EXTENDED ABSTRACT

PINE WILT NEMATODE: AN EXAMPLE OF ACTIVE RISK ASSESSMENT

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It is no easy task to judge the quality of a meat pie without tasting it (some would say it is pretty tricky even with a taste) and yet that is the essence of risk assessment. More of an art than a science, it is heavily dependent on skilled judgement and experience, often based on very limited information.

For practical purposes risk assessment falls into two broad categories, passive and active. Passive assessment involves decisions based on a review of the literature, size and vulnerability of the resource, and experience. It integrates all available information but does not generate significant new information. The great majority of quarantine risk assessments are of this type.

An active assessment includes a component of research, which might reasonably be expected to assist in quantifying the risk. Such active research may be considered where the potential danger is thought to be very high, the resource of great value, or the decisions to be made of major proportions. The risk assessment of pine wilt nematode, *Bursaphelenchus xylophilus* (Steiner and Buhrer) Nickle, to *Pinus radiata* D. Don (radiata pine) in New Zealand is an example which was carried to the active phase.

A detailed review of this study has been presented by Bain & Hosking (1988) and I do not propose to reiterate the background and nature of the disease in any detail. Its seriousness in Japan can be gauged from the 2 000 000 m^3 annual timber loss and control costs of US$35 million in 1980. The nematode is native to North America where no such damage occurs. Its principal vectors are longhorn beetles of the genus *Monochamus,* several of which occur in North Amercia, and one, *M. alternatus* Hope, in Japan. The question asked of FRI entomologists was, "In view of the nematode's devastating impact in Japan, what is the risk to radiata pine in New Zealand, and should specific quarantine action be taken to prevent its establishment?"

The risk assessment rested on three questions:

(1) How susceptible is *Pinus radiata* to pine wilt nematode?
(2) How likely is it the nematode could enter New Zealand?
(3) Once established, how would transmission of the nematode occur?

To deal with the third point first, overseas research suggests that for effective transmission of the nematode a *Monochamus* vector would also have to become established. New Zealand lacks longhorn beetles with the necessary biological attributes (Kondo *et al.* 1982) to transmit the disease effectively. The likely mode of entry was more difficult since we do not import pine logs from Japan, which would allow easiest entry, but the question of introduction in dry timber was raised. Little information was available on nematode survival in dry timber and so a programme was set up at FRI to extract nematodes from samples of pine casewood and packaging of Japanese origin. No pine wilt nematodes were recovered over a 12-month period. However, the major question raised in the assessment was the susceptibility of *P. radiata* to the disease. Even though both the probability of establishment and transmission were low, if the tree was susceptible action might well be justified.

There has been much work carried out both in Japan and the United States on the susceptibility of various pine species to *B. xylophilus* (Futai & Furono 1979; Dropkin, Foudin, Kondo, Linit & Smith 1981; Kondo *et al.* 1982; Wingfield *et al.* 1984). In general, it can be said that the Japanese work indicates that members of the subsection Sylvestres of the genus *Pinus* are most susceptible to the disease and that most North American species of pines are resistant to a variable degree. Inoculation studies in the United States (e.g., Dropkin & Linit 1982) have often given conflicting results. The Japanese work indicated that *P. radiata* was moderately resistant but United States workers reported it to be highly susceptible (Dropkin, Foudin Kondo, Linit, & Smith 1981; Dropkin, Linit, Kondo, & Smith 1981). The important point is that nearly all inoculation studies in the United States involved seedlings and much of the Japanese work used older trees, very often in plantations.

In a forest Wingfield *et al.* (1984) inoculated *P. banksiana* Lamb., *P. resinosa* Aiton, and *P. nigra* Arn. with *B. xylophilus* in concentrations which had killed similarly aged susceptible pine species. These inoculations failed to cause any damage. However, seedlings of all three trial species were killed in greenhouse inoculation studies. The question of susceptibility was clearly critical to the risk assessment. The collection of further information on the susceptibility of *P. radiata* and on the incidence of the disease in native stands of trees was considered essential to assessing the risk for New Zealand plantations, and the adequacy of present quarantine regulations. The study findings, detailed by Bain & Hosking (1988), supported the view that *P. radiata* is resistant to the disease, and that no additional quarantine practices or regulations aimed specifically at the exclusion of *B. xylophilus* and/or its vectors can be justified.

With *B. xylophilus* a relatively modest investment in active risk assessment, in the form of an investigation of disease impact in its native range, allowed us to avoid unnecessary restrictions on the movement of wood produce. At the same time, it demonstrated willingness to take scientifically well-founded decisions to ensure the best possible use of resources in the protection of our forests from exotic insects and diseases.

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