MITTEILUNGEN DER SCHWEIZERISCHEN ENTOMOLOGISCHEN GESELLSCHAFT
BULLETIN DE LA SOCIÉTÉ ENTOMOLOGIQUE SUISSE
61, 295–302, 1988

A new cavernicolous planthopper species (Homoptera, Fulgoroidea: Cixiidae) from Mexico

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A new troglobitic cixiid species, *Cixius actunus* sp.n., is described from Cueva de las Maravillas in the Sierra Madre del Sur system near Acatlán, Oaxaca, Mexico. The tentative generic placement and the uncertain phylogenetic relationship of *C. actunus* sp.n. to other North American cixiid taxa are discussed. Neither a closely related epigean cixiid group, nor a possible epigean ancestor species could so far be assessed. Possible conspecifity of *C. actunus* sp.n. with a morphologically similar, troglobitic female from nearby Cueva de Cayetaro by maintenance of gene-flow via intercave dispersal is discussed.

INTRODUCTION

Faunistic surveys of caves in Mexico, Guatemala and Belize initiated by the Association for Mexican Cave Studies (Austin, Texas) in the early 1960's, have revealed a remarkably rich cavernicolous fauna (REDDELL, 1981) comprising about 2,000 species including approximately 300 terrestrial and aquatic troglobites (obligate cavernicoles). The vast majority of these species are arthropods, mainly shrimps, arachnids and millipedes.

The Fulgoroidea (Homoptera) have so far been represented by two troglobitic species: *Cixius orcus* FENNAH, 1973 (Cixiidae) and *Oeclidius hades* FENNAH, 1973 (Kinnaridae) from caves within the Sierra Madre Oriental System, Mexico. Examination of Fulgoroidea specimens from caves of the Sierra Madre del Sur system which were found among specimens left by the late Dr. R.G. FENNAH (CAB International Institute of Entomology, London) have resulted in the discovery of at least one more new cave-dwelling cixiid species in Mexico. There is no evidence of a corresponding manuscript by Dr. FENNAH (neither in press nor in preparation) and this species is here described as new.

Cixius actunus sp.n. (figs. 2–13)

Description

Male: Body generally stramineous, with minute, dark, irregularly distributed pigment spots; eyes unpigmented; tegmina translucent, venation yellowish.

Head (figs. 5–7): vertex short, slightly concave, about 5.6 times as wide as long in middle line. Vertex separated from frons by a distinct transverse carina and with posterior margin shallowly undulate. Frons convex, slightly broadened beneath the eyes, hardly longer than maximum width; lateral carinae distinct, sharply ridged and directed laterad, median carina absent. Median ocellus

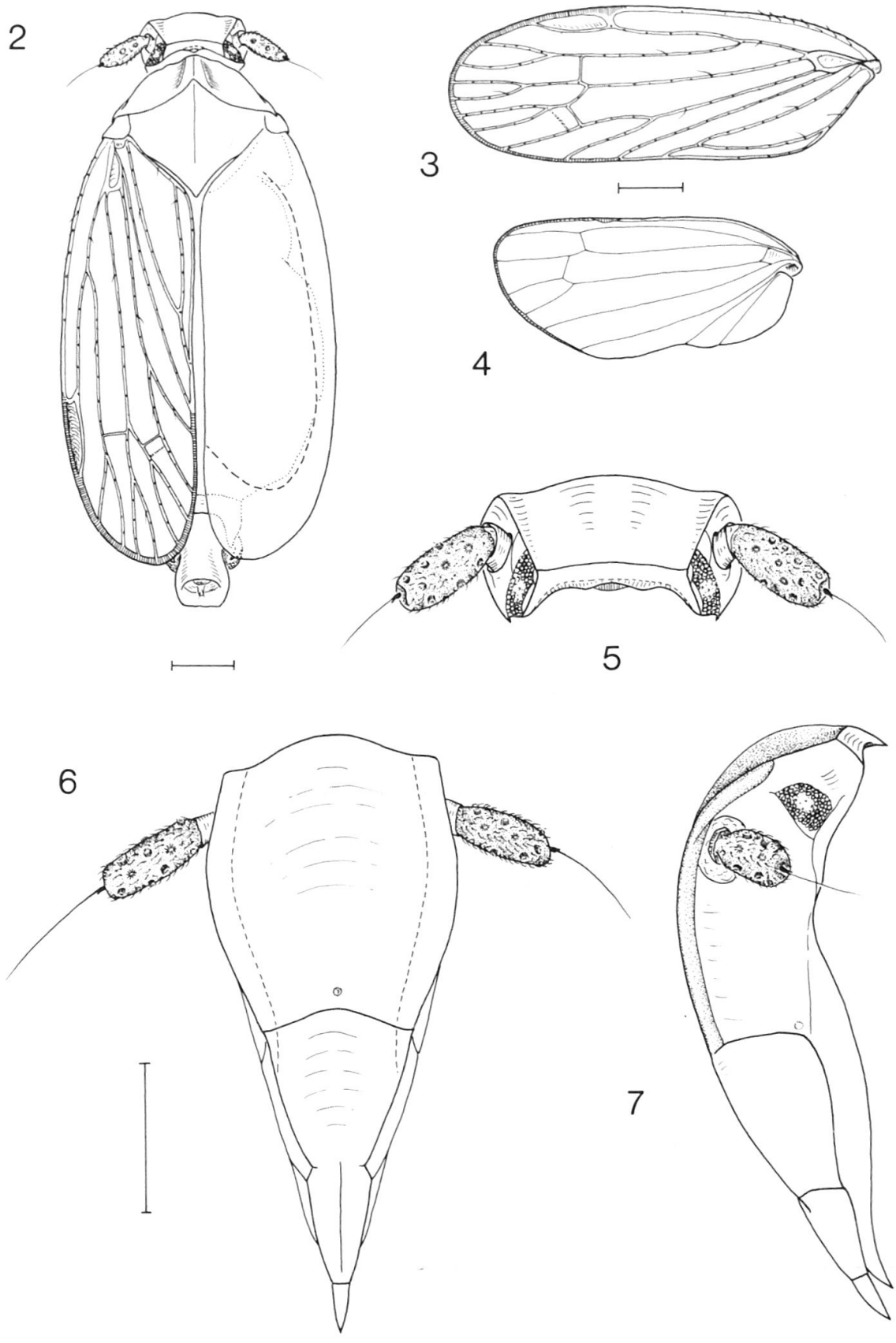
Fig. 1. Cave locations of troglobitic Cixiidae in Mexico. 1. *Cixius actunus* sp.n.; 2. *Cixius* spec.; 3. *Cixius orcus* FENNAH.

rudimentary, well above frontoclypeal suture; lateral ocelli absent. Post- and anteclypeus together about as long as frons. Rostrum surpassing post-trochanters, almost reaching to half the length of abdomen. Antennal segments cylindrical, second segment about three times as long as first. Compound eyes vestigial; ommatidia-bearing area nearly planate.

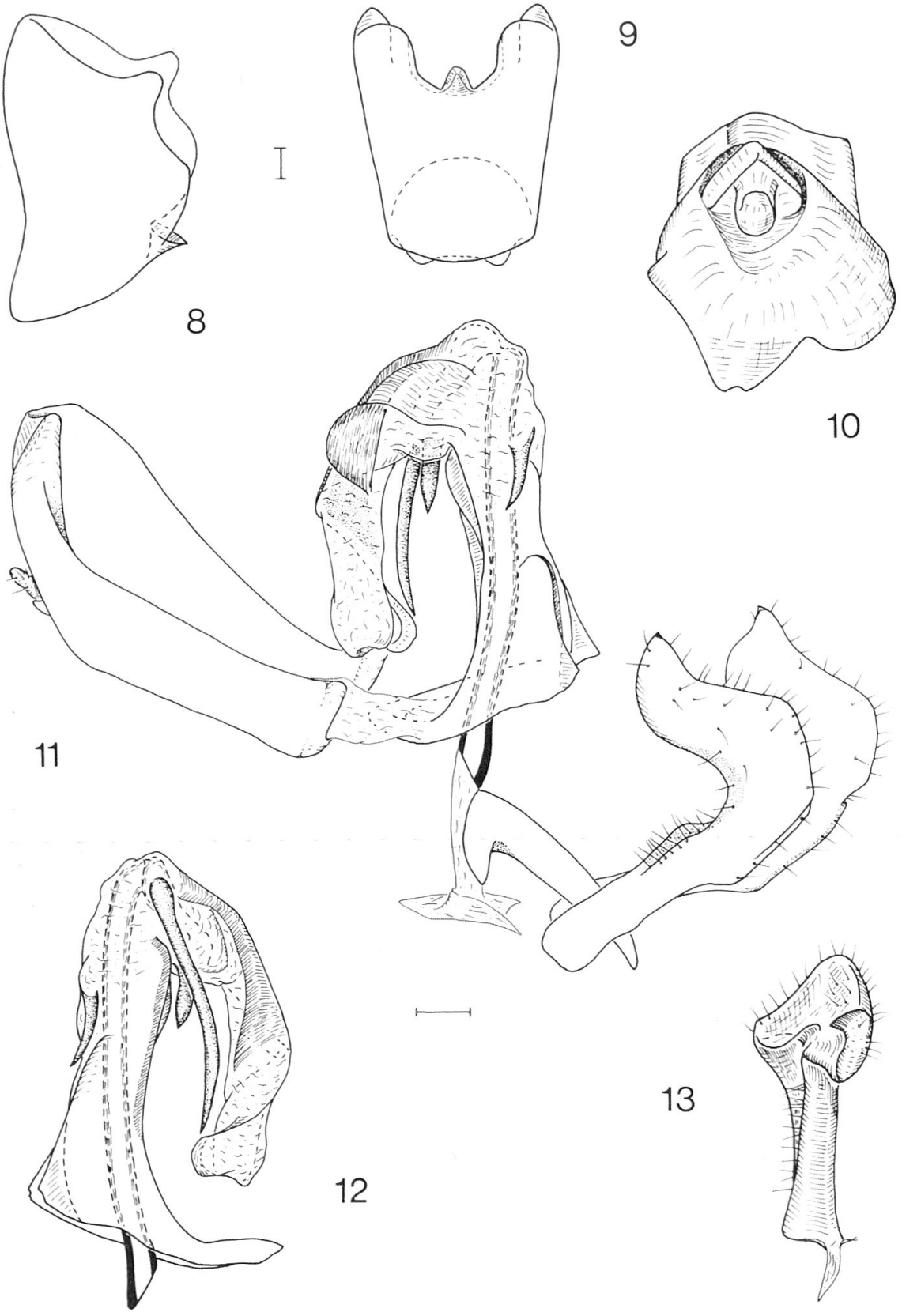
Thorax (figs. 2–4): pronotum tricarinate with lateral carinae diverging posteriorly and vanishing laterally; in middle line about three times the length of vertex, and about 2.7 times as wide as head at transverse carina. Mesonotum tricarinate with median carina distinct and lateral carinae vanishing; in middle line about 4.8 times the length of pronotum. Tegulae present. Tegmina shortened, distally not surpassing anal segment, about 2.6 times as long as maximal width. Subapical cells not separated from apical cells by crossveins; Sc + R forking in basal third of total length; Cu fork at about ⅔ of total length. Pterostigma inconspicuous. Longitudinal veins inconspicuously setose. Wings shortened, anal area distinctly reduced; R and Cu without distal fork. Hind tibiae laterally unarmed, with six apical teeth. Basal tarsal joint about 0.8 times as long as segments II and III together. Basal tarsal joint with five, second with six (four) apical teeth. Pretarsal claws slender; arolia small.

Total length: 4.5 mm.

Male genitalia (figs. 8–13): Genital segment in caudal aspect slightly higher than wide, in lateral aspect ventrally four times as long as dorsally; each laterodorsal angle produced in a short, stout, apically rounded process. Medio-



Figs. 2–7. *Cixius actunus* sp.n., holotype ♂. 2: habitus; 3: tegmen; 4: wing; 5: head, dorsal aspect; 6: head, ventral aspect; 7: head, lateral aspect. – Scale: 0.5 mm.



Figs. 8–13. *Cixius actunus* sp.n., holotype ♂. 8: genital segment, lateral aspect; 9: genital segment, ventral aspect; 10: anal segment, caudal aspect; 11: anal segment, aedeagus, connective and parameres, left lateral aspect; 12: aedeagus, right lateral aspect; 13: left paramere, dorsal aspect. – Scale: 0.1 mm.

ventral process tongue-shaped, dorsally with a feeble longitudinal carina. Anal segment twice as long as broad, in dorsal aspect proximally with lateral margins parallel, in distal half slightly broadened and bent ventrad; caudal margin asymmetrical: right laterally with a shallow lobe, left laterally produced in a short, irregularly truncate process. Basal part of aedeagus slender, ventrolaterally with two fin-like projections; subapically on each side with a short, slender, movable spine; subapically on the right side with a long, slender, terete spine which is curved basad. Distal part of aedeagus left laterally with a bell-shaped velum, and a short spinose process which arises from near the membraneous aedeagus-knee and is directed straight basad. Connective straight. Parameres basally narrow, in distal half expanding with caudal margin convex; each produced distally in a claw-like tip which is directed mediad.

Etymology: According to REDDELL (1981: p. 4) "actún" is a Mayan word used for cave.

Type-material: holotype male, Cueva de Las Maravillas, 6 km S Acatlán, Oaxaca, Mexico, 29. Dec. 1976, J. REDDELL, A. GRUBBS, C. SOILEAU, D. MCKENZIE, in Texas Memorial Museum, Austin, Texas.

Additional material: 1 nymph, IV. instar; 3 nymphs, V. instar: same data as holotype.

Distribution. Known only from Cueva de las Maravillas near the town of Acatlán in etreme northern Oaxaca. The cave has several kilometers of passage and belongs to the Escamela Limestone formation which is of Cretaceous age (REDDELL, 1981).

Remarks

The degree of troglomorphy (strong reduction of eyes, wings and pigment) suggests that *Cixius actunus* sp.n. is presumably unable of surviving outside the cave environment and is therefore ecologically classified as obligate cavernicolous (troglobitic).

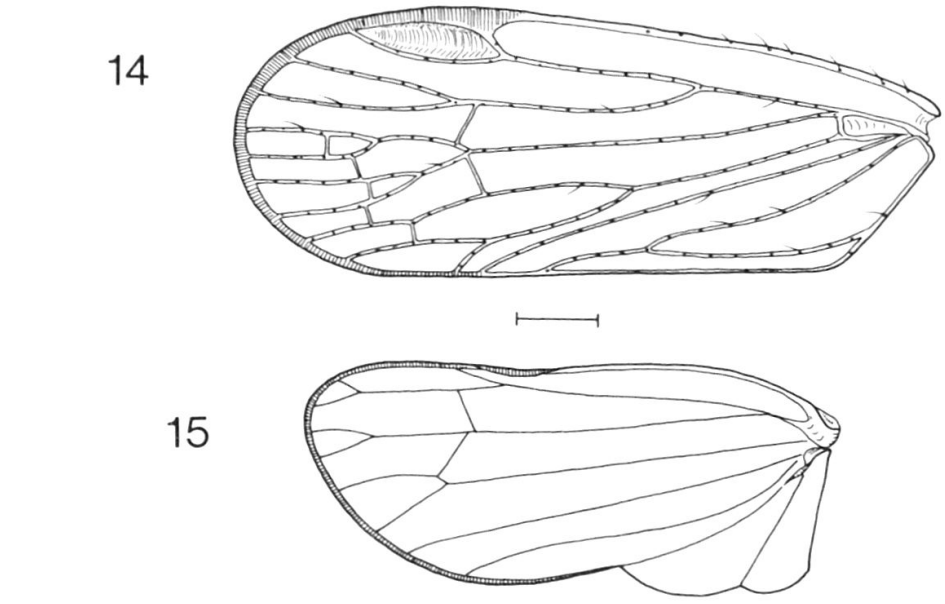
So far no epigean ancestor species could be assessed. The generic placement has to be considered tentative since the phylogenetic relationships within the Cixiidae are largely unclear. The genus *Cixius* LATR. is worldwide distributed but has never been proven monophyletic. Not even for the *Cixius* species of the New World have synapomorphic characters been recognized. KRAMER (1981) revised the North American species of *Cixius* but the characters he used to discriminate the genus are most likely either symplesiomorphies or convergencies. *Cixius actunus* sp.n. differs from other species of the genus by the lack of subapical spines of the hind tibia. In this character it resembles *Stegocixius lochites* KRAMER, 1983 from California, *Platycixius calvus* VAN DUZEE, 1914 from California and Arizona, and *Asotocixius diopter* KRAMER, 1983 from Arizona, California and Nevada. Since the genital characters do not suggest a closer relationship of *C. actunus* sp.n. to any of these species, the lack of lateral hind tibial spines is interpreted in each case to be a separate reductive apomorphy; it seems thus unlikely that these taxa may constitute a monophyletic group.

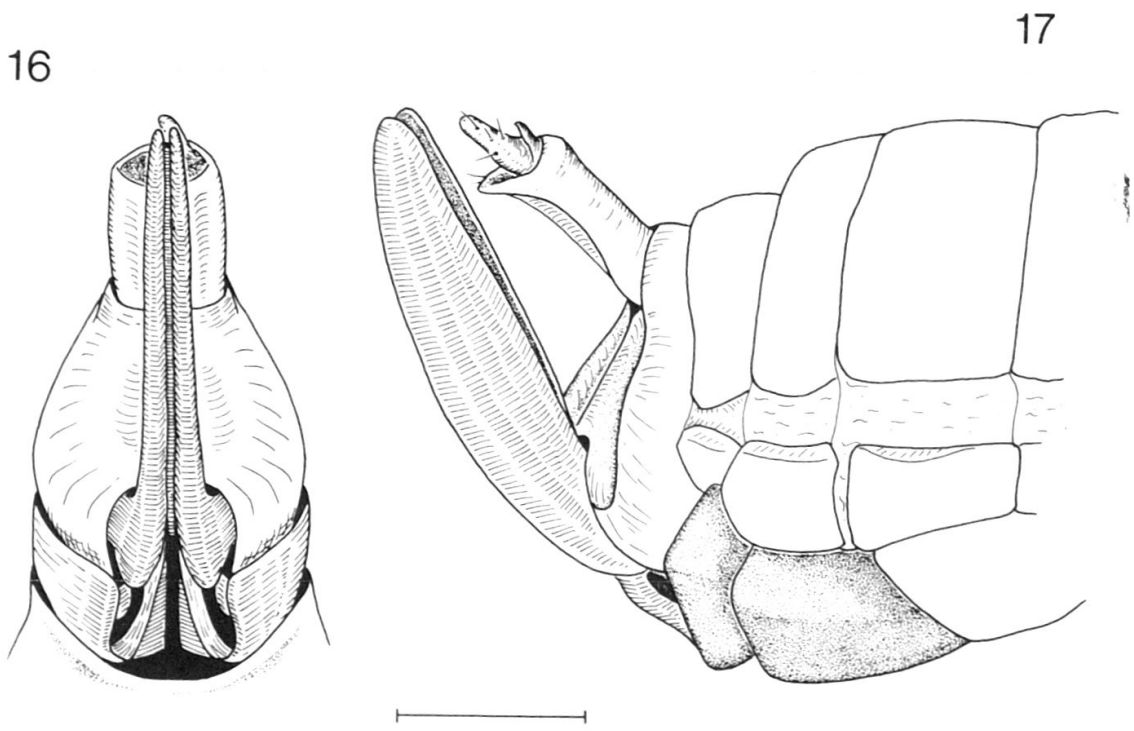
The other troglobitic cixiid species from Mexico, *Cixius orcus* FENNAH, differs from *C. actunus* sp.n. in the presence of lateral hind tibial spines and in the genital morphology: the two species certainly represent descendants from different epigean ancestor species that have invaded caves.

Cixius spec. (figs. 14–17)

Description

Female: Body generally testaceous. Proportions of head, pro- and mesonotum as in *Cixius actunus* sp.n. Median carina of frons indistinctly recogniz-





Figs. 14–17. *Cixius* spec., ♀. 14: tegmen; 15: wing; 16: female genitalia, ventral aspect; 17: female genitalia: right lateral aspect. – Scale: 0.5 mm.

able. Hindtibiae laterally unarmed, with six apical teeth; basal tarsal joint with five, second with four (three) apical teeth. Tegmen (fig. 14) less shortened and Cu fork more basad than in the male of *Cixius actunus* sp.n.; distal crossveins present; inner subapical cell separated from apical cells by a crossvein; pterostigma distinct. Wing (fig. 15) with distal R, M and Cu forks present; anal field hardly reduced.

Total length. Female 5.7 mm.

Female genitalia (figs. 16–17): ovipositor complete. IX. tergite truncate, with wax-secreting field diffusely limited.

Material examined: 1 female, Cueva de Cayetaro, 10 km SSW Acatlán, Oaxaca, Mexico, 8. Jan. 1976, M. McEachern, M. Cavenaugh; in Texas Memorial Museum, Austin, Texas.

Distribution. Know only from Cueva de Cayetaro, SSW Acatlán, Oaxaca, Mexico.

Remarks

This species resembles *C. actunus* sp.n. in proportions of head, pro- and esothorax as well as in the lack of lateral hind tibial spines, but differs considerably in the degree of wing reduction. These findings can either be interpreted as the existence of two separate species, or as sexual dimorphism. It is conceivable that gene-flow is maintained over long distances (several kilometers) through voids in cavernous rock (Howarth, 1983). Since the anal field in the wing of females is hardly affected by reduction, the females are most likely (even if weak) flyers: selection for a comparatively higher vagility in the female might have preserved its ability of flight for dispersal. The conspecifity of the females of Cueva de Cayetaro with *C. actunus* sp.n. can only be ascertained by examination of more material from both caves. Further investigations, e.g. genetic distance measures sensu Nei (1972) are desirable to assess the degree of genetic congruence or divergence between the populations of Cueva de las Maravillas and Cueva de Cayetaro.

ACKNOWLEDGEMENTS

I wish to express my sincere thanks to Dr. M. Asche, Philipps-Universität, Marburg, and Dr. M.R. Wilson, CAB International Institute of Entomology, London, for their comments on the manuscript.

ZUSAMMENFASSUNG

Eine neue höhlenbewohnende Zikaden-Art (Homoptera, Fulgoroidea: Cixiidae) aus Mexico – Eine neue troglobitische Cixiiden-Art, *Cixius actunus* sp.n. aus der Cueva de las Maravillas, Sierra Madre del Sur System, Mexico, wird beschrieben. Ihre Zuordnung zur Gattung *Cixius* Latr. ist provisorisch; nähere Verwandtschaftsbeziehungen zu anderen nordamerikanischen Cixiiden-Taxa sind z. Zt. nicht erkennbar. Bisher konnte keine oberirdische Stammart von *C. actunus* sp.n. festgestellt werden. Ein morphologisch ähnliches, ebenfalls troglobitisches Cixiiden-Weibchen aus einer anderen Höhle des gleichen Gebiets, *Cixius* spec., könnte mit *C. actunus* sp.n. konspezifisch sein, geht man von einer Verbreitungsmöglichkeit der Tiere durch das Spaltensystem des Kalksteins aus, die die Aufrechterhaltung des Genflusses zwischen beiden Populationen gewährleisten würde. Eine Entscheidung hierüber kann jedoch erst nach Vorliegen weiteren Materials getroffen werden.

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