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DECEMBER 31, 1968

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July 16, 1968

THE AFFINITIES OF THE GENUS *SOBOBAPTERON* PIERCE*

In 1965 the late Dr. W. Dwight Pierce described (under the name of *Sobobapteron kirkbyae*) an insect wing which he assigned to the extinct order Protorthoptera. The fossil was collected near the Soboba Indian Reservation, north-east of San Jacinto, California, and in shale which had previously been determined as Pleistocene by Dr. D. I. Axelrod. Realizing that the order Protorthoptera was known only from Upper Carboniferous and Permian strata, Dr. Pierce was led to believe that the age of the shale in which the fossil was found must be older than the Pleistocene and, indeed, "nearer Permian".

Since I was preparing a review of the Protorthoptera at about the time of the publication of Dr. Pierce's article, I requested and obtained the loan of the type specimen of *S. kirkbyae* for study. The present paper includes additional descriptive details of the fossil and a presentation of my own conclusions about its affinities.

Dr. Pierce based his determination of the ordinal position of the fossil on the presence of a "fringe of clubbed hairs" bordering the wing and also on the nature of the branching of the radial sector, which he felt was of a type not found in any living order of insects. Although Dr. Pierce did not make a family assignment of the species within the Protorthoptera, he included it within the superfamily Hapalopteroidea. This taxon, which was originally given ordinal status by Handlirsch (1906), was based upon a single species, *Hapaloptera gracilis*, which is now placed within the Protorthoptera, close to the family Cacurgidae (Carpenter, 1965).

Although the wing of *kirkbyae* does appear to have a border of clubbed hairs, careful examination of the fossil shows that this fringe occasionally projects for a considerable distance away from the wing itself and that the fringe is actually formed by inorganic (mineral) deposition, apparently as a result of a reaction between organic compounds of the wing and certain chemicals in the matrix.¹ The darkened, irregular areas within most cells of the wing (shown in Dr. Pierce's figure but not discussed in his description) are also mineral in nature.

*Research aided by NSF grant GB 7308-2.

¹I am indebted to Dr. Cornelius Hurlbut, of the Department of Mineralogy, Harvard University, for confirmation of this interpretation.

The venation of the wing turns out to be that of a damselfly (suborder Zygoptera) in the order Odonata (see figure 1). Dr. L. K. Gloyd, at the Museum of Zoology, University of Michigan, to whom I sent my drawing of the wing, informs me that the specimen was undoubtedly that of a species of the living genus *Enallagma* (Coenagrionidae). Dr. Gloyd was further of the opinion that the fossil wing could very well have belonged to *Enallagma clausum* Morse, which now occurs in California as well as in other parts of the United States. Unfortunately, the variability of venational details in the species of *Enallagma* prevents specific determination on the basis of the wing alone. For the present, it seems advisable to consider the specific name (*kirkbyae*) valid, since precise synonymy with any living species cannot be established. The generic name *Sobobapteron*, however, is herein placed as a junior synonym of *Enallagma* and the species moved from the Protorthoptera to the Odonata.

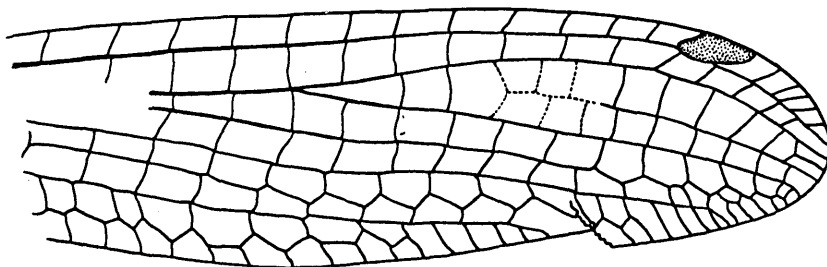


Figure 1. *Enallagma kirkbyae* (Pierce); original drawing, based on holotype (No. S9113), in Los Angeles County Museum, Invertebrate Paleontology.

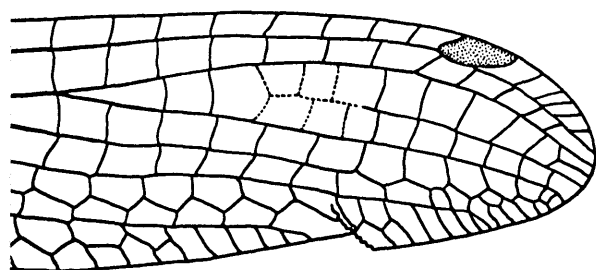
Dr. Axelrod has informed me (pers. comm.) that there is no question that the age of the deposit which produced the insect wing is Pleistocene. In his account of the plants (Axelrod, 1966), he points out that the flora of the formation (Bautista) which also produced the insect wing can largely be duplicated today by vegetation in the nearby mountains at altitudes of about 3000 ft. above the fossil site. Mammals which have been collected in the same formation are likewise considered of Pleistocene age (Frick, 1921).

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- F. M. Carpenter, Biological Laboratories, Harvard University, Cambridge, Massachusetts, 02138.

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Enallagma kirkbyae (Pierce); original drawing, based on holotype from the Pleistocene of Angeles County Museum, Invertebrate Paleontology.

Dr. Gloyd informed me (pers. comm.) that there is no question as to the deposit which produced the insect wing is Pleistocene. Dr. Gloyd, in his paper on the plants (Axelrod, 1966), he points out that the site is in the San Timoteo Canon (Bautista) which also produced the insect wing. The site is dated today by vegetation in the nearby mountains 3000 ft. above the fossil site. Mammals which have been found in the same formation are likewise considered of Pleistocene age (Gloyd, 1968).

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