

The Elm Leafminer, *Kaliofenusa ulmi* (Sundevall) (Hymenoptera: Tenthredinidae) in Virginia, and Summary of Host Records

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The elm leafminer, *Kaliofenusa ulmi* (Sundevall), also in the literature as *Fenusa ulmi* Sundevall, is of European origin and was accidentally introduced into North America, apparently toward the end of the nineteenth century. The first North American record is from New York (Felt, 1898a, b). It has since been recorded from Massachusetts, Michigan, Ontario, and Quebec (Smith, 1971).

From observations and collections from 1991 through 1994 at the University of Virginia Blandy Experimental Farm and the State Arboretum of Virginia, Clarke Co., Virginia, *K. ulmi* was discovered damaging an elm in the Arboretum and specimens were collected in a nearby 90-year old woodlot composed primarily of oak, elm, and hickory. This is the southernmost occurrence of the elm leafminer in the United States, the first record from Virginia, and the elm species *Ulmus elliptica*, is a new host record for the sawfly.

Adult.— *Kaliofenusa ulmi* adults are small (3.5 - 4.5 mm long) and black (Figs. 1, 2); males are not known. Such a sawfly taken from an elm is undoubtedly this species, but identification should always be verified. The only sawflies that are similar are other leafminers, some *Profenusa* spp. on oak and birch, *Fenusa dobrinii* (Tischbein) on alder, and *F. pusilla* (Lepeletier) on birch. Only *Profenusa alumna* (MacGillivray) on oak has been found in Virginia, and rarely, though the others are probable. See Smith (1971) for separation of *K. ulmi* from other North America species of leafminers and Liston (1993) for separation from other species of *Kaliofenusa*.

Larva.— The larvae are small (when mature about 7.5 mm long), whitish with a slightly darker head capsule, and dorsoventrally flattened. Smith (1971) separated the

larva from those of other leafminers.

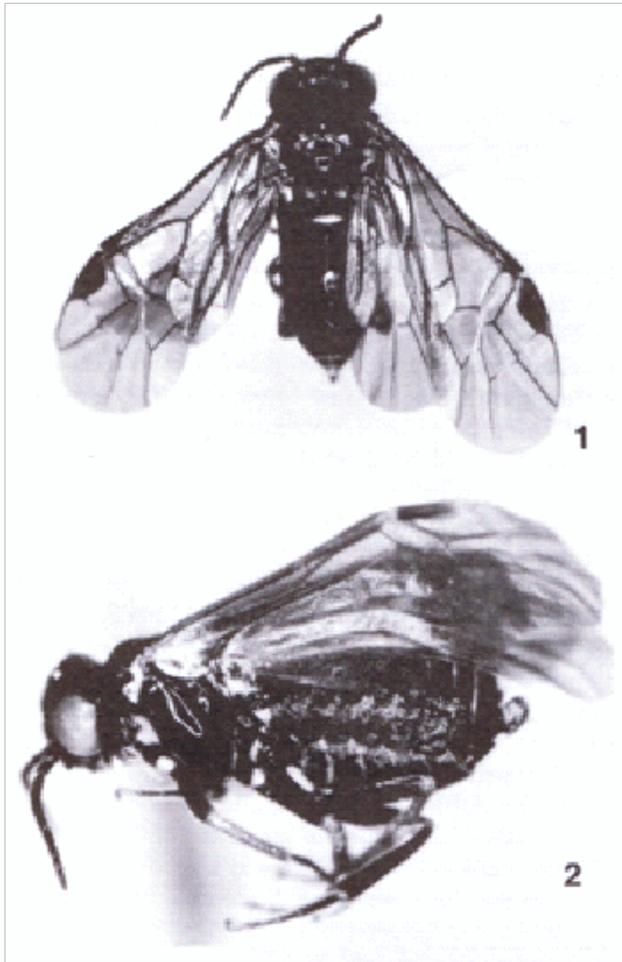
Hosts.— The sawfly is apparently specific to a single species of elm in Europe. Liston (1993) stated that it is probably confined to *Ulmus glabra*. Other species of *Kaliofenusa* in Europe mine leaves of other elms: *K. carpinifoliae* Liston in "*Ulmus minor* Mill. ~~f~~*carpinifolia* Gleditsch," and *K. altenhoferi* Liston in "*Ulmus effus* Willd (= *laevis* Pallas)" (Liston, 1993). All specimens of the leafminer so far collected in North America are *Kaliofenusa ulmi*.

Only one species of elm, Armenian elm, *Ulmus elliptica*, is attacked in the Arboretum. Other species in the elm grove are identified as follows: *Ulmus pumila*, *U. pumila* var. *arborea*, *U. carpinifolia*, *U. glabra*, *U. americana*, and an unidentified species (tagged #84-2759). For five years, I have noticed considerable browning of the single Armenian elm but none of the others, and personnel at the Arboretum have mentioned noticing it for many years. I have collected specimens of *K. ulmi* from this elm and also in Malaise traps in a woodlot about 0.8 km from the elm grove in the Arboretum. The only elm in the woodlot (slippery elm, *Ulmus rubra*) appears to have suffered no damage.

Felt (1898) reported that the "Camperdown" elms in New York were severely attacked, and that the "English, Scotch, and American species" were damaged. He gave no scientific names, and it is not known if he referred to American elm, *U. americana*. Slingerland (1905) recorded the elm leafminer from English and Scotch elms (especially the Camperdown variety) in New York and stated that American elms were immune from attack even where different host species were growing in close proximity.

Since my 1971 revision, I have seen the following host records from labels on North American specimens: *Ulmus americana* from Maine and *U. rubra* from Vermont.

Although *K. ulmi* is apparently specific to one elm species in Europe (Liston, 1993), there are various and contradicting host records in North America. This could



Figs. 1, 2. *Kaliofenusa ulmi*, adult 1, Dorsal view. 2, Lateral view. Length = 3.5-4.0 mm.

be a result of misidentification of host plants and changing nomenclature of the elms (the sawfly may know the elm species better than we do), the possibility that the sawfly has become adapted to other elm species in North America, or there are other interacting factors, environmental or physiological, that make the trees susceptible to attack.

In summary, host information in North America is as follows, with the elm names given as they are identified in the Arboretum or as they appear in the literature:

Ulmus americana L., American elm.— Felt (1898a, b) reported damage to "American species" but Slingerland (1905) stated that "American elms" were immune from attack. Several American elm trees near the Armenian elm in the Arboretum were not attacked. Elm leafminer specimens I have examined from Maine bear the labels "on American elm" and "*Ulmus americana*."

Ulmus campestris L., English elm.— "English elms" were reported as hosts by Felt (1898a, b) and Slingerland (1905) in New York.

Ulmus carpinifolia Gleditsch, smooth leaf elm.— Not attacked in the Arboretum. This is the host of another species of *Kaliofenusa* in Europe.

Ulmus elliptica Koch., Armenian elm.— The only species of elm in the Arboretum attacked. The sawfly causes severe browning of the tree.

Ulmus glabra Hudson, Scotch elm.— Recorded as the only known host in Europe (Liston, 1993). "Scotch elms" are recorded as hosts by Felt (1898a, b) and Slingerland (1905) in New York. Not attacked in the Arboretum.

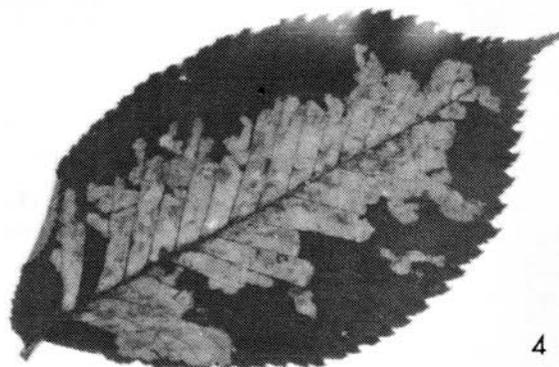
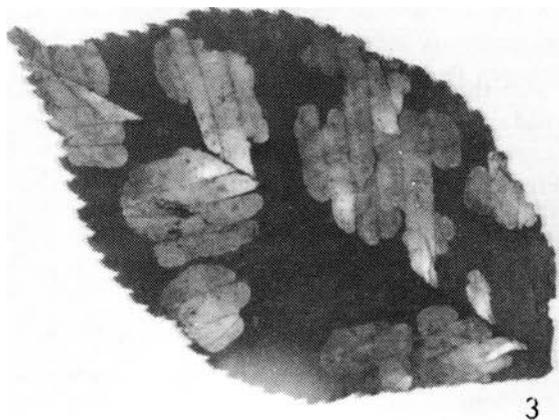
Ulmus glabra var. *camperdownii* Rehd.— Damage was reported by Felt (1898a, b) as "Camperdown" elms, and by Slingerland (1905) on "the Camperdown variety of Scotch elms" in New York.

Ulmus pumila L., Siberian elm.— Not attacked in the Arboretum.

Ulmus pumila var. *arborea* Litwinow.— Not attacked in the Arboretum.

Ulmus rubra Muhl., slippery elm.— This elm is recorded on host labels on specimens from Vermont. Specimens were collected in the woodlot on the Blandy Experimental Farm where this is the only species of elm, but no damage was observed.

Biology.— *Kaliofenusa ulmi* is univoltine. At the Arboretum, adults emerged in late April and early May of each season. They were seen flying and alighting on the host foliage, and many were swept from the grass underneath the tree. In early to mid-May, larvae were actively feeding and forming blotch mines in the foliage. Most mining begins near the midrib of the leaf, and the larvae work laterally toward the leaf edges (Figs. 3, 4). The mines may coalesce and form large blotches. There could be 20 or more mines per leaf. During the last week in May, many of the leaves were completely mined, but



Figs. 3, 4. Leaves of *Ulmus elliptica* from the Virginia State Arboretum showing blotch mines of *Kaliofenusa ulmi*. Mines begin near the midrib and extend outward into the leaf. Length of leaves = ca. 11 cm.

some larvae were still feeding. By the end of May and first of June no larvae were found, and feeding and damage was complete for the year.

My observations coincide with those of Slingerland (1905) who reported on this insect in New York, though I did not observe oviposition and overwintering sites. Emergence dates are slightly later in New York, with adults beginning to emerge in mid-May; they are especially abundant the last part of May. Eggs are inserted into the leaf from the upper surface, usually near the midrib or larger veins. Larvae hatch in about a week and take up to three weeks to develop within the leaf. When mature, the larvae eat through the leaf surface and drop to the ground where they make a small papery cocoon about an inch below the surface. There they remain and transform to adults and emerge the following spring.

Distribution.—I have examined specimens from these states and provinces: Maine, Massachusetts, Michigan, New York, Ontario, Quebec, Vermont, Virginia.

Virginia records.— Clarke Co., University of Virginia Blandy Experimental Farm and State Arboretum of Virginia, 3.2 km S. Boyce, David R. Smith: April 19, 1990 (1 swept from low vegetation in woodlot); April 19-30, 1990, April 16 - 28, 1994, April 29 - May 9, 1994 (specimens in Malaise traps in woodlot); April 27, 1993, May 10, 1993, April 28, 1994, May 9, 1994 (numerous specimens from under Armenian elm in Arboretum).

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