Information Sheet
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Leptocybe invasa, also known as the Blue Gum

Leptocybe invasa, the Blue Gum Chalcid wasp

Insect Biology, Symptoms and Damage

Eucalyptus seedlings and trees of less than three years of age appear to be the most severely affected by attack of *L. invasa*. The adult female wasp (about 1.2 mm in length) lays her eggs on the midrib, petioles and stem of young trees, as well as on newly produced coppice growth and seedlings, resulting in the formation of bump-shaped galls. These lead to stunted growth of the trees.

Five stages of gall development have been identified occurring prior to wasp emergence:

1. One to two weeks after egg laying, cork tissue appears at the egg insertion point and gall development begins within the plant tissue;
2. Development of a typical bump shape until the gall reaches its maximum size;
3. Fading of green colour on the gall surface, changing to a glossy pink colour;
4. Loss of gall glossiness with a colour change occurring to light or dark red;
5. Emergence holes of wasps visible.

The biology of the pest has aided its spread internationally. Adult females live for approximately seven days, reproducing asexually by thelytokous reproduction (without mating). Development from egg laying to wasp emergence from the galls in South Africa, has recently been found to be as short as 72 days. Furthermore, the ability to tolerate a wide range of climatic conditions has aided in the spread of *L. invasa* into new environments.

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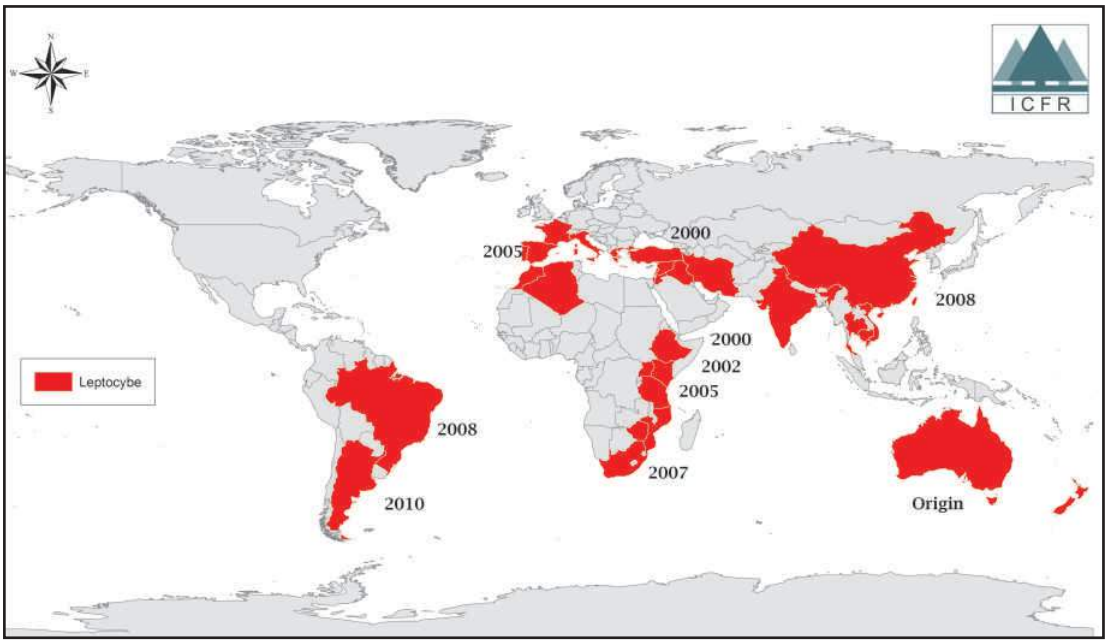
Distribution

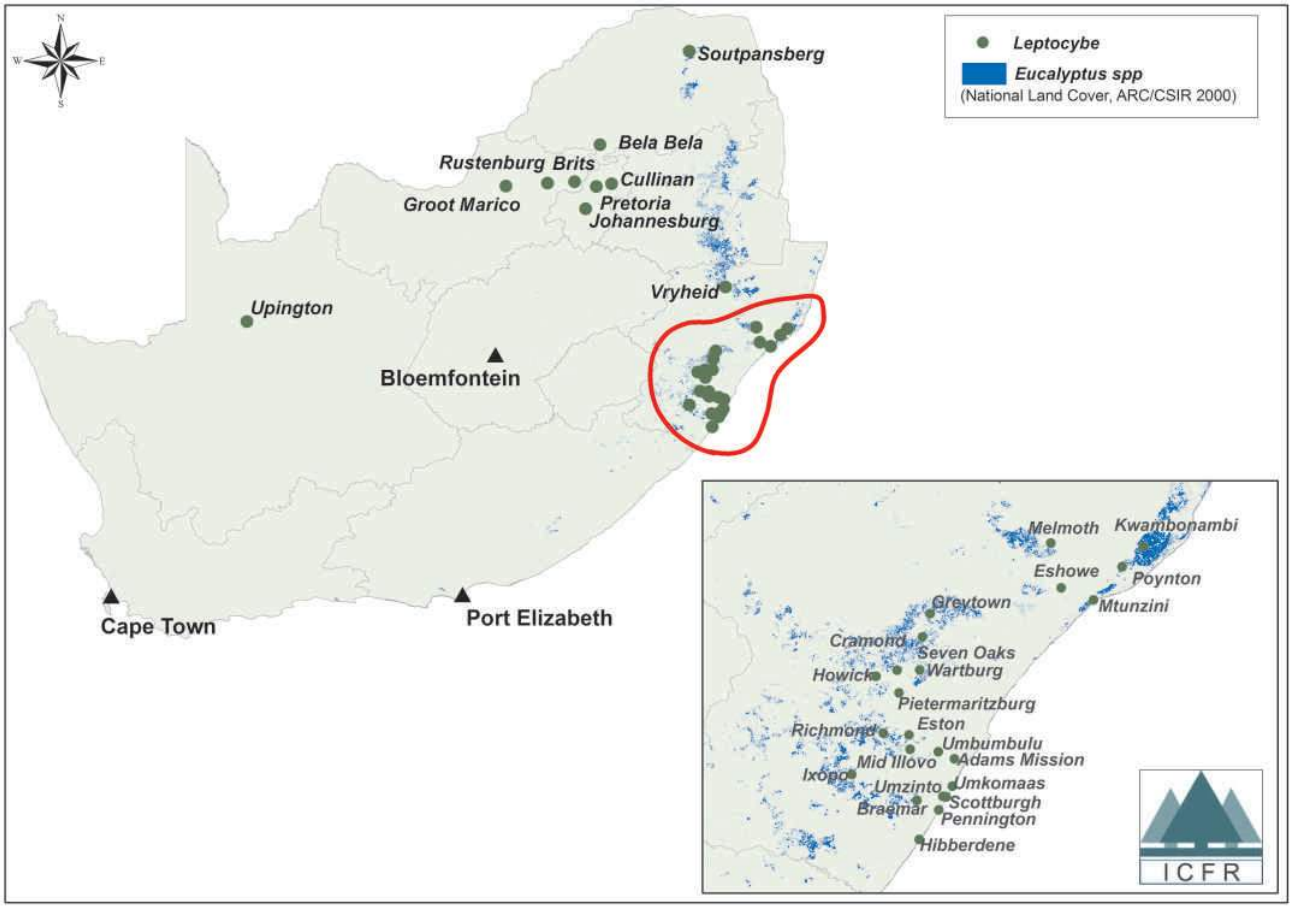
Countries from which *Leptocybe invasa* has been reported. (Date indicates when first discovered in each country)



- **Africa:** Algeria, Ethiopia, Kenya, Morocco, Mozambique, South Africa, Tanzania, Uganda and Zimbabwe
- **Asia and the Pacific:** China, Cambodia, India, New Zealand, Thailand, Vietnam
- **Europe:** France, Greece, Italy, Portugal, Spain, Turkey
- **Latin America and Caribbean:** Argentina, Brazil, Uruguay
- **Near East:** Iraq, Iran, Israel, Jordan, Lebanon, Syria, Turkey

Current distribution of *Leptocybe invasa* in South Africa

(Some of the data regarding distribution was provided by M. Verleur (Sappi) and I. Thompson (NCT).



Hosts and Susceptibility

Observations in most countries where *Leptocybe invasa* occurs report a range of susceptibility amongst the *Eucalyptus* spp. and hybrids. Some of this variation may be environmentally influenced, but a large component is clearly genetically controlled. This can be exploited in breeding programmes, and is likely to be one of the main forms of control for commercial producers. Work undertaken by the TPCP has shown that most, if not all *Eucalyptus* plants that have been screened showed signs of oviposition by *L. invasa*. For some plants, however, this did not develop any further and these are then defined as **'Resistant'**. **Tolerant** species are infested by the wasp but show only limited galls formation.

Susceptible species appear to be readily infested by the wasp with severe gall development. The table below lists those *Eucalyptus* spp. clones and hybrids that have been reported as being infested, or not, in literature or in studies by the TPCP. The designation in this table as resistant, tolerant or susceptible is qualitative (given the variation in the reported information in literature) and provides an indication of the trends observed. It should not be used for decisions about what to plant, and for such decisions, growers are advised to contact their suppliers or the TPCP to determine whether the specific material they intend to plant has been screened for susceptibility.

The following *Eucalyptus* species and clones have been reported to be infested by *L. invasa* either in the literature or by screening trials conducted by the TPCP. Note: Some species or hybrids are represented by only a few individuals or clones.

Species, Clone or Hybrid	Range in susceptibility (qualitative)
Corymbia sp.	
Corymbia citriodora ssp. citriodora	Resistant
Corymbia henryi	Resistant
Corymbia maculata	Resistant
Corymbia torelliana	Resistant
Eucalyptus sp.	
Eucalyptus alba	Resistant
Eucalyptus botryoides	Susceptible
Eucalyptus bridgesiana	Susceptible
Eucalyptus camaldulensis	Tolerant – Susceptible
Eucalyptus camaldulensis ssp. simulata	Susceptible
Eucalyptus camaldulensis var. camaldulensis	Susceptible
Eucalyptus camaldulensis var. obtusa	Susceptible
Eucalyptus cladocalyx	Resistant
Eucalyptus cloeziana	Resistant
Eucalyptus dunnii	Resistant – Tolerant
Eucalyptus globules ssp maidenii	Resistant – Susceptible
Eucalyptus globulus	Susceptible
Eucalyptus gomphocephala	Resistant
Eucalyptus grandis	Resistant – Susceptible
Eucalyptus leucoxylon	Resistant
Eucalyptus microcorys	Resistant – Susceptible
Eucalyptus nitens	Resistant
Eucalyptus pellita	Resistant – Susceptible
Eucalyptus pilularis	Resistant – Susceptible
Eucalyptus robusta	Susceptible
Eucalyptus saligna	Susceptible
Eucalyptus sideroxylon	Resistant
Eucalyptus smithii	Tolerant – Susceptible
Eucalyptus tereticornis	Tolerant – Susceptible
Eucalyptus tereticornis ssp. tereticornis	Susceptible
Eucalyptus urograndis	Susceptible
Eucalyptus urophylla	Tolerant – Susceptible
Eucalyptus viminalis	Susceptible
Commercial hybrids and clones	
Eucalyptus grandis x E. camaldulensis	Resistant – Susceptible
Eucalyptus grandis x E. nitens	Resistant – Susceptible
Eucalyptus nitens x E. grandis	Susceptible
Eucalyptus grandis x E. urophylla	Resistant – Susceptible
Eucalyptus saligna x E. urophylla	Resistant – Tolerant

Spread

It is not known how fast *L. invasa* can spread naturally. However, it has spread from the north to the south of Africa, in less than a decade, and the rate of spread is thus most likely attributed to and assisted by human means. While accidental spread of adults with humans is possible, the most probable mode of spread is in the larval form within infected plant material. It is therefore very important to avoid the movement of material from infested to uninfested areas, and screening of seedlings for infestation is necessary before transporting plants between such regions occurs. Regular assessment of infestation in different areas would also greatly assist in reducing the risk of movement.

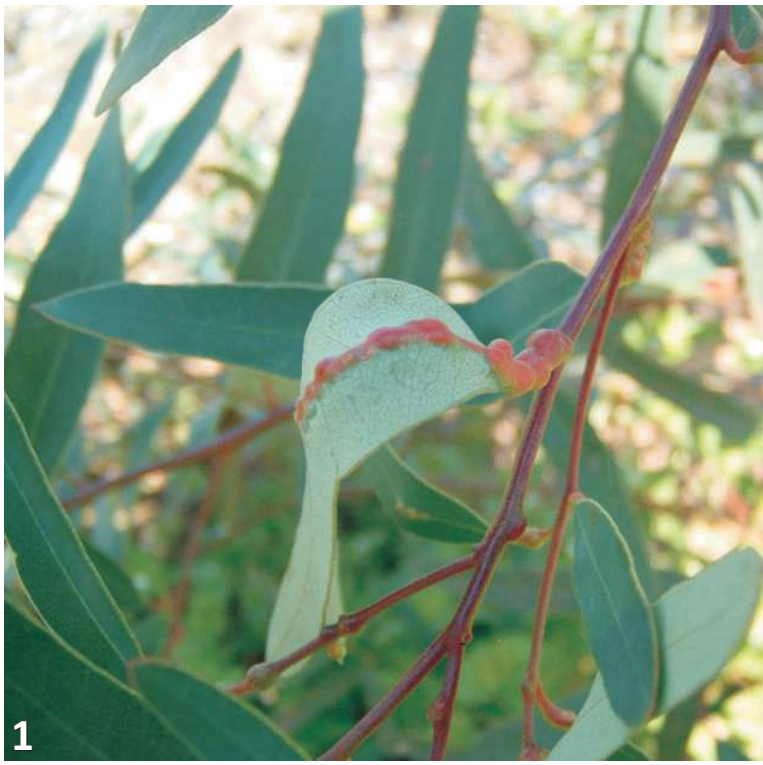
Silvicultural and Chemical Control

Cultural control can help to lower populations of *L. invasa* during the early stages of an invasion in a particular area. These methods are aimed at removing and destroying any infested material. However, they are inefficient during high infestations when it is impossible to remove all infested material over a wide area. Furthermore, in warmer regions these cultural practices are less effective due to the year – round presence and overlapping generations of *L. invasa* making it impossible to schedule cultural control methods for periods of pest absence. Knowledge regarding the impact of *L. invasa* on cultural coppicing practices will be investigated by the ICFR. Trials will be undertaken to test coppice and seedling susceptibility, and management practices aimed at combating *L. invasa* infestations.

Several chemical products have been tested internationally to control *L. invasa* in both the nursery and field with varying levels of success. In South Africa, there are currently no chemical products registered for use against *L. invasa*. The ICFR is conducting trials using pesticides to quantify the impact of the gall wasp on tree growth by obtaining growth and yield data from both susceptible and tolerant *Eucalyptus* hybrid clones. Information obtained from these trials will assist in determining the effectiveness of pesticides, and in identifying product application timing and period of spraying for any age-related responses.

Biological Control

Biological control with parasitoids of *L. invasa* is widely expected to be the second most major method to control the pest in plantations, other than planting resistant material. To enable the release of these parasitoids in South Africa, they need to be identified as suitable, their biology and safety for



1. Leaf and petiole galls caused by *Leptocybe invasa.*
2. Leaf, petiole and stem galls on a eucalypt susceptible to *Leptocybe invasa.*
3. Contorted leaves due to the formation of leaf galls of a susceptible eucalypt species.

South African biodiversity confirmed in approved quarantine facilities, and release permits applied for from the South African Government. Four wasp parasitoids have been identified by collaborators in Israel, and imported for study in South Africa, including *Quadrastichus mendeli*, *Selitrichodes kryceri* and two *Megastigmus* spp. A fifth species, a *Selitrichodes* sp., discovered by Prof Stefan Neser (University of Pretoria) appears to hold much promise for *Leptocybe* control and is currently the main focus of study by the TPCP team.

While all evidence points to the fact that biological control will be one of the cornerstones of controlling *Leptocybe* in future, both the application process for release and the eventual performance of the biological agent are uncertain. Interim decisions and control efforts therefore need to focus on minimising spread, using silvicultural and chemical control where feasible and planting resistant material.

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Nyeko P, Mutitu KE, Otieno BO, Ngae GN and Day RK. 2010. Variations in *Leptocybe invasa* (Hymenoptera: Eulophidae) population

4. Visual symptoms of a tree infested by *Leptocybe invasa.*

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