UDC 565.735:551.78(4) Paleontological Journal, **28**(3), 1994

THE FIRST FOSSIL FIND OF THE FAMILY DERBIDAE AND A REDESCRIPTION OF THE PALEOGENE GENUS *Hooleya* Cockerell (ACHILIDAE) (INSECTA: HOMOPTERA, FULGOROIDEA)

A. F. Emeljanov

Institute of Zoology, St. Petersburg

Abstract: The first fossil member of the family Derbidae, the new monotypic genus *Positrona* from the Baltic amber, of the tribe Otiocerini, and close to the Recent *Pyrrhonice* gen. nov. and *Pyrrhoneura* is described. The Triassic genus *Sanctipaulus* and the Paleogene *Hooleya* previously included in this family belong to other groups of cicadas. The last genus is redescribed (the holotype of the only species was restudied) and assigned to the Achilidae (Achillini).

• • •

Dr. R. Kulicka, curator of the entomological collection in the Museum of the Earth, Warsaw, and D. Ye. Shcherbakov of the Paleontological Institute (PIN), Russian Academy of Sciences, helped in locating, in the amber collection of the Museum of the Earth, a representative of the family Derbidae. Dr. D. N. Lewis, curator of fossil invertebrates and plants in the Natural History Museum in London, and Dr. J. G. Darrell loaned the holotype of *Hooleya indecisa* for restudy. I thank all of these persons.

The literature contains two descriptions of fossil insects assigned to the family Derbidae. One was omitted from the catalog of Metcalf and Wade [12], and the other was published after completion of that catalog. *Sanctipaulus mendesi* Pinto [14], from the Upper Triassic, shows no reliable evidence of belonging to the family Derbidae, and should be removed from the family and restudied. The other species, *Hooleya indecisa* Cockerell [5] from the Isle of Wight (England) [10], was described from a fragment of a fore wing, and erroneously assigned to the Derbidae; however, according to Cockerell [5], F. Muir, an expert on the Fulgoroidea, considered it comparable to the Recent genus *Nesokaha* Muir of the tribe Otiocerini. Restudy of the type species shows that it should indisputably be assigned to the family Achilidae, particularly to the tribe Achillini. Cockerell's illustration was clearly drawn by eye and is not entirely accurate.

Translated from: Pervaya iskopayemaya nakhodka semeystva Derbidae i pereopisaniye paleogenovogo roda *Hooleya* Cockerell (Achilidae) (Insecta: Homoptera, Fulgoroidea). Paleont. zhur., No. 3, pp. 76-82, 1994.

ISSN0031-0301/94/0003-0092

Thus, this find from the Baltic amber is the only fossil insect whose assignment to the Derbidae family to the tribe Otiocerini cannot be doubted.

FAMILY ACHILIDAE STÅL, 1866

SUBFAMILY ACHILINAE STÅL, 1866

TRIBE ACHILLINI EMELJANOV, 1991

Key to Genera of Tribe Achillini

1(2). Oblique veins in pterostigma have apices inclined toward tip of wing. Posterior part of radius (RP) divided into three branches, whose bases are close. First crossvein rm joins media after its third branching ..... *Hooleya* Cockerell, 1922 (fig. 1*a*).

2(1). Oblique veins in pterostigma have apices inclined toward base of wing. Bases of branches of RP widely spaced. First rm joins media before its second branching ..... *Achilla* Haglund, 1899 (fig. 1*b*, *c*).

Genus *Hooleya* Cockerell, 1922

Type species. *H. indecisa* Cockerell, 1922; Upper Eocene-Lower Oligocene; Great Britain.

Diagnosis. Fore wing: Oblique veins in pterostigma with apices inclined toward wing tip. Posterior part of radius (RP) divided into three branches, with close bases. First crossvein rm joining media after its third branching.

Specific composition. Type species.

Systematic position. A completely straight, well-developed claval suture is characteristic of a normal closed clavus; with an open clavus the suture is faint or not manifested at all, and the line of CuP along which it runs is curved. Thus the higher Derbidae with open clavus, particularly the Otiocerini, and also the Nicertini, Zoraidini and Sikaianini, must be excluded. Some derbids show such features of the genus *Hooleya* as a comparatively narrow interradial area and the media bent at crossvein rm which is shifted beyond third fork of the media; but in the Derbidae these features do not occur in combination with a wide costal area and a long part of the fork of CuA before the crossvein mcu, and they are characteristic of tribes with an open clavus. An exception is *Pseudomysidia* Metcalf of the Derbini [4, fig. 11], which is clearly distinct in long and narrow wing configuration. Wide wings among the Derbidae occur in the tribes Rhotanini and Derbini (fig. 2), but in both of these the configuration of the CuA and the position of the crossvein rm do not match. In addition, the veins preserved in the impression should bear sensory pits ("granules") on the stem of CuA in the Rhotanini or on ScR and M in the Derbini; such granules were definitely not present in our specimen, judging by the very well preserved

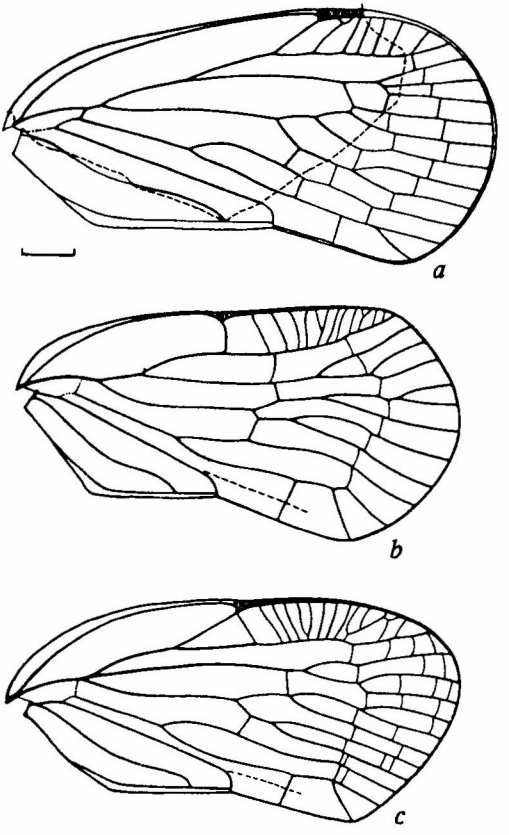

Fig. 1. Fore wings of representatives of the tribe Achillini: *a* - *Hooleya indecisa* Cockerell, holotype In 24364 (reconstruction, dashed line bordering preserved fragment); *b* - *Achilla* sp., Recent; *c* - *Achilla hecate* Emeljanov, Recent.

impression. The combination of features characteristic of *Hooleya* does not occur in the lower Derbidae with no sensory pits on the fore wings.

On the other hand, among the Achilini and Achillini could be found, separately or in combination, almost all the main features of venation in *Hooleya*: a dense series of slanting crossveins in a wide costal area (see, e.g., [6, fig. 43]), a displacement of rm beyond third fork of the media vein, a long part of the fork of CuA before the crossvein mcu, and the absence (in relief) of the base of CuA before the arculus; the precostal area is similarly developed in the tribes Achillini and Seviini (see figs. in [1, 3, 7]). A narrow interradial area occurs most often in the higher Derbidae, but only in combination with a narrow costal area. The comparatively large size of *Hooleya* with its wide and short wings is also more typical of the Achilidae than the Derbidae, and in the large Derbidae the wings are elongated.

Hooleya indecisa Cockerell, 1922

Pl. VII, fig. 1

Holotype. Natural History Museum, London, In 24364, incomplete cast of left fore wing (without part of membrane and clavus); England, Isle of Wight, Gurnard Bay; Upper Eocene-Lower Oligocene, lower part of the Bembridge Marls, Insect Limestone.

Description (fig. 1*a*). Distinct precostal area is comparatively wide at base and narrow in remainder, up to pterostigma. Costal area is wide. Stem of ScRM, which forms anterior margin of basal cell, is high and carinate; basal cell is large with arculus slanted posteriorly toward base of wing. Common stem of ScRM distally from arculus approximately equal to it in length. Radius (more exactly, ScR) branches for first time halfway to stigma. RA (ScRA), after nodal branch ($ScRA_1$), gives rise from branch RA_2 to comb of oblique veins (part with five branches is preserved). Wing margin distally from node (apex of $ScRA_1$) is transversely striated, wider than apical part of precostal area, and forms indistinct extravenal pterostigma (as is characteristic of many Achilidae, including *Achilla*). Interradial area is approximately twice narrower than costal; radiomedial area has almost same width as costal area. RP, after first crossvein rm in short segment, divided into three branches in form of anterior comb, and its posterior branch takes on second crossvein rm. First branching of M is at level of first branching of RA; three branches of M form posterior comb; first crossvein rm is connected after third branching. Base of CuA is almost indiscernible in relief (as in *Achilla*). Anterior cubitus branches at level of first branching of R, its anterior branch basally arcuate and its posterior branch continues common stem without break. Nodal crossvein mcu is at level of first branching of RA and joins vein MP. Clavus is separated by sharp and completely straight suture. First claval vein (Pcu) is preserved near edge of break in impression as small fragment near base and longer fragment near merger with second claval vein (A_1), judging by its curvature. Wing is sclerotized and convex, with characteristic transverse corrugation of cells and sharp, carinate veins. Whole wing was wide and short, since angle between ScR and CuA is large and vein RP divided at edge of preserved fragment (which usually happens near margin of wing).

FAMILY DERBIDAE SPINOLA, 1839

SUBFAMILY DERBINAE SPINOLA, 1839

TRIBE OTIOCERINI MUIR, 1917

The extinct genus *Positrona* gen. nov. described below is assigned to the tribe Otiocerini in the strict sense [2] and belongs to the part of it characterized by a first mcu originating distally from the branching of M—that is, from MP. This includes both genera with a normal position of RP, like *Positrona*, and those with RP branching off from M (*Mysidioides* Mats., *Heronax* Kirk., *Platocera* Muir, etc.). The latter group is definitely secondary and almost surely monophyletic; the first group can be divided into several subgroups that are perhaps not directly related. In the *Kaha* subgroup the submarginal row of veins of the membrane together with the apical clavus vein forms one smooth arcuate line (*Kaha* Kirk., *Nesokaha* Muir, *Eusyphax* Fenn.); in the *Otiocerus* subgroup the apical vein of the clavus continues more-or-less smoothly only as far as the posterior branch of MA, on which it forms a scarp and continues distally from MA to RA

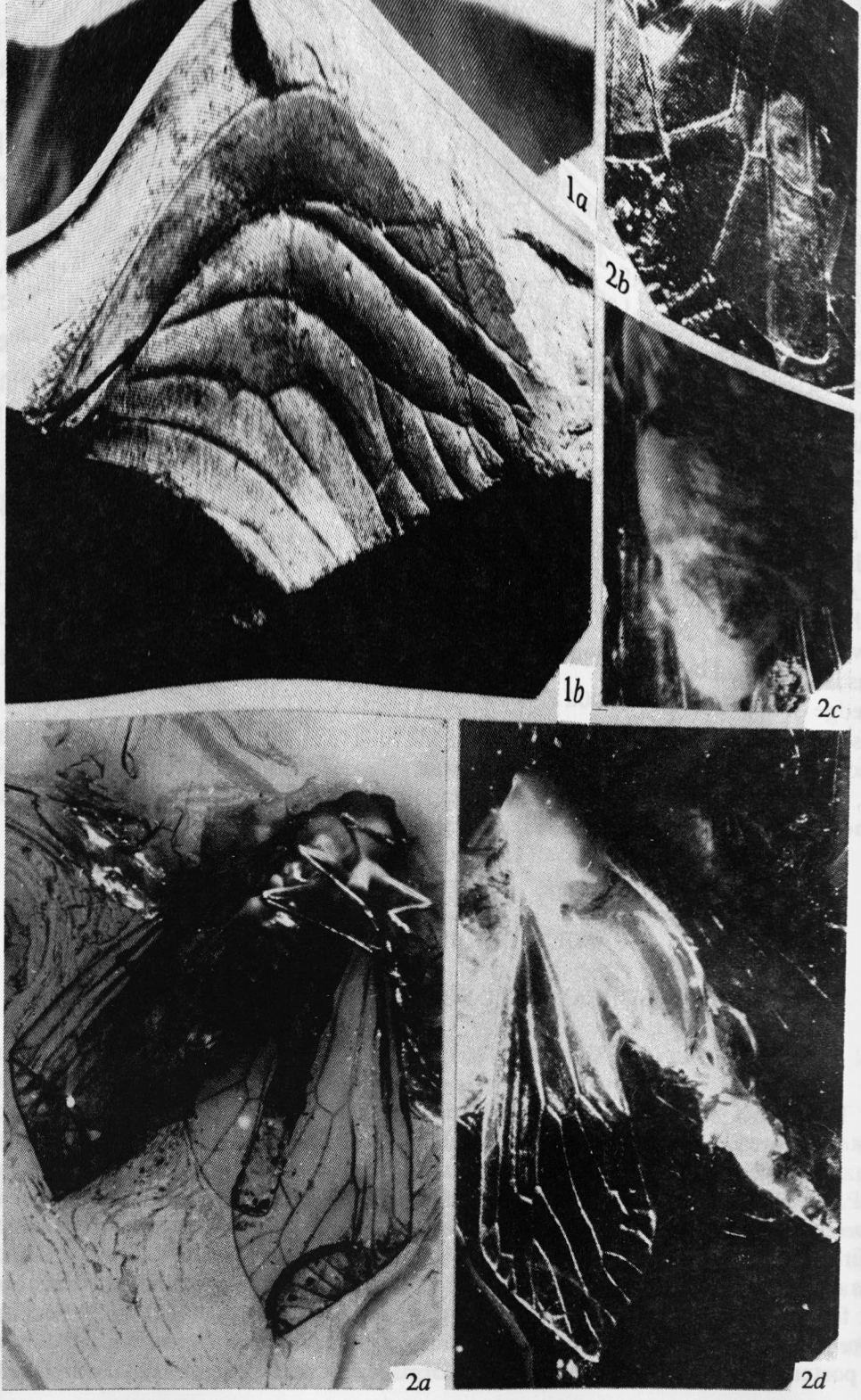

PLATE VII

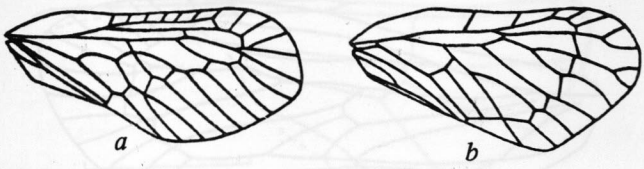

Fig. 2. Fore wings of representatives of family Derbidae: *a* - *Dysimiella williamsi* Broomfield (Derbini), Recent [4]; *b* - *Decora lalage* Fennah (Rhotanini), Recent [9]. Not to scale.

(*Otiocerus* Kirby, *Apache* Kirk., *Pyrrhoneura* Kirk., *Pyrrhonice* gen. nov.). In *Positrona* the breakin the arc is sharper and occurs on MP; another feature peculiar to the new genus is that the continuation of the apical vein of the clavus rests on MP proximally from its apical fork.

The literature contains very few illustrations of hind wings of Otiocerini. RP extending to the wing apex is uncharacteristic of *Pyrrhoneura*, but does occur in *Anotia* Kirby [8] and *Flaccia* Stål [11]. A forked CuA has not been found in this tribe.

The key below enables the genus *Positrona* to be distinguished from the Recent genera *Pyrrhoneura* Kirk. (Fiji, Philippine and Sunda islands) and *Pyrrhonice* gen. nov. (established below for the African species described within *Pyrrhoneura* [13, 15, 16]):

1(2). Fork of posterior branch of MA much shorter than fork of MP, base of which is approximately at equal distances from wing margin and from first crossvein mcu. RA has three postnodal branches. CuA_1 continues to wing margin ..... *Pyrrhonice* Emeljanov, gen. nov. (fig. 3*b*).

2(1). Fork of anterior branch of MA is approximately as long as fork of MP, base of which is close to wing margin and is far from first crossvein mcu. RA has two postnodal branches.

KEY TO PLATE VII

Fig. 1. *Hooleya indecisa* Cockerell, holotype In 24364, fore wing under different illuminations (×9).

Fig. 2. *Positrona shcherbakovi* Emeljanov, sp. nov., holotype No. 4390: 2*a* - overall view from below (×15), 2*b* - hind wing from below (×21.6), 2*c* - abdomen from below (×23.9), 2*d* - overall view from above (×15).

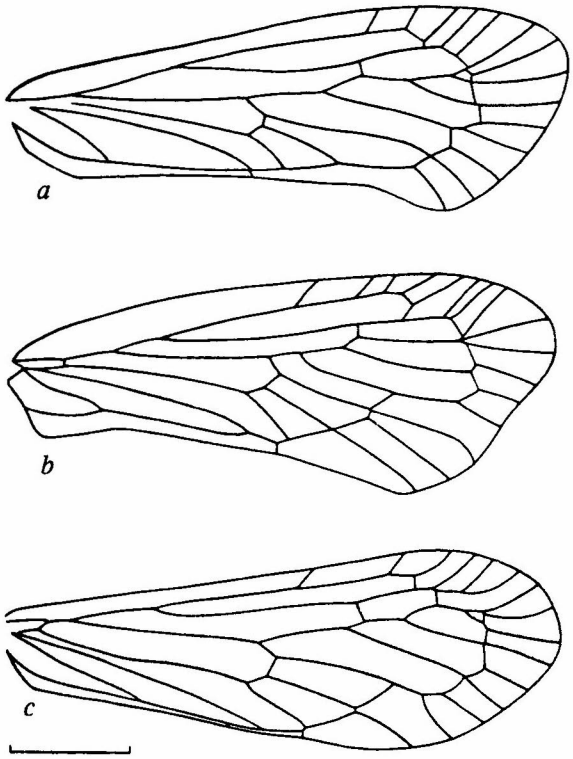

Fig. 3. Fore wings of representatives of tribe Otiocerini: *a* - *Pyrrhoneura saccharicida* Kirkaldy, Recent [11]; *b* - *Pyrrhonice mlanjensis* Muir, Recent [14]; *c* - *Positrona shcherbakovi* sp. nov, holotype No. 4390.

3(4). Second crossvein mcu departs from CuA_1 far beyond first cubital cell. Second claval cell is markedly shorter than vein $Pcu+A_1$. Fork of RA close to nodal $ScRA_1$. CuA_1 does not reach wing margin, but merges with CuA_2 into single submarginal vein ..... *Pyrrhoneura* Kirkaldy, 1907, s. str. fig. 3*a*; type species *P. saccharicida* Kirk.)

4(3) Second mcu branches off near apex of first cubital cell. Second claval cell is no shorter than $Pcu+A_1$. Fork of RA shifted away from nodal $ScRA_1$. CuA_1 continues to wing margin ..... *Positrona* Emeljanov, gen. nov. (fig. 3*c*).

Genus ***Pyrrhonice*** Emeljanov, gen. nov.

Generic name. Greek *pyrrhos* (fire) and Greek *nike* (victory).

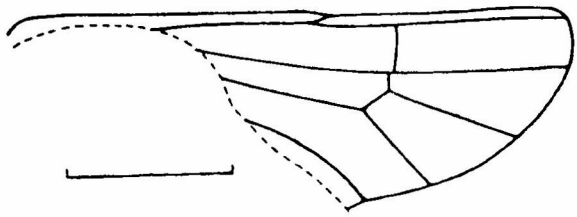

Fig. 4. *Positrona shcherbakovi* sp. nov., holotype No. 4390, hind wing, composite drawing based on both wings.

Type species. *Pyrrhoneura mlanjensis* Muir; Recent; Africa.

Diagnosis. Fore wing (fig. 3*b*): RA having three postnodal branches. Fork of posterior branch of MA much shorter than fork of MP, base of which approximately at equal distances from wing margin and from first crossvein mcu. CuA_1 continuing to wing margin.

Specific composition. *Pyrrhonice mlanjensis* (Muir), comb. nov. and *P. nigeriensis* (V. St.), comb. nov.; Recent; Africa.

Genus ***Positrona*** Emeljanov, gen. nov.

Generic name. From elementary particle, known as *positron*.

Type species. *P. shcherbakovi* sp. nov.

Diagnosis. Head with fairly wide metopa without projecting details and corners. Proboscis short, with apex truncate. Lateral contour of head (masked by white turbidity) evidently formed by small eyes and large round (second segment) antennae (as in *Nesokaha*). In fore wing (fig. 3*c*) RA forked, its two branches shifted away from nodal $ScRA_1$; RP having three branches; crossvein ir present. Two crossveins rm. Media vein with eight terminations—MA in posterior comb, posterior branch of MA and MP dividing subapically. Nodal crossvein mcu connecting MP with CuA_1. Second crossvein mcu arising from anterior cubital cell (as in *Pyrrhonice* and some others). Second claval cell comparatively long, no shorter than $Pcu+A_1$ (as in *Nesokaha, Otiocerus*, etc.). Hind wings (fig. 4) characterized by RP running parallel to anterior margin and ending at apex of wing, by simple media, forked CuA, and presence of crossveins rm and mcu continuing each other. Stridulatory plate evidently not developed. Abdomen, seen from below, visibly segmented, with anemestetor hairs prominent. Pregenital sternite of female (VII) enlarged, its posterior margin projecting strongly sinusoidally (as typical of many Otiocerini; pl. VII, fig. 2*c*).

Specific composition. Type species.

Positrona shcherbakovi Emeljanov, sp. nov.

Pl. VII, fig. 2

Specific name. In honor of paleoentomologist D. Ye. Shcherbakov.

Holotype. Museum of the Earth, Warsaw, No. 4390, female; Poland, Baltic coast near Gdansk; Upper Eocene, Baltic amber.

Description (figs. 3*c*, 4). Color of all parts not concealed by cloudiness is pale cream, whitish or yellowish, as far as can be judged through amber.

Dimensions in mm: Length of body with wings - 5.5, without wings - about 3; length of fore wing - 4.8, of hind wing - 3.3.

Remarks. This insect obviously had its dorsal surface adhering to the resin. The wings are half opened, the apices of both fore wings turned down ventrally. The hind wings are buckledfrom vein CuP, so that the wing sector from CuP to A_1 cannot be examined. The head and thorax are covered by a dense white turbidity that does not permit examination of details of head and pronotum necessary for determining the systematic position. Antennae cannot be clearly distinguished separately. Legs are clearly visible, and abdomen from below also, except for ovipositor, which (like fore part of body) is masked by white turbidity.

Material. Holotype.

REFERENCES

1. Emeljanov, A. F., 1991, On the volume and subdivisions of the fam. Achilidae (Homoptera, Cicadina). Entomol. obozreniye, Vol. 70, No. 2, pp. 373-393.
2. Emeljanov, A. F., 1992, Two new tribes, a new genus and a new species of the family Derbidae (Homoptera, Fulgoroidea). Vestnik zool., No. 4, pp. 19-23.
3. Emeljanov, A. F., 1992, A description of the tribes in the subfam. Achilinae (Homoptera, Achilidae) and a correction of their composition. Entomol. obozreniye, Vol. 71, No. 3, pp. 576-597.
4. Broomfield, P. S., 1985, Taxonomy of neotropical Derbidae in the new tribe Mysidiini (Homoptera). Bull. Brit. Museum Natur. History (Entomol)., Vol. 50, No. 1, 152 pp.
5. Cockerell, T. D. A., 1922, Fossil arthropods in the British Museum. VIII. Homoptera from Gurnet Bay, Isle of Wight. Ann and Mag. Natur. History, Ser. 9, Vol. 10, pp. 157-161.
6. Dworakowska, I., 1988, Main veins of the wings of *Auchenorrhyncha* (Insecta, Rhynchota: Hemelytrata). Entomol. Abhandl. Staatl. Museum Tierkunde Dresden, Vol. 52, pp. 63-108.
7. Fennah, R. G., 1950, A generic revision of the Achilidae (Homoptera: Fulgoroidea) with descriptions of new species. Bull. Brit. Museum Natur. History (Entomol.), Vol. 1, No. 1, 170 pp.
8. Fennah, R. G., 1952, On the generic classification of Derbidae (Fulgoroidea), with descriptions of new neotropical species. Trans. Roy. Entomol. Soc. London, Vol. 103, No. 4, 109-170.

9. Fennah, R. G., 1970, Fulgoroidea (Homoptera) from Rennell and Bellona islands. The Natural History of Rennell Island, British Solomon Islands. Danish Sci. Press, Copenhagen, Vol. 6, pp. 43-95.
10. Jarzembowski, E. A., 1980, Fossil insects from the Bembridge Marls, Palaeogene of the Isle of Wight, Southern England. Bull. Brit. Museum Natur. History (Geol.), Vol. 33, No. 4, pp. 237-293.
11. Kirkaldy, G. W., 1907, Leaf-hoppers - supplement (Hemiptera). Rep. Work Exp. Sta. Hawaiian Sugar Planters' Assoc. Bull. Vol. 3, 186 pp.
12. Metcalf, Z. P. and V. A. Wade, 1966, A catalogue of the fossil Homoptera (Homoptera: Auchenorrhyncha). In: General Catalogue of the Homoptera. N. Car. State Univ., Raleigh, Fasc. 1, Suppl., 245 pp.
13. Muir, F., 1918, Notes on the Derbidae in the British Museum Collection. Entomol. Monthly Mag., Vol. 54, pp. 228-243.
14. Pinto, I. D., 1956, Artrópodos da formação Santa Maria (triássico superior) do Rio Grande do Sul, com notícias sôbre alguns restos vegetais. Bol. Soc. Brasil. Geol., Vol. 5, No. 1, pp. 75-96.
15. Synave, H., 1973, Monographie des Derbidae africains (Homoptera-Fulgoroidea). Fondat. Favor Rech. Sci. Afr., Études du Continent Africain, Bruxelles, Vol. 2, 223 pp.
16. Van Stalle, J., 1983, New and interesting African Derbidae (Homoptera, Fulgoroidea). Bull. Inst. Roy. Sci. Natur. Belgique, Vol. 55, No. 1, 61 pp.