

# Section 7 – Biocontrol of conical snails

## Overview

Biological control, or biocontrol, is pest control provided by natural enemies of the pest. Natural enemies can be predators, parasitoids or pathogens. There are few natural predators of Mediterranean pest snails in Australia. Small numbers of snails are consumed by mice, lizards and birds. Naturally occurring nematodes and bacteria for snail control have been investigated in Australia<sup>1,2,3</sup>. Where there are not enough natural enemies to suppress an introduced pest, they can be imported from their native range following strict testing to ensure they attack only the target pest.

The parasitoid fly, *Sarcophaga villeneuveana*, is an imported biocontrol agent that attacks the Conical snail and the Small pointed snail<sup>4</sup> from spring to early autumn. The fly is established in the Yorke Peninsula and Eyre Peninsula regions of South Australia<sup>4,6,7</sup>. In cropping regions where the fly is present, biocontrol of conical snails can be encouraged by providing the flies with nursery areas of suitable habitat (Table 7.1).

Table 7.1: Key actions in regions where the fly is present.	
Actions	Considerations
<b>Spring to early autumn</b>	
Promote flowering native plants around paddock perimeters where snails are a problem	<ul style="list-style-type: none"> <li>Native vegetation that flowers in spring and summer provides flies with shelter and food (nectar and pollen)</li> </ul>
Reduce ground refuges for conical snails in and around paddocks	<ul style="list-style-type: none"> <li>Conical snails commonly shelter in and under weeds, canola stalks, and under rocks or other refuges</li> <li>Reducing refuges forces snails to climb elevated objects, making them more vulnerable to fly attack</li> </ul>
Minimise insecticide use near fly nurseries	<ul style="list-style-type: none"> <li>Flies are active from spring to early autumn and can be killed by broad-spectrum insecticides</li> </ul>

## Fly life cycle

Adult flies are active from spring to early autumn<sup>4,8</sup>. They attack aestivating conical snails at least 5mm in shell length<sup>9</sup>. After mating, female flies lay a single live larva near the shell opening of a resting snail<sup>8</sup> (Figure 7.1). The larva crawls inside the shell and consumes the flesh of the snail, killing it. The larva pupates inside the shell and emerges about eight days later as an adult fly. Adults live for approximately 60 days, and feed on floral nectar and pollen. The generation time is about 20 days<sup>9</sup>. Approximately six to eight generations are possible from spring to early autumn in southern Australia<sup>8</sup>. Flies enter diapause in autumn and overwinter in the pupal stage inside the snail shell, then emerge as adults in early spring.

## Fly identification

*Sarcophaga villeneuveana* belongs to the family Sarcophagidae (flesh flies). Adults are similar in appearance to bush flies (Figure 7.1). They are 5 to 7mm in length with reddish eyes, and grey and white parallel stripes on the thorax between the wings. Larvae are white maggots up to 6mm in length. Pupal cases are brown in colour, and easily visible with the naked eye inside the shell opening of a parasitised snail.

## Geographic distribution and parasitism levels

The fly is established on southern Yorke Peninsula and Lower Eyre Peninsula<sup>4,7</sup>. Up to 30 to 50 per cent of snails more than 5mm in length can be parasitised by flies at sites near flowering vegetation<sup>7</sup> (Figures 7.2, 7.3). These parasitism levels help suppress conical snails. Parasitism is often nil or less than three per cent in areas without native vegetation, even when populations of conical snails are high<sup>4,6</sup>. Flies need food and shelter for survival and reproduction. Snails resting on objects above ground level are most likely to be parasitised (Figure 7.4)<sup>4,8</sup>.

## Encouraging biocontrol of conical snails

In regions where *S. villeneuveana* is present, biocontrol can be encouraged by promoting spring and summer-flowering vegetation on property perimeters where conical snails are a problem. Providing flies with food and shelter can increase their survival and reproduction, so they can attack more snails. Flies feed on inflorescences with shallow nectaries. Promote a mix of native plant species endemic to local areas to give a continuous sequence of flowers accessible to flies in spring and summer. Potentially suitable species include *Melaleuca* spp, *Bursaria spinosa*, *Leptospermum* spp and *Hakea* spp.

The fly is less successful attacking conical snails sheltering in refuges at ground level, such as under weeds, rocks and other objects (Figure 7.4)<sup>4,8</sup>. Removing refuges forces conical snails to rest on objects above ground level where they are more vulnerable to fly attack. Exposure to broad-spectrum insecticides is harmful to flies. Minimise insecticide use near fly refuges from spring to early autumn.

Figure 7.1: Life cycle of the parasitoid fly, *Sarcophaga villeneuveana*.

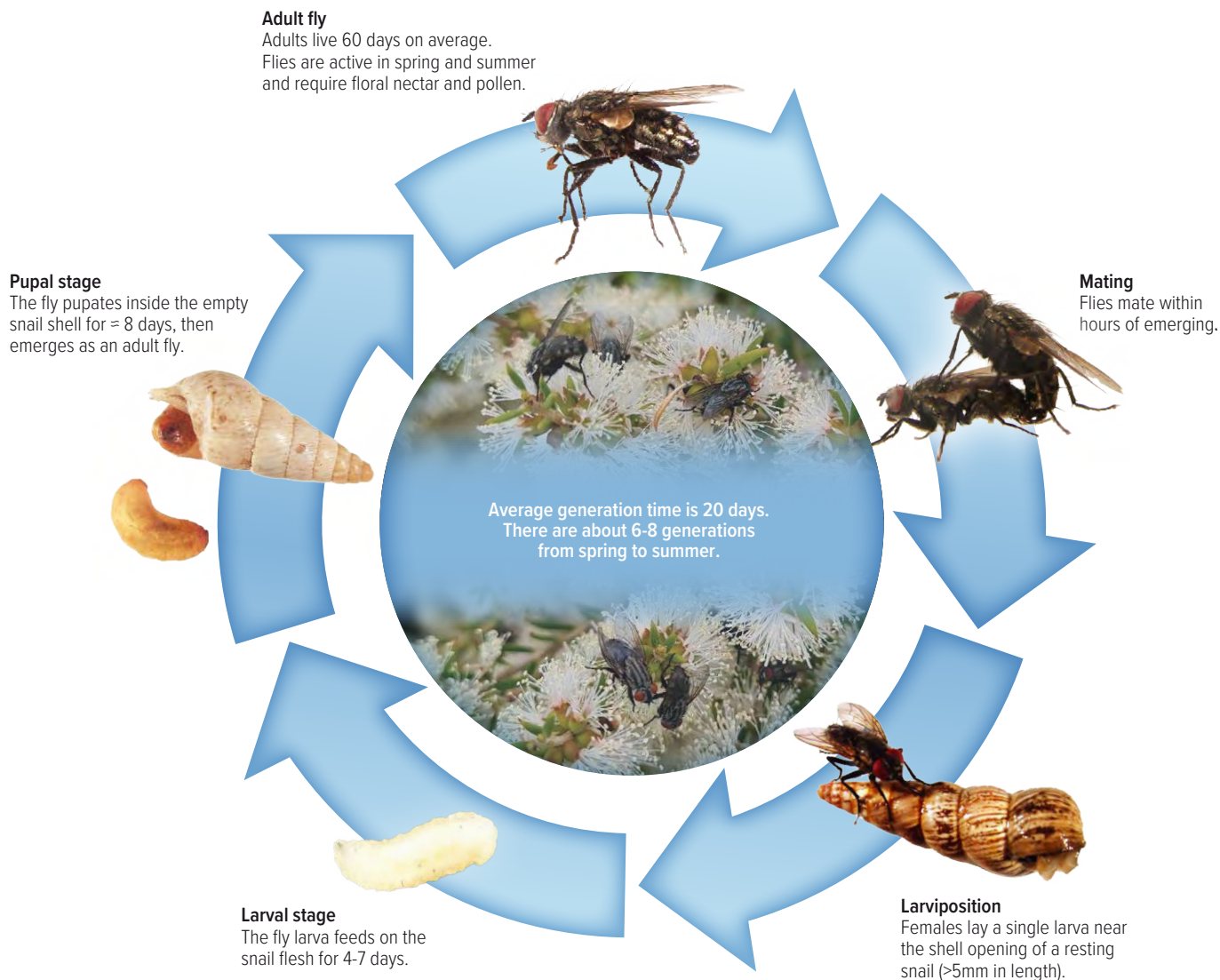


Image: Alex Seret, SARDI

Figure 7.2: a) and b) Areas with higher parasitism or c) and d) low parasitism of conical snails by the parasitoid fly.

a)



b)



c)



d)



Images: Kate Muirhead

Figure 7.3: *Sarcophaga villeneuveana* feeding on flowers of *Bursaria spinosa*.



Image: Nicole Fechner

Figure 7.4: Conical snails resting in elevated positions are more vulnerable to fly attack than snails sheltering in refuges.



Image: Nicole Fechner



Image: Kym Perry



Image: Kym Perry



Image: Kym Perry

# References

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