

## THE GENETICS OF *PHYTOPHTHORA PLUVIALIS* IN NEW ZEALAND

Red needle cast (RNC), caused by *Phytophthora pluvialis*, has been a significant disease in plantations of *Pinus radiata* in parts of New Zealand since at least 2008. The first symptoms of disease are olive coloured lesions on needles, which may contain dark resinous spots or bands. Later, needles in the lower part of the crown turn red, before being cast prematurely (Fig. 1). In severe cases, the entire crown can be affected.



Figure 1. Typical symptoms of RNC. Photo: Stuart Fraser.

To date, *P. pluvialis* has only been reported from New Zealand and the Pacific Northwest of the USA. In New Zealand it has been reported from radiata pine and Douglas fir (*Pseudotsuga menziesii*). In the USA, it has been isolated from Douglas fir, streams, rain traps, soil and tanoak (*Notholithocarpus densiflorus*).

The main aim of this study was to determine if *P. pluvialis* was native or introduced to New Zealand. To help answer this question, genetic markers (single nucleotide polymorphisms) were identified from the genome of *P. pluvialis* and used to compare the genetic diversity of populations of *P. pluvialis* from New Zealand and the USA.

Results of this study indicate that *P. pluvialis* was introduced to New Zealand. The New Zealand population of *P. pluvialis* has very low levels of genetic diversity, half that of the USA populations. This is shown in a minimum spanning network (Fig. 2). Isolates from the USA make up most of the network (contain most of the diversity),

while isolates from New Zealand form two small clusters. Isolates from the USA clustered together based on geographic proximity, which was not the case for the isolates from New Zealand.

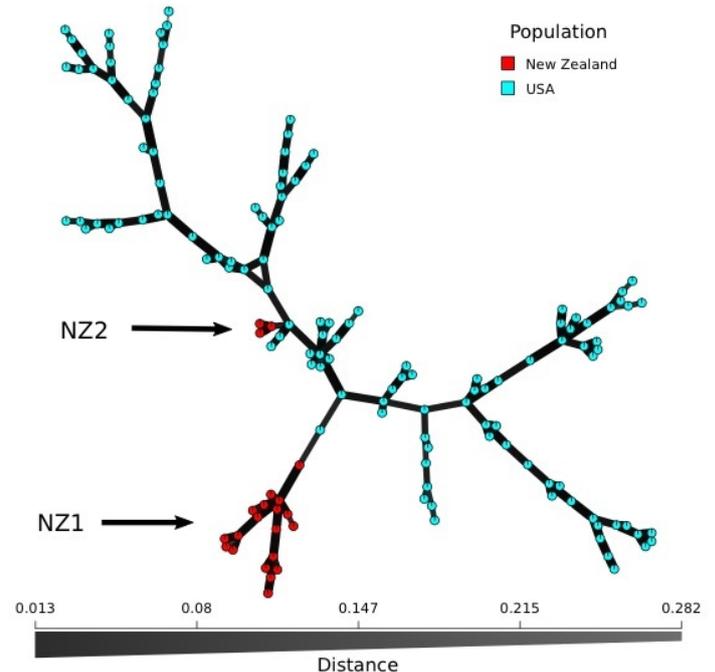


Figure 2. Minimum spanning network showing the genetic relationship among isolates of *P. pluvialis* from New Zealand and USA.

Interestingly, isolates of *P. pluvialis* from New Zealand formed two groups, termed “NZ1” and “NZ2”, which may suggest two separate introductions. The majority of isolates grouped in NZ1, potentially indicating an earlier introduction than NZ2. This is supported by the finding that NZ2 is more closely related to isolates from the USA (Fig. 2). Most NZ2 isolates came from Northland (Fig. 3), possibly suggesting a second introduction of *P. pluvialis* occurred in this region.

This study shows the importance of a maintaining a strong biosecurity system to protect New Zealand’s primary industries. The genetic markers used here can be used to monitor the population dynamics of *P. pluvialis* in the future.

## EUCALYPTUS VARIEGATED BEETLE (EVB) MARCHES ON

We last updated readers on the *Paropsisterna variicollis* (EVB) incursion in Hawke's Bay in September last year. At that time, the beetle had been observed infesting eucalyptus in Hawke's Bay from Te Pohue in the north (B. Rogan, FH News 269) to the Manawatu town of Woodville in the south. It has now hitchhiked across the Ruahine Ranges perhaps riding on trucks or trains to Taihape, and south to the Wairarapa. To track the spread of the pest, visit the NatureWatch website: <http://naturewatch.org.nz/taxa/495700-Paropsisterna-variicollis>

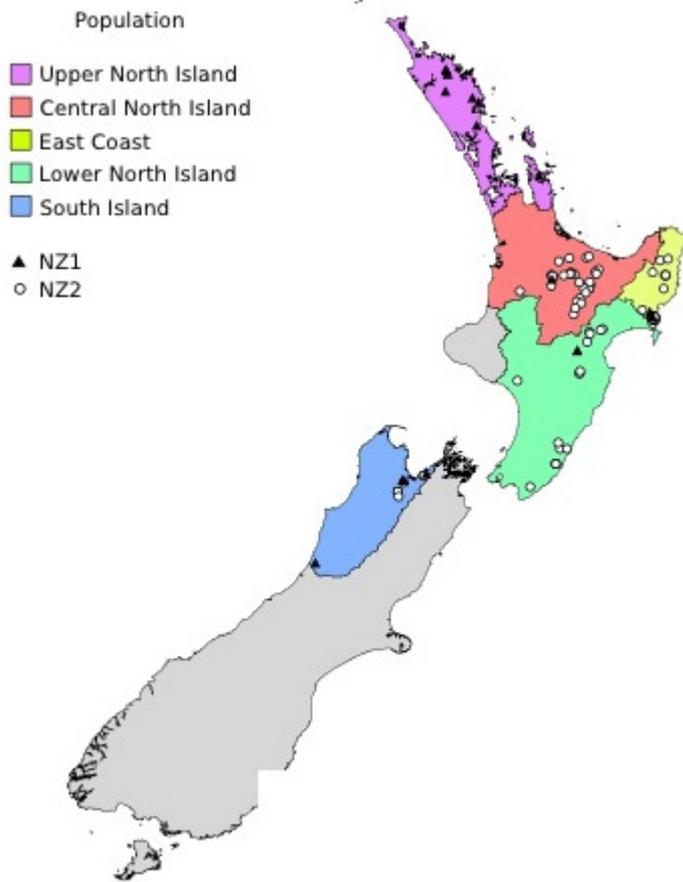


Figure 3. Sampling locations for *P. pluvialis* and the distribution of the NZ1 and NZ2 groups.

This research has been published as:

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Figure 4. Left, eucalyptus tortoise beetle (bottom) found together with an eucalyptus variegated beetle (above). Right, the striking striped larvae of EVB. Photos: Andrew Pugh & Angus Gordon.

*Enoggera nassau*, an egg parasitoid of the eucalyptus tortoise beetle (*Paropsis charybdis*), has been observed attacking the eggs of EVB. However, the presence of the parasitoid has not halted the observed rapid population growth of this pest. On some susceptible species of eucalyptus, such as *E. bosistoana*, groups of larvae have been seen marching together from leaf to leaf and stripping all leaves from entire branches.

Toni Withers is keen to hear from any companies or groups who might be interested in contributing to a research programme on this pest in the future.

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