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FOSSIL LEAF-MINES OF *BUCCULATRIX* (LYONETIIDAE) ON *ZELKOVA* (ULMACEAE) FROM FLORISSANT, COLORADO

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ABSTRACT. A fossil leaf of *Zelkova* from the Florrisant formation was found to contain the mine of a species of *Bucculatrix*. This is compared to mines of extant species of *Bucculatrix* of the *ulmifoliae*-group.

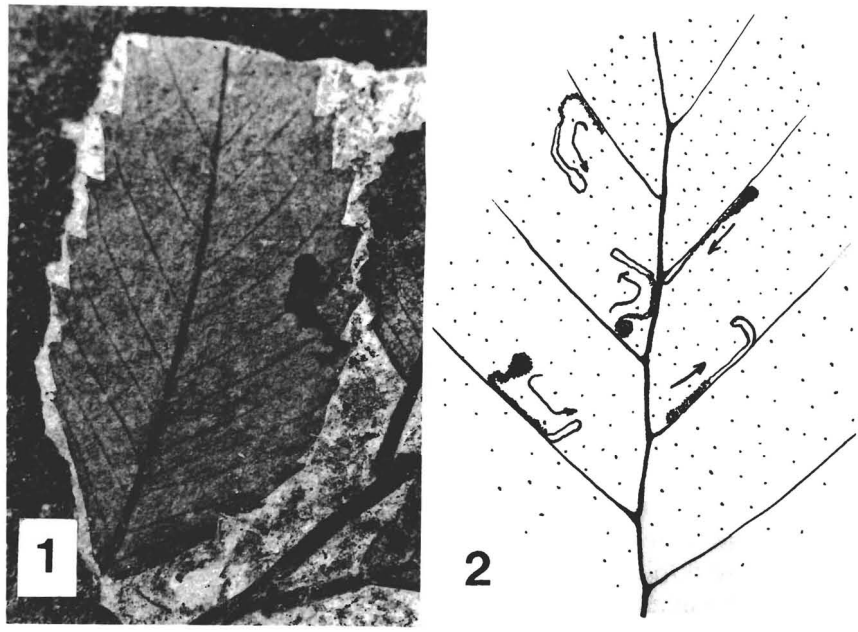
Leaf-mining insects, whose larvae feed between the cell layers of individual leaves, are found in four orders, i.e., Hymenoptera, Diptera, Coleoptera, and Lepidoptera (Needham et al., 1928). Among the Lepidoptera, the habit is most widespread among primitive superfamilies. Some families are composed entirely of leaf-miners, e.g., Eriocraniidae, Gracillariidae, Lyonetiidae, while others have both leaf-mining and external feeding representatives, e.g., Incurvariidae, Gelechiidae (Opler, 1974). Leaf-mining larvae feed in a stereotyped, conservative manner, and their workings may be readily identified to family, genus and even species, even after the responsible inhabitant has departed.

The discovery of identifiable mines on finely preserved fossil leaves has allowed biologists not only to gain insight into the evolution of Lepidoptera, whose fossil record is scant, but to trace back specific insect-host plant relationships into geological time (Lewis, 1969; Opler, 1973, 1974; Hickey & Hodges, 1975).

Opler (1973, 1974) provided evidence from fossil mines that several oak leaf-mining moths from western North America have probably survived virtually unchanged since the late Miocene epoch (18 million years b.p.). Subsequently, Hickey and Hodges (1975) reported that a *Phyllocnistis* (Phyllocnistidae) fossil mine on *Populus* of Eocene age was clearly *not* the same species as any modern *Populus*-feeding *Phyllocnistis*.

The present report is of *Buccalatrix* mines found on fossil leaves of *Zelkova drymeja* (Ulmaceae) (Fig. 1) from the Florissant formation in central Colorado, which is Oligocene age (30 million years b.p.). The host genus (*Zelkova*) has long since vanished from North America and today occurs only in temperate Eurasia. The mines are dissimilar to those made by any living North American species (Braun, 1963), but are recognizably similar to, but not conspecific with, *Bucculatrix ulmifoliae* Hg., which feeds on *Ulmus* in Europe and by *Bucculatrix ulmicola* Kuzn., which feeds on *Zelkova* in eastern Europe (Fig. 2).

This discovery is another important piece of evidence which dem-



FIGS. 1 & 2. *Bucculatrix* leaf mines. **1**, fossil leaf of *Zelkova drymeja* from Florrisant formation with *Bucculatrix* mine (photograph by J. A. Powell); **2**, drawing of *B. ulmicola* mines on *Zelkova* sp. from Rodini, Rhodos, Austria (drawing by G. Deshka).

onstrates the historical fidelity of host relationships among the *Bucculatrix ulmifoliae* species group with Ulmaceae for at least 30×10^6 years. Whether the descendents of the Florissant moths eventually shifted their distribution to Eurasia as antecedents of the *Bucculatrix ulmifoliae* group or whether the Florissant mines represented an invasion from Eurasia which has since died out is indeterminate.

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LITERATURE CITED

BRAUN, A. F. 1963. The genus *Bucculatrix* in America north of Mexico. Mem. Am. Entomol. 18:1–208.

HICKEY, L. J. & R. W. HODGES. 1975. Lepidopteran leaf mine from the early Eocene Wind River formation of northwestern Wyoming. Science 189:718–720.

LEWIS, S. E. 1969. Lepidopterous larval mining on an oak (?) leaf from the Latah Formation (Miocene) of eastern Washington. Ann. Entomol. Soc. Amer. 62:1210.

NEEDHAM, J. G., S. W. FROST & B. H. TOTHILL. 1928. Leaf-mining Insects. Williams and Wilkins Co., Baltimore. 351 pp.

OPLER, P. A. 1973. Fossil lepidopterous leaf mines demonstrate the age of some insect–plant relationships. Science 179:1321–1323.

——— 1974. Biology, ecology, and host specificity of Microlepidoptera associated with *Quercus agrifolia* (Fagaceae). Univ. California Publ. Entomol. 75:1–83.