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Excerpt from Canadian Entomologist, June, 1940.

THE GENUS EPHORON\*

BY HERMAN T. SPIETH,  
College of the City of New York

Williamson (1802) described the white fly *Ephoron leukon*. From his description of the insect and its habits, recent workers have been able to identify the species correctly. Hagen (1863) suggested that *Baetis alba* Say is a synonym of *E. leukon* Williamson. Eaton (1871, p. 124) was undecided as to the identity of *E. leukon*. In 1883 (p. 47), however, he indicated that *leukon* is a synonym of *albus* Say, which he considered to be a member of the genus *Polymitarcys*. This genus he had erected in 1868, employing *Ephemera virgo* Oliver as the genotype.

McDunnough (1926) showed that both the generic and trivial names of *Ephoron leukon* are valid, and thus *Ephoron* should supersede the generic name *Polymitarcys*. He also showed, as has been confirmed subsequently by other workers, that *album* Say although belonging to *Ephoron* is not a synonym of *E. leukon* Williamson. Ulmer (1932, 1932-33) considered both *Ephoron* and *Polymitarcys* to be valid genera with *leukon* Williamson as the genotype of *Ephoron* and *virgo* Oliver as the genotype of *Polymitarcys*. Traver (1935), however, considered *Polymitarcys* as a synonym of *Ephoron* and indicated *E. virgo* Oliver as the genotype. Lestage (1938) has reviewed the entire problem at some length, but, due to the lack of material, did not arrive at any definite conclusion. In order to clarify the situation there are two questions that should be answered:

1. What are the correct genotypes of (a) *Polymitarcys* and (b) *Ephoron*?
2. Is *Polymitarcys* a synonym of *Ephoron*?

When he erected *Polymitarcys* Eaton (1968, p. 86) made *P. virgo* Oliver the genotype. Therefore *P. virgo* is the type by original designation.

Williamson (1862, p. 71) in describing *Ephoron* did not designate a type but since only one species, *leukon*, was included in the original article, it automatically becomes the genotype according to the International Rules of Zoological Nomenclature.

Regardless of the subsequent fate of these two genera, the species mentioned above remain the respective genotypes, and *virgo* can not be considered the genotype of *Ephoron*.

McDunnough (1926, p. 184) wrote: "*Ephoron* Will. will supersede *Polymitarcys* Eaton as there seems little doubt from Williamson's account of the habit of the 'White Fly' that he was dealing with a species of this genus." All American workers have accepted McDunnough's conclusions.

Ulmer (1932, p. 209), however, wrote: "McDunnough will den Namen *Polymitarcys* Etn. ersetzen durch dem alteren Namen *Ephoron* Will.; das ist nicht notig, wenn man die hier hergehorigen nordamerikanischen Arten generisch von den ubrigen trennt, also beide Gattungen bestehen lasst, wie ich vorschlagen mochte; bei *Polymitarcys* ist die A<sub>1</sub> des Vorderflügels gegabelt, zweiaestig, und die Interkalaraden liegen zwischen diesen 2 Asten; dagegen ist bei *Ephoron* die A<sub>1</sub>, normal, ungegabelt und die Interkalaraden liegen zwischen

\*Without the courtesy of research facilities at the Amer. Mus. Nat. Hist., this work could not have been accomplished. My sincere thanks to the Museum and in particular to Dr. Frank E. Lutz, Curator of Entomology.

$A_1$  und  $A_2$ ; zudem ist *Ephoron* durch sehr stark vergrösserte Augen des ♂ von *Polymitarcys* verschieden." Ulmer thus feels that both genera are good.

Of the generally accepted valid species that have been placed in these two genera, the nymphs of five are known. Ide (1935) has figured and described the ♂ nymph of *leukon*. *E. album* nymphs of both sexes are in the author's collection. Eaton (1883-88, pl. 28), Vayassiere (1882, figs. 9, 11, 12) and Schoenemund (1930, figs. 119, 120) have described and illustrated the nymph of *virgo* Oliver. Tiensuu (1935, fig. 5) has described the nymph of *ladogensis* from Finland, while Ueno (1931, fig. 1) has figured and described a species from Japan. Careful, detailed comparison of *leukon* and *album* nymphs with the descriptions and figures of the other three species leaves no doubt that the differences between the species are very small and certainly of not more than specific rank. The sixth gill of *virgo* as illustrated by Eaton and Schoenemund differs from all other four species. Vayassiere (1882), however, has shown the gill of *virgo* to be similar to that of the other species. Apparently Eaton's delineator erred and Schoenemund has followed him.

The adults are better known than the nymphs, but even here most species are known from only a few individuals. In those species where adequate material has been studied (i.e., *album*, *leukon*, *virgo*, and *savignyi*) there appears to be considerable individual variation in the cubital area of the fore wing (the  $A_1$ - $A_2$  area of Ulmer). A detailed comparison of the eyes, legs, wings, genitalia, cerci, general configuration, size and coloration of *E. album* and *E. leukon* with other species that have been placed in *Polymitarcys* (i.e., *virgo*, *ladogensis*, *savignyi*, *annandalei*, *indicus*) shows that with the exception of the eyes and the cubital area of the wings, all other characters exhibit only specific differences. In fact, if it were not for the size and coloration, it would be impossible to separate individuals of these various species.

As mentioned above, the cubital area of the wing is highly variable. Typically we find in this area a number of long, longitudinal, nearly parallel intercalaries. Their distal ends reach the wing margin but their proximal ends terminate in the membrane and are attached to each other or to the major veins by cross veins. From the most posterior of these longitudinal intercalaries a number of short, secondary intercalaries arise and run to the anal margin of the wing. As in all members of the Ephemeroidea, these species have the  $Cu_2$  distally diverging strongly from the  $Cu_1$ . Since the long intercalaries lie parallel to the  $Cu_1$  they therefore are almost at right angles to the  $Cu_2$ . Between the bases of these intercalaries and the  $Cu_2$  there is usually an accessory vein that parallels the  $Cu_2$ . It extends inward from the margin of the wing and sometimes, as in *indica* and *annandalei*, is attached to the  $Cu_1$ . In others such as *album* and *leukon*, it usually does not reach the  $Cu_1$  but is attached to one of the longitudinal intercalaries. Thus this vein which is Ulmer's fork of his  $A_1$  is present in the distal edge of the fore wings of all species but may be lacking proximally in some species. Careful study of actual specimens shows that it is not a true fork of the  $Cu_1$  ( $A_1$ ) but actually just another secondary intercalary that sometimes is attached to the  $Cu_1$ . If the attachment or nonattachment of this vein to the  $Cu_1$  is considered of generic value, then some specimens of both *leukon* and *album* will belong to *Ephoron* and others collected from the same nuptial swarm will belong to *Polymitarcys*.

The differences in size of the eyes of various species and consequent varying of the relative distance between the eyes are also of only specific value. A parallel condition is found in *Potamanthus*, *Hexagenia*, and *Baetis*.

In addition to the evidence listed above, there is a more potent argument still for the inclusion of all these species in one genus. Genera are figments of the human mind and not realities of nature. As such they are of great convenience to taxonomists in showing relationships, in illustrating how we think

the evolution of the group has taken place in the past, and in keeping the group of species within workable bounds. Unless the creation of a new genus will help the taxonomist in some such manner, there is no justification for its erection. If, however, we base genera not primarily upon convenience, but merely upon differences, then the only logical conclusion is that each species must be placed in a different genus.

In the problem under consideration, we have a small number of species which are extremely closely allied not only structurally but also ecologically. They form a distinct, compact, phylogenetically and biologically well isolated group within the family to which they belong. To separate this group into two genera would not only obscure the relationships of these species to each other but would also tend to obscure the familial relationships.

Further, as shown above, the only differences available for the separation of this group of species into two genera are not valid. Even if they were valid, we still would lack means of separating the nymphs.

Thus from all points of view, i.e., legalistic, structural, ecological, and theoretical, we must conclude that *Polymitarcys* is a synonym of *Ephoron*.

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