

## The establishment of the clearwing moth for horehound control in South Australia

Susan Ivory

South Australian Research and Development Institute, Primary Industries and Regions South Australia, Waite Building, Waite Road, Urrbrae, South Australia, GPO Box 397, Adelaide, SA 5001  
(susan.ivory2@sa.gov.au)

**Summary** Two biological control agents have been released in South Australia for the control of horehound *Marrubium vulgare* L. The plume moth *Wheeleria spilodactylus* Curtis (Lepidoptera: Pterophoridae) and the clearwing moth *Chamaesphecia mysiniiformis* Biosduval (Lepidoptera: Sesiidae).

The clearwing moth was unsuccessfully released at two South Australian sites in 1997. Subsequent releases occurred at three sites in 1999 (Narrung, Monarto and Wilpena). The establishment of the clearwing moth had previously only ever been confirmed at Monarto.

Surveys were undertaken at Narrung and Wilpena to determine the establishment status of the clearwing moth. Establishment at Wilpena was confirmed while no evidence of establishment was found at Narrung.

**Keywords** Horehound, *Marrubium vulgare*, Horehound clearwing moth, *Chamaesphecia mysiniiformis*.

### INTRODUCTION

Horehound is an invasive perennial herb found in disturbed native vegetation, wastelands, roadsides, and pastures. It is widespread in south eastern Australia and was estimated to occur on 20 million hectares of land receiving more than 200 mm of annual rainfall in South Australia (Clarke *et al.* 2000).

In 1997 and 1999, the clearwing moth was released at various sites across Australia, as a biological control agent for horehound to complement and provide an alternative to the plume moth in low rainfall regions.

Weiss and Sagliocco (2012) clearly describe the life cycle of the clearwing moth. The clearwing moth larvae has been observed to cause plant mortality (Weiss and Sagliocco 2012) as a result of disruption to the vascular flow caused by the consumption of stem and crown material. The resulting tunnels also provide an indirect entry point for pathogenic infection.

In South Australia, clearwing moth eggs were first released near Murray Bridge and Cambrai in 1997 (Weiss and Sagliocco 2012). The Cambrai release consisted of 100 eggs and subsequent monitoring in the following years failed to detect the clearwing moth and the site was considered to have failed. Establishment

failure was attributed to insufficient release numbers and host plants being too old and woody (Clarke *et al.* 2000).

In 1998 the clearwing moth was successfully reared at Waite, in Adelaide. In 1999, 189 adults emerged producing 5830 eggs. These eggs were released into three sites, Narrung (1830 eggs), Monarto (1500 eggs) and Wilpena (2500 eggs) (Clarke *et al.* 2000).

A clearwing moth larva was found at Monarto in the stem of a horehound plant in 2005 (pers. obs.) and the site has since been used by the University of Tasmania to harvest clearwing moth infected crowns as part of their distribution program in Tasmania. Little work has been undertaken in South Australia to assess establishment at the remaining two sites.

Tunnelling attributed to the clearwing moth was observed within horehound crowns and stems at Wilpena in October 2008 (Dr Mike Keller, pers. comm.).

### METHOD

**Surveys** In October 2011, a field survey was undertaken at Wilpena, South Australia to confirm the establishment of the clearwing moth. 55 random live plants were destructively sampled to determine the presence of larvae, pupae or tunnelling within the crown and stem.

Additional work undertaken in November 2011 made an initial assessment of the distribution of the clearwing moth at Wilpena. Between one and five random live plants were destructively sampled at each of 20 sites and the presence of larvae or pupae recorded. The sampling path followed a creek line from where the initial release had occurred. Sampling commenced east along the creek from the initial release until no more larvae or pupae were found. In this direction horehound was continuous on either side of the creek line for approximately 5 km. Sampling continued south west from the initial release along the creek line and in the nearby camping ground until the horehound ceased due to undisturbed native vegetation. An opportunistic sample was taken further south west from the release site, beyond the area of undisturbed native vegetation, in an area with a history of disturbance.

In November 2011, random live plants were destructively sampled at Narrung and the presence of larvae, pupae and tunnelling was recorded.

#### RESULTS AND DISCUSSION

**Presence of clearwing moth at Wilpena** The initial survey of horehound plants at Wilpena found 52.5% of plants had larvae or pupae. In total, 74.5% of plants sampled appeared to have been utilised by the clearwing moth (Table 1). This is comparable to the work undertaken by Sagliocco and Weiss (2004) where 50.3% of plants at the original 1997/98 release site in Wyperfield National Park, Victoria, had been attacked by 2003, and in 2004, where 46% of live plants over a greater number of sampling sites contained larvae (Weiss and Sagliocco 2012).

The plume moth was also found to be present at Wilpena, observed as adults.

**Table 1.** Number and percentage of plants sampled, presenting with larvae, pupae or tunnelling.

	No. of plants	% of plants
Larvae present	26	47
Pupae present	3	5.5
Tunnels, no larvae or pupae present	12	22
No larvae, pupae or tunnels	14	25.5
Total	55	100

**Distribution of clearwing moth at Wilpena** The clearwing moth was found approximately 5 km east following the creek line or 3 km, in a straight line, from the initial release, and 3.28 km south west following the creek line or 2.8 km, in a straight line, from the initial release. The clearwing moth was not detected beyond 5 km east of the initial release despite healthy horehound plants being present. The boundary of the south westerly distribution of the clearwing moth from the initial release was not able to be determined due to time constraints.

**Presence of clearwing moth at Narrung** Surveys at Narrung found that there was little horehound present at the initial release site. Those plants that were present showed no larvae, pupae or presence of

tunnelling. Destructive sampling within 10 km of the initial release found no evidence of clearwing moth larvae or pupae, or the presence of tunnelling. The local indigenous community and land managers have been working very hard to manage horehound in the Narrung area making it difficult for the long term establishment clearwing moth. A heavy infestation of small conical snails around the crown and lower stems may have impacted on the moth's ability to successfully emerge from plants, further reducing its ability to establish. This site will now be abandoned due to the lack of plants.

**Future work** The Wilpena site will now be used as a harvest site to collect larvae and pupae in crowns for a planned release at Venus Bay on the coast of western Eyre Peninsula, South Australia.

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