PORINA WISEANA SPP.
Identification, monitoring and management options

KEY POINTS FOR FARMERS

• Know how to identify moths and caterpillars and the damage they do to pasture.
• Have a basic understanding of the porina life cycle. Note that development for the late flight caterpillar is less predictable than for the early flight caterpillar.
• Understand the economic impact of porina caterpillar damage to your pasture and business.
• Focus on the optimal time for control. Use monitoring techniques to track moth flight and caterpillar development to ensure timely booking of spray contractors.
• Discuss your findings and knowledge with your neighbours.
• Apply cost effective control measures in a timely manner using the lowest cost control option (Diflubenzuron – an insect growth regulator [IGR]).
• In the Southern North Island late flight caterpillars are generally the greatest threat to pasture because they feed during winter when pasture growth is slow.
• Failure to identify a porina problem early on results in reduced efficiency of insecticide, the need for more expensive options or poor stock performance.
• A prolonged dry period or drought in spring and autumn may reduce populations and can make monitoring and control decisions difficult.

IDENTIFICATION AND BIOLOGY OF MOTH CATERPILLAR

There are around seven species of Wiseana. The moths differ in size, colour and marking. W. Cervinata (Plate 1) and W. Copularis (Plate 2) are most common on the east coast of the North Island, with W. Copularis tending to fly later in the season.

Plate 1: W. Cervinata
Plate 2: W. Copularis

• W. Cervinata moths have a wingspan of 30-38mm, and are pale brownish-black with white and black markings on the forewings. W. Copularis have a slightly larger wingspan, and are pale brown with fewer markings.
• All moths have a characteristic curved wing shape (Plate 1).
• Porina moths have short antennae.
• The male abdomen (anterior) is pointed; the female abdomen is cigar shaped.
• Moths live for a few days and fly with temperatures above 8.3°C. After mating, females lay most of their 500-2800 eggs in their emergence area. Around 30-50% of eggs are laid during the dispersal flight. Moths preferably seek pasture >75mm high to lay eggs.
• Eggs hatch in 3-5 weeks.

Initially, caterpillars live on the soil surface under litter (up to 12mm deep) until they commence burrowing at around 4-15 weeks when they are 10-12mm long (Plate 3 and 3a).

Eggs and caterpillars are highly vulnerable to dry weather and trampling by stock. Once burrowed, they are relatively safe from dry conditions.

Plate 3: Juvenile caterpillars scaled with a 10 cent piece 20mm in diameter
Mature caterpillars have a dark brown-black head. They are yellowish-cream on the underside and grey-green on the back (Plate 4). Caterpillars increase in size by moulting (shedding their skin), grow to maturity in around 270 days and are up to 70mm long.

Caterpillars construct more or less vertical tunnels in the soil up to 300mm deep. Mined soil that covers the burrow entrance is intertwined with ‘silk threads’ that hold soil particles together. In comparison, worm casts are smooth and firm up with age (Plate 5).

Porina caterpillars are a denuding pest feeding on the growing points of pasture plants (Plate 6). Caterpillars feed at night in the immediate vicinity of the burrow, forming saucer-sized areas of pasture damage. With high populations damage areas overlap and cause widespread pasture loss (Plate 7). They can move to ‘new’ pasture and construct new burrows. As well as feeding at the surface they can store pasture by packing it into their burrows and will feed below ground for several days in cold weather.

LIFE CYCLE AND MONITORING FOR OPTIMUM CONTROL

The Porina moth has an annual life cycle (Plate 8). Occurrence can vary according to the region, district and farm aspect (Figure 1).

Plate 3a: A recently moulted juvenile porina caterpillar
Plate 4: Porina caterpillar
Plate 5: Porina cast (left) and worm cast (right)
Plate 6: Yellow arrows point to ‘A’ = feeding area and ‘B’ = burrow
Plate 7: Widespread Porina caterpillar damage to pasture at Pongaroa
Plate 8: Annual lifecycle of Porina (DSIR Information Series No. 105/1 Perrott, D.C.F. 1974)
In the Wairarapa and Southern Hawke’s Bay there are two distinct flight periods, each with an annual cycle. In 1999, an AGMARDT and NuFarm Ltd funded project showed the degree of variation in moth and caterpillar development through the Southern North Island and the need for farmers to develop a monitoring system.

Spring ‘peak’ moth flights ranged from 9 October to 12 December with caterpillar field monitoring dates between 25 December and 7 February. Autumn ‘peak’ moth flights ranged from 18 January to 22 February with caterpillar field monitoring dates between 6 March and 15 May.

On one farm that monitored temperatures and moth flights for five years, data showed wide variation in the time taken for caterpillars to reach the burrowing stage. This was related to different autumn weather patterns, with dry cooler autumns extending the time to burrowing (late June).

The low cost caterpillar control option using an insect growth regulator such as Diflubenzuron has a narrow window of opportunity for application. Monitoring provides information that allows greater accuracy in detecting caterpillars at the optimum time (caterpillars around 20-25mm long).

To minimise pasture damage and assess the economic impact Porina is likely to have on your business relative to the cost of control, the critical monitoring elements are:

- Define which flight (spring or autumn or both) is likely to affect the farm (Figure 1).
- Monitor the moth flight(s) to ascertain when 50% of the flight has occurred.
- Record maximum and minimum temperatures to determine the actual heat units accumulating (degree days) and therefore the speed of caterpillar development.
- Use this data to determine the time to look for juvenile caterpillars (Figure 2).

### EARLY FLIGHT

**Usually southerly/easterly aspects**

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### LATE FLIGHT

**Usually northerly/westerly aspects**

| P | M | P | M | E | S | P | M | E | S | S | C | C | C | C | C | C |

**Figure 1:** The dual Porina life cycle in the Southern North Island  
(P = Pupae, M = Moth, E = Eggs, S = Surface caterpillars, C = Subsurface caterpillars causing pasture damage)
MONITORING METHOD

Wairarapa and Southern Hawke's Bay farmers have successfully used the following procedure for late flights (January/April). It does require some commitment.

• Monitor moths using a simple light trap (Plate 9) until the moth flights cease.
• Record maximum and minimum temperatures daily until 600 degree-days (see below) are accumulated. Use a thermometer mounted on a southerly wall (see Plate 10).
• Interpret data to estimate time for field inspections.

Maintaining a moth trap can be time consuming, though it can be an excellent opportunity for a school project! Alternatively, at night farmers can monitor moth activity under lights or against windows with lights on in the room. Use a scale of 1-10, with 10 being extremely dense flight. The key issue is getting some information on moth flights.

Record the number of moths trapped or your score each night.

Daily totals/scores are accumulated for the duration of the flight to determine when 50% of moths have flown, also known as 'peak flight' (total number of moths flown/scores divided by 2).

Record this date.

Temperatures above 8°C are required for egg and caterpillar development.

600 degree-days (600DD) are required between egg hatch and burrowing. This period is around 90 days from the 'peak flight' date (early flight) and up to 130 days (late flight) depending on the season.

Use the formula below to work out degree-days from maximum and minimum temperature data then accumulate daily degree-days (a minus figure is zero) from the date when 50% of moths have flown. (Alternatively contact your consultant for assistance.)

\[
(\text{Max. temp}-8)+(\text{Min. temp}-8)+2(\text{Mean temp}-8)
\]

4

Once 600DD have been accumulated check the turf mat and soil for caterpillars to a depth of 3cm (Plates 3 and 3a). (Note: Larger early flight caterpillars may be 150-280mm deep.)

Continue to monitor until the majority of caterpillars are within the target length for spraying (20-25mm).

Figure 2: Graph showing accumulated moth flight (black line) and the accumulated 600DD (dotted line) from 'peak flight' on 15 February
SPADE MONITORING AT 600DD

Use a 200mm-wide spade to dig square divots from the soil. The number of divots dug depends on the area to be sampled and the density of pests. With higher populations it is easier to come to a conclusion about the economics of control. With few to no caterpillars more divots are required to determine the outcome.

In flat paddocks avoid sampling on the diagonal. In hill country, work diagonally up the slope (Plate 11). Sampling can be time consuming. With more confidence, if 1-3 caterpillars are being found (the likely economic threshold) there is less need to examine the entire sample. However, for the economic equation the number of ‘total’ caterpillars found is required.

Initially, to assess the stage of caterpillar development, aim to sample in areas likely to harbour caterpillars: moist areas, knobs in hill country or amongst rank pasture or Californian thistles.

Skim off the top 3cm of turf and carefully examine the turf for 12-15mm long caterpillars. Then check deeper – 45mm long caterpillars can be 300mm deep.

Record the number of caterpillars found. Ideally record their length so a picture can be built of the different stages of development over the farm or within paddocks.

To calculate caterpillars per m², divide the total caterpillars found by the number of divots dug then multiply by 25. (Note: ONE caterpillar per spade or divot is equal to 25 caterpillars per m² using a 200mm-wide spade.)

The economics of control depend largely on the farm or paddock gross margin. With a gross margin of $1000/ha, ONE caterpillar per divot represents $100 of lost production. Control costs are around $25/ha (using Diflubenzuron).

An estimate of the value of lost pasture (VLP) over the caterpillar-feeding period is derived using: the farm or paddock gross margin/ha the population of burrowed caterpillars per m² monitored, and the damage coefficient of 0.004% (40% loss of pasture /100 caterpillars).

Example:
Paddock gross margin/ha = $800
Caterpillars per m² = 35
VLP = $800 x 35 x 0.004 = $112

Alternatively, substitute farm or paddock gross margin for actual loss of dry matter.

Example:
Estimated DM production = 4972 KgDM
Caterpillars per m² = 35
DM lost to Porina = 4972 x 35 x 0.004 = 696 KgDM
(x value of DM cents per kg)

MANAGEMENT OPTIONS

• Use AR37® endophyte in Per. Ryegrass as it confers a feeding deterrent to caterpillars.
• Young pastures (<4 years) are more susceptible to damage than old pastures.
• With higher value farm systems use alternative insecticides.
• Use supplementary feed to offset lost pasture.
• Use nitrogen strategically to grow more pasture or repair damage.
• Consider pasture management options by controlling lax pasture and managing conservation systems.
• Natural diseases can play a part in control but usually at the latter end of the caterpillars’ growth cycle once the damage is done. Biological control agents are being investigated.

KEY POINTS WHEN USING DIFLUBEN

• Insecticide rarely results in 100% control. Optimum spray application time is critical for effective economic control. Spray once caterpillars are feeding and 20-25mm long.
• A ‘water rate trial’ suggested little difference in control between 50 and 200L water/ha.
• Ensure even coverage of spray.
• Spray insecticide onto short pasture so the active ingredient is accessible to caterpillars.
• With 70-80% control being common, high populations may be reduced but still high enough to cause pasture damage.

ECONOMICS OF CONTROL

Research has provided valuable data to work out the economic losses associated with Porina caterpillar.

As a rule of thumb the % loss in pasture and income is equal to half the population of caterpillars per m².
BE WARY OF LOOK-ALIKE MOTHS AND CATERPILLARS

Moths: A light trap attracts Porina and many other moths. Armyworm moth may be confused with Porina moth (Plate 12 and 13).

Plate 12: Army Caterpillar moth. Note long antennae, darker colour, forewings not curved

Plate 13: Porina caterpillar moth. Note short antennae, lighter colour, curved forewings

Caterpillars: Juvenile cutworm caterpillars are very like Porina.

The top caterpillar in Plate 14 is the Porina caterpillar. The lower Cutworm caterpillar has a black head, is a similar length, is fatter, khaki in colour and will curl up as shown in Plate 15.

Plate 14

Plate 15