

ARMILLARIA SPORE DISPERSAL

Armillaria root disease is widespread throughout New Zealand in pine forests and kiwifruit orchards, and in trees in parks, home gardens, and riparian zones (*FHNews* 85:3-4, 88:2, 115:1). In plantations of radiata pine, losses have traditionally been associated with first-rotation stands planted on sites cleared of native forest. The disease is caused by two species of indigenous wood decay fungi, *Armillaria novae-zelandiae* and *A. limonea*, both of which occur naturally within native forest ecosystems. After tree felling, the fungi colonise the stumps of the native trees, and infection spreads into the new plantations through root contact between the stump roots and those of the young growing pine trees. While little native forest is now converted to plantation, the legacy of this once-common practice is still with us. It has been estimated that national losses in the year 2000 due to the impact of Armillaria root disease amounted to \$37 million, as a result of early stand mortality and subsequent unrealised growth increment on infected living trees. Although the influence of this early period of native forest conversion is declining, the national cost of the disease has nevertheless been forecast at \$20 million for the year 2020. This is because although Armillaria-caused mortality and increment loss are now comparatively low, there are indications that infection may be spreading into new areas of pine plantation by means of spore dispersal. Firstly, the disease occurs in pine stands on sites where there has been no history of indigenous forest. Then, numerous studies have established that New Zealand *Armillaria* populations are composed of densely distributed colonies, implying that spore dispersal is prevalent. This is in stark contrast to the distribution pattern of *Armillaria* species in many regions overseas, where colony densities are often much lower, indicating that their establishment by spores is less frequent. It may also be significant that, in general, only *A. novae-zelandiae* has been found in pine stands on non-native forest sites, suggesting that this species may disperse to a greater extent than *A. limonea*.

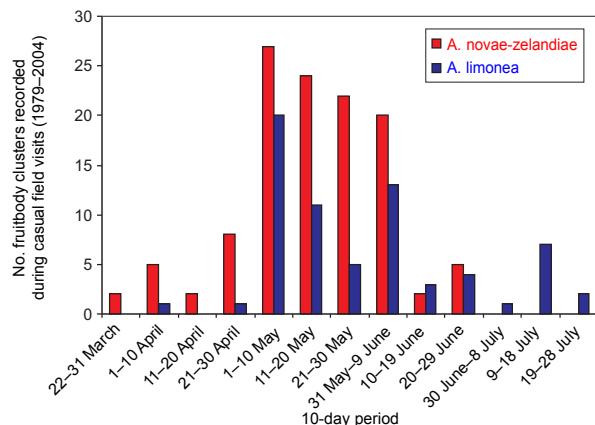


Fruitbodies of *Armillaria novae-zelandiae* collected from indigenous forest in order to obtain spores for treating pine stem segments and stumps.



Armillaria mycelial ribbons growing beneath the bark of a radiata pine stump treated with spores of *Armillaria novae-zelandiae*.

It is therefore important to clarify the role of spore dispersal by direct means. A number of studies have already confirmed that partially buried, freshly cut, pine stem segments are readily colonised after treatment with spores of *A. novae-zelandiae*. *Armillaria* can often be found beneath the bark in piles of partly buried slash and log debris, and it is conceivable that contact between this material and extending roots of young pine trees may lead to the formation of new infection centres. It was recently shown for the first time that freshly cut radiata pine stumps are also susceptible to spore colonisation, although it has been found that thinning stumps are commonly invaded vegetatively from *Armillaria* inoculum already present on the site. New work is aimed at resolving the threshold spore density required for colonisation to occur, and relating this to seasonal and spatial patterns of spore dispersal present in the atmosphere. Although fruiting is rarely seen in pine forests, large fruitbody clusters releasing copious quantities of spores are produced in native forests throughout the country during late autumn-early winter (see graph). This work forms part of a larger Forest Health Armillaria research programme directed towards developing a protocol for the identification of more severely infested stands, and a disease management remedial procedure that can be applied to such sites.



Armillaria fruiting periods in the central North Island

(Ian Hood, Judy Gardner, and Tod Ramsfield, Forest Research)

ARMILLARIA HINNULEA IN NEW ZEALAND

Armillaria hinnulea was described as a new species in 1983 based on 39 collections: 33 from Tasmania, five from Victoria, and one from the South Island of New Zealand. It is distinguished macroscopically from *A. novae-zelandiae* by its non-slimy cap, and a stem that broadens at the base, and from *A. limonea* by its brown cap which lacks sandpaper-like scales, and its overall pinkish-brown colours, especially in the gills. *Armillaria hinnulea* is also readily differentiated microscopically, in particular by its possession of a particular structure (clamp connection) not found in other Southern Hemisphere *Armillaria* species. It is therefore speculated that *A. hinnulea* is more closely related to Northern Hemisphere species that also exhibit this feature. Recent phylogenetic analysis of the internal transcribed spacer region



Fruitbodies of *Armillaria hinnulea* recently collected in South Island beech forest.

of the ribosomal DNA supports this Northern Hemisphere relationship. In Tasmania and Victoria, *A. hinnulea* is found in wet sclerophyll forest dominated by *Eucalyptus regnans* and *E. obliqua*, and with co-dominants that include *Nothofagus cunninghamii* and *Acacia melanoxylon*. In New Zealand it has been found only in the *Nothofagus* forests of the north-western quadrant of the South Island. It has not been recorded in pine plantations, and it is not known if it is harmful to *Pinus radiata*. Could this be a recent invasion of New Zealand as a result of wind dispersal from Australia? Forest Research has begun a research programme to look at the population genetics of *A. hinnulea* and assess the current state of variation between different populations as an indicator of whether it is a relatively recent arrival or a much more ancient member of the New Zealand fungal flora. A field trip to the Nelson region in May

2004, in tandem with the annual New Zealand Fungal Foray (*FHN* 129: 1–2), furnished fresh collections and cultures of this species which will be utilised for population genetic studies that will be initiated in the upcoming year. The goal of this FRST-funded research programme is to shed light on how a wood-colonising basidiomycete and pathogen might invade a native forest, and how such insight could be used to enhance New Zealand's biosecurity against human-assisted fungal invasions.

(Geoff Ridley and Tod Ramsfield, Forest Research)

IUFRO FOREST BIOSECURITY CONFERENCE

It is not long until the IUFRO Forest Health and Biosecurity Conference being held at Hanmer Springs 9–13 August 2004 (*Forest Health News* 130: 1-2). There will be presentations by speakers from around the world on a diverse range of forest insect pests including gypsy moth, painted apple moth, gum leaf skeletoniser, and emerald ash borer. Other presentations will look at the role of forest diversity in pest dynamics. The conference is open to everyone and registrations are welcome. The regular registration period is being extended to 15 July, after which a late fee will apply.

For details of programme, transport, and accommodation visit www.forestresearch.co.nz/iufro2004 or

contact eckehard.brockerhoff@forestresearch.co.nz, but hurry!

NEW RECORDS

New host record for New Zealand – Fungus: *Valsaria rubricosa*; **Bioregion:** Gisborne; **Host:** *Pinus radiata*; **Coll:** B Rogan, 27/04/2004; **Ident:** P Gadgil, 18/06/2004; **Comments:** Species of *Valsaria* are saprophytes. Previous records are from *Elaeocarpus* and *Nothofagus*.

New distribution record for New Zealand – Fungus: *Cladosporium allii*; **Bioregion:** Wellington; **Host:** *Arthropodium* sp.; **Coll:** B Doherty, 16/06/2004; **Ident:** K Dobbie, 22/06/2004; **Comments:** This species was previously known from Auckland and mid Canterbury. It is associated with leaf spots on *Allium* and *Arthropodium*.

New distribution record for New Zealand – Insect: *Nambouria xanthops* (Pteromalidae); **Bioregion:** Waikato; **Host:** *Eucalyptus ?viminalis*; **Coll:** C Inglis, 10/06/2004; **Ident:** J Bain, 16/06/2004; **Comments:** This Australian species was first found in New Zealand in 1999 and has been recorded from about 12 species of *Eucalyptus* here. It was previously known from Auckland and Coromandel.

New distribution record for New Zealand – Insect: *Mycopsylla fici* (Homotomidae); **Bioregion:** Gisborne; **Host:** *Ficus macrophylla*; **Coll:** B Rogan, 05/06/2004; **Ident:** J Bain, 24/06/2004; **Comments:** This Australian species was first recorded in New Zealand in 1995 and until now was known only from Auckland.

New distribution record for New Zealand – Insect: *Acrocercops laciniella* (Gracillariidae); **Bioregion:** Nelson; **Host:** *Eucalyptus leucoxylon*; **Coll:** B Doherty, 27/06/2004; **Ident:** D Jones, 05/07/2004; **Comments:** This Australian species was first found in New Zealand in 1999. Its main hosts are *Eucalyptus* spp. and it is widespread in the North Island. This is the first record from the South Island.

New distribution record for New Zealand – Insect: *Ceroplastes sinensis* (Coccidae); **Bioregion:** Taranaki; **Host:** *Eucalyptus ficifolia*; **Coll:** L Renney, 15/05/2004; **Ident:** J Bain, 24/06/2004; **Comments:** This introduced species is found in most regions of the northern half of the North Island. It has a wide host range.

New host record for New Zealand – Insect: *Pseudococcus longispinus* (Pseudococcidae); **Bioregion:** Auckland; **Host:** *Myrsine australis*; **Coll:** C Inglis, 09/06/2004; **Ident:** D Jones, 10/06/2004; **Comments:** This cosmopolitan, polyphagous species was first recorded in New Zealand in 1890.

New host record for New Zealand – Insect: *Nipaecoccus aurilatanus* (Pseudococcidae); **Bioregion:** Auckland; **Host:** *Agathis moorei*; **Coll:** C Inglis, 01/06/2004; **Ident:** D Jones, 15/06/2004; **Comments:** This Australian species is usually found on *Araucaria* spp. but has been recorded on other *Agathis* spp.

New host record for New Zealand – Insect: *Ceroplastes sinensis* (Coccidae); **Bioregion:** Auckland; **Host:** *Lepidozamia peroffskyana*; **Coll:** C Inglis, 08/06/2004; **Ident:** D Jones, 15/06/2004; **Comments:**

This introduced species is found in most regions of the northern half of the North Island. It has a wide host range but this is the first record on the family Zamaceae.

New host record for New Zealand – Insect: *Ceroplastes sinensis* (Coccidae); **Bioregion:** Hawke's Bay; **Host:** *Eucalyptus ficifolia*; **Coll:** C Inglis, 18/06/2004; **Ident:** J Bain, 23/06/2004; **Comments:** This introduced species is found in most regions of the northern half of the North Island. It has a wide host range but this is the first record on *Eucalyptus* in New Zealand.

New host record for New Zealand – Insect: *Ceroplastes sinensis* (Coccidae); **Bioregion:** Hawke's Bay; **Host:** *Alectryon excelsa*; **Coll:** C Inglis, 21/06/2004; **Ident:** J Bain, 28/06/2004; **Comments:** This introduced species is found in most regions of the northern half of the North Island. It has quite a wide host range that includes both native and exotic plants.

New host record for New Zealand – Insect: *Hemiberlesia lataniae* (Diaspididae); **Bioregion:** Auckland; **Host:** *Ficus pumila*; **Coll:** C Inglis, 14/06/2004; **Ident:** R Henderson, 14/06/2004; **Comments:** This cosmopolitan, polyphagous species was first recorded in New Zealand in 1979 at Kerikeri. It has been recorded from various species of *Ficus* overseas.

New host record for New Zealand – Insect: *Acrocercops laciniella* (Gracillariidae); **Bioregion:** Auckland; **Host:** *Angophora costata*; **Coll:** C Inglis, 14/06/2004; **Ident:** J Bain, 28/06/2004; **Comments:** This Australian species was first found in New Zealand in 1999. It has been recorded from a wide range of *Eucalyptus* spp., *Lophostemon confertus*, and *Angophora floribunda*.

New host record for New Zealand – Insect: *Uraba lugens* (Nolidae); **Bioregion:** Auckland; **Host:** *Angophora costata*; **Coll:** C Inglis, 14/06/2004; **Ident:** J Bain, 28/06/2004; **Comments:** The main hosts of this Australian species are *Eucalyptus* spp. but it has also been recorded from *Lophostemon confertus*, *Angophora floribunda*, *Quercus* spp., and *Metrosideros excelsa*.

New host record for New Zealand – Insect: *Saissetia coffeae* (Coccidae); **Bioregion:** Auckland; **Host:** *Lepidozamia peroffskyana*; **Coll:** C Inglis, 08/06/2004; **Ident:** D Jones, 15/06/2004; **Comments:** This is a very polyphagous species. It has been recorded from the family Zamiaceae overseas.

New part of host affected – Insect: *Eriococcus fossor* (Eriococcidae); **Bioregion:** Auckland; **Host:** *Nestegis cunninghamii*; **Coll:** C Inglis, 05/05/2004; **Ident:** R Henderson, 24/05/2004; **Comments:** This species usually occurs on the leaves of the host but in this sample it was on the fruit.

(John Bain, Forest Research)