DOI:10.6660/TESFE.1994046 台灣昆蟲Formosan Entomol. 14: 529-533 (1994) 研究報告 Research report

Formosan Entomologist
Journal Homepage: entsocjournal.yabee.com.tw

The Origin of the Pollymerized Flagellum of Fulgoroidea (Homoptera) 【Research report】

蠟蟬總科不等寬鞭節源起 (同翅目)【研究報告】

Chung-Tu Yang and Wen-Chi Hsieh
楊仲圖、謝文綺

*通訊作者E-mail :

Received: Accepted: 1994/10/22 Available online: 1994/12/01

Abstract

The antennae of five instar nymphs and adult of Euphyonarthex phyllostoma Schmidt (Tettigometridae) are described and illustrated. Detail structures of the antennae have been observed using scanning electron microscopy. The origin of polymerized flagellum of Fulgoroidea is discussed.

摘要

本文繪圖、敘述 Euphyonarthex phyllostoma Schmidt (蟻蠟蟬科)五個齡期的若蟲及成蟲之觸角，部分觸角表面微結構使用掃描式電子顯微鏡觀察。並解說蠟蟬總科不等寬鞭節之由來。

Key words: Antennae, nymph, Fulgoroidea.

關鍵詞: 觸角、若蟲、蠟蟬總科。

Full Text: PDF(4.57 MB)

下載其它卷期全文 Browse all articles in archive: http://entsocjournal.yabee.com.tw

中華昆蟲 14: 529-533(1994)
Chinese J. Entomol. 14: 529-533(1994)

The Origin of the Polymerized Flagellum of Fulgoroidea (Homoptera)

Chung-Tu Yang and Wen-Chi Hsieh Department of Entomology, National Chung Hsing University, 250 Kuo-Kuang Road, Taichung 402, Taiwan, R.O.C.

ABSTRACT

The antennae of five instar nymphs and adult of *Euphyonarthex phyllostoma* Schmidt (Tettigometridae) are described and illustrated. Detail structures of the antennae have been observed using scanning electron microscopy. The origin of polymerized flagellum of Fulgoroidea is discussed.
Key words: Antennae, nymph, Fulgoroidea.

蠟蟬總科不等寬鞭節源起(同翅目)

楊仲圖、謝文綺 國立中興大學昆蟲學系 台中市國光路 250 號

摘　要

本文繪圖、敘述 *Euphyonarthex phyllostoma* Schmidt (蟪蠟蟬科)五個齡期的若蟲及成蟲之觸角，部分觸角表面微結構使用掃描式電子顯微鏡觀察。並解說蠟蟬總科不等寬鞭節之由來。
關鍵詞：觸角、若蟲、蠟蟬總科。

Introduction

The Fulgoroidea is characterized by the polymerized flagellum of the projection protruding from inner apical portion of the third antennal segment. But the origin of the polymerized flagellum of Fulgoroidea is still unclear. Emeljanov (1987) analyzed that "It is possible that the polymerization of the flagellum in the common ancestor of the Cicadina (=Auchenorrhyncha) commenced from the apex and was completed in different ways after the separation of the Cicadelloidea from the common stem of the other cicadines. The imaginalization of the larval antennae of the Cicadelloidea and Fulgoroidea may be the original state of all of the cicadines, if the non-polymerized antennae of the cercopo-cicadoid larvae was formed by instauration, which then in the Cicadoidea also passed on into the imago." and "A second variant postulates the independent transition of the imaginal antennae into the larvae in the Cicadelloidea and Fulgoroidea."

An observation of the antennae of the five instar nymphs and adult of *Euphyonarthex phyllostoma* tells a different story except "the process of the polymerization of the flagellum in the common ancestor of the Cicadina commenced from the apex." Here the origin of polymerized flagellum of Fulgoroidea is explained.

Description

First instar nymph (Fig. 1.A, Fig. 2.A)

Pedicel with 2 sensilla placodea near middle, apex not oblique, as long as wide. Third segment longer than length of pedicel, about 1.9:1; narrower than width of pedicel, about 1:1.2; the widest part about 0.05mm, the longest part about 0.12 mm. Third segment at apical outer portion with a rather large sensillum placodeum, its appearance nearly same as in pedicel; inner apical portion observing by SEM somewhat cone-shaped, apical level lower than in sensillum placodeum, by light microscope transparent, hole-like.

Second instar nymph (Fig. 1.B, Fig. 2.B)

Pedicel with 2 sensilla placodea at outer apical portion, apex somewhat oblique, 1.2 times longer in longest part than wide at widest part. Third segment longer than length of pedicel, about 1.6:1; narrower than width of pedicel, about 1:1.4; the widest part about 0.05mm, the longest part, about 0.12mm. Third segment at apex where original cone-shaped structure situated with projection distinct, very short, terete, truncate at apex, apical level higher than in sensillum placodeum.

Third instar nymph (Fig. 1.C, Fig. 2.C)

Pedicel with 4 sensilla placodea at outer apical portion, apex distinctly oblique, 1.4 times longer in longest part than wide at widest part. Third segment shorter than length of pedicel, about 1:1.2; narrower than width of pedicel, about 1:2.4; the widest part about 0.05mm, the longest part about 0.12mm. Projection relatively long, but still shorter than length of third segment.

Fourth instar nymph (Fig. 1.D, Fig. 2.D)

Pedicel with 8 sensilla placodea at outer apical portion, 2 times longer than wide. Third segment shorter than length of pedicel, about 1:2; narrower than width of pedicel, about 1:2.8; the widest part about 0.05mm, the longest part about 0.12 mm. Projection as long as length of third segment.

Fifth instar nymph (Fig. 1.E, Fig. 2.E)

Pedicel with 16 sensilla placodea at outer apical portion, 2.2 times longer than wide. Third segment shorter than length of pedicel, about 1:2.8; narrower than width of pedicel, about 1:3.6; the widest part about 0.05mm, the longest

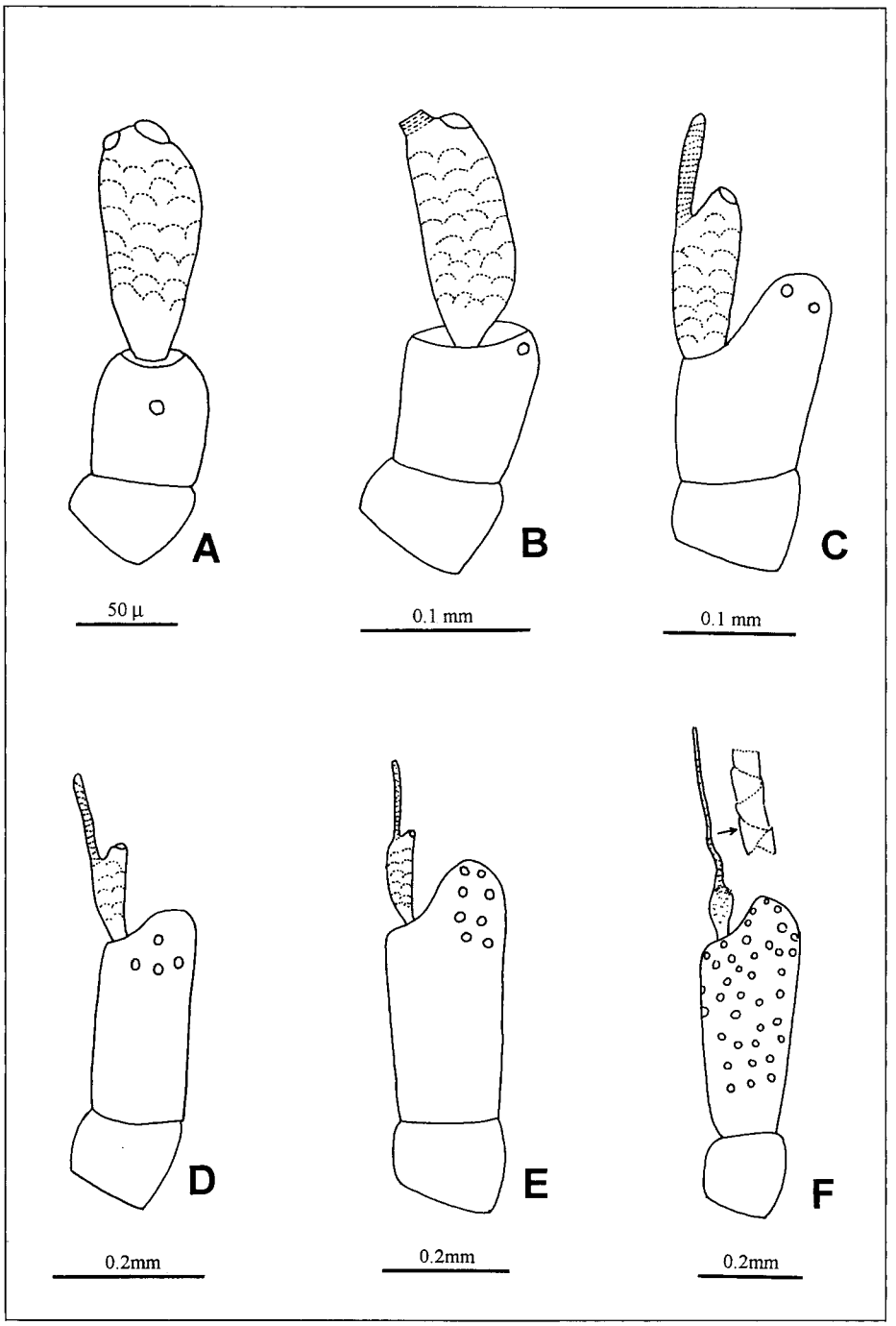

Fig. 1. Antennae of *Euphyonarthex phyllostoma* Schmidt A, first instar nymph; B, second instar nymph; C, third instar nymph; D, fourth instar nymph; F, fifth instar nymph.

part about 0.12mm. Projection as long as length of third segment.

Adult (Fig. 1.F)

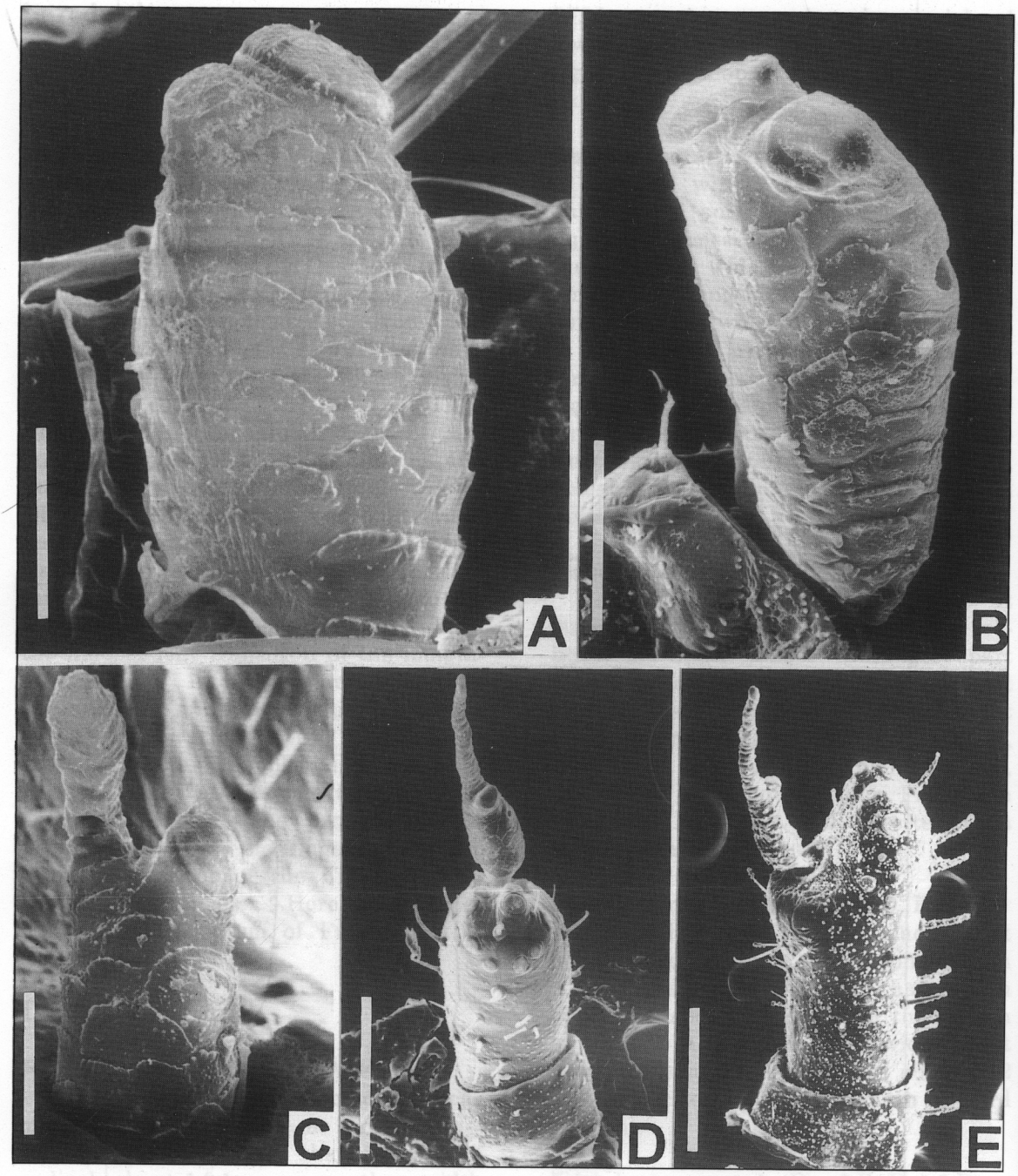

Fig. 2. Antennae of *Euphyonarthex phyllostoma* Schmidt A, first instar nymph; B, second instar nymph; C, third instar nymph; D, fourth instar nymph; E, fifth instar nymph. (Scale: A=25mm; B, C and E=35mm; D=150mm)

Pedicel with about 70 sensilla placodea at whole surface except base, at apex distinctly oblique, 2.5 times longer than wide. Third segment shorter than length

of pedicel, about 1:4.5; narrower than width of pedicel, about 1:4; the widest part about 0.05mm, the longest part about 0.12mm. Projection distinctly longer than length of third segment.

Discussion

According to Emeljanov (1990) and Fang and Yang (unpublished), Tettigometridae is considered as a primitive family of Fulgoroidea. The polymerized flagellum of the first instar nymph of *Nisia serrata* Tsaur (Meenoplidae), *Mindura subfasciata kotoshonis* Matsumura (Nogodinidae) and *Kallitaxila sinica* (Walker) (Tropiduchidae) were examined, being the same form as in *E. phyllostoma* adult, also supports this conclusion. Therefore, the character transformation during ontogeny of *E. phyllostoma* is used in following to explain the origin of the polymerized flagellum of Fulgoroidea.

The filiformed flagellum of the first instar nymph consists of single segment, and is characterized by somewhat cone-shaped projection at inner apical portion and the large sensillum placodeum at outer apical portion. The antennae of the second instar nymph differs from the first instar nymph in having the projection distinct, short, truncated at apex; and the third segment is retarded, as long and wide as in the first instar nymph. The antennae of the third instar nymph differs from those of second instar nymph in having relatively long projection. The third segment still is retarded, as long and wide as in the first instar nymph. Up till the third instar, the development of the polymerized flagellum has been completed except projection remaining still relatively short, not as long as in most nymphs and adults of the other families of Fulgoroidea.

The Hemiptera and Cicado-Cercopoidea possess filiformed flagellum and the Fulgoroidea possess polymerized flagellum. Our study of the ontogeny of all those taxa reveals that early developmental stages of all those taxa have filiformed flagellum but that during the subsequent development of the Fulgoroidea, filiformed flagellum transforms into polymerized flagellum. In other words, the filiformed flagellum is observed to be more general and the polymerized flagellum less general. According to biogenetic law (Nelson, 1978), the filiformed flagellum is thus inferred to be the original state antennae of Fulgoroidea.

Therefore we propose that the polymerized flagellum of Fulgoroidea derived from the filiformed flagellum, and not derived from "The imaginalization of the larvae antennae." as Emeljanov (1987) suggested.

Acknowledgments

This research was financially supported in part by the National Science Council under project NSC 84-2321-B-005 -062.

References

Emeljanov, A. F. 1987. The Phylogeny of Cicadina (Homoptera, Cicadina) based on comparative morphological data. Acad Sci USSR. (Trans. All-union Entomol. Soc. Vol. 69: 14-17.)

Emeljanov, A. F. 1990. An attempt of construction of phylogenetic tree of planthopper (Homoptera, Cicadina). Rev. Entomol. I'USSR LXIX, 2: 353-355.

Nelson, G. 1978. Ontogeny, phylogeny, paleontology and the biogenetic law. Syst. Zool. 27: 324-345.

Received for publication September 2, 1994; revised mamuscript accepted October 22, 1994.