**Joint ICFR/TPCP Leptocybe Awareness Field Day**

**Date:** Tuesday 19 April 2011  
**Venue:** Dukuduku Village Hall, SiyaQhubeka, St Lucia Hall  
**Time:** 08h30 for 09h00

**PLEASE REMEMBER THAT HARD HATS MUST BE WORN TO THE FIELD VISITS**

---

**PROGRAMME**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Presenter</th>
<th>Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>08h30</td>
<td>Meet for tea and coffee at the Dukuduku Village Hall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>09h00</td>
<td>Welcome and overview of the National Forest Protection Strategy</td>
<td>Colin Dyer</td>
<td>ICFR</td>
</tr>
<tr>
<td>09h15</td>
<td>The When, Where and How of <em>Leptocybe invasa</em></td>
<td>Gudrun Dittrich-Schröder</td>
<td>TPCP</td>
</tr>
<tr>
<td>10h00</td>
<td>Control: What are the options?</td>
<td>Brett Hurley</td>
<td>TPCP</td>
</tr>
<tr>
<td>10h40</td>
<td>An Integrated Pest Management (IPM) project proposal for <em>Leptocybe invasa</em></td>
<td>Ryan Nadel</td>
<td>ICFR</td>
</tr>
<tr>
<td>11h10</td>
<td>Commencement of two field visits</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lunch will be provided in field.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The When, Where and How of *Leptocybe invasa*

Gudrun Dittrich-Schröder, Michael J. Wingfield, Brett Hurley, and Bernard Slippers

1 Forestry and Agricultural Biotechnology Institute, University of Pretoria, Pretoria, 0002, South Africa
2 Department of Zoology and Entomology, University of Pretoria, Pretoria, 0002, South Africa
3 Department of Genetics, University of Pretoria, Pretoria, 0002, South Africa

Summary

*Eucalyptus* plantations in South Africa and around the world have recently become threatened by the invasive gall-forming wasp, *Leptocybe invasa* (Hymenoptera: Eulophidae). The pest originated in Queensland, Australia, but was only discovered there after it appeared on *Eucalyptus camaldulensis* in the Middle East and Mediterranean region in 2000. Since then, it has spread rapidly in Africa, South America, South East Asia and China. In Africa, *L. invasa* appeared in Ethiopia in 2002, Kenya and Tanzania in 2005, Zimbabwe and South Africa in 2007, and, Mozambique in 2009. In South Africa, it was first noticed in Pretoria, but since then has been recorded from other regions in the country and is spreading rapidly.

*Leptocybe invasa* causes serious damage to young growing shoots of *Eucalyptus* spp. grown in plantations. *Leptocybe invasa* affects the *Eucalyptus* plants by oviposition on leaf midribs, petioles and branches, which results in gall formation. The wasp infests trees of all ages, from nursery stock to mature trees, but the damage is severe on fast growing younger plants. In instances where severe oviposition has taken place, gall development may stunt the growth of the tree to such an extent that it remains a shrub and does not develop fully. Oviposition usually takes place on small leaves as young as 1-2 weeks old. Unlike the situation in its native environment, *L. invasa* is very noticeable in non-native *Eucalyptus* plantations where it has caused significant damage.

*Leptocybe invasa* is 1.1-1.4 mm in length with a brown head and body with a slight metallic shine. Under ideal conditions the adults live for approximately 6 days. *Leptocybe invasa* exhibits thelytokous reproduction, where females develop from unfertilized eggs and males are absent or scarce. This mode of reproduction is being confirmed using flow cytometric techniques. Preliminary results confirm a thelytokous mode of reproduction in *L. invasa* in South Africa.

Molecular genetic studies using mitochondrial DNA are being conducted to determine the diversity and relationship of these introduced populations as well as to provide early confirmation/identification from larvae in galls.
Figure 1.  
A: Leptocybe invasa adult (Photo: Zvi Mendel); B: A gall cut open showing a mature L. invasa adult ready to emerge as well as two L. invasa mature larvae; C: An L. invasa larva; D: Oviposition ‘scarring’ on the midrib of a Eucalyptus leaf; E & F: Emergence holes of L. invasa from galls on the leaf and stem respectively
Control: What are the options?

Brett P. Hurley\textsuperscript{1,2}, Gudrun Dittrich-Schröder\textsuperscript{1,2}, Michael J. Wingfield\textsuperscript{1}, Stefan Nesser\textsuperscript{1}, and Bernard Slippers\textsuperscript{1,3}

\textsuperscript{1} Forestry and Agricultural Biotechnology Institute, University of Pretoria, Pretoria, 0002, South Africa  
\textsuperscript{2} Department of Zoology and Entomology, University of Pretoria, Pretoria, 0002, South Africa  
\textsuperscript{3} Department of Genetics, University of Pretoria, Pretoria, 0002, South Africa

* brett.hurley@fabi.up.ac.za

Summary

The \textit{Eucalyptus} gall wasp, \textit{Leptocybe invasa} has rapidly become a serious forest pest in South Africa. For this reason, various TPCP studies have been initiated to deal with the pest. In the short to medium term, these are focused in two main domains, namely resistance screening and biological control. A first step was to develop useful screening procedures to enable forestry companies to identify patterns of susceptibility in \textit{Eucalyptus} spp., but more importantly in clonal hybrids. Following a pilot trial in 2009, a larger screening trial with 50 clones or families was completed in 2010. Results from this trial show distinct differences between \textit{Eucalyptus} provenances, but also great variation within provenances, noticeably GC and GU clones (see Figure). These results clearly demonstrate that planting resistant material can assist in the management of this insect. From these trials the techniques have now been established and refined to a point where it can be routinely implemented. Apart from technical information, the TPCP members are already using data from this trial to make decisions regarding planting stock. A much more extensive screening trial is currently being run which will provide further information on the most suitable species and clones to plant.

Possibly the best available option to deal with the growing \textit{L. invasa} invasion is via biological control. Considerable effort is being made to identify effective parasitoid wasps that can be used for this purpose. Collections have thus been made by the TPCP team in Australia and concurrently, imported via collaboration with Dr. Zvi Mendel in Israel. There are consequently various agents that have been studied under quarantine conditions in the facilities at the UP Experimental Farm with the aim of supplying the necessary data to enable us to apply for release permits in South Africa. Of the four agents studied thus far, a newly discovered species of \textit{Selitrichodes} appear to hold particular promise and is the focus of our efforts at present. Research at the FABI quarantine facility at the UP Experimental Farm to investigate the biology, specificity and effectiveness of this parasitoid is at an advanced stage. Data from these experiments is required to apply for release of this parasitoid, and to increase the effectiveness of these releases. Preliminary data is very positive, regarding the specificity and high parasitism levels obtained by this parasitoid. The aim is to apply for release by mid-2011.

In parallel to the above studies, two projects with a longer-term focus are also being pursued. In the first, molecular tools are being developed to study the diversity of this pest across its invasive range. Such information would be crucial in future to monitor the durability of resistance of clones. Secondly, together with Dr. Sanushka Naidoo, an MSc project is comparing expression profiles in resistant lines. These are the first steps towards understanding the mechanism underlying resistance, which could be used in future breeding and or screening strategies.
Average percent infestation of forty nine Eucalyptus provenances by Leptocybe invasa (Hymenoptera: Eulophidae) during the period 19 October - 13 April 2010
An Integrated Pest Management (IPM) project proposal for

*Leptocybe invasa*

**Ryan Nadel**
*Institute for Commercial Forestry Research, Pietermaritzburg*
Ryan.nadel@icfr.ukzn.ac.za

**Summary**

*Leptocybe invasa* is a major pest on several *Eucalyptus* species and hybrid clones in South Africa. Extensive galling of predominantly leaf and petiole tissue of susceptible seedlings and young trees by *L. invasa*, can result in severely stunted tree growth. In an attempt to quantify the impact of *L. invasa* on tree growth and to assess the effectiveness and timing of chemical products for control methods, an integrated pest management (IPM) trial is proposed. The trial will compare growth/yield data for three selected *Eucalyptus* hybrid clones that have varying levels of susceptibility to *L. invasa* (one *Eucalyptus grandis* × *E. camaldulensis* (GC) and two *Eucalyptus grandis* × *E. urophylla* (GU) hybrid clones). The testing of three chemical pesticide treatments that include a systemic, contact and organic pesticide will be compared over a nine month period. Chemical pesticide treatments will be applied over a 3, 6, and 9 month period for the selected clones to identify age-related responses and timing of application for effective control. The proposed study will determine the growth/yield loss caused by *L. invasa* in addition to testing potential chemical products and optimising the timing of application for three clones of varying susceptibilities.
Field Visits

Field Stop 1: S 28°25.245’ E 032°12.838’

The first field stop is very close to Mtubatuba and is located on Mondi property.

This field site will focus on family, species and clonal differences with regard to their susceptibility towards *Leptocybe invasa*.

This field stop has an ICFR *Eucalyptus longirostrata* trial that assists in identifying both family and individual tree differences with regard to their susceptibility.

Surrounding the ICFR trial site are several rows of various commercially planted hybrid clones and species that provide a perfect opportunity to compare and thus highlight degrees of susceptibility.

Field Stop 2: S 28°25.162’ E 032°11.939’

This site is on a private growers land.

This field site is not too far from the first site and will show infestations of *Leptocybe* on slightly older trees.