EXOTIC FOREST PEST ADVISORY

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Natural Resources Canada, Canadian Forest Service

Nun Moth – *Lymantria monacha*

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Figure 1. Female nun moth with characteristic black and white colouring

Introduction

The nun moth, *Lymantria monacha* (L.) (Lymantriidae), is a major pest of coniferous and deciduous trees in Europe and Asia. Frequent outbreaks occur in Poland, where the average interval between outbreaks is 8 years. A serious outbreak damaged or destroyed about 400 000 km^2 of mainly spruce and pine forests in Russia and eastern Prussia from 1853 to 1863. Outbreaks last for approximately 5 years in pine forests and 7 years in spruce forests. The nun moth owes its name to its similarity to the monk moth, *Panthea coenobita* (Esper) (Noctuidae), which also has a black and white monk-cloak colouring (Figure 1). The gypsy moth, *Lymantria dispar* (L.) (Lymantriidae), is a closely related species.

Hosts

In Europe, outbreaks of nun moth occur only in conifer-dominated forests, where spruce (*Picea*), pine (*Pinus*), fir (*Abies*) and larch (*Larix*) species predominate; however this insect also defoliates deciduous trees such as birch (*Betula*), hornbeam (*Carpinus*), beech (*Fagus*), oak (*Quercus*) and several other genera (Figure 2).

Figure 2. Austrian conifers defoliated by nun moth

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The Threat

Indigenous North American trees that have been attacked in Europe include Sitka spruce (*Picea sitchensis*), Douglas fir (*Pseudotsuga menziesii*), Grand fir (*Abies grandis*) and lodgepole pine (*Pinus contorta*). Nun moths have been successfully raised on white fir (*Abies concolor*), Colorado spruce (*Picea pungens*), white spruce (*P. glauca*) (Figure 3), Douglas-fir (*Psuedotsuga menziesii*), eastern hemlock (*Tsuga canadensis*), gray birch (*Betula populifolia*), red, valley and black oak (*Quercus rubra, Q. lobata,* and *Q. velutina*, respectively) and black cherry (*Prunus serotina*) in quarantine laboratories in North America. The nun moth's ability to seriously defoliate Sitka spruce, Douglas fir, grand fir and lodgepole pine in Denmark poses a significant threat to the forests of Canada and especially to those of British Columbia

Figure 3. White spruce defoliated by nun moth

Spread and dispersal

There is a high risk that the nun moth will be introduced and successfully established in Canada. The adult moths are strong flyers and immature larvae can be dispersed by wind. Host material and favourable habitat are abundant across the country. The point of entry would most likely be shipping ports; eggs can be laid on dunnage, on containers or on the ships themselves. Ports on both the west and east coasts of Canada are adjacent to natural and urban forests. Lighting around dockyards attracts adult nun moths, which are most active after dark. Subsequent movement of containers throughout Canada could enhance dispersal.

Recognition

Adults are characterized by a large colour variation from almost black to chalk white (Figure 4). Most commonly the adults have chalk-white forewings with strong notched black lines and patches, while the hind wings are greyish with a darker fringe (Figure 5). The female's abdomen is reddish with black bands and has an extremely long extensible ovipositor. The wingspan of the female is 50 to 58 mm. The adult male has a wingspan of 42 to 46 mm and strongly pectinate antennae (Figure 6). The outline of the female at rest is that of an isosceles triangle, that of the male an equilateral triangle (Figure 7).

Newly hatched larvae are about 4 mm long, black and have protruding hairs almost as long as the body (Figure 8). Mature larvae reach 30 to 35 mm in length and vary from basic light to dark brown to grey, green or yellow. The head is pale brown with dark markings (Figure 9). White patches are visible on each side of the back just behind the head and sometimes in the middle of the back further along the body (Figure 10). Pairs of blue warts are apparent along the back of the nun moth larva (Figure 11).

Pupae are naked, stout, shiny reddish brown with bristled light coloured hair, and are about 18 to 25 mm long (Figure 12). Eggs are round, brown to purplish in colour, 1 mm in diameter and laid in clusters (Figure 13).

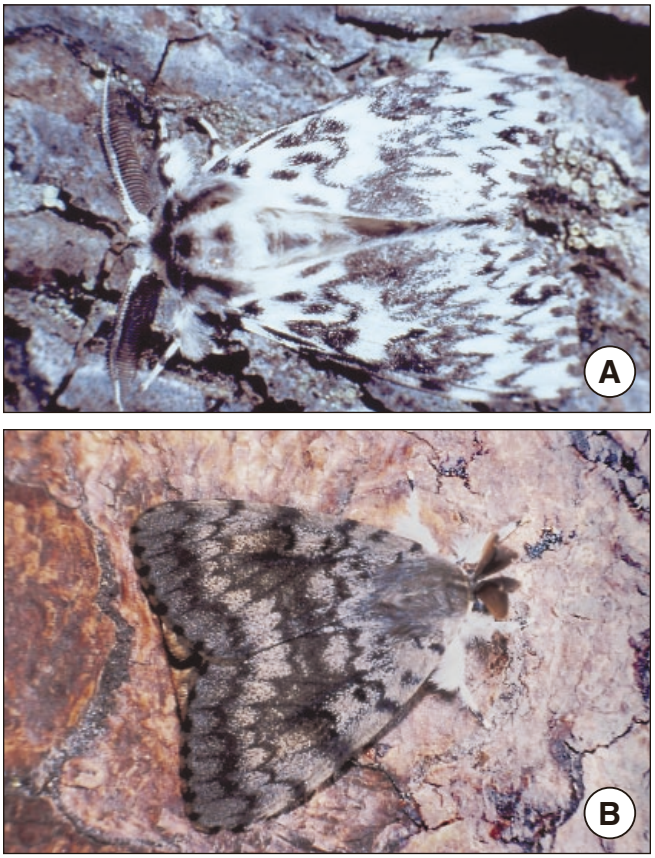

Figure 4. Male adults of different colours

Figure 5. Black lines on wings

Figure 6. Antennae on a male nun moth

Figure 7. Outline of male and female

Figure 8. immature larvae

Figure 9. Head markings on mature larva

Figure 10. White patches on mature larva

Figure 11. Blue warts on back of larva

Figure 12. Pupa

Figure 13. egg cluster

Damage to Trees

Early-instar larvae feed only on new needles. Larvae are incapable of utilizing old foliage until the second or third instar. On broad-leaved trees larvae begin by perforating new leaves and then consume the whole leaf except for the middle vein. In pines the immature larvae feed only on male flowers which can lead to total destruction of next year's flowering buds. Severe defoliation of more than about 70-80% will cause mortality of spruce trees within a year. At high population levels larvae also defoliate understorey shrubs, particularly *Vaccinium* species.

Life History

Nun moth produces one generation per year. Moth emergence occurs from mid July to late August and adults are active for about 40 days. Adults are good fliers, nocturnal and attracted to lights. Females lay up to 300 eggs in clusters of 20 to 50 eggs under bark scales and in crevices mostly along the lower bole of the tree (Figure 14). The insect overwinters in the egg stage. Hatching occurs in May usually just before bud burst. Larvae climb the tree stem in search of new foliage and buds. Wind dispersal of immature larvae to neighbouring trees is common. Larval development, comprising five to seven instars, requires from 7 to 11 weeks. Pupation normally occurs in July or August on branches near feeding sites or in bark crevices along the trunk.

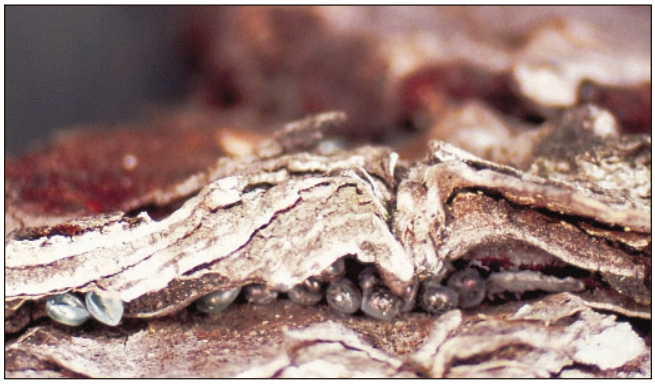

Figure 14: Eggs under bark scale

Control

Understanding the biology and behaviour of the nun moth is the first step in reducing the risk of their introduction. Reducing lighting around ships and ports in the Far East during times of female flight activity lessens the risk of oviposition on ships and containers. High-risk ships can be identified for more intensive inspection. Aerial applications of *Bacillus thuringiensis*, an insecticidal bacterium, to outbreak populations may be effective. Pheromone trapping can be used both for detection purposes and as a means of disrupting mating.

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