University of Idaho Extension

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Large Yellow Underwing
A New Cutworm in Idaho

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KEY FACTS

- Potential threat to winter wheat and barley, Austrian winter peas, alfalfa, grass forages, winter vegetables, and home flower and vegetable gardens planted into weedy patches
- European species first reported in North America during 1979
- Confirmed in Idaho since 2005 in Boundary, Latah, Nez Perce, and Twin Falls counties, but likely occurs statewide
- First Idaho crop infestations in Nez Perce County, February – April 2009, in winter wheat
- Larvae actively feed during winter months

BACKGROUND

Noctua pronuba (pronounced knock-TOO-ah pro-NEW-bah) is an accidentally introduced cutworm known as the large or greater yellow underwing for its distinctively colored adult moth stage. Native to western Europe, the insect was first detected in North America during 1979, when several moths were collected around a porch light in Nova Scotia, Canada.

No one knows how it arrived in North America from Europe. *Noctua pronuba* moths are unusually strong fliers, so it is conceivable they arrived by flight. However, they were probably carried here via human-aided transport (such as shipboard moths or larval-infested horticultural plants).

Once present in North America, the insect steadily dispersed south and westward across Canada and the U.S. In the West, moths were detected in Wyoming during 2000, in western Oregon and Alberta (Canada) during 2001, and in Washington state and British Columbia during 2004. First detection in Idaho occurred on May 1, 2005, when a single full-grown caterpillar was discovered in a home vegetable garden in Moscow. This initial detection was followed three weeks later by capture of an adult moth 300 miles away in Twin Falls County. We believe *Noctua pronuba* had been present in Idaho for several years before those first reports in 2005. The insect has since been confirmed in Boundary and Nez Perce counties.

IDENTIFICATION

Eggs

Eggs occur as a single large mass on plants and non-plant surfaces. Each mass consists of dozens to hundreds of individual pinhead-sized eggs arranged side by side in neat rows. Masses often occur at the leaf tips of grassy plants. Several other common moths also lay eggs as masses, so this feature is not diagnostic for *Noctua*. Eggs are initially cream-colored, but darken with age.

Larvae

Full-grown larvae are about 1.5 inches long and have smooth, hairless bodies. Most are olive brown but some (figure 1) have a distinct reddish tinge. Green variants are known elsewhere but have yet to be reported in Idaho.

Each body segment is marked with a bold black and cream dash on either side of the mid-line (figure 2). The overall appearance is a series of dark broken dashes that run the length of the body. Marks are strongest on the back half of the body and fade toward the head. The tan head is marked with two thick black lines that point inward at the middle (figure 3).

All other commonly encountered cutworms in Idaho lack the series of broken black dashes that identify *Noctua pronuba*. The only other strongly marked cutworm that overwinters as a larva is the spotted cutworm, *Xestia* species. Spotted cutworm larvae bear diagonal black triangular slashes along the sides of the last four or five body segments that increase in boldness at the end of the body (figure 4).

Pupae

Pupae are dark brown and about an inch long; pupal body shape is typical of many Idaho moths and is not distinctive to *Noctua pronuba* (figure 5). Pupae occur without a silken cocoon under crop residue on the soil surface, or within the first inch of loose soil.

Moths

Moths are easily identified by color and size. The hindwings are brightly colored yellow-orange with a broad black band border (figure 6). Forewings of male moths are usually mottled dark gray with irregular black spots, while the forewings of females are light reddish-tan with scattered freckles. Ten different color variants occur in Europe. Outstretched wings measure about 2 inches from tip to tip.

Figure 1. General body color of *Noctua pronuba* larvae is olive brown, but red-tinted specimens like this one also occur.

Figure 2. Larvae are strongly marked with a series of broken black dashes over cream-colored lines.

Figure 3. Tan-colored head capsule is marked with two black stripes (arrows) that point inward at the center.

Figure 4. Spotted cutworms are marked with forward-slanting black triangular slash marks that are most prominent on the last few body segments.

Figure 5. Pupal stage of *Noctua pronuba.*

Figure 6. Pinned specimens of male (upper) and female (lower) moths. The round spot in the center of the body behind the head is the reflection from the pin rather than an actual mark on the insect.

Figure 7. Pinned female moth specimen showing resting position of front wings folded over hind wings.

Moths fly at night and rest by day in dense vegetation. If these moths are flushed from daytime hiding places, their bright hindwings make them startlingly visible. Moths fly with jerky, fluttery movement and quickly drop back into vegetation. As soon as they land, they fold their drab forewings over the brightly colored hindwings (figure 7). The camouflage coloration of the forewings makes these moths difficult to see, and the visual effect is as if the moths have vanished into thin air.

A closely related European species, *Noctua comes* (pronounced knock-TOO-ah COE-mees), was accidentally introduced into British Columbia during 1982. This second exotic cutworm moth is similar in appearance to *pronuba* but has an obvious black dash mark in the center of the yellow area on its hindwing. *Noctua comes* is noticeably smaller than *pronuba* and so is named the lesser yellow underwing; its outstretched wings measure 1.5 inches from tip to tip. Entomologists at Washington State University found *Noctua comes* larvae at commercial vineyards in south-central Washington during 2005. This species is not known in Idaho.

BIOLOGY

Life cycle

Figure 8 shows our current understanding of pest seasonal life cycle in Idaho. *Noctua pronuba* survives Idaho winters as partially grown to almost-mature larvae under plant residue, low-growing weeds, and similar protected places on the soil surface. Larvae sporadically feed through the winter months whenever temperatures are above the mid-40s. Entomologists in Michigan—where the first U.S. cases of crop damage were observed during 2007—nicknamed *Noctua pronuba* the winter cutworm and the snow cutworm for its ability to feed actively when other cutworms are dormant for the winter. Larvae there occasionally were observed crawling on snow.

Intensive larval feeding begins again with warm weather in late February or March. Like other cutworms, *Noctua pronuba* larvae feed at night and hide during the day under crop residue or clods. When disturbed, they curl into a C-shape typical of cutworms. Caterpillars pupate during May and emerge as night-active moths beginning in early June. We believe that most seasonal flight and egg-laying activity occurs during August. Moths are active through October.

Females require at least 4 to 6 weeks to mature their eggs, after which they lay egg masses on leaves and stems as well as on sticks, fences, and vehicles. A single moth lays up to 2,000 eggs.

Eggs hatch after 2 or 3 weeks. Caterpillars feed from mid-August through fall and winter. Larvae develop through six instars, each larger than the previous. The earliest-hatching larvae have enough time to develop into full-grown caterpillars during the fall, while the last-hatching larvae do not reach full size until the following spring. It is these partly mature larvae that pose the threat of economic damage when they begin feeding again the following March and April.

We believe a single generation develops annually in Idaho. But given observed moth flight in Idaho from early June through late October, it is possible that two generations develop. In Europe, one generation is typical but two generations sometimes occur.

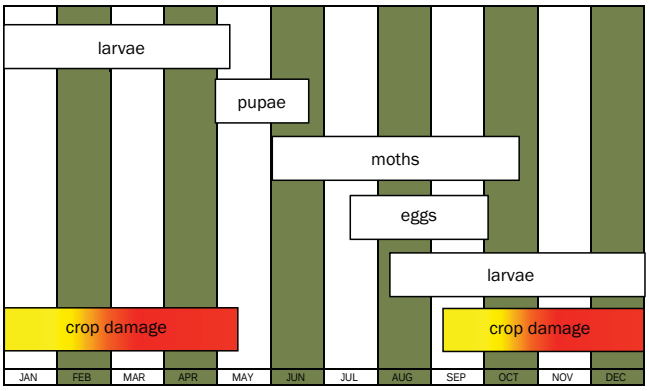

Figure 8. Presumed seasonal life cycle of *Noctua pronuba* in Idaho. Red and yellow bars show periods of greatest larval feeding.

Host plants

Larvae eat a wide variety of leafy vegetables, root crops, ornamental flowers, and weeds in addition to alfalfa, wheat, and other agronomic crops (table 1). In Britain, *Noctua pronuba* is a common but minor pest in home flower and vegetable gardens.

Table 1. Larval host plants of *Noctua pronuba*, the large yellow underwing

Agronomic crops
oats, rye, wheat
alfalfa
forage grasses
Vegetables
beets, carrots, cole crops, lettuce, onions, potatoes, tomatoes
Landscape flowers
carnations, chrysanthemums, gladiolus, forget-me-nots, freesia, mums, primrose, violets
Small fruits
currant, grapes, strawberries
***Poa* turf grasses**
Weeds
chickweed, dandelion, dock, *Polygonum* knotweed
Others
Atriplex desert saltbush

Damage

Damage combines the stem-girdling and crown-feeding habits typical of subterranean cutworms with the leaf-feeding behavior associated with climbing cutworms. On some plants the cutworms also feed in the canopy on flowers buds and open blooms. On root crops, larvae chew around the crown and gnaw on roots.

There are two main periods of larval feeding: late summer through mid-fall, and early spring. Larvae also feed on mild days throughout the winter months. In Michigan, *Noctua pronuba* larvae became nuisance pests around homes when they crawled en masse like armyworms from nearby infested crops into garages, sheds, and barns. Roads in some places were slippery from their crushed bodies.

PEST STATUS

United States

Even though *Noctua pronuba* had been present in North America since 1979, crop damage was not reported until fall 2007 when Michigan farmers reported severe infestations in alfalfa hay and winter wheat fields. Larval feeding began in October and continued sporadically through March. Michigan homeowners subsequently complained their lawns were invaded by uncountable thousands of larvae that remained active under the snow during January. Even more bizarre were reports of dogs vomiting blood and passing whole larvae in their stool after eating these caterpillars.

Idaho

Following first pest detection in Idaho during spring 2005, informal sightings of moths gradually increased, but larvae were rarely seen and never reported from any crop. The first damaging infestations of larvae in Idaho were observed February 2009 in a winter wheat field near Lewiston. Leaf-clipping was severe enough that the field was treated with insecticide, plowed down, and reseeded. A second winter wheat field near Lapwai likewise suffered enough damage during April 2009 that it too was sprayed with insecticide and no-till reseeded. Damage appeared as if plants had been clipped with scissors (figure 9). During the day, larvae themselves could only be seen by searching under crop residue or digging between the rows 4 to 5 inches deep; night inspections with flashlights detected larvae feeding on plants and crawling on crop residue. Industry field staff subsequently reported infestations on Austrian winter peas and lentils, but these reports remain unconfirmed.

These Nez Perce County infestations—though limited—represent the most westward reports of economic damage from *Noctua pronuba* in the U.S. The only other states reporting field crop infestations are Michigan (winter 2007-2008) and North Dakota (spring 2008).

Although specimens have only been confirmed in four Idaho counties—Boundary, Latah, Nez Perce, and Twin Falls—it seems likely that *Noctua pronuba* has established itself across the state. Any “cutworms” or “armyworms” actively feeding on warm winter days, or crawling on

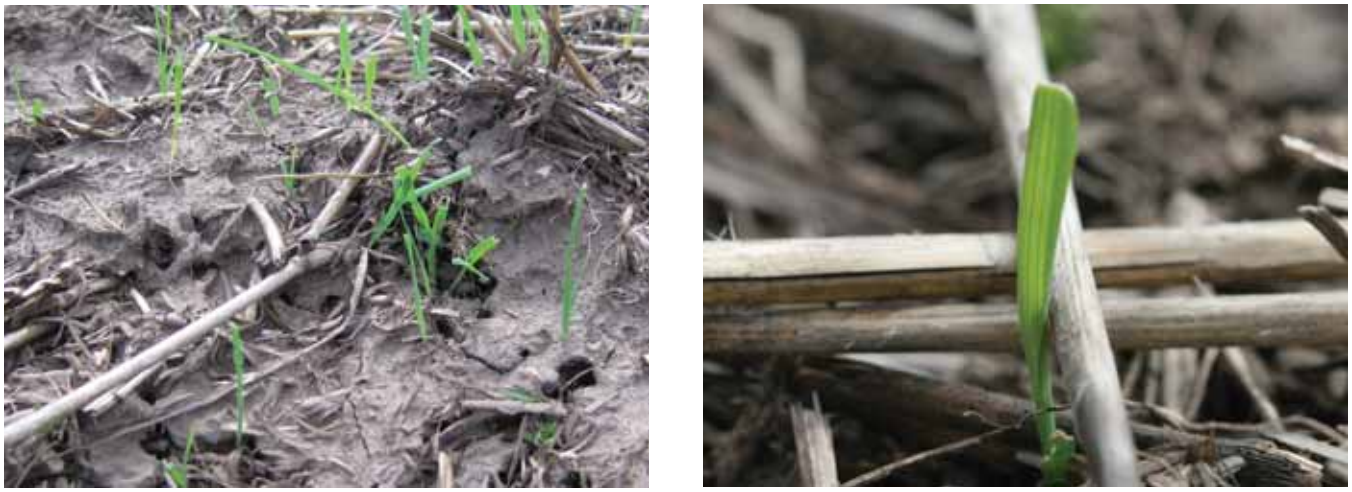

Figure 9. Larval feeding on winter wheat appears as if plants have been clipped with scissors (left). Close-up of leaf-clipping feeding damage (right).

snow-covered yards, should be considered suspect specimens of *Noctua pronuba*.

INFESTATION RISK FACTORS

Although our direct experience with *Noctua pronuba* in Idaho is limited, we believe the following three factors increase risk of damaging infestations:

Fields with green vegetation from early fall through spring

Larval infestations are most likely in any fall-seeded crop (but especially winter wheat or other grass cereals), fields with perennial crops continuously present (particularly alfalfa and grass forages), and fallow fields with abundant volunteer cereal plants or winter grassy weeds. All of these allow for fall egg laying and subsequent larval feeding through winter and the following spring.

Spring crops planted in fields where volunteer wheat and barley grew during September but were sprayed out in the fall

Volunteer wheat and barley plants are potential egg-laying sites when they are present during the August – September moth flight period. Even if volunteer cereal plants were subsequently eliminated with herbicides during October, any larvae already present might survive the winter and be ready to feed again in the spring. Early seeded spring crops would be especially susceptible to damage. Our limited experience suggests that winter wheat after winter wheat is the crop sequence most likely to develop damaging larval infestations.

This same principle extends to backyard vegetable and flowers gardens. Early season vegetables seeded or transplanted into weedy garden plots during April are at highest risk of damage from overwintering larvae. Larval presence in home landscapes during early spring is associated with mats of chickweed in flowerbeds and gardens.

Reduced tillage

Any cropping system that reduces soil disturbance potentially increases survival of *Noctua pronuba* larvae and pupae already present on the surface. Similarly, any management system that creates mats of crop residue on the soil surface potentially increases survival of larvae already present by serving as protective daytime hiding places.

MANAGING LARVAL INFESTATIONS IN COMMERCIAL CROPS

No research has been conducted on management of *Noctua pronuba* in any agronomic crop in the U.S or elsewhere. Until specific tactics can be devised, we recommend the following general IPM practices:

Scouting and economic thresholds

Visually examine fall-seeded crops monthly after plant emergence through winter months when fields are not covered in snow, and continue scouting through early May. Especially check winter wheat and alfalfa during February and March on mild days after the first snow melt. Focus on bare patches in fields with thinned plant stands, and look for plants showing cutworm leaf feeding and stem clipping. Confirm that living larvae are present by searching under crop residue; in no-till fields where soil is loose, dig 4 or 5 inches deep between the rows.

Economic thresholds are not available. You can judge the potential for continued feeding injury from larval size. If most larvae are at least 1.5 inches long, they already have done most of their feeding for the year and will pupate during May. In contrast, if most of the larvae are less than an inch long, they will continue feeding until they reach their full-grown size in early May.

The night-flying moths are attracted to lights and can be monitored with insect light traps. Captures anticipate the timing of egg-laying, but no research is available to predict severity of larval infestations from moth captures. Limited studies in Europe suggest that *Noctua pronuba* females produce a male-attracting pheromone, but no commercial lures have been developed.

Biological control

Several species of naturally occurring predatory ground beetles could potentially prey on *Noctua* larvae and pupae, but there are no practical ways of manipulating these beneficial agents to increase their impact, other than minimizing use of broad-spectrum insecticides. Parasitic wasps and flies that kill larvae are known in Europe but are unstudied in North America.

Cultural practices

Avoid planting winter wheat after winter wheat. Manage crop residue after harvest so that thick mats do not accumulate on the surface where larvae can hide.

Insecticides

Observed crop damage in Idaho has been limited to winter wheat. Table 2 lists commercial insecticides labeled for cutworm control in wheat. All of these products should be highly effective against *Noctua pronuba* larvae, especially if field scouting detects larvae while they are still small. Table 2 omits products that list armyworms or climbing cutworms without naming cutworms; these unlisted products may not be as effective in controlling soil-dwelling caterpillars.

Wheat seed treated with imidacloprid (Gaucho and others) or thiamethoxam (Cruiser) at high label rates for grasshopper control might also suppress early season *Noctua* infestations. However, because product labels specifically state that these seed treatments only provide early season protection from grasshoppers, and further, because neither seed treatment lists cutworms or armyworms on the label, it seems likely that any *Noctua* suppression would be temporary. Seed treatments are most effective against sucking insects or insects that directly feed on seed. Insects with chewing mouthparts that feed on leaves—such as grasshoppers and cutworms—are more difficult to kill with seed treatments.

Table 2. Insecticides labeled for cutworm control in wheat

Active ingredient(s)	Trade names	Use status[1]	Signal word(s)[2]
beta-cyfluthrin	Baythroid XL	RUP	warning
carbaryl	Sevin 5 Bait[3]	general use	caution
chlorpyrifos	Lorsban 4F and others	RUP	warning
chlorpyrifos and gamma-cyhalothrin	Cobalt	RUP	danger
cyfluthrin	Baythroid 2	RUP	danger
	Tombstone Helios	RUP	warning
gamma-cyhalothrin	Proaxis and others	RUP	caution
lambda-cyhalothrin	Warrior with Zeon Technology and others	RUP	warning
zeta-cypermethrin	Mustang	RUP	warning
	Mustang Max	RUP	caution
	Respect	RUP	caution

[1] RUP = restricted use pesticide (use limited to certified, licensed pesticide applicators); general use = use does not require certified pesticide applicator license

[2] Danger = can cause severe skin burns or permanent eye injury
Warning = moderately acutely toxic if swallowed, inhaled, or on the skin OR can cause moderate skin or eye irritation
Caution = slightly acutely toxic if swallowed, inhaled, or on the skin OR can cause slight skin or eye irritation

[3] Only bait formulations of carbaryl are labeled for cutworms

Photo credits
Figure 4 from Ken Gray slide collection, Oregon State University. All other photos by Edward John Bechinski, University of Idaho

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