

Fossil Neuroptera of the Lower Cretaceous of Baisa, East Siberia Part 3. Chrysopidae

(Insecta)

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The subfamily Limaiinae Martins-Neto et Vulcano, 1988 is redefined. The monotypic new genus *Baisochrysa*, gen. nov. with the type species *B. multinervis*, spec. nov., and the following six new species of the genus *Mesypochrysa* are described: *magna*, *falcata*, *chrysopa*, *curvimedia*, *angustialata*, *minima*.

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Introduction

The present paper on Chrysopidae forms the third part of a series dealing with Neuroptera from the Lower Cretaceous of Baisa (Makarkin 1990a, b). The locality is situated at the Vitim River, in Burayatia (East Siberia, Russia). The age of this fauna is Neocomian.

Mesozoic "chrysopids" have usually been assigned to the family Mesochrysopidae. This family was established by Handlirsch (1906- 1908) for the genus *Mesochrysopa* from the Jurassic of Bavaria, Germany. He considered this family as closely related to the Chrysopidae. Martynov (1927) described within Mesochrysopidae the second genus *Mesypochrysa* from Upper Jurassic of Karatau (Kazakhstan). The family has been considered in that composition for a long time, either as distinct family (Martynova 1949, 1962) or as subfamily within Chrysopidae (Adams 1967, Schlüter 1984). Later Panfilov (1980) included in Mesochrysopidae the genera *Chrysoleonites* Martynov, 1925, *Macronympha* Panfilov, 1980, *Aristenymphes* Panfilov, 1980, *Nemphoides* Panfilov, 1980, and *Microsmylus* Panfilov, 1980 from the Upper Jurassic of Karatau, and Ansoerge and Schlüter (1990) added *Liassochrysa* from the Lower Jurassic of Dobbertain in Mecklenburg, Germany.

Heterogeneity of genera included is obvious (Adams & Penny, 1992). Most mesochrysopid genera do not possess the set of wing features characteristic of the Chrysopidae. In particular, Mesochrysopidae have fused apically the subcosta (Sc) and the radius (R) (except for *Liassochrysa* ?), and the space apical to Sc 1+ R broad, with long furcate branches. I think, Mesochrysopidae undoubtedly are a distinct family, except the genus *Mesypochrysa* which is a chrysopid one.

In 1988 Martins-Neto and Vulcano established a new subfamily Limaiinae within Chrysopidae including the genera *Limaiia* Martins-Neto et Vulcano, 1988, *Araripechrysa* Martins-Neto et Vulcano, 1988, and *Caririchrysa* Martins-Neto et Vulcano, 1988 from the Santana Formation (Lower Cretaceous) of Brazil. Recently the genus *Caririchrysa* was synonymized with *Mesypochrysa* (Martins-Neto 1992), and *Mesypochrysa* transferred by me to Limaiinae (Makarkin 1994). In the present paper I redefine the Limaiinae and exclude the genus *Araripechrysa* from this subfamily.

The genera *Drakochrysa* Yang et Hong, 1990 from the Early Cretaceous of China and *Araripechrysa* apparently belong to the subfamily Nothochrysinae. The study is based on fossil material

deposited in the Paleontological Institute in Moscow. The wings of all specimens are illustrated with the apex to right.

Subfamily Limaiinae Martins-Neto et Vulcano, 1988

Description. Forewing. R entering margin at or just beyond wing apex [1], with apical branches simple and very densely spaced [2]. Branches of the radial sector (Rs) not coalesced with the media (M) [3]. Intramedian cell long, tapering basally, at least four times as long as wide [4]. Crossvein between the intramedian cell and the anterior cubitus (CuA) (*imc-cua*) shift far distal [5]. Two regular gradate series of crossveins [6]. Anal veins simple [7].

Hindwing. Venation in general as in forewing. M forked nearly opposite the arising of Rs and connected to Rs by a crossvein (state 0) or with the anterior branch arising from the stem of Rs and the posterior branch straight, unforked (state 1) [8].

Composition. Two genera, *Mesypochrysa* Martynov, 1927 (13 species from the Upper Jurassic to Lower Cretaceous of Kazakhstan, Siberia, Mongolia and Brazil), and *Limaia* Martins-Neto et Vulcano, 1988 (1 species from the Lower Cretaceous of the Santana Formation, Brazil).

Discussion. The configuration of the radius (character [1-2]) is a very conspicuous and characteristic feature of this subfamily. It may be considered the most convincing synapomorphy. Two other important features of wings of the Limaiinae are the distal shift of *imc-cua* in forewing [5] and migration of the origin of anterior branch of M to Rs in hindwing [7].

Limaia is the poorly defined genus within the subfamily. I was not able to identify any serious distinguishing features except the posterior cubitus (CuP) not fused basally to CuA (!). I guess it seems to be an incorrect interpretation. Possibly, the genus *Limaia* is a synonym of *Mesypochrysa*.

Remarks. Although in the genera *Cretachrysa* Makarkin, 1994 and *Baisochrysa*, gen. nov. the apical portion of the wings is unknown, they apparently belong to Lamiinae. This is supported by character [5].

Genus *Mesypochrysa* Martynov, 1927

Mesypochrysa Martynov, 1927: 764; Martynova 1949: 169; Martynova 1962: 281; Adams 1967: 219; Panfilov 1980: 108; Ponomarenko 1992: 107; Schlüter 1984: 7; Ansorge & Schlüter 1990: 92; Semeria & Nel 1990: 30; Adams & Penny 1992: 36; Martins-Neto 1992: 121; Makarkin 1994: 288.

Caririchrysa Martins-Neto et Vulcano, 1988: 196; Martins-Neto & Vulcano 1989: 313; Ansorge & Schlüter 1990: 92; Martins-Neto 1992: 121 (syn.).

Type species. *Mesypochrysa latipennis* Martynov, 1927 (by monotypy).

Composition. Four species from the Upper Jurassic of Karatau, Kazakhstan (Martynov 1927, Panfilov 1980); 6 species from the Lower Cretaceous of Baisa, East Siberia (described below); 1 species from the Lower Cretaceous Bon-Tsagan, Mongolia (Ponomarenko 1992); 2 species from the Lower Cretaceous of the Santana Formation of Brazil (Martins-Neto & Vulcano 1988).

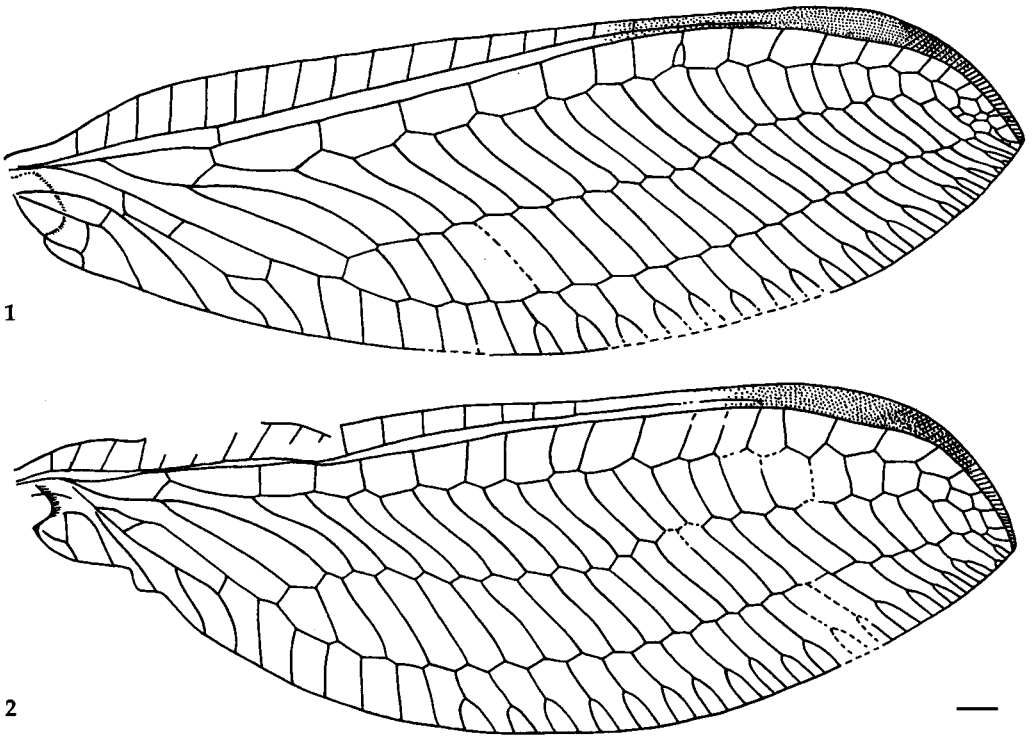
Mesypochrysa magna, spec. nov.

Figs 1-9

Types. Holotype: Specimen N 3064/2409, layer 15, a complete forewing. – Paratypes: Specimen N 3064/2411, layer 15, an almost complete forewing; specimen N 3064/2391, layer 27, a poorly preserved insect, with an incomplete forewing and hindwing overlapped; specimen N 1989/32, layer 19, a poorly preserved insect, with one incomplete forewing; specimen N 1989/41, layer 19, apical fragment of a forewing.

Other material examined. Specimen N 3064/968, layer 15, apical fragments of a forewing and hindwing overlapped.

Etymology. From Latin *magnus*, large.



Figs 1-2. *Mesypochrysa magna*, spec. nov. 1. Holotype, specimen N 3064/2409, forewing. 2. Paratype, specimen N 3064/2411, forewing. Scales: 1 mm.

Description. Body poorly preserved. Prothorax apparently very short. Legs covered with very short and dense bristles. Forewing. Length 26 mm, width 8.4 mm (N=2). Costal space moderately broad, 1.2 mm wide (N=3). Rs arising at nearly a right angle, slightly basally to *sc-r* and distally to the median fork. Basal stem of Rs (before *rs-m*) shorter than *rs-m*. Rs with 20-21 branches. Longest gradate cells 4.5-5.6× as long as wide. Intramedian cell 6.1-6.3× as long as wide (5.1 in No.3064/2411), smoothly tapering basally. Proximal intramedian crossvein (*ma-mp*) very short. The pseudocubitus well developed.

Hindwing incomplete. M with the anterior branch arising from the stem of Rs and the posterior branch straight, unforked.

Comparison. *M. magna*, spec. nov. is closely related to *M. chrysopoides* Ponomarenko, 1992, but the latter has Rs arising at an acute angle and basal stem of Rs longer than *rs-m*.

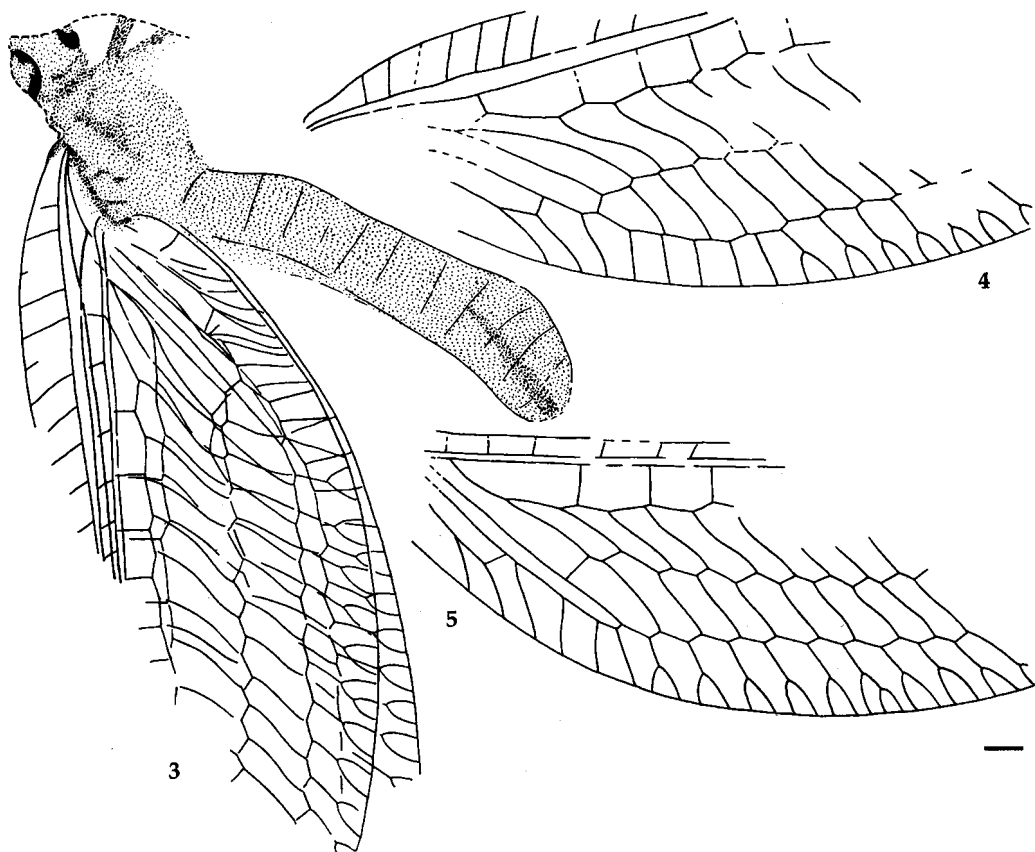
Mesypochrysa falcata, spec. nov.

Figs 10-12

Types. Holotype: Specimen N 1989/33, layer 19, apical fragments of a forewing and hindwing overlapped. – Paratype: Specimen N 1989/29, layer 19, complete apical $\frac{3}{4}$ of a hindwing.

Etymology. From Latin *falcatus*, axe-shaped.

Description. Forewing. Wing apically broadly rounded. Branches of Rs very closely spaced. Longest gradate cells 5.4-6.7× as long as wide.



Figs 3-5. *Mesypochrysa magna*, spec. nov. 3. Paratype, specimen N 3064/2391. 4. Same, forewing. 5. Same, hindwing. Scale: 1 mm.

Hind wing. Estimated length about 25 mm. Slightly falcate. Rs with 19 branches or more. M apparently with the anterior branch arising from Rs. Rs covered with very sparse bristles, which are about $2\times$ as long as width of these veins. Bristles on the costa (C), Sc and R quite dense and very short, not longer than width of these veins.

Comparison. *M. falcata*, spec. nov. differs from all other species of the genus by having of the dense venation and falcate hindwing.

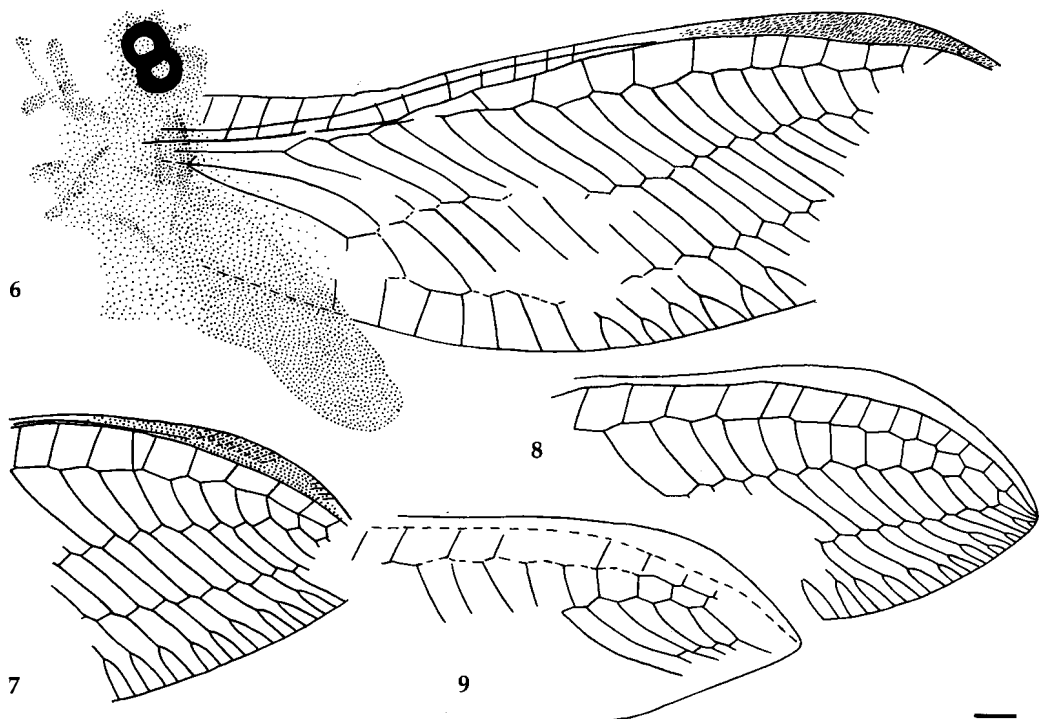
***Mesypochrysa chrysopa*, spec. nov.**

Figs 13-14

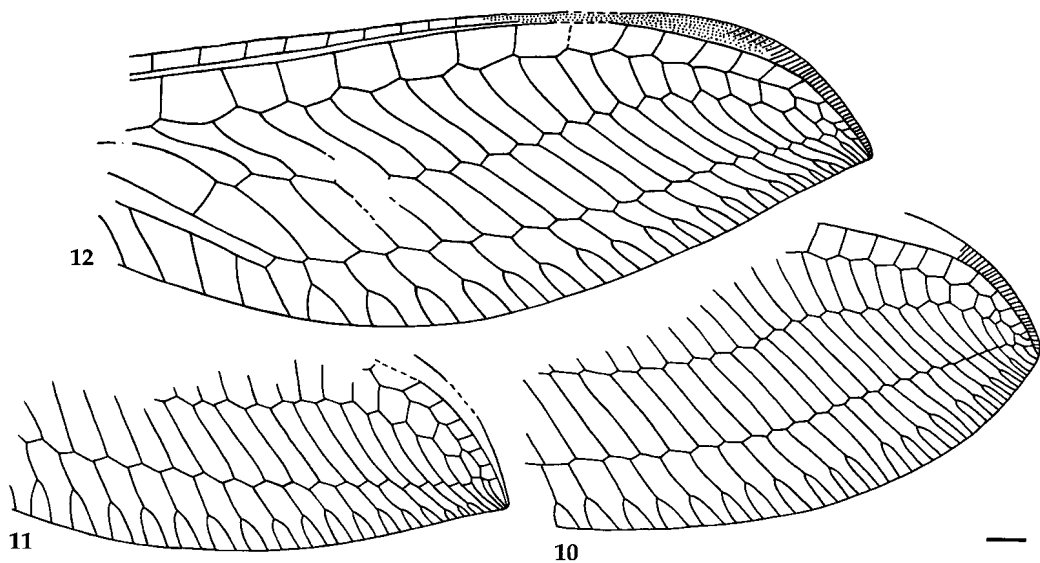
Types. Holotype: Specimen N 3064/2432, layer 31, a complete forewing. – Paratype: Specimen N 3064/2431, layer 31, an almost complete hindwing.

Etymology. From the generic name *Chrysopa*.

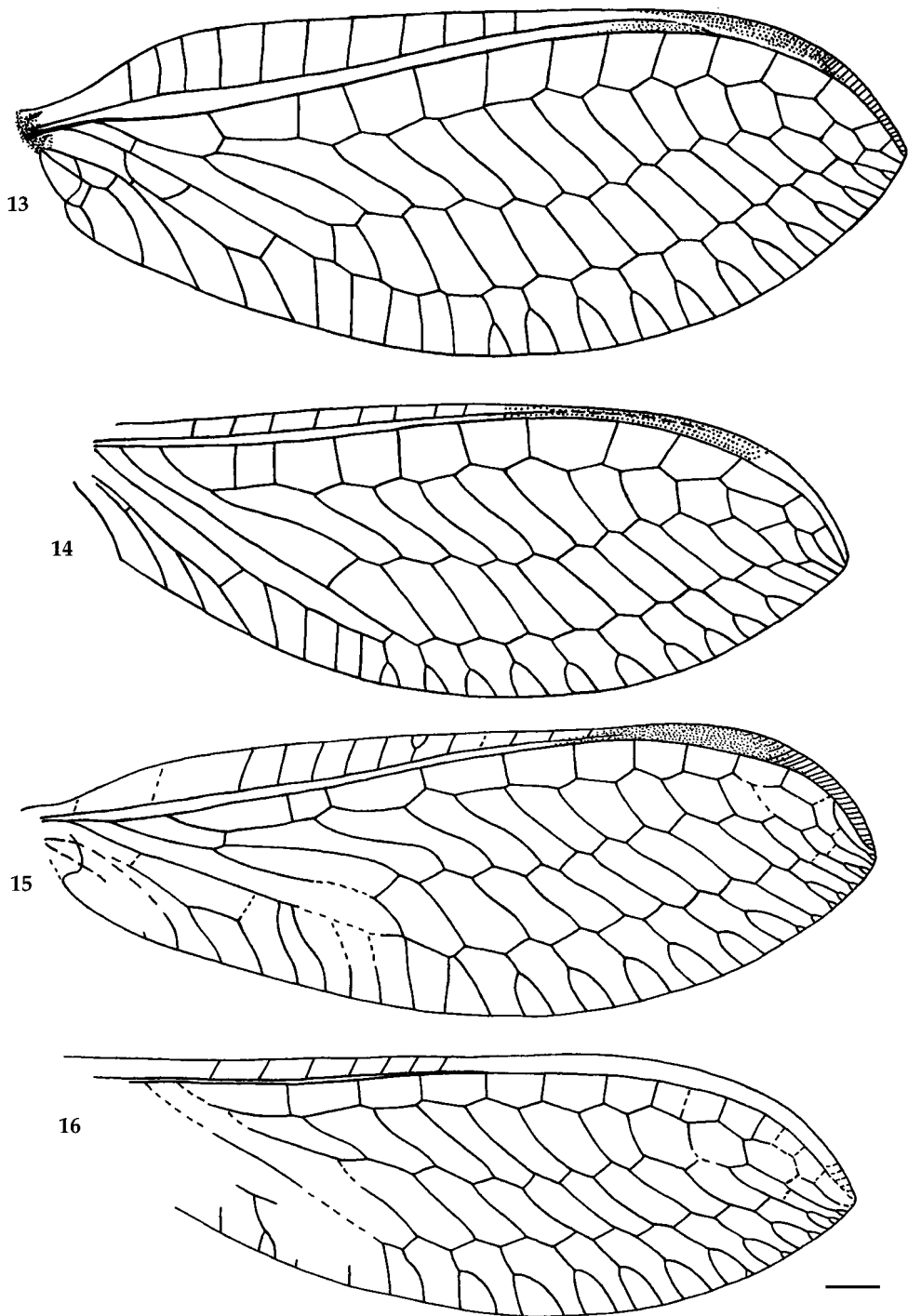
Description. Forewing. Length 17.2 mm, width 6.6 mm. Costal space quite broad, 1.1 mm wide. Basal stem of Rs somewhat longer than *rs-m*. Rs arising at obtuse angle, with 10 branches. Longest gradate cells $2.5-2.7\times$ as long as wide. Intramedian cell $4.6\times$ as long as wide. Proximal intramedian crossvein rather long. Bristles on branches of Rs widely spaced, short, somewhat longer than width of these veins.



Figs 6-9. *Mesypochrysa magna*, spec. nov. 6. Paratype, specimen N 1989/32. 7. Paratype, specimen N 1989/41, forewing. 8. Specimen N 3064/968, forewing. 9. Same, hindwing. Scale: 1 mm.



Figs 10-12. *Mesypochrysa falcata*, spec. nov. 10. Holotype, specimen N 1989/33, forewing. 11. Same, hindwing. 12. Paratype, specimen N 1989/29, hindwing. Scale: 1 mm.



Figs 13-14. *Mesypochrysa chrysopa*, spec. nov. 13. Holotype, specimen N 3064/2432, forewing. 14. Paratype, specimen N 3064/2431, hindwing.
 Figs 15-16. *Mesypochrysa curvimedia*, spec. nov. 15. Holotype, specimen N 1989/44, forewing. 16. Same, hindwing.
 Scale: 1 mm.

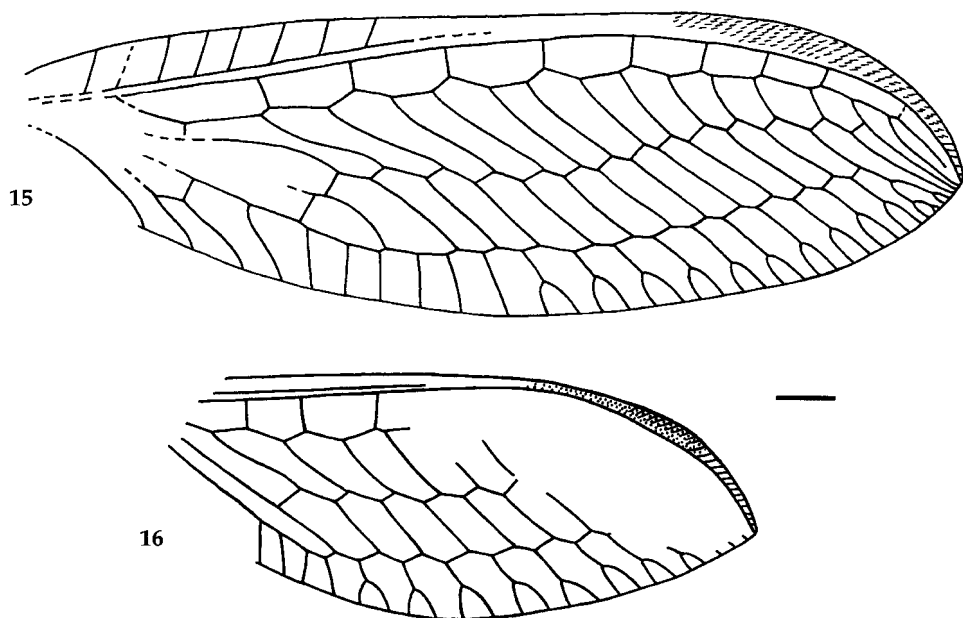


Fig. 17. *Mesypochrysa angustialata*, spec. nov. Holotype, specimen N 3064/2209, forewing.

Fig. 18. *Mesypochrysa minima*, spec. nov. Holotype N 1989/7, hindwing. Scale: 1 mm.

Hindwing. Length 15.5 mm, width 5.7 mm. Rs with 11 branches. Anterior branch of M arising from Rs. Bristles as in forewing.

Comparison. This new species resembles by the shape of forewing *M. latipennis* Martynov, 1927 and *M. intermedia* Panfilov, 1980, but is distinguished from the former by fewer branchings of Rs, and from the latter by very dense venation in apical part of the wing.

***Mesypochrysa curvimedia*, spec. nov.**

Figs 15-16

Types. Holotype: Specimen N 1989/44, layer 25, a complete forewing and hindwing overlapped.

Etymology. From the Latin adjective *curvus*, curved, and *media*, median vein.

Description. Forewing. Length 16.5 mm, width 5.5 mm. Costal space quite narrow, 0.8 mm wide. Rs with 10 branches. Intraradial area very narrow, especially basally. Rs inclined about 30 degree. Basal *rs-ma* short. Longest gradate cells 3.0-3.5 × as long as wide. M running in a smooth curve, not angulate, then crossing inner gradate series. Intramedian cell 5.5 × as long as wide.

Hindwing. Length c. 15.5 mm, width 5.0 mm. Intraradial area very narrow. Apparently the anterior branch of M arising from Rs.

Comparison. *M. curvimedia*, spec. nov. differs from all other species of the genus by the smoothly curved media.

Mesypochrysa angustialata, spec. nov.

Figs 17, 23

Types. Holotype: Specimen N 4210/2209, layer 25, an almost complete insect, with all four wings overlapped.

Etymology. From Latin *angustus*, narrow, and *ala*, wing.

Description. Body poorly preserved. Antennae and legs covered with very short and dense bristles. Forewing. Length about 16.8 mm, width 5.2 mm. Costal space narrow, 0.7 mm wide. Rs inclined about 40 degree. Basal *rs-ma* short. Basal stem of Rs (in front of *rs-ma*) 4× as long as *rs-ma*. Longest gradate cells 4.8-5.0× as long as wide. Intramedian cell poorly preserved, about 5× as long as wide.

Hindwing. Apex of wing subacute. Details of the venation not visible.

Comparison. *M. angustialata*, spec. nov. is distinguished from all other species of the genus by very narrow forewings.

Mesypochrysa minima, spec. nov.

Fig. 18

Types. Holotype: Specimen N 1989/7, layer 31, an incomplete hindwing.

Etymology. From Latin *minimus*, small.

Description. Hindwing. Estimated length about 11.5 mm, width 4.3 mm. Rs with 8-9 branches. Anterior branch of M arising from Rs. Inner gradate series parallels the outer.

Comparison. *M. minima*, spec. nov. differs from all species of the genus by its small size.

Mesypochrysa spp.

Figs 19, 24-25

Material examined. Specimens N 3064/2234, layer 31; N 3064/2430, layer 31; N 3064/2423, layer 31; poorly preserved, almost complete insects, with all four wings overlapped.

Remarks. Three specimens are determined as *Mesypochrysa* spec. They do not have any distinguished feature, except the shape and size of forewing.

Subfamily indeterminated

Genus *Baisochrysa*, gen. nov.

Type species. *Baisochrysa multinervis*, spec. nov.

Etymology. From the locality Baisa and the genus name *Chrysopa*.

Description. A representative of the Chrysopidae, apparently Limaiinae, differing in having the following combination of features: branches of Rs not coalesced with M; intramedian cell long, tapering basally; crossvein between the intramedian cell and CuA (*imc-cua*) shift far distal; three gradate series in both wings; in forewing the first anal vein (A1) and A2 forked; in hindwing M bifurcate.

Composition. Only the type species.

Comparison. The new genus is distinguished easily from other genera by three gradate series and the anal veins forked. Martins-Neto and Vulcano (1988) described their new genus *Caririchrysa* as having three gradates. However, I think it seems to be an incorrect interpretation. Later, when Martins-Neto (1992) synonymized *Caririchrysa* and *Mesypochrysa*, they noted two gradate series in *Caririchrysa*.

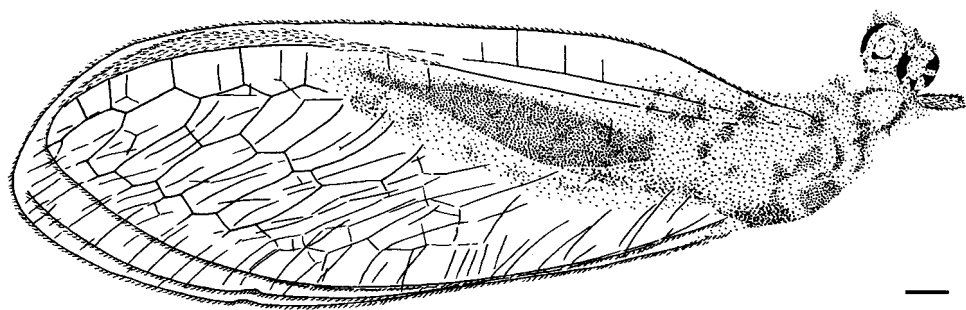
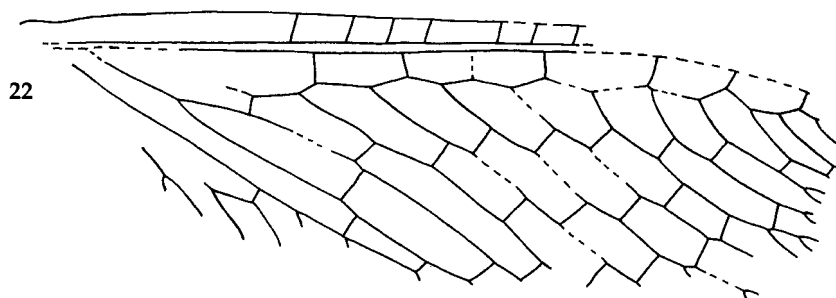
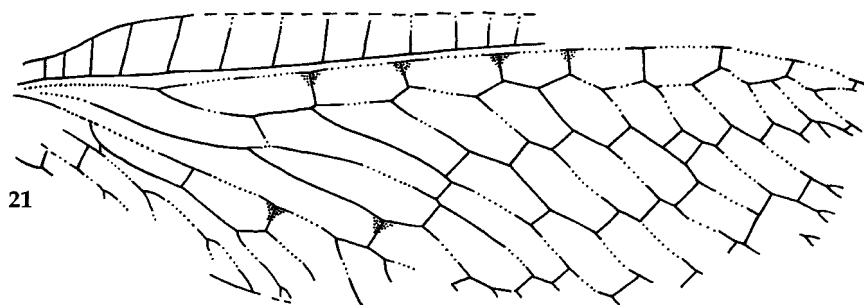
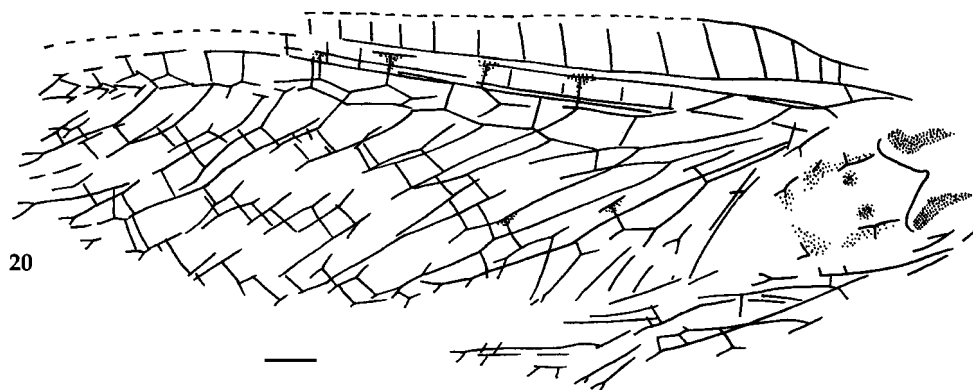
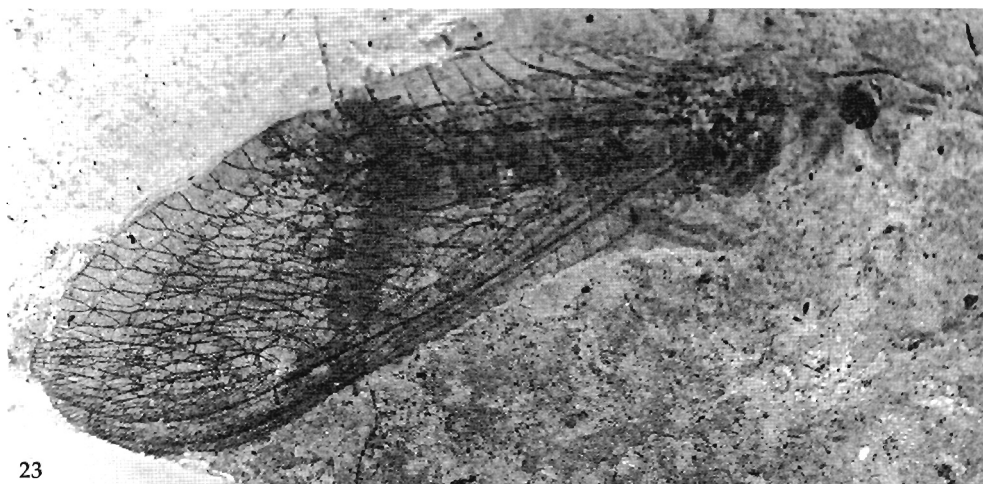


Fig. 19. *Mesypochrysa* spec. Specimen N 3064/2234. Scale: 1 mm.



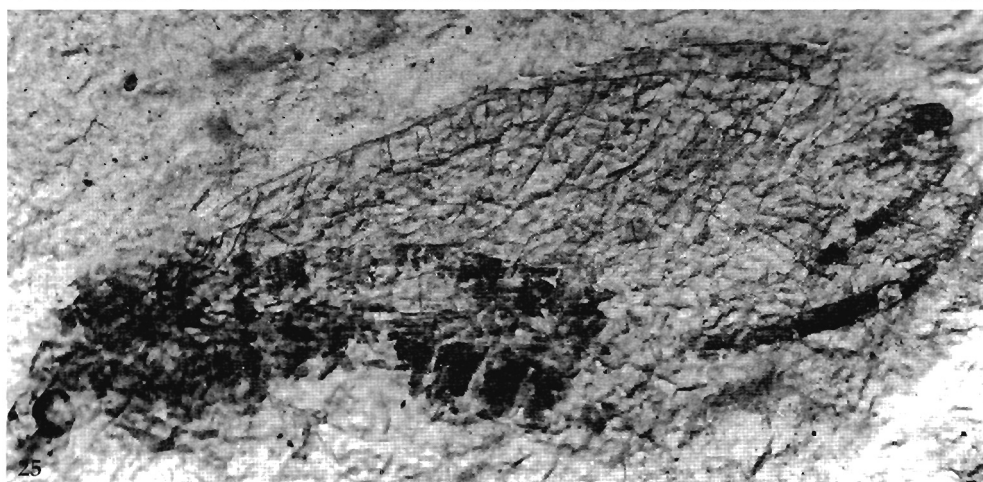
Figs 20-22. *Baisochrysa multinervis*, gen. et spec. nov. 20. Holotype N 3064/2433. 21. Same, forewing. 22. Same, hindwing. Scale: 1 mm.



23



24



25

Types. Holotype: Specimen N 3064/2433, layer 31, a rather good preserved insect, with incomplete body and wings.

Etymology. From Latin, *multus*, many, and *nervus*, vein.

Description. Mesonotum with two lateral dark stripes. Metanotum with two dark spots.

Forewing. Six crossveins shaded anteriorly with dark, that is four basal intraradial crossveins, *mp-cua*, and distal *cua-cup*. Estimated length about 19 mm. Costal area moderately broad, wide 1.1 mm. Intramedial cell 5× as long as wide. Basal piece of Rs (in front of *rs-ma*) longer than the distance between *rs-ma* and basal branch of Rs. A1 2× forked. A2 at least 1× forked.

Hindwing. Intramedial cell 5× as long as wide. A1 at least 1× forked.

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◁ Fig. 23. *Mesypochrysa angustialata*, spec. nov. Holotype, specimen N 3064/2209.

Figs 24-25. *Mesypochrysa* spp. 24. Specimen N 3064/2423. 25. Specimen N 3064/2430. Scale: 1 mm.

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