ENTOMOLOGY NOTES
No. 20
PUBLISHED AS A SERVICE OF
THE MICHIGAN ENTOMOLOGICAL SOCIETY

Acorn Insects

The colorful days of autumn are a bustling time for woodland animals. Many prepare their winter homes. Squirrels, blue jays, and woodpeckers collect and store acorns, an important winter food. But behind the scenes, there is an inconspicuous group that vastly outnumbers the energetic squirrels and jays. This group also feeds on acorns—insects!

Over 100 species of insects feed on the nuts of North American trees, including acorns, the nuts produced by oaks. Many nut insects cause few problems for humans. Some, however, like nut weevils, the acorn moth, and the filbertworm destroy so many nuts that it is difficult for trees to reproduce.

Acorn insects lead fascinating lives. Many play important ecological roles as consumers of acorns, as food for insect-eating animals, or as pioneers that hollow out acorns which other insects and small animals can use as homes.

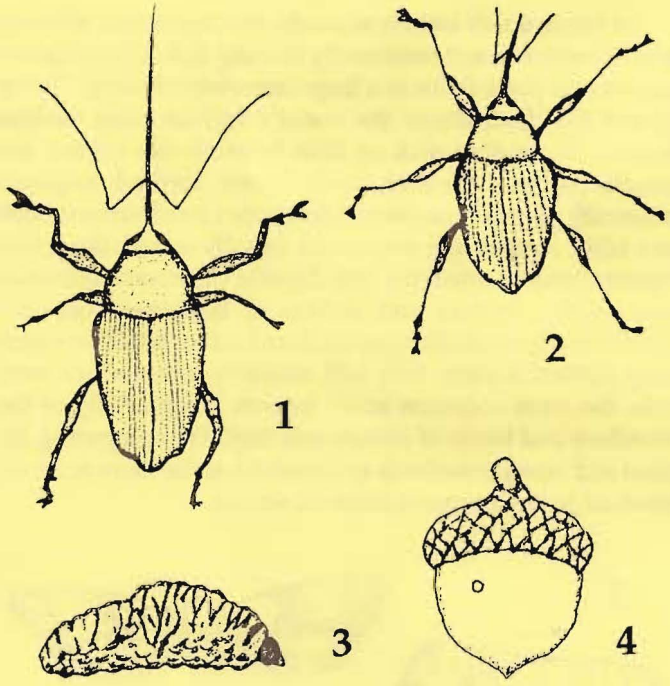
Common Acorn Insects

The most common acorn insects are the acorn weevils which are 1/2 inch long and have snouts with small, saw-like teeth. There are two types, or genera: the long-snouted acorn weevils (genus *Curculio*, Fig. 1) and the short-snouted ones (genus *Conotrachelus*, Fig. 2). The long-snouted acorn weevil's snout may be equal to or greater than the length of its body. The short-snouted weevil's snout is one-half or less than its body length.

Adults of both genera feed on acorns, but only the long-snouted weevils can chew or drill into the shells to feed on the meat inside. They also generally feed on acorns still attached to oak trees. Short-snouted weevils bite off bits of acorn meat from between cracks in the shells of acorns lying on the forest floor.

After eating their fill, females often lay eggs in the acorns on which they've fed. Long-snouted females lay their eggs in the holes drilled into acorns during feeding, but short-snouted females lay eggs between cracks in the acorn shells.

Legless, grub-like acorn weevil larvae (Fig. 3) hatch from eggs a few days after they are laid. There may be one to several acorn weevil larvae in each acorn. Larvae typically go through five growth stages, or instars. Each instar ends with the molt or shedding of the old skin, providing the larva with more room to grow. After a few weeks, larvae chew their way out of the acorn, burrow into the soil to pupate, and eventually emerge as adults in 1 or more years. Short-snouted larvae usually exit from a single hole that already exists in the acorn (Fig. 4), but long-snouted larvae may chew their own exit hole through the acorn shell.



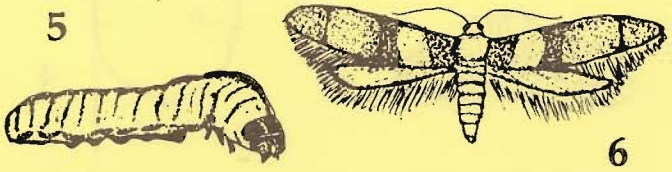
Like larvae of the short-snouted acorn weevil, acorn moth larvae (Fig. 5) can feed only on damaged or sprouting acorns. The grayish female acorn moths (Fig. 6) lay eggs in damaged acorns, sometimes in the emergence holes of acorn weevil larvae. It's easy to distinguish the acorn moth larva, a caterpillar, from acorn weevil larvae. The acorn moth larva has three pairs of legs near the head and is generally longer than the legless, fat larvae of acorn weevils. Larvae of the acorn moth feed on acorns and probably on the fungi that often grow in damaged acorns. They usually pupate inside the acorns.

The filbertworm, a moth whose larvae closely resemble the acorn moth, is also often found in acorns. Unlike the acorn moth, which usually attacks acorns on the ground, the filbertworm attacks developing acorns on the trees.

Gall wasps are some of the oldest known acorn eaters. Fossil gall wasps, thousands of years old, have been found in acorns from the famous La Brea Tar Pits of California. Adult females lay their eggs in female flowers of oaks in the spring, which causes galls, abnormal growths of plant tissue, to develop in or on the acorn. Gall wasp larvae live in and feed on the plant tissue inside the galls. The acorn plum gall (Fig. 7) is quite conspicuous. It is a blood-red globe about an inch in diameter that is attached to the acorn cup. Many of these external galls drop off the acorns in the autumn. Other galls are inconspicuous and can be found only by opening acorns and examining the contents. Internal galls usually consist of small, stony cells embedded in the acorn meat (Fig. 8). While gall wasps usually do not cause extensive damage to acorns, in 1989, the pip gall wasp, a serious pest in some years, destroyed millions of acorns in Pennsylvania.

Studying Acorn Insects

To locate acorn insects to study, you must find infested acorns, which is not necessarily an easy task. Collect some acorns and place them in a large container of water. Those acorns that float above the water's surface often contain insects. Those that sink or float beneath the surface are usually sound. Another, more crude method, requires bouncing acorns from about 2 feet onto a hard surface, such as a table. Acorns that bounce are usually sound; those that contain insects often fall flat. Divide the acorns into two groups, the floaters and sinkers or bouncers and non-bouncers. Then carefully open them and see whether or not they contain insects. You will probably locate acorn weevils, the most common acorn insects. Keep a tally of the numbers and kinds of insects you find. Try comparing the float and bounce methods to see which is the more accurate method to detect insect-infested acorns.



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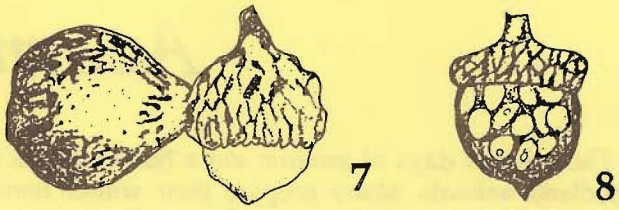
Rearing acorn weevil adults from larvae is easy. Make a wooden frame from narrow strips of wood, staple coarse wire mesh to the bottom of the frame, and place the frame over a shallow pan or greenhouse flat filled with moist potting soil or vermiculite. Place infested acorns in the frame and keep the rearing containers at 65° to 75° F. After a week or so, acorn weevil larvae may emerge and drop into the pan below the frame. You can collect the larvae from the soil's surface, or you may have to sift the pan's contents.

Acorn weevil larvae may burrow down 8 inches into the soil to pupate, so you will need deep containers such as 1-gallon plastic milk jugs to house your insects. Carefully cut off the tops of the jugs with a pair of scissors, but leave the handles attached for easy lifting. Fill the jugs two-thirds full with an equal mixture of sand and potting soil. (Sand alone will also work quite well.) Place the larvae on the surface and watch them burrow in. Water the jugs regularly to keep the soil moist, so the larvae will not desiccate.



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Short-snouted weevil adults may begin to emerge in 6 to 8 weeks. Long-snouted weevils, depending upon the species, take several months to emerge. Parasitic wasps may also emerge. If no adults emerge, disease may have killed them. Provide the emerged adults with cracked acorns (collected in the fall and refrigerated) and watch them feed.

Keep the acorns from which your acorn weevil larvae have emerged. Place these acorns in different habitats such as a lawn and a forest, and leave them for a few weeks. The weevil emergence holes will provide entrances into the acorns for small animals. Collect the acorns and see what small animals are living inside. You may find ants, centipedes, millipedes, mites, snails, beetles, and fly larvae. Do the types of animals you find differ with habitat?

Try collecting acorns that appear to have been on the ground for some time and see who's home. The types and numbers of animals usually change with time, a process called succession.

There are lots of other experiments you can do with acorns and their insects; have fun thinking them up and doing them.

For more information on oaks, acorns, and acorn insects, consult the following:

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Charles E. Williams

Michigan Entomological Society, c/o Department of Entomology, Michigan State University, East Lansing, Michigan 48824 - (22-XI-89)