MAIN PESTS OF SPRUCE FORESTS IN SOUTH EAST EUROPE

Norway spruce (*Picea abies*) grows through much of Central and Eastern Europe from Norway in the northwest and Poland eastward, in the mountains of central Europe, southwest to the western end of the Alps, and southeast in the Carpathians and Balkans to the extreme north of Greece. The northern limit is in the arctic, just north of 70°N in Norway. Its eastern limit in Russia is difficult to define, due to extensive hybridisation and intergradation with the Siberian spruce (*P. obovata*). Trees grow to 40–50 m tall and 100–150 cm dbh; crown conic. Bark orange-brown, finely flaking, becoming gray-brown, scaly on old trees. Branches short and stout, the upper levels ascending, the lower drooping; twigs orange-brown, usually glabrous. Buds reddish brown, 5–7 mm, apex acute. Needles 1–2.5 cm in length, 4-angled in cross section, rigid, light to dark green, bearing stomata on all surfaces, apex blunt-tipped. Seed cones (10–)12–16 cm; scales diamond-shaped, widest near middle, 18–30 × 15–20 mm, stiff, leathery, margin at apex erose to toothed, apex extending 6-10 mm beyond seed-wing impression.(http://en.wikipedia.org/wiki/Picea_abies. The health status of individual spruce trees is characterized mainly based on defoliation, i.e. the relative foliar loss of a tree crown compared to that of a fully-foliated, healthy reference tree growing in the same stand and site conditions. Tree crown defoliation is a non-specific damage symptom, normally connected with different harmful factors each of which may act separately or together. To determine the effects of single factors on the amount of damage and their importance is usually very difficult. It is usually impossible to separate the influence of climate change from other harmful factors (insects, pathogens, air pollution) affecting the health status in forest ecosystems.

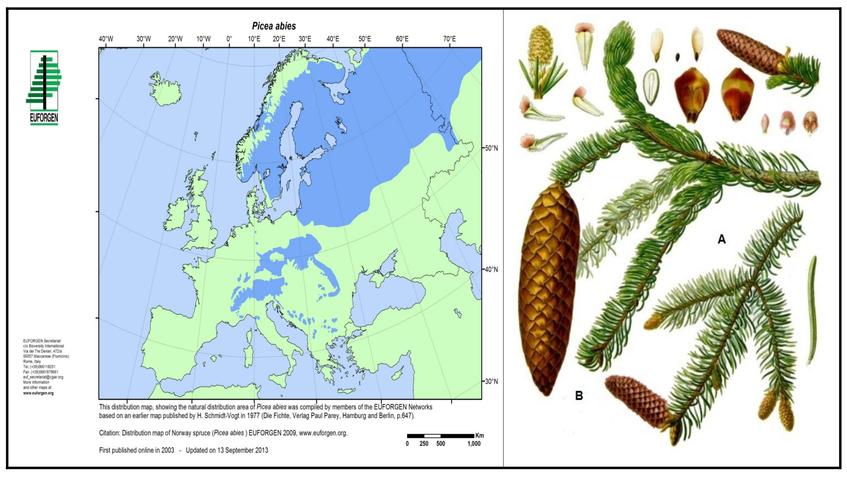

Figure 1. Natural range (*http://www.euforgen.org*) of Norway spruce (*Picea abies*), and morphology of needles **(A)** and cones **(B)** and buds. (*http://commons.wikimedia.org/*).

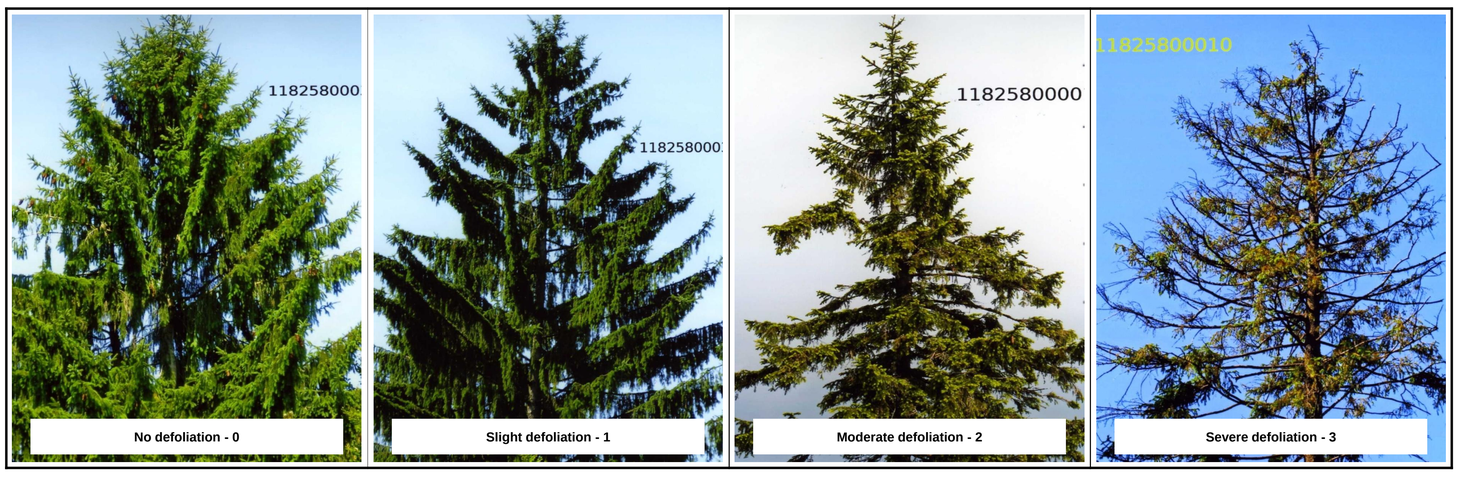

Figure 2. Spruce defoliation is defined as leaf loss in the assessable crown as compared to a reference tree. Defoliation is assessed in 5 classes : **0** (0 – 10 % defoliation), **1** (11 – 25 % defoliation), **2** (26 – 59 % defoliation), **3** (60 – 99 %), **4** (100 % defoliation). (Photos: P. Fabianek.)

Main pests on needles. Spruce needle eating insects (Spruce web-spinning sawfly, Gregarious spruce sawfly) are damaging for both young and older trees. Larvae feed on needles in large groups. Spruce needle cast/blight is a general term used to describe diseases in which needles are shed from a tree. Once a spruce has succumbed to a primary pest, secondary pests begin attacking the trees.

Figure 3. Major pests on spruce needles. **A:** Spruce web-spinning sawfly (*Cephalcia abietis*); **B**, **C** - Gregarious spruce sawfly (*Pristiphora* (*Lygaeonematus*) *abietina*); **D** - Spruce needle cast/blight (*Lirula macrospora). (* Photos: P. Kapitola).

Main pests on branches and shoots. Six toothed spruce bark beetle attacks young trees, or the top of the older trees (thin bark parts). Brunchorstia disease is most damaging to conifers that are planted near the limit of their range; attacks are favored by shaded conditions, badly aerated plantations in which humidity is high. The predisposing factors for Cenangium canker are not totally clear but spruce stressed by drought, insects, or other factors, are most often affected.

Figure 4. Major pests on branches and shoots. **A**: Six toothed spruce bark beetle (*Pityogenes chalcographus*), [Photos: M. Jurc (beetle) and F. Lakatos (galleries)]; **B:** Brunchorstia disease (*Gremmeniella abietina*) – damage (*left*) and black fruiting bodies (*right*); **C**: Cenangium canker (*Cenangium ferruginosum*) - black fruiting bodies. (Photos: P. Kapitola B,C).

Spruce decline and main pests on trunks: Spruce decline is a complex disease caused by a combination of insects, and other agents (such as soil and climate conditions) which act together to cause a serious reduction in tree health. Typically, the first symptom observed on a declining tree is a deterioration of the needles. Abiotic factors like devastating hurricanes, strong winds, persistent drought or logging damage can have detrimental effects on spruce forests. These conditions also cause problems for spruce trees. Once a spruce has succumbed to a primary pest, secondary pests begin to attack (large pine weevil, European spruce bark beetle, Pissodes weevils, red banded polypore, annosus root disease, honey fungus, red heart of pine and so on). These secondary pests are normally attracted to spruces recently affected by abiotic and biotic stressors.

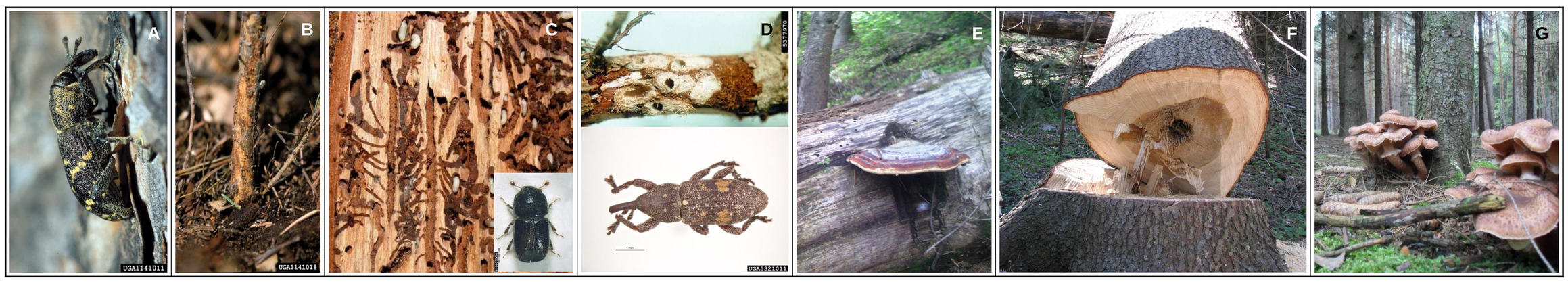

Figure 5. Major pests that damage spruce trunks. **A**: Large pine weevil (*Hylobius abietis*) adult; **B**: damage, (Photos: Gy. Csóka A,B); **C**: European spruce bark beetle (*Ips typographus*), galleries and a beetle, (Photos: F. Lakatos - galleries and M. Jurc - beetle); **D**: Pissodes weevils (*Pissodes* spp.), (Photos: M. Zubrik – demage and PDI Library - beetle); **E**: Red banded polypore (*Fomitopsis pinicola*)*;* **F***:* Annosus root disease (*Heterobasidion annosum*), (Photos: S. Mirtchev D,E)*;* **G***:* Dark honey fungus (*Armillaria ostoyae*), (Photo: J. Cepelak).

Food and Agriculture Organization of the United Nations

For additional information visit

www.fao.org/forestry/pests/en/

MINISTRY FOR FOREIGN AFFAIRS OF FINLAND

This publication has been made possible by the generous support of the Ministry for Foreign Affairs of Finland