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LIFE HISTORY AND HABITS OF *COLEOTECHNITES EDULICOLA* (GELECHIIDAE) A PINYON NEEDLE MINER IN THE SOUTHWEST

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ABSTRACT. *Coleotechnites edulicola* infests needles of pinyon, *Pinus edulis* Engelm., in the southwestern United States. The species is univoltine. Moths fly in June and July, and eggs are laid inside previously mined needles. First-stage larvae bore into green needles, feed within them, and overwinter there as 2d and 3d instars. The insects pupate in late spring. Persistent infestations can cause severe defoliation and presumably weakening and mortality of heavily infested trees. Several eulophids and pteromalids, and a single species of braconid, are recorded as associates.

During summer 1973, our attention was called to a population of needle miners causing heavy defoliation to pinyon (*Pinus edulis* Engelm.) in the Animas Valley north of Aztec, San Juan County, New Mexico, and on the Colorado side of the state line in La Plata County. We knew that pinyon needle miners are occasionally reported from the Southwest; the Aztec infestation offered an opportunity to make observations on the life history and habits of the species.

Needle miners have received relatively little attention in western North America. Freeman (1960) reviewed those of the entire continent, discussing 23 species of gelechiids, yponomeutids, and tortricoids, mainly from a systematic standpoint. The only ones that have been studied in much detail in the West are two species of *Coleotechnites* (Gelechiidae) infesting lodgepole pine, *P. contorta* Dougl.; *C. milleri* (Busck) in the Sierra Nevada of California (Struble, 1972), and *C. starki* (Freeman) in the Canadian Rockies (Stark, 1954, 1959). Two other species of *Coleotechnites*, *C. ponderosana* Hodges and Stevens from Colorado (Hodges and Stevens, 1978) and an undescribed species infesting Jeffrey pine, *P. jeffreyi* Grev. and Balf. in southern California (Luck, 1976), have also been studied, but in lesser detail.

Distribution

We have reared *C. edulicola* from a number of northern New Mexico localities, and have seen specimens reared from pinyon in southern Utah (Fig. 1). We have also seen evidence of larval activity near Salida, Chaffee County; Pueblo, Pueblo County; Walsenburg, Huerfano County,

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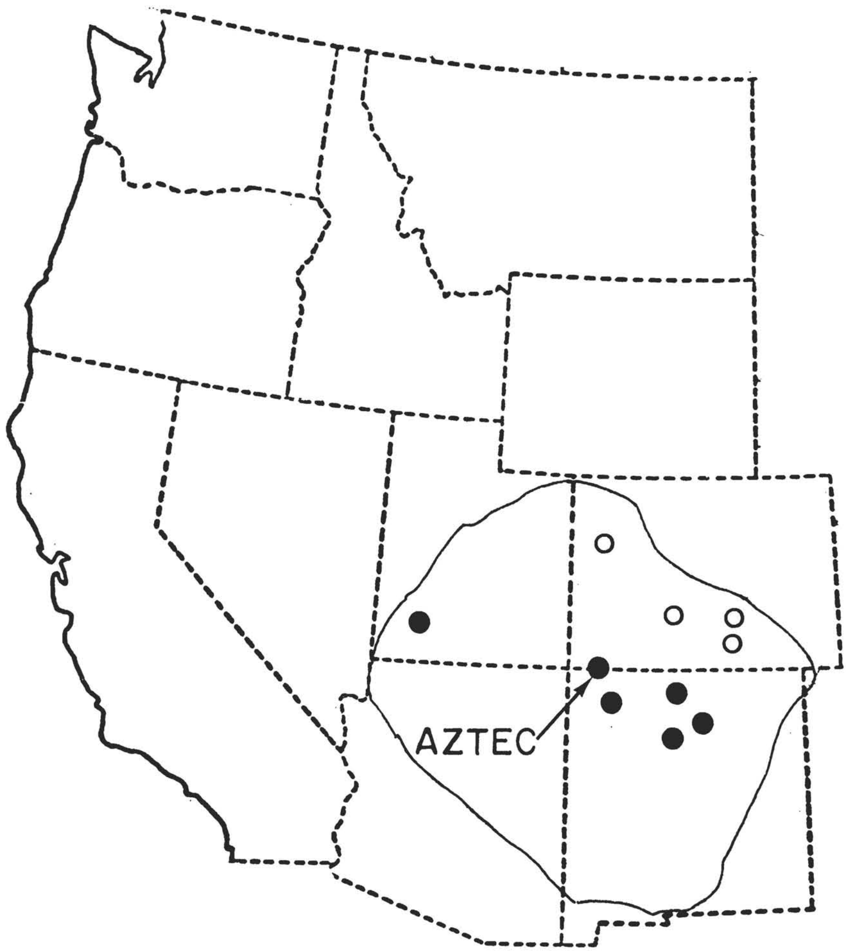

Fig. 1. Occurrence of *Coleotechnites edulicola* within general range of *Pinus edulis*; ●—adults reared, ○—larval feeding observed.

and Rio Blanco, Rio Blanco County, Colorado. The range of *C. edulicola* may in fact coincide with that of pinyon over much of the Southwest. All the rearings and feeding observations have been from naturally occurring trees.

LIFE HISTORY AND HABITS

Coleotechnites edulicola has a 1-year life cycle; the adults fly in early summer and young larvae make up the overwintering stage (Fig. 2).

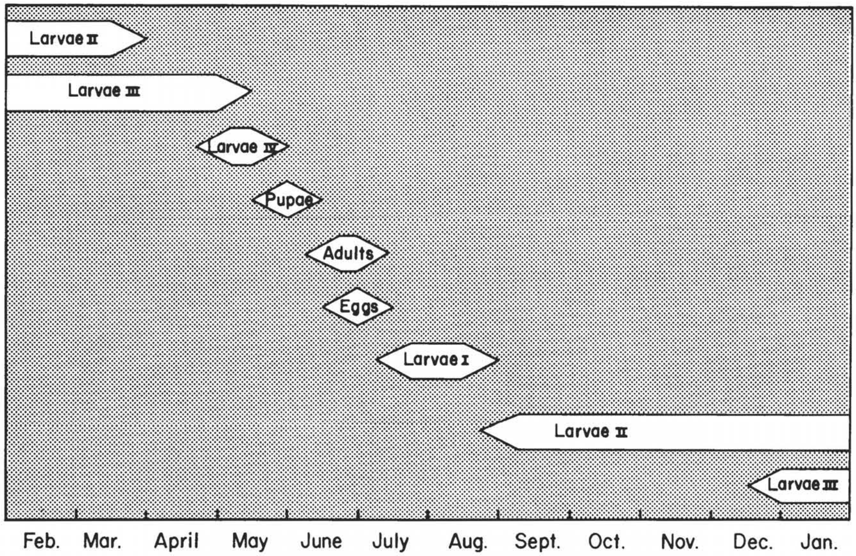

Fig. 2. Generalized life history of *Coleotechnites edulicola* at Aztec, New Mexico.

The following details of the life history were developed from a series of observations, collections, and rearings, mainly of the Aztec population, during the period 1973–1976.

Adults

The adults are small silvery-gray moths, wingspan ca. 10 mm, found from early June through mid-July. Hodges and Stevens (1978) present a detailed description of both sexes. The moths are generally quiescent during the daytime, rendered nearly invisible against twigs and bark by their pattern of black and silver scales. When disturbed they fly rapidly for a few seconds, generally within the branches of the tree on which they were resting, and upon re-alighting, scurry rapidly to another resting spot. Mating and oviposition have not been seen.

Eggs

The eggs are yellow-orange, nearly globular, and ca. 0.2 mm in diameter. They are laid in clusters of variable size, around 6–12 eggs each. Most eggs are laid inside needles mined out the previous year. A few are also found in older mines. The eggs are generally within 1 or 2 mm from an opening—either an exit hole or a "ventilation" hole.

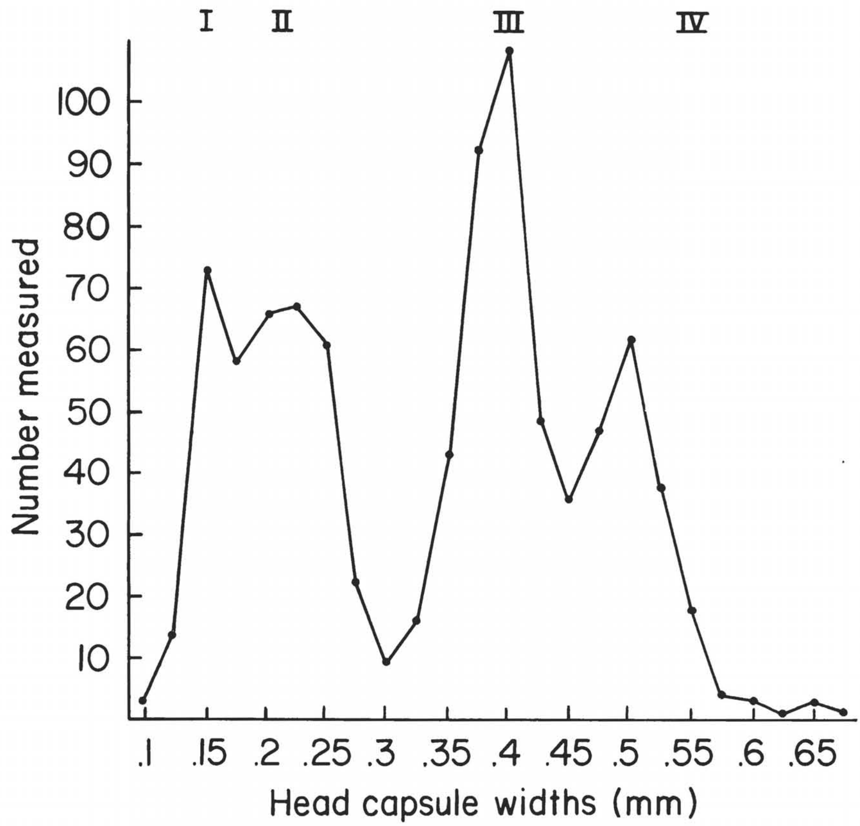

Fig. 3. Head capsule measurements (n = 894) of *Coleotechnites edulicola* larvae.

Larvae

The eggs begin hatching around the end of June (Fig. 2) and the stage I larvae crawl to and colonize previously uninfested needles. The larval period lasts most of the year, from early July until May or early June of the following summer. Measurements of 894 head capsules yielded a frequency curve with 4 distinct peaks, indicating 4 instars (Fig. 3). Inspection of the curve might suggest stages I and II larvae are members of the same set; however abandoned stage I head capsules were readily found in mines containing stage II larvae, thus confirming 2 early larval stages with head capsule widths averaging ca. 0.15 and 0.25 mm, respectively. These observations on number of larval stages and head capsule sizes closely parallel those reported by Luck (1976) on the only other univoltine *Coleotechnites* studied in comparable detail.

As shown in Fig. 2, *C. edulicola* was found to overwinter in both instars II and III. Larva II is by far the most protracted stage.

Most (ratio ca. 5:1) larvae are found in needles of the current year's growth; i.e., most needles are attacked the year they are produced. A few larvae infest older needles. Initial entry by stage I caterpillars is made on the convex side of the needle, within ca. 2 mm of the apex. Early in the larval period (e.g. 23 July 1975) mines are visible to the naked eye only on close inspection. No more than a single larva per needle was ever found.

As the larval period continues, additional needles of the current year's growth are invaded. Within the same needle bundle, larvae cross between the flat (facing) needle sides; a small amount of silk often holds the 2 needles temporarily together. Larvae move to other needle bundles without production of silk.

In the early larval period (instar I) frass is packed into the mined-out needle, but in later stages it is pushed out. Needles inhabited by 3d or 4th stage larvae have several holes for frass disposal and larval exit.

Throughout their lives the larvae are medium brown—most are uniformly colored, others tend to be mottled. Head capsules and thoracic and anal shields are dark brown to black. Fully developed larvae are ca. 8 mm long.

Pupae

C. edulicola pupates around the end of May within the last mined needle, near an open hole cut by the larva near the needle apex. The pupae are elongate, cylindrical, black, and about 6 mm long.

EFFECT ON HOST TREES

Repeated defoliation by *Coleotechnites* needle miners reduces growth of stems, shoots, and needles, and—in more severe cases—kills trees (e.g., Struble, 1972). Such appears to be the general case with *C. edulicola*. All degrees of damage, including tree mortality presumably resulting from repeated defoliation, could be found at the Aztec site. Under the circumstances (unmanaged southwestern pinyon-juniper forest), such mortality does not constitute a problem. Only where pinyons are intensively cultured and/or appearance is important would the species likely be considered a pest.

Fig. 4 compares the appearance of shoots on a currently infested, persistently defoliated tree with one that is essentially uninfested. The infested needles are shed prematurely, leaving the shoots with a characteristic bare-stemmed, tufted appearance.

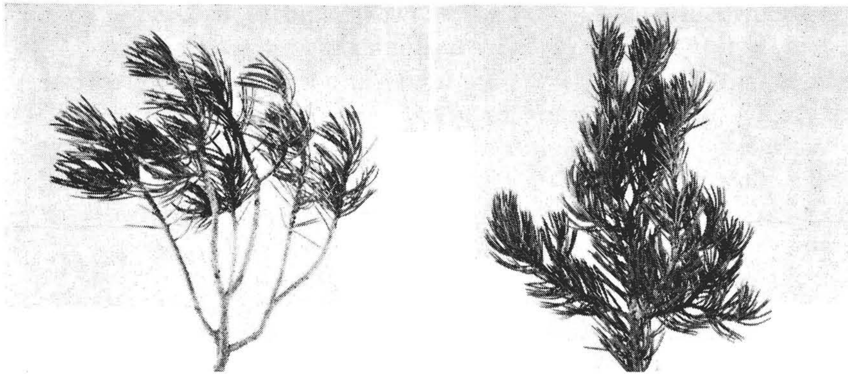

Fig. 4. Branches from adjacent pinyons showing effects of severe (left) and negligible (right) defoliation caused by *Coleotechnites edulicola*.

C. edulicola shares with *C. ponderosana* (Stevens, 1973) the characteristic of colonizing trees in a highly differential manner. For example, the shoots shown in Fig. 4 were taken at the same time from comparable parts of 2 adjacent pinyons. One tree was severely defoliated (29.7% of the needles infested) while infestation was negligible on the other. Tree resistance may be involved.

ASSOCIATES

Several species of parasitic Hymenoptera were dissected or reared from samples of pinyon foliage infested with *C. edulicola* from Aztec, Santa Fe, and Nageezi (San Juan County), New Mexico. These included undetermined species of *Chrysocharis* and *Dicladocerus* and a single specimen of *Zagrammosoma multilineatum* (Ashmead), all Eulophidae, and several pteromalids, not determined beyond family. A possibly undescribed *Apanteles* (Braconidae) was reared abundantly from Aztec.

ACKNOWLEDGMENTS

We thank Les Eklund and Ron Shannon for field assistance. Associated parasitic Hymenoptera were identified by Gordon Gordh (Eulophidae, Pteromalidae) and P. M. Marsh (*Apanteles*), U.S. National Museum, Washington, D. C.

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PIERIS NAPI OLERACEA (PIERIDAE) CAUGHT BY INSECTIVOROUS PLANT

Pieris napi oleracea Harris is frequently found in bog areas (Shull 1977, J. Lepid. Soc. 31: 68–70) and swamps where insectivorous plants may occur. On 20 June 1977, Pamela Matthews, James Douglas, and I were collecting in a white cedar (*Thuja occidentalis* L.) swamp north of Craftsbury, Orleans Co., Vermont. The swamp contains sphagnum moss and small patches of sundew plants (*Drosera rotundifolia* L.). In a sphagnum patch by our trail, we found a dead *P. n. oleracea* female, which was caught by the dorsal surface of its body and wings on several of the sticky sundew leaves. The external cuticle of the hapless butterfly appeared to be intact, but the internal soft parts were gone. Because we had visited this area twice during the previous week, and such a white object near our path would have attracted our attention, we surmise that the butterfly had died recently. How it became caught in the sundew, and whether its internal parts were digested by the plant or by some sucking predator which encountered the immobilized butterfly are not known.

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