INTRODUCTION

Kaori dieback is an increasing problem affecting kaori (Agathis australis) in Auckland and Northland (Fig. 1). Phytophthora taxon Agathis (PTA) has been identified (by Ross Beever) as a causal agent of kaori dieback, but we do not know if PTA is a new endemic species or whether it has been described elsewhere and was introduced to New Zealand.

MULTI-GENE ANALYSIS

Preliminary studies showed small genetic differences between the species in Clade 5 using the ITS region of the nuclear ribosomal DNA. More recently, researchers are using multiple loci from both the nuclear and mitochondrial genomes to resolve species boundaries within Phytophthora. We have commenced a multi-gene phylogenetic study to better understand the relationship between these members of Clade 5. Although relationships within Clade 5 remain uncertain, PTA is consistently differentiated from the other two species in Clade 5, based on the three gene regions sampled to date, Translation Elongation factor 1 alpha, Beta-tubulin, and the mitochondrial gene NADH dehydrogenase.

MISTAKEN IDENTITY?

• PTA was originally misidentified as the morphologically similar P. heveae.
• PTA shares a place in Phytophthora Clade 5 with P. heveae and P. katsurae but has different osospore morphology (Fig. 2). The morphospheres are distinguished largely on basis of spore ornament.
• PTA’s life history clearly distinguishes it from other species such as P. infestans and P. cactorum, which have distinctive morphology and host range.

SPECIES CONCEPT FOR PTA

• The genus Agathis consists of 21 species.
• Its range extends west to Sumatra; north to the Philippines; east to Fiji; and south to New Zealand (Fig. 4).
• The greatest representation of the genus (five species) occurs in New Caledonia.
• Agathis australis is restricted to New Zealand.
• Preliminary evidence suggests that A. robusta – native to southeast Queensland – is resistant to PTA.

We will seek Clade 5 morphospecies (i.e., P. katsurae and P. heveae) known from ‘indigenous’ communities in tropical forests in Australia, Papua New Guinea, Sumatra, Philippines; Vanuatu, New Caledonia and Fiji for comparative purposes.

Once we have collected isolates of PTA from the range of infested kaori throughout the North Island, we will establish: - Colony morphology on V8 juice, MEA, and PDA - Morphologic and morphometric variation of sporangia, oogonia, oospores and antheridia - Pathogenicity - Host range of PTA on other Agathis spp. (Fig. 4).

By combining phylogenetic analysis with examination of all other morphological and physiological data we will be able to infer whether this taxon is unique and not previously described.

MICROSATELLITE ANALYSIS TO RESOLVE ORIGINS AND QUESTIONS AROUND TIME OF EXOTIC INCursion

• Founder populations typically contain only a small fraction of the genetic variation found in the original source populations. Because founder populations are usually small, genetic drift can occur during the founder event and in subsequent generations until the population size increases. Therefore the genetic structure of founder populations is often very different from the original source populations.

• Phytophthora ramorum population dynamics research in Oregon over the last four years has focused on understanding the evolution of the three clonal lineages of the exotic sudden oak death pathogen Phytophthora ramorum.

• We aim to screen a ‘population-sample’ of PTA isolates for alleles at 10 microsatellite loci to derive an estimate of the genetic diversity of the sample, and decide whether it is indicative of an introduced founder population, or whether the population structure reflects characteristics of a founder population.

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REFERENCES: A. Beever RE, Maepa MA, Robertson TD, Dick MA, Ramsfield TD, Dick MA, Horner IJ 2008. Kauri (Phytophthora taxon Agathis) under threat from the exotic sudden oak death pathogen Phytophthora ramorum: A review of New Zealand kauri (Agathis australis) in Auckland and Northland (Fig. 1). Phytophthora taxon Agathis (PTA) has been identified (by Ross Beever) as a causal agent of kaori dieback, but we do not know if PTA is a new endemic species or whether it has been described elsewhere and was introduced to New Zealand.

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