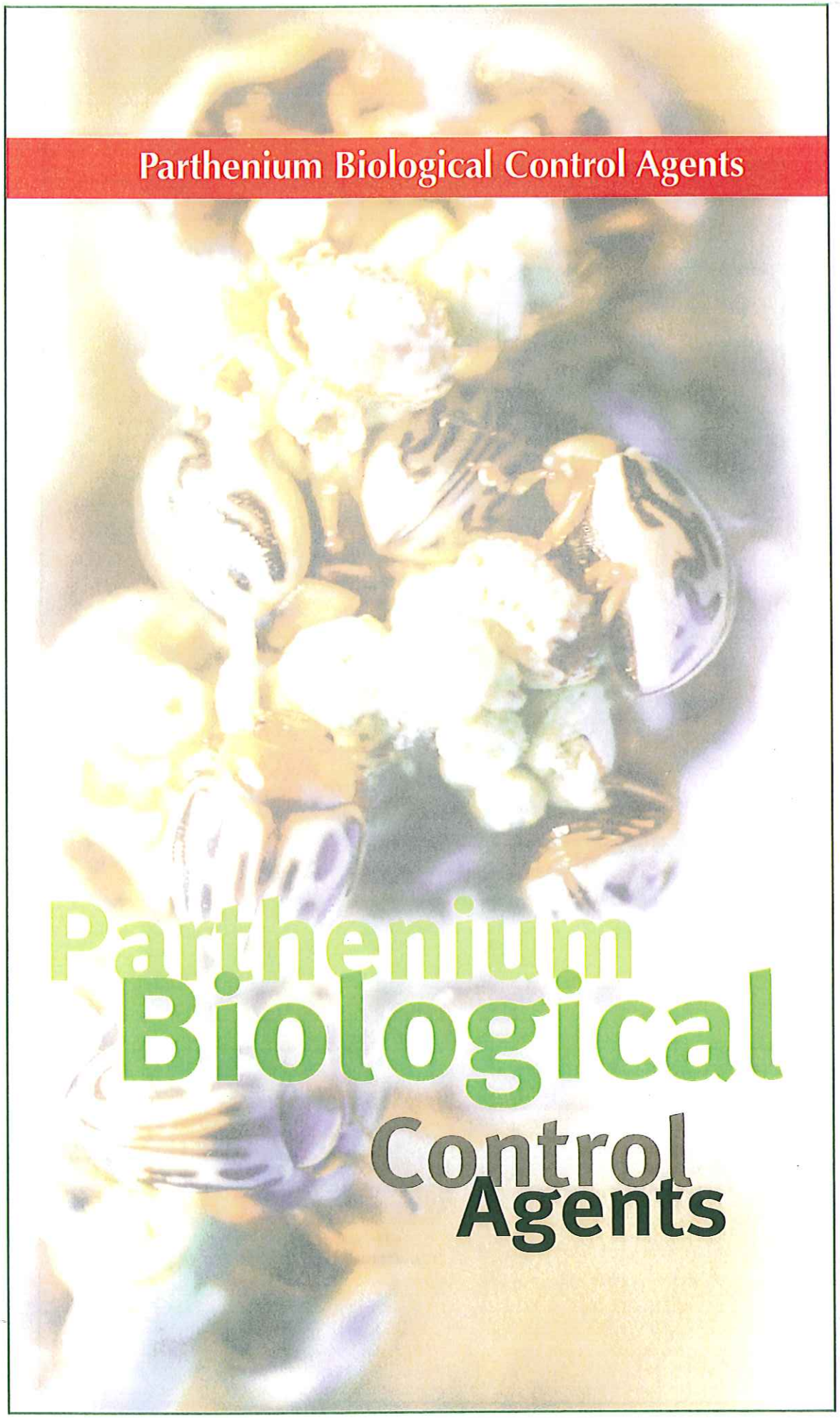
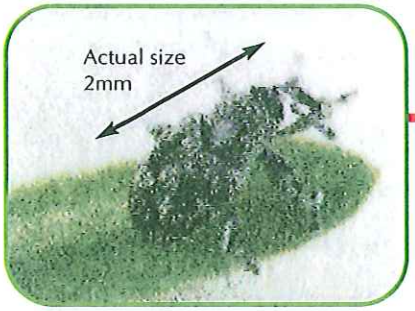

Parthenium
Biological
Control
Agents

Smicronyx lutulentus (seed feeding weevil)



• adults feed on flower buds

lay eggs in flower buds

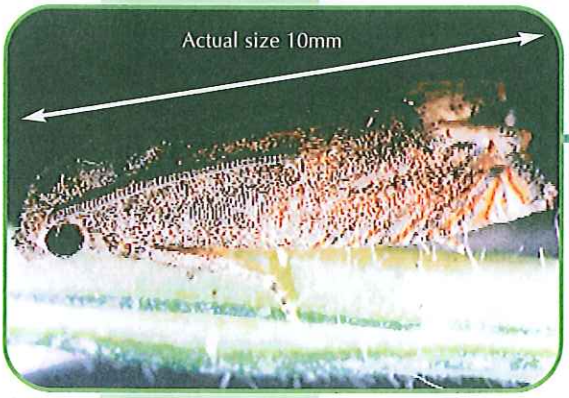
- from Mexico
- summer feeding weevil
- adult emergence from soil is triggered by rainfall
- ***Smicronyx*** larvae are located in the flowering seed head. To determine whether *Smicronyx* is present, rub the parthenium flower in your hand, and look for the larvae. Collect flower heads or entire plants to leave at a suitable nursery site.

adults emerge

seeds drop off the plant and larvae burrow into the soil to pupate

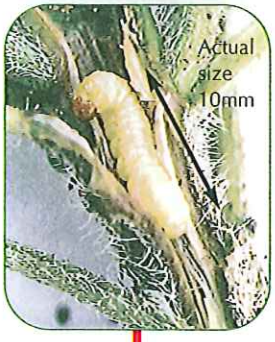
• larvae feed in seeds (1 larva/seed) and eat the contents

Epiblema strenuana (stem galling moth)

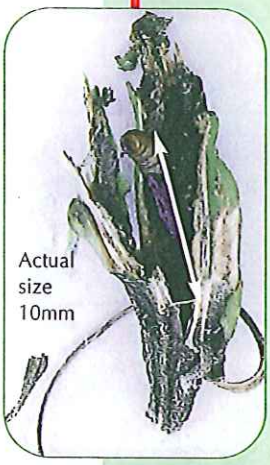


lay eggs on leaves

• larvae initially feed on leaves then bore into stems



- from Mexico
- life cycle 4 weeks in summer
- can produce up to 6 generations per year
- larvae are straight and yellow or cream, with a brown head
- up to 30 larvae per plant
- overwinters as resting larvae in dead stalks
- adults emerge in early spring
- also feeds on Noogoora burr
- *Epiblema* is established in all climatically suitable areas.



• larvae pupate in the galls

• larvae produce galls in mature and young plants
• they continue to feed in these galls
• gall size varies depending on the plant

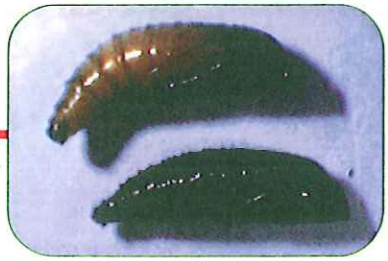
Carmenta ithacae (stem boring caterpillar)

• adults active during the day

• eggs laid singly near the veins or mid-ribs hatch in 10–14 days

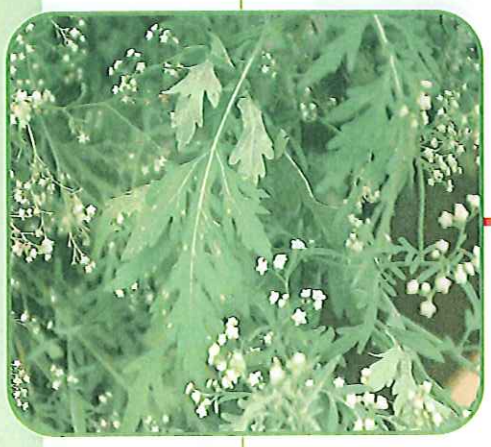
- from Mexico
- 12,500 moths released at 30 sites, 1998–2001
- 3–4 generations
- not yet established, recoveries only from irrigated nursery sites so far.

• larvae are stem-borers that feed in the lower stem and crown for 5–6 weeks



• larvae pupate in the stem, moths emerge in 10–12 days

Puccinia abrupta var. *partheniicola* (parthenium rust)



• light infection in autumn

- from Mexico
- dependent on temperature and moisture (rain/dew)
- 1 generation/14 days at optimum conditions
- spores are powdery and wipe off easily
- ***Puccinia abrupta var. partheniicola*** can be established by growing cultures on plants under artificially moist conditions and distributing the plants at suitable sites. The nursery should be established in the cooler months.

cool night temp (15-16°C) + 6 hours leaf moisture

• heavy infection in autumn to early summer

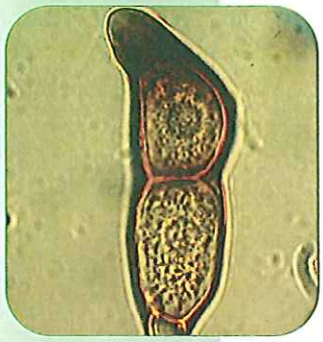
cool night temp (15-16°C) + 6 hours leaf moisture

• causes yellowing and twisting of leaves

low levels of rust survive until weather conditions improve

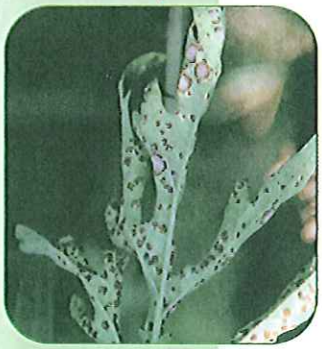
Puccinia melampodii (summer rust)

• teliospores under leaves remain on leaves 9-12 days after infection

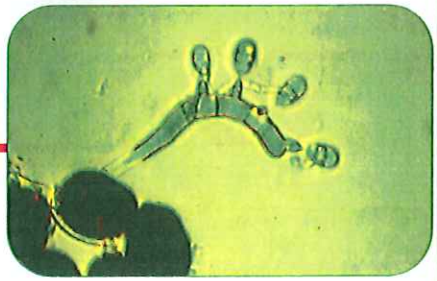


• germination at 15-30°C and 5+ hours of dew

- from Mexico
- dependant on temperature and moisture
- 1 generation/9 days at optimum conditions
- spores underneath leaves won't wipe off
- similar to noogoora burr rust
- ***Puccinia melampodii*** can be established by growing cultures on plants under artificially moist conditions and distributing the plants at suitable sites. The nursery should be established in the cooler months.



• grey bloom = germinating teliospores



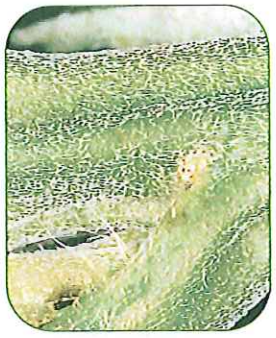
• basidiospores carried by wind to infect new leaves

• yellow blotches early signs of infection 7-9 days

Conotrachelus albocinereus (stem boring weevil)

• adults feed on leaves and stem tips at night

- from Argentina
- adults active at night
- 3–4 generations per year
- 15,000 weevils released between 1998 and 1999
- not yet established, only limited recoveries made so far.

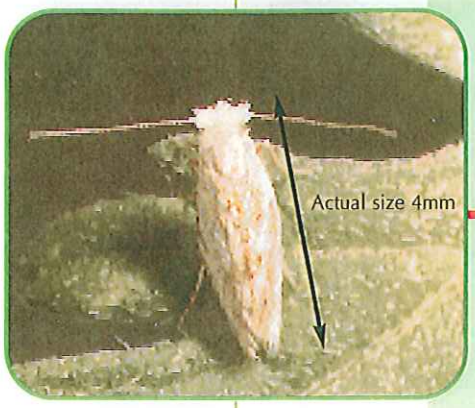


• eggs laid on the leaves near the leaf axil

• larvae pupate in the soil

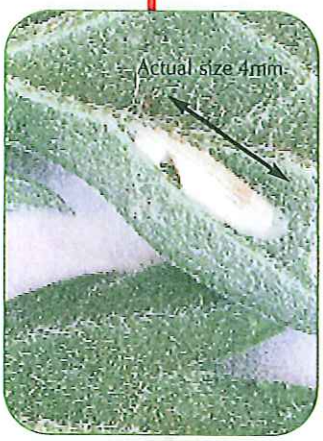
• larvae bore into the stems, feeding causes galls

Bucculatrix parthenica (leaf mining moth)



eggs are laid on leaves

- from Mexico
- adults live for 4-5 days
- mate after 1 day
- larvae mine for 14 days
- cocoons last for 7 days
- life cycle about 28 days
- ***Bucculatrix*** is established in all climatically suitable areas.
- ***Bucculatrix parthenica,*** a leaf-mining moth, is established in all areas.



• larvae pupate in cocoons on the underside of leaves and stems

• larvae mine into the leaf leaving thread-like trails

• larger larvae feed and produce windows on the leaf

Listronotus setosipennis (stem boring weevil)

• nocturnal adults feed on leaves and flowers

• lay eggs in flower heads or leaf bases

hatch 3-5 days later

• larvae bore into flower stalks and stems

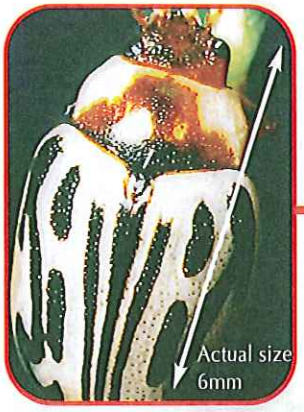
• mature larvae leave stem and move to root crown where they feed on crowns and tap roots

adult emergence triggered by rainfall

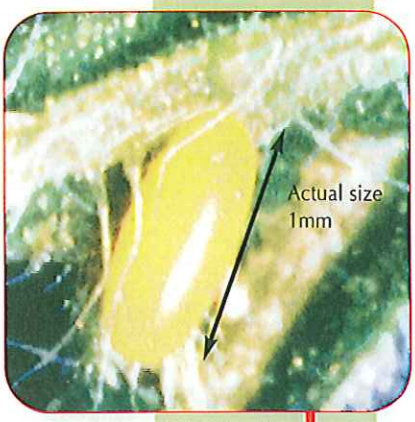
• pupate in soil inside fibrous capsules

- from Argentina and Brazil
- larvae are shaped like a "c"
- larvae are white with a brown head
- survive dry weather in soil
- ***Listronotus*** larvae can be found anywhere in the stem, but especially near soil level. It is necessary to pull up the stems to determine whether ***Listronotus*** is present. The larvae are 'C' shaped and white. Collect entire infested plants and leave them at a suitable nursery site.

Zygogramma bicolorata (leaf feeding beetle)



• adults feed on leaves and flowers



• eggs laid on leaf underside

4-6 days

- from Mexico
- overwinter in soil
- emergence triggered by rain
- most damaging agent where found
- ***Zygogramma*** can be found on the parthenium weed leaves and stems. Collect by cutting parthenium weed plants and placing them in loosely woven chaff bags for transport to the nursery site. Remember not to leave the bags in the sun. Large numbers should be put out at any one site. ***Zygogramma*** can take a number of years to establish depending on the occurrence of suitable rainfall.

• young adults emerge in large numbers and feed ferociously

• larvae feed on leaves and buds

• full grown larvae enter the soil and pupate in earth capsules

Correct application is the key to effective herbicide use. Timing and weather are also critical when spraying parthenium weed. Parthenium weed needs to be young (prior to seeding), with pastures actively growing and seeding. A good profile of soil moisture should be present and air temperature less than 30°C.

Spraying success depends on the environmental conditions on the day (wind, temperature and humidity) and the type, condition and efficiency of spraying equipment. Plant maturity and stress will also influence the outcome—younger parthenium weed plants are easier to kill but they will not take up the herbicide as well when under moisture stress.

For maximum herbicide effect and parthenium weed control, completely wet the plant with the herbicide mix, use wetting agents, and maintain a follow-up program.

▼ Boom spraying is a practical way of applying herbicide to large infestations.

5. Introducing biological control agents

The Department of Natural Resources, Mines and Energy began research into the biological control of parthenium weed in 1977. Nine different insect species and two rust fungi have been released.

Current status of biocontrol agents

Zygogramma bicolorata, a leaf-defoliating beetle, is now widespread from Moolayember Dip near Injune to Emerald. It is also found in isolated patches further north.

Listronotus setosipennis, a stem-boring weevil, is established throughout the Comet River system, from Clermont to Springsure and in the Suttor–Bowen river systems. It occurs in isolated patches in the Belyando Shire and the Isaac–Connor river systems.

Smicronyx lutulentus, a seed-feeding weevil, is now established in the Comet River system and north to Clermont.

Epiblema strenuana, a stem-galling moth, is established in all areas.

Bucculatrix parthenica, a leaf-mining moth, is established in all areas.

Conotrachelus albocinereus, a stem-galling weevil, was released in 1998 and 1999. Larvae have been recovered from release sites in the Rolleston district, but it is too early to determine if the insect is established.

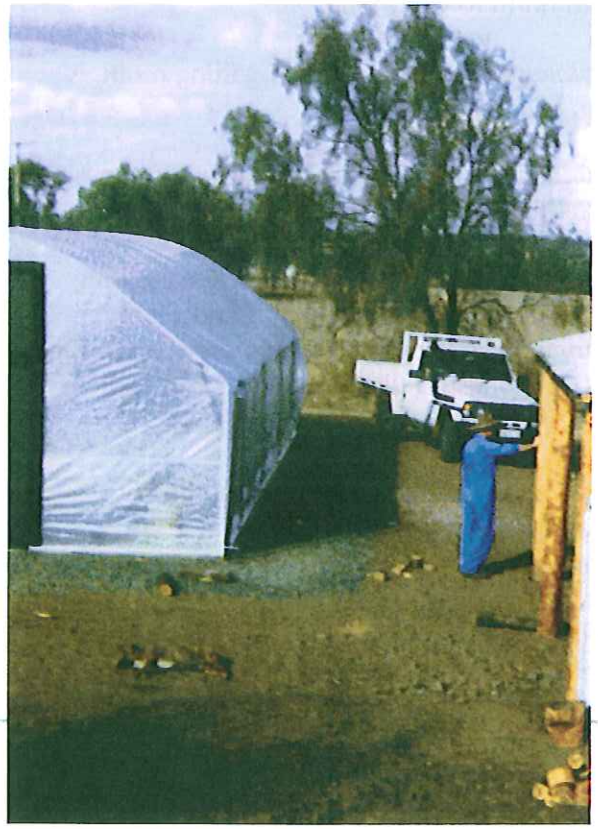
Carmenta ithacae, a root-boring moth, was widely released in 1998 and 1999. Larvae have been recovered from release sites at Clermont and Wycarba. As yet, it is too early to determine if the insect is permanently established.

Platphalonidia mystica, a stem-boring moth, and *Stobaera coccina,* a sap-sucking beetle, have not become established.

Puccinia abrupta var. *partheniicola,* the winter rust, has established over a wide area from Clermont south to Injune and around Rockhampton. It is generally more active in the southern region. Sporadic outbreaks occur over the cooler months when rainfall is adequate. Higher temperatures may inhibit its establishment further north.

Puccinia melampodii, the summer rust, was released over a wide area from Injune north to Greenvale between 1999 and 2002. It is now established in most districts. However, recent drought conditions have severely reduced its activity.

▼ A newly constructed parthenium biocontrol nursery.



Field collection of biocontrol agents

Field collection and redistribution of biocontrol agents is the most cost-effective way of establishing them in new areas. Community involvement in the field collection and redistribution of biocontrol agents can greatly speed up their overall establishment and spread.

To locate collection sites within your area, contact your local parthenium group officers, your local government weeds inspector or the Department of Natural Resources, Mines and Energy Land Protection Officers.

Nursery sites for biological control

For best results with establishment of agents, a nursery site should be developed. This can be done individually or in collaboration with your neighbours or local Landcare group. A nursery site will provide biocontrol agents with green parthenium weed throughout the growing season. This is particularly important during periods of dry weather when the abundance of agents may decline.

A nursery site can provide agents for collection and redistribution to other areas or act as a reservoir. Where possible, nursery sites should be located close to larger infestations of parthenium weed to help agents disperse.

Nursery sites can be maintained by some form of irrigation or be sited in creek flats, gullies or swampy areas that are kept moist by a natural water source such as a spring.

Do not leave isolated patches of parthenium weed for a nursery site, as they will provide a source of seed for further infestation.

Tips for establishing biological control

Zygogramma can be found on the parthenium leaves and stems. Collect by cutting parthenium plants and placing them in loosely woven chaff bags for transport to the nursery site. Remember not to leave the bags in the sun. Large numbers should be put out at any one site. *Zygogramma* can take a number of years to establish depending on the occurrence of suitable rainfall.

▲ A parthenium plant grown in a nursery for distributing biocontrol.

Listronotus larvae can be found anywhere in the stem, but especially near soil level. It is necessary to pull up the stems to determine whether *Listronotus* is present. The larvae are 'C' shaped and white. Collect entire infested parthenium plants and leave them at a suitable nursery site.

Smicronyx larvae are located in the flowering seed head. To determine whether *Smicronyx* is present, rub the parthenium flower in your gloved hand, and look for the larvae. Collect flower heads or entire plants to leave at a suitable nursery site.

Establish winter rust, *Puccinia abrupta*, by growing cultures under artificially moist conditions and distributing the plants at suitable sites. The nursery should be set up in autumn.

The summer rust, *Puccinia melampodii*, can be established in a similar manner. Nurseries should be functioning during spring and summer.

Epiblema and *Bucculatrix* do not require collection as they have established in all climatically suitable areas.

Conotrachelus albocinereus and *Carmenta ithacae* are not yet present in sufficient numbers to allow for field collection.

Biocontrol agents may fail to establish in some areas, even after well-planned collection and distribution. Repeated releases may be necessary.

▲ Releasing biocontrol agents.