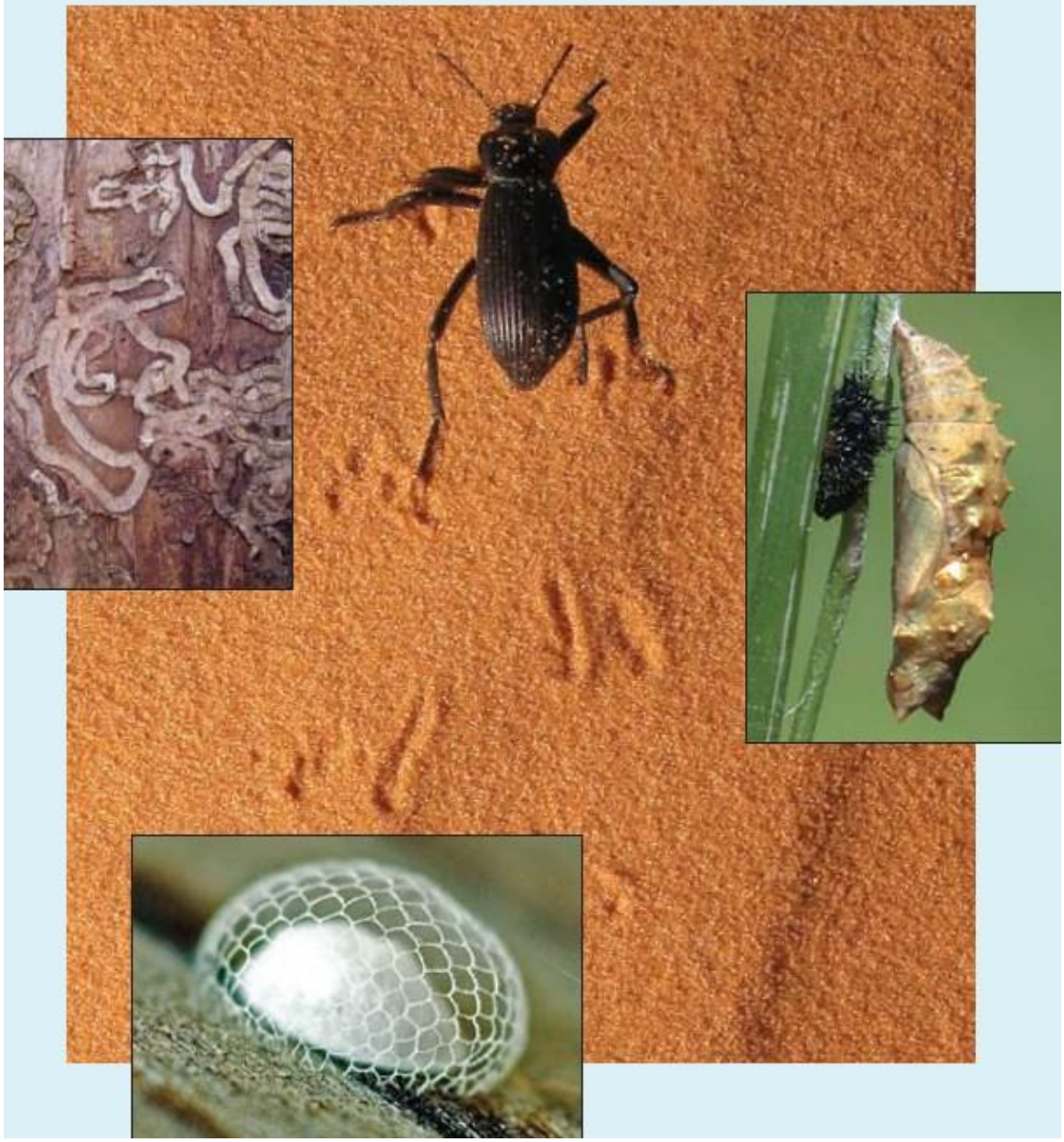
Tracks & Sign of Insects
and Other Invertebrates

A Guide to North American Species

Charley Eiseman and Noah Charney



Introduction

We were on a tight schedule: 15,000 miles in forty days. We had just driven the first 1,600 miles from our starting point in New England—with stops including the Delaware Water Gap, Virginia's Great Dismal Swamp, coastal North Carolina, and the Great Smoky Mountains—and were hoping to make the most of our short time in a new ecoregion, the Inner Plateau of Tennessee, where Noah grew up. In the morning, we packed up our cameras and headed outside, bound to fully explore the surrounding wilderness. Five hours later, Noah's mom poked her head out the front door. "Why are you two still standing around in the driveway?"

The work of invertebrates is all around us. Pausing to examine the miniature worlds we habitually overlook reveals a remarkable diversity of stunningly complex patterns. Perhaps you have already pondered the intricate scratch marks in the algae on your picnic table, wondered what creature is responsible for the papery red discs you find stuck to logs in your woodpile, or wanted to know who has been cutting those clean circular holes out of the leaves in your rosebush. While working on this book, we sought out sign of invertebrates in the depths of pristine wildernesses from all the major ecotypes in North America. Yet the phenomena we found most compelling were the ubiquitous ones that probably can be found right around your house, if not in your house, such as green lacewing eggs, slug tooth marks, leafcutter bee sign, and pirate spider egg sacs. Indeed, when we set out on walks to search for invertebrate sign, we usually found it difficult even to make it to the end of the driveway. There were too many subjects to photograph on the leaves of every shrub and tree we encountered.

When you encounter one of these mystery signs, it's hard to know where to begin in identifying it. Although you may stumble by chance on the answers to some such riddles in the fine print of a conventional field guide, this book is devoted entirely to them. We have brought a large amount of

An *Acanthocephala*-style egg (2 mm) of a leaf-footed bug (Coreidae). (OK) Photo by Sam Houston.

Leaf-Footed Bugs

Eggs of leaf-footed bugs (Coreidae) come in a variety of shapes and arrangements, but they are always deposited on their sides. Some are more than 3 mm long. *Acanthocephala* eggs are large, oval, and somewhat three-sided in cross section. They are laid singly or in small groups. Rather than a distinct cap, the egg has a perforated ring at one end, forming a line of weakness where the chorion is torn when the nymph emerges. Squash bug (*Anasa*) eggs are similarly shaped but smaller, laid singly or in loose groups of 15 to 50 on leaves or stems of cucurbits. They are shiny and range from pale yellow to brown.

Other leaf-footed bug eggs have a definite circular lid, which is off-center relative to the axis of the egg. *Chelinidea* eggs are oval and brown with whitish blotches. They are laid several in a row along a prickly pear spine, with the lids facing up at an angle from the spine. The western conifer

Below: **Leaf-footed bug (Coreidae) eggs (about 1.3 mm each) on a cholla spine, similar to those of *Leptoglossus*. (AZ)** ***Below bottom:*** **Eggs (1 mm each) of *Chelinidea*, a leaf-footed bug (Coreidae), one of which has hatched. (AZ)**

close inspection, it is revealed to be a tightly woven horizontal orb web that has been pulled into the shape of a dome. As with the linyphiid domes, this web is surrounded by an irregular maze of threads.

Holocnemus pluchei

Holocnemus pluchei, a common pholcid in California's Central Valley, makes a distinctive spherical web about 2 inches (5 cm) in diameter. These are built only by egg-carrying females and are found attached to outdoor ceilings on buildings or in junipers and other shrubs. The female remains inside the sphere until the eggs hatch, and the spiderlings stay until their first molt.

Lampshade Weavers

The aptly named lampshade weavers (Hypochilidae: *Hypochilus*) make unmistakable lampshade-shaped webs attached to the undersides of overhanging ledges and other similar surfaces. A typical web we measured in the Smoky Mountains was 3.1 inches (8 cm) in diameter at its circular attachment to the ledge, with the clearly visible "lampshade" mesh of cribellate silk measuring 2 inches (5 cm) tall and 4.7 inches (12 cm) wide. Beyond this, the web flares out into a much larger network of threads, which are not as easily seen. The spider typically rests pressed against the rock in the center of the web. White, circular "web scars" are visible on former web locations.

Web of a lampshade weaver (Hypochilidae: *Hypochilus*). The visible portion is 5 inches (12 cm) across. (TN)

Four-sided case (8.5 mm) of a pupating *Brachycentrus* (Brachycentridae), found attached to the underside of a rock. (WA)

in a log cabin. Very neat cases of this type, up to 17 mm long, likely belong to *Brachycentrus*. In this genus, part of the case may be circular in cross section and made only of silk. The case of *Eobrachycentrus gelidae* (NW mountain springs; up to 13 mm) is largely composed of moss, with loose ends often left projecting from the sides, and has a four-lobed posterior opening. The case of *Adicrophleps hitchcocki* (E; up to 7 mm) is similar, but the posterior opening is circular.

Some brachycentrids make tapering cases that are circular in cross section, with thin ribbons of plant material wrapped around the circumference. They may include rock fragments and are sometimes largely of silk alone. The cases of *Micrasema* species (up to 10 mm) may be straight or curved, and the posterior end may be reduced with silk to a three- or four-lobed opening. *Amiocentrus aspilus* (W; up to 16 mm) makes a straight case with a round posterior opening that is not reduced with silk.

Giant caddisflies (Phryganeidae) mostly live in still water and make large, cylindrical cases, up to 6 cm long, that are round in cross section. Those of *Beothukus complicatus* (north central; up to 4 cm), *Hagenella canadensis* (NE; rare), *Oligostomis* (NE; up to 5 cm), and *Ptilostomis* (up to 6 cm) are made of discrete, ringlike sections of leaf and bark pieces joined end to end. Cases of *Agrypnia* (up to 2 inches [5 cm]), *Phryganea* (up to 2.2 inches [5.6 cm]), and *Oligotricha lapponica* (AK; up to 1.1 inches [2.8 cm]) are constructed of closely fitting pieces of leaves and bark arranged spirally. Members of two other families also make cases with similar construction. *Triaenodes* (Leptoceridae) fashions straight, slender, tapered cases of spirally arranged pieces of green plants, up to 1.3 inches (3.3 cm) long.

A *Ptilostomis* larva (Phryganeidae) and its 2.4-inch (6-cm) case. (MA)

Above top: **This viceroy caterpillar (Nymphalidae: *Limenitis archippus*) has prepared its cottonwood leaf hibernaculum and is ready for winter. (MA)** ***Above:*** **A red-spotted purple (*Limenitis arthemis*) hibernaculum as it appears in winter. (OH) Photo by Judy Semroc.**

The webbing holding this dead apple leaf to the twig was spun by the rusty tussock moth caterpillar (Lymantriidae: *Orgyia antiqua*) whose cocoon is hidden within. (VT)

ing the petiole to the twig by winding silk around both. This shelter stays attached to the twig all winter, concealing the caterpillar as it waits to resume feeding in the spring. Other *Limenitis* species also have this habit, including the red-spotted admiral (*L. arthemis*; includes the white admiral and red-spotted purple), Lorquin's admiral (*L. lorquini*), and Weidemeyer's admiral (*L. weidemeyerii*).

Although the cut-leaf tube is unique to *Limenitis* caterpillars, several moth larvae