Leaf-sucking tingid (Carvalhotingis visenda): a potential biological control agent for cat’s claw creeper (Macfadyena unguis-cati)

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Summary  Cat’s claw creeper, Macfadyena unguis-cati (L.) Gentry (Bignoniaceae), is a major environmental weed in south-east Queensland and northern NSW. The biological control program for cat’s claw creeper in Australia was initiated in 2001. The leaf-sucking tingid Carvalhotingis visenda (Drake & Hambleton) was the second agent to be imported in a quarantine facility for host-specificity studies, which showed that it is highly specific. The tingid sucks and feeds the content of leaf cells causing chlorosis and resulting in reduced plant vigour and subterranean tuber production. If approved, this agent will be released in the field.

Keywords  Macfadyena unguis-cati, cat’s claw creeper, Carvalhotingis visenda, tingid, herbivory, host-specificity.

INTRODUCTION
Cat’s claw creeper, a climbing woody vine, is native from Mexico through Central America to tropical South America including Trinidad and Tobago (Dhileepan et al. 2005). In Australia, it is an invasive weed in coastal Queensland and New South Wales (Batianoff and Butler 2003), where it poses a significant threat to biodiversity in riparian and rainforest communities (Vivian-Smith and Panetta 2004). In Queensland, cat’s claw creeper is a Declared Class 3 weed and in NSW it is a Category W4C weed.

Chemical control options for cat’s claw creeper are available, but are often not used due to the sensitive ecosystems (riparian vegetation and rainforest) where it occurs. Whilst aboveground growth can be effectively treated, infestations are often difficult to access and not readily killed due to regeneration from subterranean tubers. Consequently, there is a need to treat infested areas with mechanical or chemical control options repeatedly over a number of years. This severely limits the size of areas that can be treated. Hence, biocontrol appears to be the most desirable option to manage this invasive species (Dhileepan et al. 2005).

Surveys in Brazil, Argentina, Paraguay, Venezuela and Trinidad resulted in the identification of several potential biological control agents (Sparks 1999). This paper reports a summary of work done so far on the leaf-sucking tingid as a potential biological control agent for cat’s claw creeper in Australia.

CAT’S CLAW CREEPER LEAF-SUCKING TINGID
The genus Carvalhotingis is known only from Central to South America (Mexico, Guatemala, Argentina, Brazil, Bolivia and Peru) (Froeschner 1995). The leaf-sucking tingid is only recorded from M. unguis-cati (Drake and Ruhoff 1965). Surveys in the native range conducted by South African colleagues over a four year period have also only recorded this species on M. unguis-cati (S. Neser pers. comm.). The leaf-sucking tingid used in this study, was sourced from a laboratory colony maintained at the Plant Protection Research Institute, Pretoria (Williams 2003). This colony was established from material collected on M. unguis-cati in Argentina and Brazil in April 2002 (S. Neser pers. comm.). Dr Thomas J. Henry, from the Systematic Entomology Laboratory, USDA, Beltsville, Maryland, USA, has confirmed identification of the tingid species (Williams 2003).

LIFE CYCLE
The leaf-sucking tingid has a short generation time of about 38 days. Females lay their eggs on the undersides of leaves and the eggs hatch in about 15 days. Newly emerged nymphs feed on the underside of leaves, causing chlorosis. There are five nymphal instars and the total nymphal duration is about 24.9 ± 0.38 days. Females start laying eggs after 8 days, about 6.8 ± 0.8 eggs day⁻¹ with an average of 73.9 ± 11.2 eggs each in their lifetime. Females (48.0 ± 7.3 days) lived longer than males (24.4 ± 7.9 days).

HOST SPECIFICITY
Detailed host-specificity testing was conducted using potted plants in temperature-controlled glasshouse (22–27°C) in the quarantine facility at the Alan Fletcher Research Station. The potential host-range of the leaf-sucking tingid was evaluated on the basis of nymphal development, adult feeding and survival, and oviposition preference using choice and no-choice tests involving 38 plant species in 10 families.
The host specificity trials carried out in Australia so far support South African results, which indicate that the leaf-sucking tingid is highly host-specific and does not pose risk to any non-target plants in Australia. It can lay eggs and complete nymphal development only on the target weed, cat’s claw creeper. An application for approval to field release the agent in Australia has been lodged.

**DAMAGE POTENTIAL**
Feeding by tingsids in general causes shoot and leaf discoloration and premature leaf drop, which results in stunted growth of plants and reduced plant vigour (Drake and Ruhoff 1965). Studies using a chlorophyll meter (SPAD-502®) under quarantine conditions revealed that feeding by the leaf-sucking tingid reduced leaf chlorophyll content by 61–91% in six weeks. In contrast, in plants where the agent was excluded, the leaf chlorophyll content increased over this period. Leaf chlorosis on the target weed due to feeding resulted in a significant negative impact on growth rates of cat’s claw creeper seedlings. Feeding also affected the number of new leaves produced over the six week period. The reduced plant growth rates obtained in the quarantine study are consistent with the results obtained in earlier simulated herbivory trial (Raghu and Dhileepan, 2005).

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**REFERENCES**