Cutworms: Noctuidae
Larval Collecting Protocol

Host plants:

A large number of species of cutworms will feed on a wide range of plants from a number of families of plants. Cutworms will feed on most of the prairie-grown commodities including canola, mustard, wheat, barley, triticale, peas, alfalfa, clover, several fescue species, and timothy.

Identification, Life cycle and Damage:

Adults: There are many species of cutworms and the appearance of the adult moths varies. As a generalization, adult moths are approximately 20 mm long, with a 20-40 mm wing span (Figure 1). They are tan, reddish-, greyish brown with patterning on the forewings and more uniformly coloured hindwings.

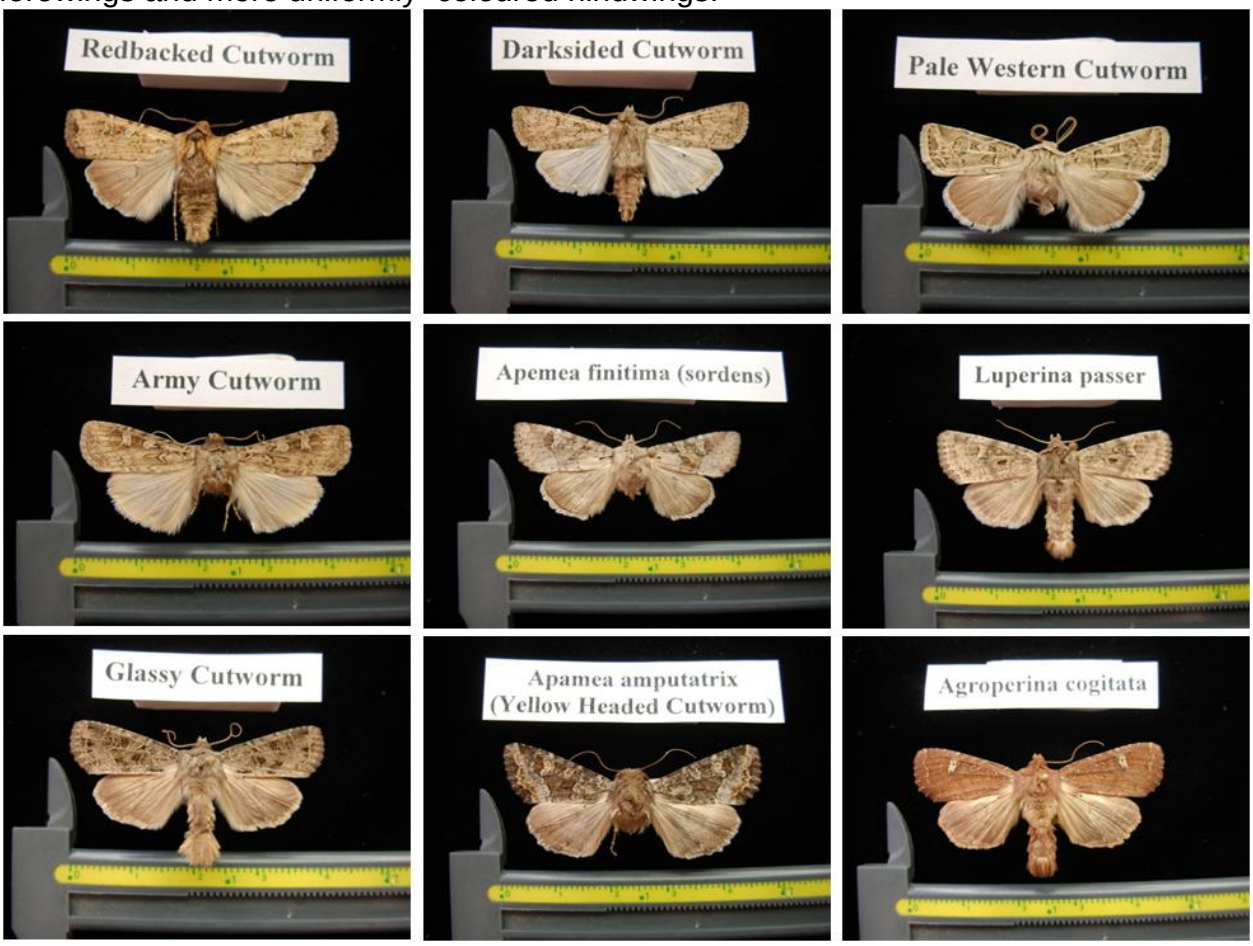

Figure 1. Examples of pinned specimens of cutworm moths (AAFC-Otani). Note: Abdomens are missing in some images but photos have been included for wing pattern comparisons.

Eggs: Eggs are round, yellowish-white and tiny. Each species lays eggs in different locations with some preferring to lay eggs on freshly disturbed soil, on the leaves of a host plant (Figure 2), or on the soil near a host plant Eggs are laid singly or in small groups.

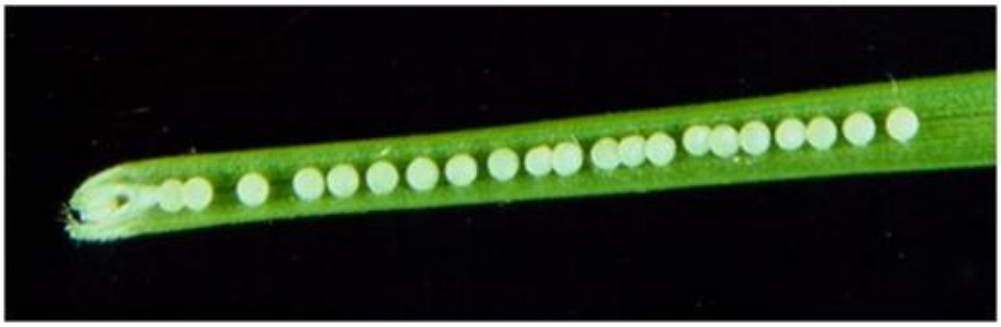

Figure 2. Glassy cutworm (*Apamea devastator*) eggs, each measuring 1 mm in diameter, laid in a small group on a blade of grass (AAFC-Byers).

Larvae: Most species of cutworms on the Canadian prairies are univoltine (one generation per year) and have six larval growth stages (instars). Some species overwinter in the egg stage while others overwinter as 1st, 2nd, or 3rd instars. Mature larvae may reach 35 (e.g., redbacked cutworms) to 40 mm (e.g., glassy cutworms) in length. Larvae range in colour from translucent, pale white, pale yellow, tan, brownish-yellow, reddish-brown, grey or black and can be patterned with spots, bristles, stripes, or chevrons in a number of colour variations. Glassy and yellow-headed cutworm larvae possess an enlarged neck shield in addition to the typical black or brown head capsule present on all cutworm larvae.

Larvae feed on leaves or stems; shredding, clipping, or completely consuming newly emerging plants. Bare patches can occur where plants have been consumed or clipped below the soil surface. Feeding can also occur within the crown, where the above-ground vegetation turns brown and dries, resulting in browned-off or dead patches in fields.

Figure 3. Redbacked (left) and darksided (right) cutworm larvae (MAFRI-Gavloski).

Pupae: Pupation occurs in a reddish-brown puparium that is formed within an earthen cell 3-8 cm below the soil surface (Figure 3).

Figure 4. Reddish-brown redbacked cutworm pupa measuring approximately 20 mm long (AAFC-Otani).

Monitoring and Collection

Pheromone monitoring: Extensive research has been conducted on the isolation and use of pheromone trapping to monitor several cutworm species. Results from redbacked cutworm pheromone trapping studies indicated poor correlations between trap counts and larval densities or yield losses. Canadian pheromone monitoring protocols have been researched and developed for pale western and army cutworms, but no monitoring currently occurs in Canada.

Larval monitoring: Egg and larval mortality is suspected to affect cutworm populations greatly and likely influences outbreak situations. Scouting should commence with the onset of field work until the end of June on the prairies. Cutworms feed at night and hide in the soil or under debris during the day. This larval nocturnal activity pattern makes detection more difficult. Early spring monitoring is advised for

cutworm management. Fields demonstrating poor or slow emergence should be examined for cutworm activity and the presence of larvae. Manually check by examining plant foliage and digging in the soil near damaged or missing plants. If seed rows appear to be missing, dig or search where the next green plant occurs; i.e., cutworms feed on healthy plants and will move to find them. Because they are eaten by birds, large aggregations of birds on fields should similarly be investigated for cutworm presence.

The primary goal of cutworm monitoring is to determine the species, the larval instar stage and the number of larvae per m^2 or per plant. Well-researched economic thresholds exist for only a small number of species of cutworms. Most thresholds for cutworms in field crops are nominal.

How to collect larvae:

Manually search foliage for evidence of cutworms or their feeding, and dig in soil. Focus on transition zones between areas of damaged and healthy plants; e.g., dig where the row starts to disappear, or carefully examine green vegetation in proximity to clipped, dried or brown patches. **Some species of above-ground feeding cutworms emerge from the soil late in the day to feed up on foliage. Other species of below-ground feeding cutworms remain below the soil surface feeding on the roots or amongst the crown of the plant. Digging should be focused 2-5 cm deep and near missing or damaged plants (hint: look where the soil transitions from dry down to moist).**

Timing:

Spring monitoring is advised for cutworms. Eggs or early instar larvae are incredibly hard to locate in late fall and are poor predictors of populations in the following spring. Poor germination, and dry or cool growing conditions often mask cutworm activity.

Preserving and rearing cutworm larvae:

Cutworms are challenging to preserve or rear. Mortality in field-collected specimens is common and due to several factors. Intact larvae retrieved from digging often suffer internal injury and die quickly if isolated for rearing. Also, soil-borne fungi, bacteria, and viruses will kill seemingly healthy larvae.

Retaining a cutworm. Larvae should be handled as little as possible and always gently. Larvae require a feeding substrate both for humidity and food. Isolating individual larvae is ideal because diseases or parasitoids can be contained and separated to prevent entire collections from death. Place a larva, plus feeding substrate (e.g., prepared media, host plant, piece of root crown), into a clean container. Alternatively, small paper bags can be used for collection and shipping of cutworm, PROVIDED the paper bag is protected from compression (e.g., place paper bag sample into box for shipping). Do NOT include soil with the cutworm specimen – it damages the cutworm (abrasion, cuts), speeds dessication, and introduces disease.

Multiple cutworms, when collected into a single container, can cannibalize one another when stressed and left without food.

Record the following for the sample or use this as a <u>label</u> for your container:

Collection date:	10 May 2011
Collector name:	Jennifer OTANI
Nearest town:	Beaverlodge AB
GPS or Legal Land Location:	N°55.19520° W119.39413°
Specimen description:	Unknown cutworm
Host plant:	Canola cv. 45H21
Previous crop:	Canola

Photos. Excellent photos will help a trained agricultural entomologist identify the cutworm species, approximate larval instar stage and facilitates more accurate assessments of risk or management options. Consider taking a few focused, close-up photos of the cutworm that captures:

- → **a dorsal (back) view** (e.g., does it have stripes running down the back?),
- → **a lateral view** (e.g., are there stripes running down either side?),
- → **a ventral (underside) view** (e.g., how many prologs or legs and where are they located on the various segments?),
- → **a photo of the head capsule** (e.g., what colour, what markings?),
- → **a relative length** of the larva (e.g., how long is it? This will help estimate how long until it pupates?).

Preserving a cutworm. Currently there are two research goals to preserving larvae, namely, to obtain (a) *morphological* specimens versus obtaining (b) *genetic* specimens. **Each purpose requires a different preservation solution:**

(a) Morphological specimens: Specimens that will be used to aid the development of larval cutworm identification keys for producer and industry use.

1. Consider preserving a subsample (e.g., N=1 or 2) of the cutworm larvae into a vial containing a 9:1 ratio of 70% ethanol to 10% glacial acetic acid. This mixture should ***preserve the specimen's colour*** for at least 2 months.
2. Make sure to **include the above label** inside the vial (pencil or laserprint only – ethanol rinses away ink).
3. Make sure the vial is topped-off with above preservation liquid (i.e., right to the top of the vial and to **ensure the specimen is completely submerged**) then seal the lid.
4. Ship the sample to Jennifer Otani for coordinating later use by researchers.

(b) Genetic specimens: Specimens that will be used to investigate and define cutworm species (i.e., long-term research investigating the development of genetic identification tools capable of definitively determining cutworm larvae at any instar stage).

1. Take a photo of the cutworm larva if possible.
2. Estimate the live length of the cutworm, and record the colour and/or distinguishing pattern on its upper side.
3. If possible, record the pest name (e.g., darksided cutworm) or species name.
4. Preserve a single cutworm larva (e.g., N=1 only) into a full vial of 95% ethanol so that the larva is completely submerged. This mixture **does *NOT preserve colour*** but will preserve the genetic information.
5. **Include the above label** (pencil or laserprint only) in the vial and then tightly seal the lid.
6. Carefully pack vials in a sturdy box to prevent breakage during shipping, and then ship the box to Kevin Floate at:

   Lethbridge Research Centre
   Agriculture and Agri-Food Canada
   5403 - 1 Avenue South
   PO Box 3000
   Lethbridge AB T1J 4B1
   Ph: 403- 317-2242

7. Send Kevin an e-mail to let him know the samples are coming his way (kevin.floate@agr.gc.ca), and include any photographs or descriptive information from steps # 1, 2 or 3).