes annosus*, with special references to inoculum and control of the disease in New York. Memoir No 391, Cornell University Agruculture Experimental station, 54 pp.

Vedlegg 1. PM 5/3(5). Decision-support scheme for quarantine pests (version 2011). EPPO. Kan lastes ned her: <http://archives.eppo.int/EPPOStandards/prd.htm>.

Vedlegg2. Guidance to the questions 7 and 10 in the scheme

Vedlegg 3. Ratings used for describing the level of uncertainty