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Remarks on the neuropterofauna (Insecta, Neuroptera) from the Brazilian Cretaceous, with keys for the identification of the known taxa

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ABSTRACT

This paper reviews all previous knowledge about neuropterans from the Santana Formation (Lower Cretaceous, northeastern Brazil) involving a decade of research in this group. The neuropterofauna from Santana Formation is one of the most complete and diverse known, formed by 50 species distributed in 28 genera, representing 11 families: Ascalaphidae, Myrmeleontidae, Psychopsidae, Chrysopidae, Berothidae, Sisyridae, Nemopteridae, Roeslerianidae, Babinskaiidae, Paleoleontidae and Makarkiniidae. All the known material is from the laminated limestone, tip of the Crato Member, lowest unit of the Santana Formation, Lower Cretaceous, Ceará State, northeastern Brazil. This research have the objective to furnish the keys for the identification of all known Brazilian fossil neuropterans and 16 Figures containing the drafts of all Brazilian neuropterans holotypes.

Keywords: Neuroptera. Keys. Lower Cretaceous. Santana Formation. Brazil.

RESUMO

O principal objetivo deste trabalho é o de sintetizar uma década sobre o conhecimento dos neurópteros da Formação Santana, fornecendo-se um guia prático de identificação, útil a estudantes, pesquisadores e iniciados em paleoentomologia.

A neuropterofauna da Formação Santana vem demonstrando ser uma das mais completas e diversificadas que se tem conhecimento. Ela é composta por 50 espécies distribuídas em 28 gêneros, representando 11 famílias: Ascalaphidae, Myrmeleontidae, Psychopsidae, Chrysopidae, Berothidae, Sisyridae, Nemopteridae, Roeslerianidae, Babinskaiidae, Paleoleontidae e Makarkiniidae, que com exceção destas quatro últimas, todas possuem representação atual. Todo o material conhecido é proveniente do nível de calcário laminado, topo do Membro Crato, unidade inferior da Formação Santana, Bacia do Araripe, Cretáceo Inferior do Estado do Ceará, nordeste do Brasil. A terminologia empregada segue a de trabalhos anteriores da série sobre neurópteros.

Palavras-chave: Neuroptera. Chave. Cretáceo Inferior. Formaçâo Santana. Brasil.

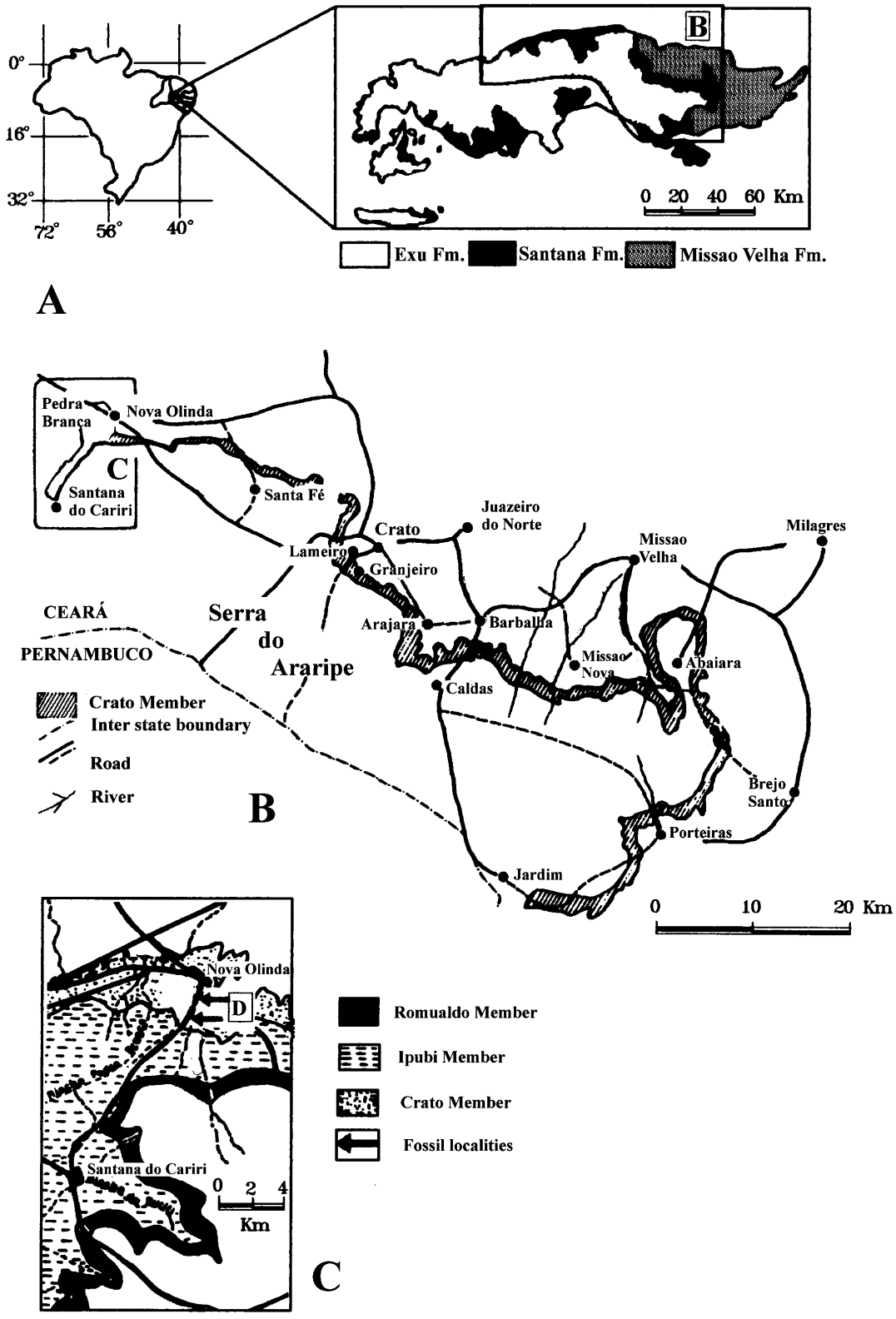

Figure 1. A) Geographical situation B) Araripe geological map. C) Outcrops of Crato Member. D) Position of the collected specimens.

INTRODUCTION

This paper reviews all previous knowledge about neuropterans from the Santana Formation (Lower Cretaceous, northeastern Brazil) involving a decade of research in this group (Fig. 1).

The neuropterofauna from Santana Formation is one of the most complete and diverse known, formed by 50 species distributed in 28 genera, representing 11 families: Ascalaphidae, Myrmeleontidae, Psychopsidae, Chrysopidae, Berothidae, Sisyridae, Nemopteroidea (Roeslerianidae and Nemopteridae), Babinskaiidae, Paleoleontidae and Makarkiniidae (after Martins-Neto, 1992 a, b, 1994, 1997, 1998; Martins-Neto and Vulcano, 1989 a, b, c, 1990 a, b, 1997).

The Neuroptera fauna from the Brazilian Cretaceous is unique in several aspects as for example the fact that, until this moment, just a single genus, *Mesypochrysa* MARTYNOV 1927, is known outside Brazil, exhibiting a high grade of endemism. Babinskaiidae, Roeslerianidae, Paleoleontidae and Makarkiniidae are families totally extinct, but during Cretaceous, paleoleontids are represented in Asia, Canada and, based on unpublished information, in Spain and England. Nemopteroidea, which have extant representatives (Nemopteridae and Crocidae), are absent in the Brazilian entomofauna, although abundant and diverse during the Cretaceous times, with three genera and five described species, distributed in two families: Nemopteridae and Roeslerianidae.

The mirmeleontids are dominant in the Santana Formation neuropterofauna with 10 genera (36%) and 23 species (46%). The dominant genera are *Blittersdorffia* MARTINS-NETO AND VULCANO 1989a and *Pseudonymphes* MARTINS-NETO AND VULCANO 1989a, both with five species. *Cratonemopteryx* MARTINS-NETO 1992a (Nemopteridae), *Neurastenyx* MARTINS-NETO AND VULCANO 1997 (Paleoleontidae) and *Caririneura* MARTINS-NETO AND VULCANO 1989a (Myrmeleontidae Araripeneurinae) are represented each one by three species. The genera *Mesypochrysa* MARTYNOV 1927 and *Cratochrysa* MARTINS-NETO 1994 (Chrysopidae), *Babinskaia* MARTINS-NETO AND VULCANO 1989a and *Neliana* MARTINS-NETO 1992a (Babinskaiidae) and *Araripeneura* MARTINS-NETO AND VULCANO 1989a (Myrmeleontidae Araripeneurinae) are represented each one by two species. The other genera, *Bleyeria* MARTINS-NETO 1992a, *Paracaririneura* MARTINS-NETO AND VULCANO 1997, *Cratopteryx* MARTINS-NETO AND VULCANO 1989a and *Caldasia* MARTINS-NETO AND VULCANO 1989a (Myrmeleontidae Araripeneurinae), *Cratoscalapha* MARTINS-NETO AND VULCANO 1997 and *Karenina* MARTINS-NETO 1997 (Ascalaphidae), *Araripeberotha* MARTINS-NETO AND VULCANO 1990 and *Caririberotha* MARTINS-NETO AND VULCANO 1990 (Berothidae), *Cratosisyrops* MARTINS-NETO 1997 (Sisyridae), *Pulchroptilonia* MARTINS-NETO 1997 - Psychopsidae-, *Makarkinia* MARTINS-NETO 1997 (Makarkiniidae), *Roesleriana* MARTINS-NETO 1997 and Krika MARTINS-NETO 1992b (Roeslerianidae) and *Paraneurastenyx* MARTINS-NETO 1998 (Paleoleontidae) are monotypic most they unique in the neuropterofauna.

All the known material came from the laminated limestone, tip of the Crato Member, lowest unit of the Santana Formation, Lower Cretaceous, Ceará State, northeastern Brazil (Fig. 1). The terminology adopted here follows previous papers of the Neuroptera series (Martins-Neto, 1998). The systematic and taxonomic summary is available in Martins-Neto (1997).

TERMINOLOGY (Fig. 2)

Main venation: AA - anterior anal; CuA, CuP - respectively, anterior and posterior cubital vein; CuA2 - the most proximal secondary branch of CuA; MA, MP - respectively, anterior and posterior median vein; RA, RP - respectively, anterior and posterior radial vein; ScP - posterior subcostal vein.

Special areas: 1. Anal area (AAN): small area between A1 and the anal margin. 2. Costal area (AC): area between the costal margin and ScP, filled by several Pectinated cross veins. 3. Cubital area (ACU): triangular area between MP2+CuA1, CuA2 and the posterior argin. 4. Posterior Cubital area (ACP): triangular area between CuP and A1. 5. Pre setorial area (APS): area between the wing base and the posterior radius (RP); above by ScP below by MP1. This area is occasionally filled by pre setorial subcostal cross veins. 6. Radial area (AR): relatively narrow area between the apex and the RP origin, bordered below by RA. 7. Setorial area (AS): area between the RP secondary branches. 8. Subcostal area (ASC): area between ScP and RA.

Cells: 9. Cubital cells (ccu): cells from the cubital area, since CuA2, until the posterior margin, forming a triangular area between CuA2, MP2+CuA1 and the posterior margin. 10. Posterior cubital cells (ccup): cells of the posterior cubital area formed by the CuP secondary

branches. 11. Hypostigmal cell (h): long cell placed below the ScP/RA fusion point. 12. Infra radial cells (cir): cell space between oma and the first cross vein of the medial area. 13. Radial cells (cr): radial area cells formed by the radial cross veins. cr1 - basal radial cells. cr2 - the subsequent one. 14. Pre cubital cells (cpcu): pre cubital area cells. cpcu1 - basal pre cubital cell. 15. Pre medial (cpm): cells anterior of the medial area. cpm1 - first pre medial cell. 16. Pre setorial (cps): pre setorial area cells formed by radial cross veins after the RP origin. cps1 - basal pre setorial cell.

Special cross veins: 17. Humeral (hu): basal cross vein of the subcostal area. 18. Oblique vein (o): oblique cross vein between MP1 and MP2. 19. Pre cubital cross veins (pcu): cross veins ofe the pre cubital area. 20. Pre setorial cross veins (ps) : cross veins of the pre setorial area. 21. Pseudomedia (psm): cross veins forming a continuous line looking like a median vein. This is a common character in chrysopids, very rare in other insects. 22. Pseudocubitus (psc): similar to the pseudomedia, but in the cubital region. 23. r-m : cross vein which links R to M.

Origin points or fusion points: 24. fsr : fusion point between ScP and RA. 25. ocua : CuA2 origin. 26. ocup : CuP origin. 27. orp : RP origin. 28. orp1 : first RP branch origin. 29. oma : MA origin.

Others: 28. an - antenna. 29. pro - pronotum.

KEYS FOR IDENTIFICATION OF THE SANTANA FORMATION NEUROPTERA

Key for the families (valid only for the Araripe fauna)

(1) Fore wing with oblique vein (o) 2
- Fore wing without oblique vein (o) 5

(2) Hind wing as long as fore wing 3
- Hind wing at least twice longer than fore wing. . . . NEMOPTEROIDEA 4

(3) Fore wing with RP branches not fused 11
- Fore wing with RP branches partially fused . . 20

(4) Fore wing with the costal cross veins dichotomous. h without cross veins. CuP secondary branches dichotomous…ROESLERIANIDAE 21
- Fore wing with the costal cross vein dichotomous only after fsr. h with at least, one cross vein. CuP secondary branches without dichotomies…NEMOPTERIDAE: (1 gen. *Cratonemopteryx*; 3 sp.) 28

(5) Fore wing with ScP distally fused with RA 6
- Fore wing with ScP and RA unfused 8

(6) Fore wing with de AC narrower than the AR. ASC without cross veins 7
- Fore wing with the AC four times wider than the AR. ASC with more than 60 cross veins… MAKARKINIIDAE: *Makarkinia* (1 sp. *Makarkinia adamsi*, Fig. 13 A).

(7) Fore wing with the RP origin at one third or less from the wing base. More than 10 cr. h absent… ASCALAPHIDAE 22
- Fore wing with the RP origin at one-forth to one and half from the wing base. Four cr. h present 23

(8) Fore wing elongated, with at least two cr. MA+MP origin at RA+RP. M secondary branches with only marginal dichotomies 9
- Fore wing triangular, wider in the mid length, without cr. oma at RP. M secondary branches multi branched… PSYCHOPSIDAE: *Pulchroptilonia* (1 sp. *Pulchroptilonia espatifata* , Fig. 12).

(9) Fore wing with costal cross veins distally multi branched 10
- Fore wing with costal cross veins unbranched… CHRYSOPIDAE 24

(10) Fore wing elongated, three and half times longer than wide… BEROTHIDAE 27
- For wing ovated, two and half times longer than wide… SISYRIDAE: *Cratosisyrops* (1 sp. *Cratosisyrops gonzagai*, Fig. 10C).

Key to the g enera

(11) Fore wing with a long h. More than three branches of RP 12
- Fore wing without h. RP with only one secondary branch… *Bleyeria* (1 sp. *Bleyeria nordestina*, Fig. 8F).

(12) Fore wing with a very long cir 13
- Fore wing with a small cir 16

(13) Fore wing with oma after cr1 14
- Fore wing with oma at cr1 15

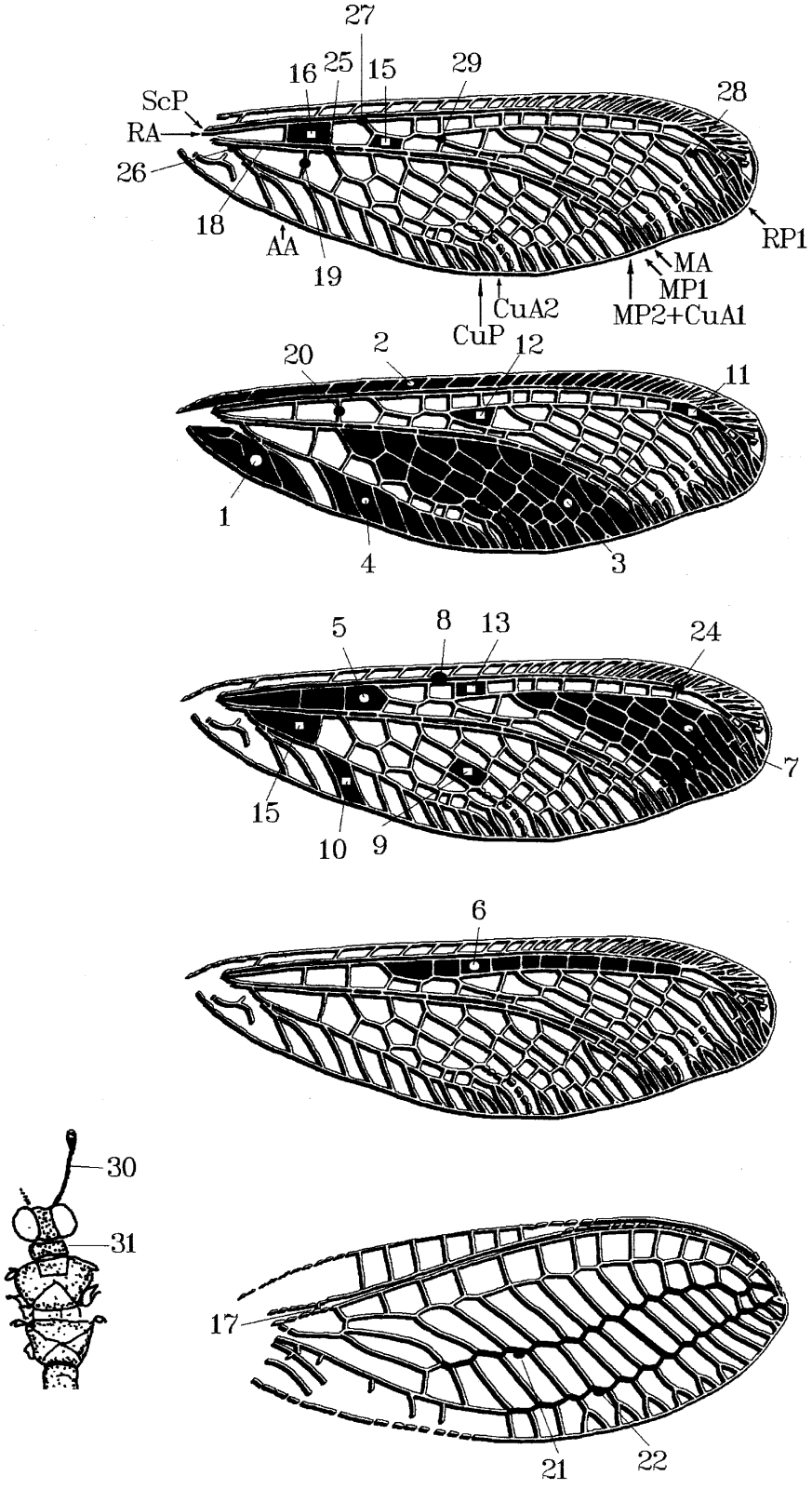

Figure 2. Terminology, mainly of the wing veins. See details in pages 99 and 100.

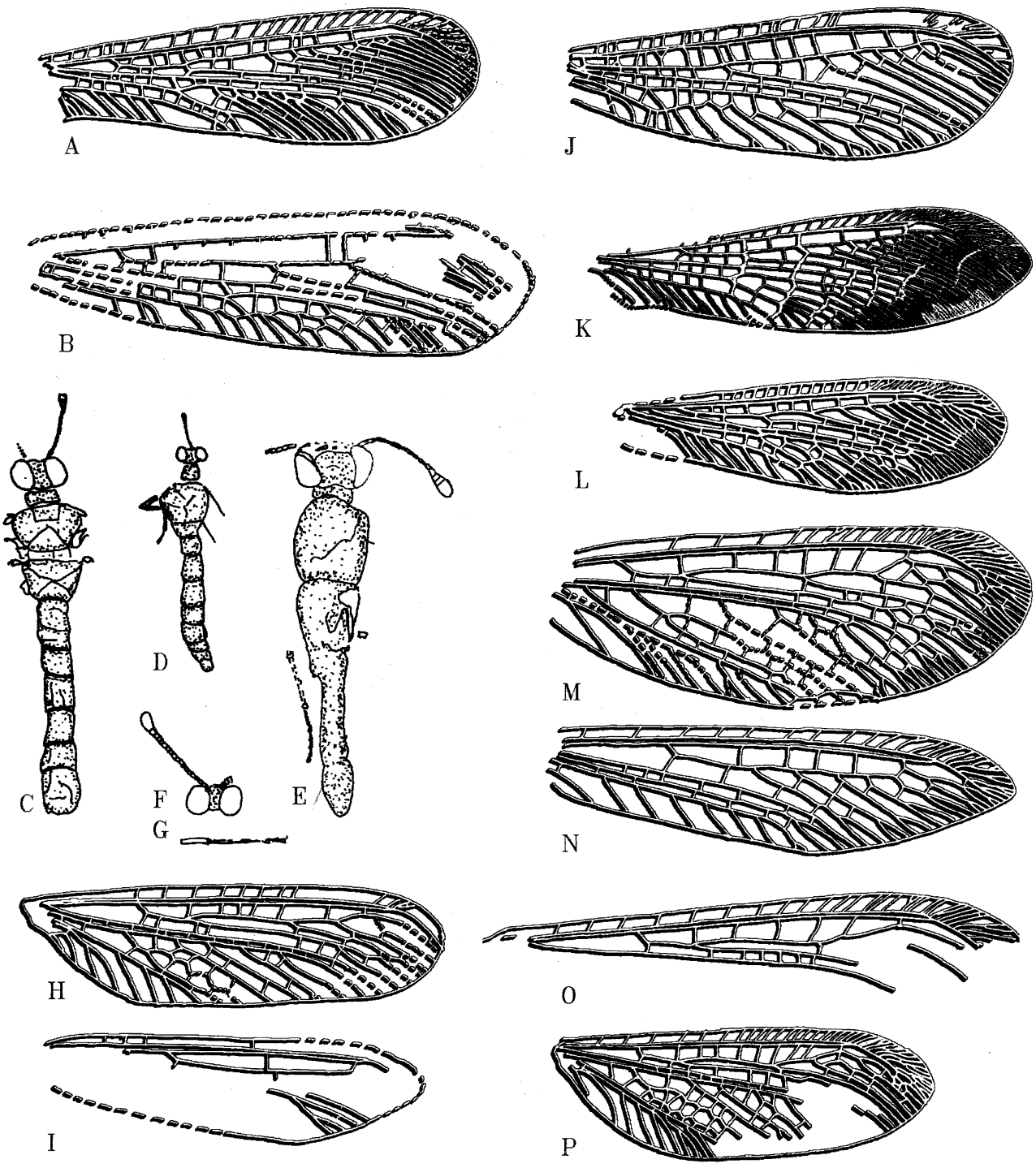

Figure 3. A and C) *Blittersdorffia pleoneura* MARTINS-NETO AND VULCANO 1989a. : A) Fore wing of the holotype; C) body details drawing of additional material. B) *Blittersdorffia volkheimeri* MARTINS-NETO AND VULCANO 1989b, fore wing of holotype. D and L) *Blittersdorffia polyplusia* MARTINS-NETO 1997: D) body detail and L) fore wing, both of the holotype. E, H, I, and O) *Araripeneura gracilis* MARTINS-NETO AND VULCANO 1989a: E and O) respectively detail of the body and fore wing, drawing of additional material; F, G, M, N, and P) *Araripeneura regia* MARTINS-NETO AND VULCANO 1989a. F, G, and P) respectively details of the head, anterior member and hind wing, of the holotype. M and N) respectively fore wing and hind wing, drawing of additional material.

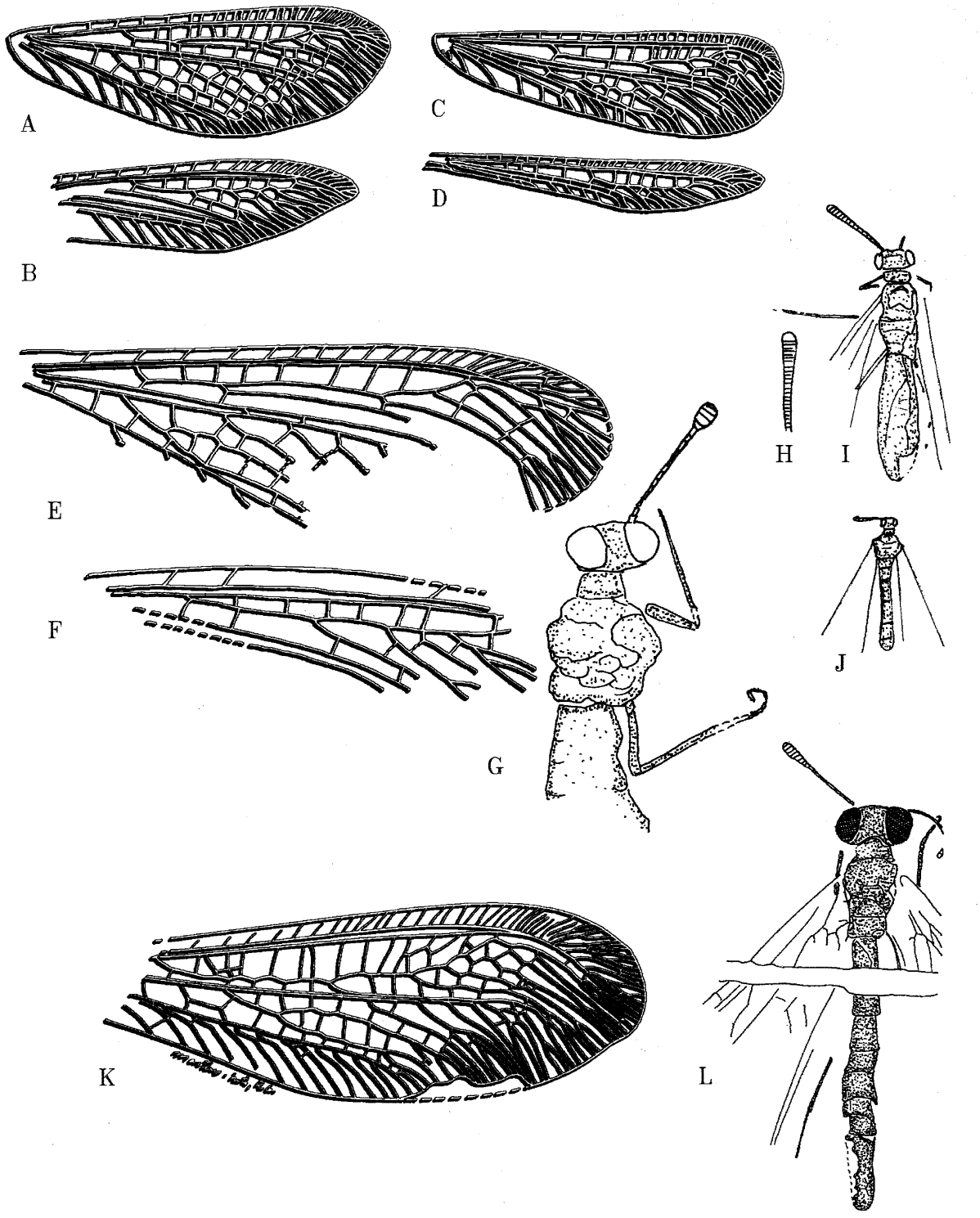

Figure 4. A, B, H, and I) *Caririneura damianii* MARTINS-NETO 1992a. , respectively fore wing, hind wing, antenna detail and body detail, of the holotype. C, D, and J) *Caririneura microcephala* MARTINS-NETO AND VULCANO 1989a, respectively fore wing, hind wing and body detail, of the holotype. E-G) *Caririneura crassatella* MARTINS-NETO AND VULCANO 1997, respectively fore wing, hind wing and body detail, of the holotype. K and L) *Paracaririneura priscila* MARTINS-NETO AND VULCANO 1997, respectively fore wing and body detail, of the holotype.

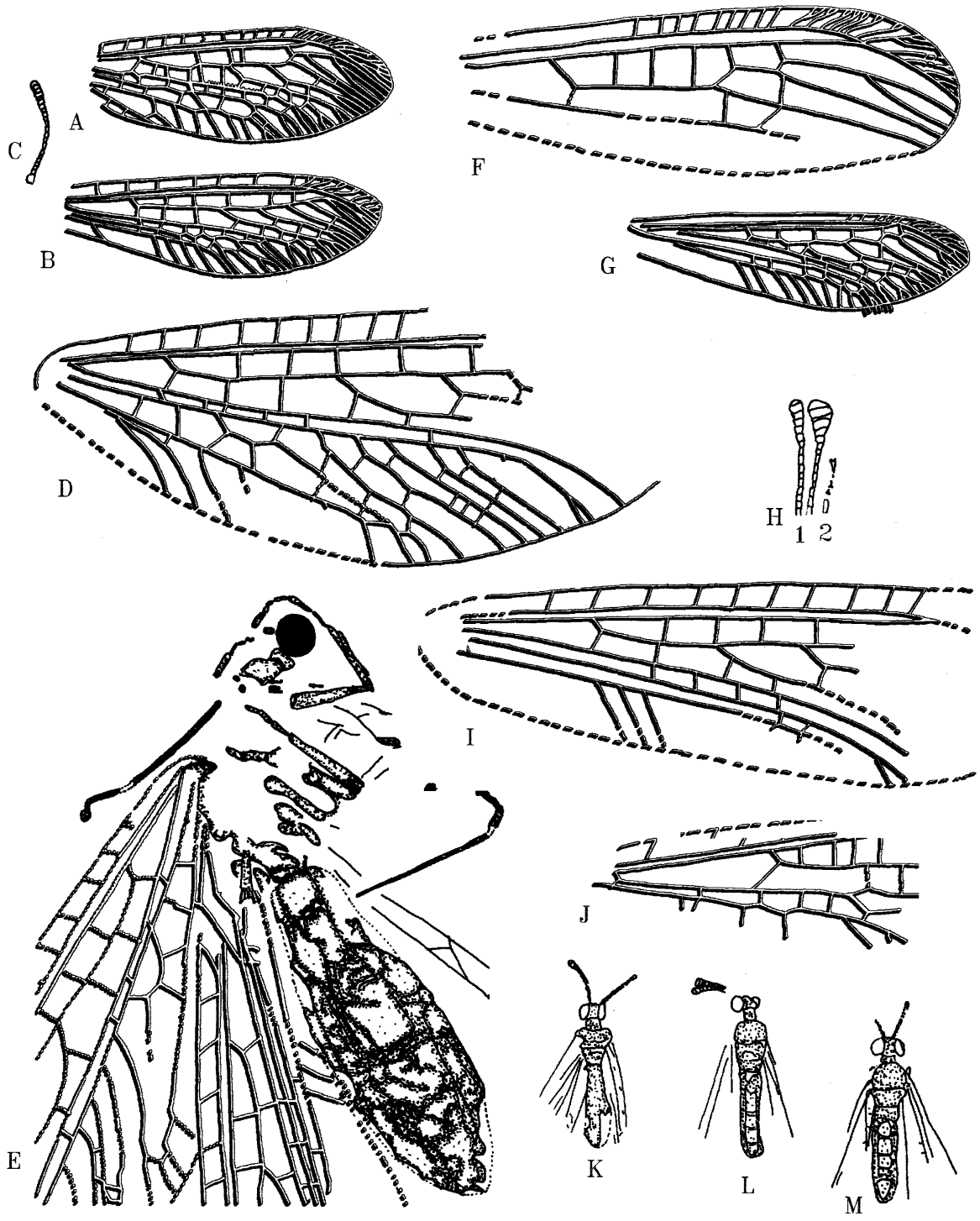

Figure 5. A-C, and K) *Pseudonymphes araripensis* MARTINS-NETO AND VULCANO 1989a, respectively fore wing, hind wing, antenna detail and body detail, of the holotype. D, E, and I) *Cratopteryx robertosantosi* MARTINS-NETO AND VULCANO 1989a., respectively fore wing, body detail and hind wing, of the holotype. F) *Pseudonymphes zambonii* MARTINS-NETO 1998, fore wing of the holotype. G, H, and L) *Pseudonymphes ponomarenkoi* MARTINS-NETO 1992a, respectively hind wing, antenna details (H1), anterior (H2) and body details, of the holotype. J and M) *Pseudonymphes brunherottae* MARTINS-NETO 1994, respectively fore wing and body detail of the holotype.

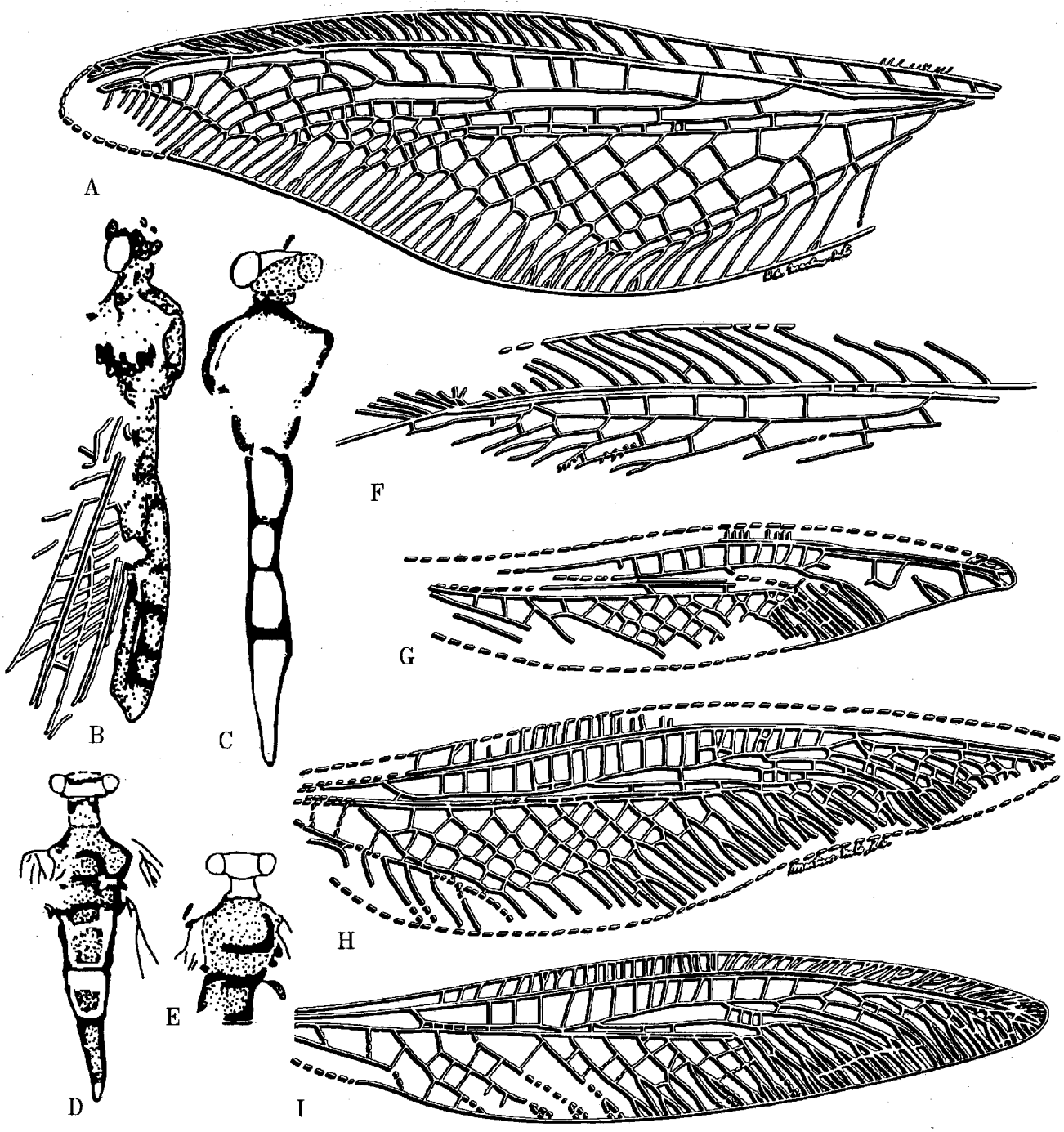

Figure 6. A, B, and F) *Cratoalloneura acuminata* MARTINS-NETO 1992a., respectively fore wing, body detail and hind wing, of the holotype. C and H) *Cratoneura dividens* MARTINS-NETO 1994, respectively body detail and fore wing, of the holotype. D and I) *Cratoneura longissima* MARTINS-NETO 1992b, respectively body detail and fore wing, of the holotype. E and G) *Cratoneura pul - chella* MARTINS-NETO 1992b, respectively body detail and fore wing, of the holotype.

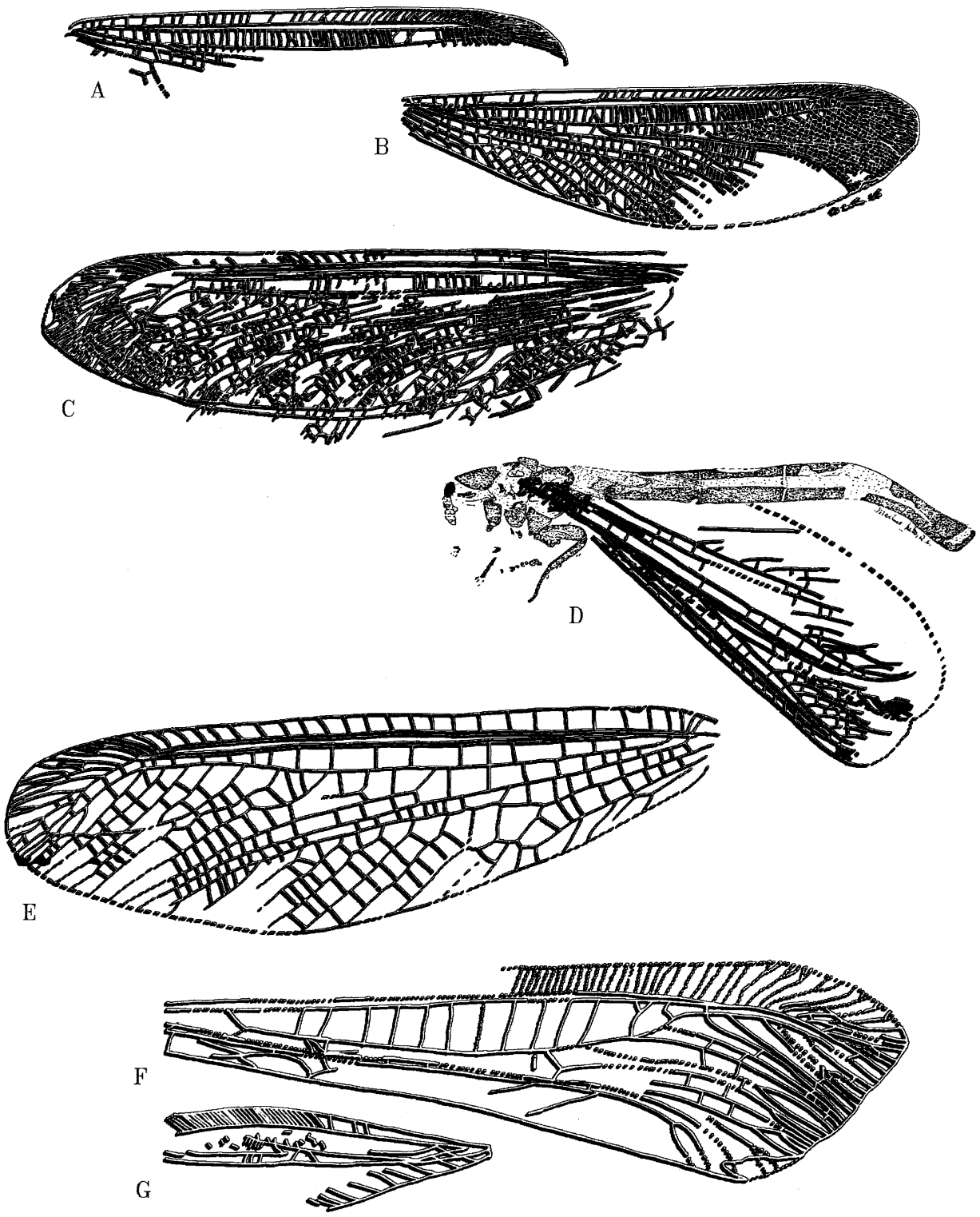

Figure 7. A and B) *Neurastenyx araripensis* MARTINS-NETO 1997, respectively fore wing and hind wing, of the holotype. C) *Neurastenyx polyhymnia* MARTINS-NETO 1997, fore wing, of the holotype. D) *Neurastenyx gigas* MARTINS-NETO AND VULCANO 1997, of the holotype. E) *Paraneurastenyx ascalaphix* MARTINS-NETO 1998, fore wing, of the holotype. F and G) *Caldasia cretacea* MARTINS-NETO AND VULCANO 1989a., respectively fore wing and hind wing, of the holotype .

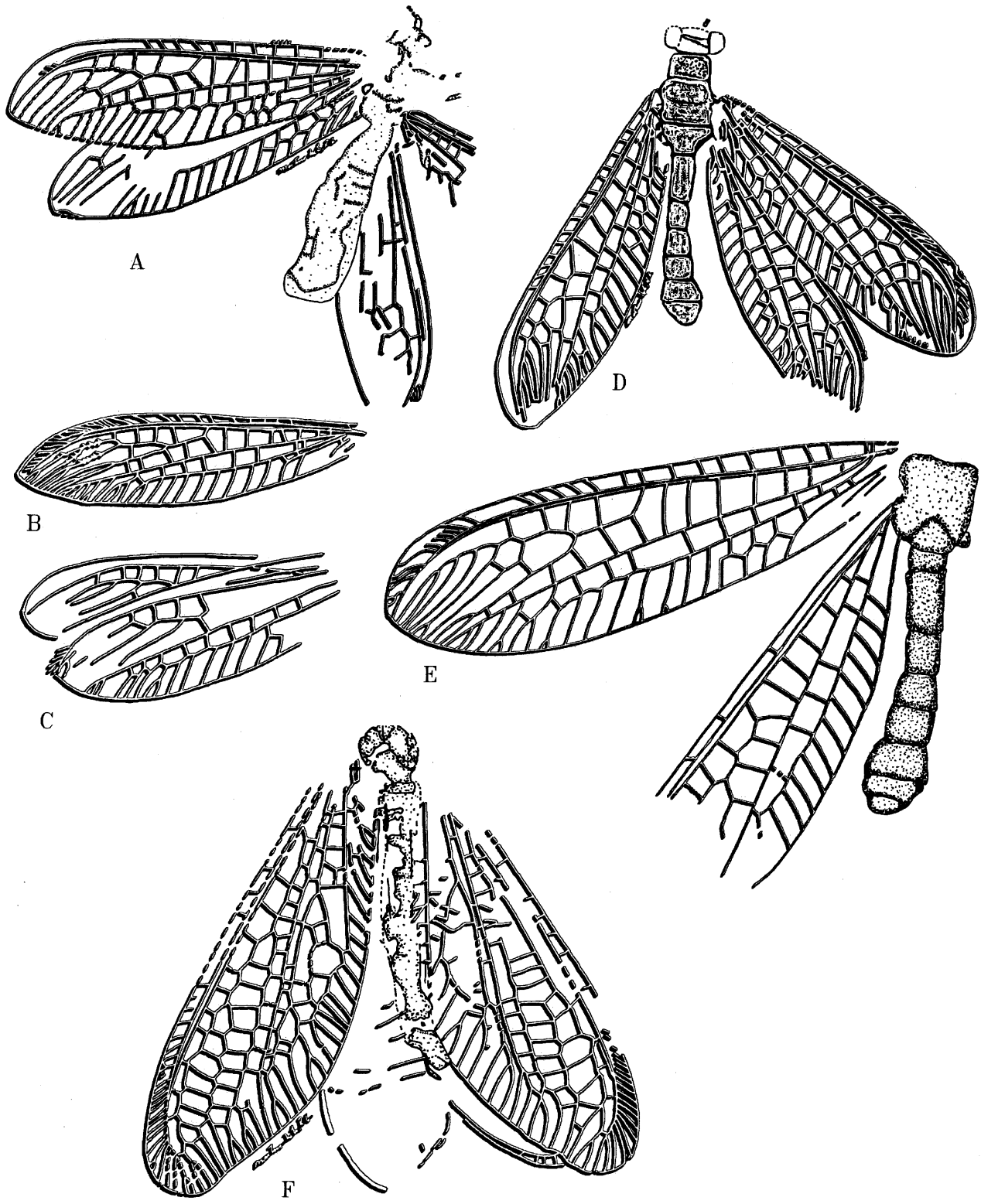

Figure 8. A, D, and E) *Neliana maculata* MARTINS-NETO 1992b. A) holotype, D and E) additional material. B and C) *Neliana im - polluta* MARTINS-NETO 1997; B) fore wing reconstruction, based on the holotype; C) fore wing and hind wing, of the holotype (F) *Bleyeria nordestina* MARTINS-NETO 1992 a., holotype.

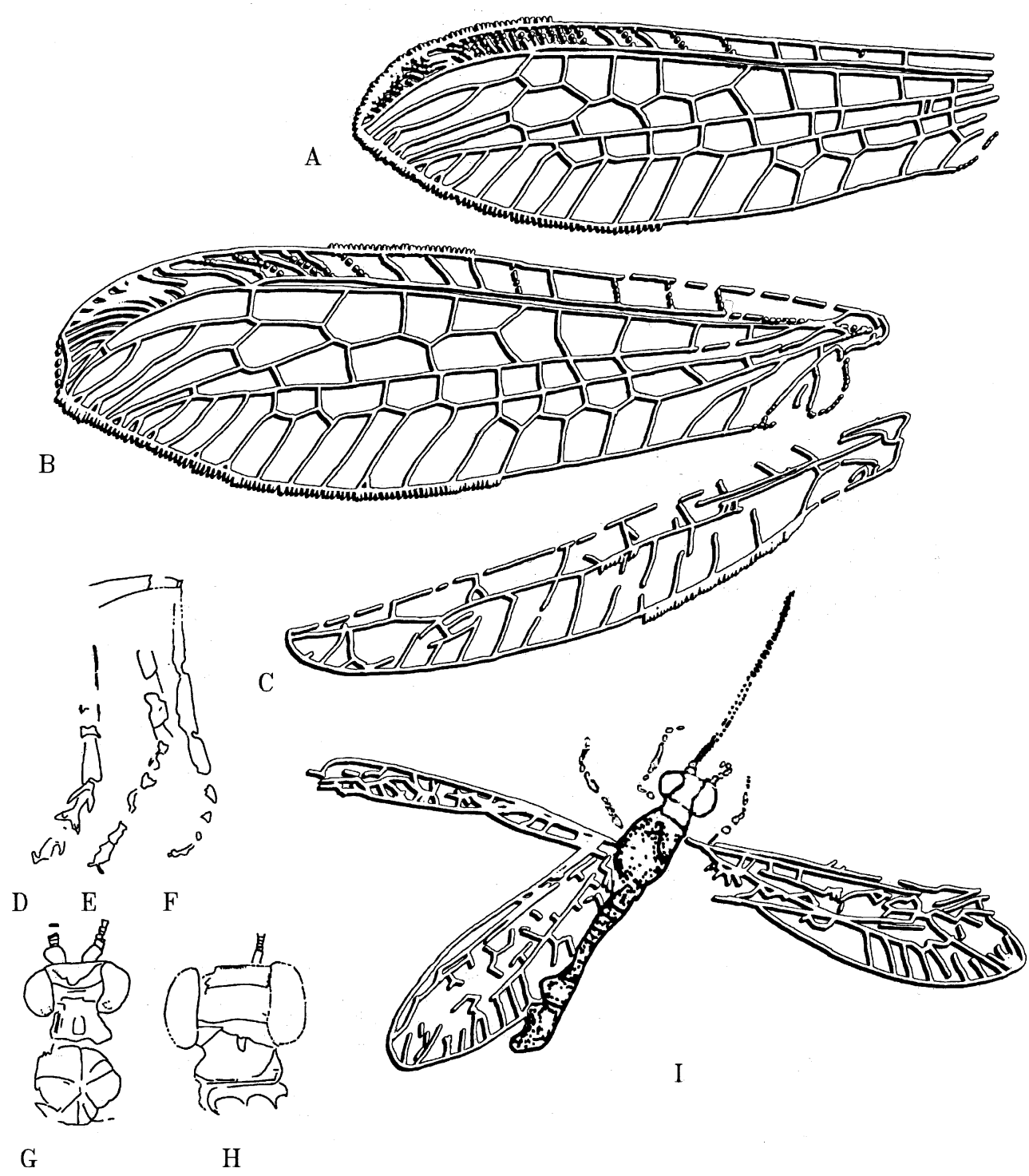

Figure 9. A and G) *Babinskaia formosa* MARTINS-NETO AND VULCANO 1989a., respectively fore wing detail and body detail, of the holotype. B-F, H, and I) *Babinskaia pulchra* MARTINS-NETO AND VULCANO 1989a., respectively forewing, hind wing, anterior member, middle member, posterior member, head detail and general view, of the holotype.

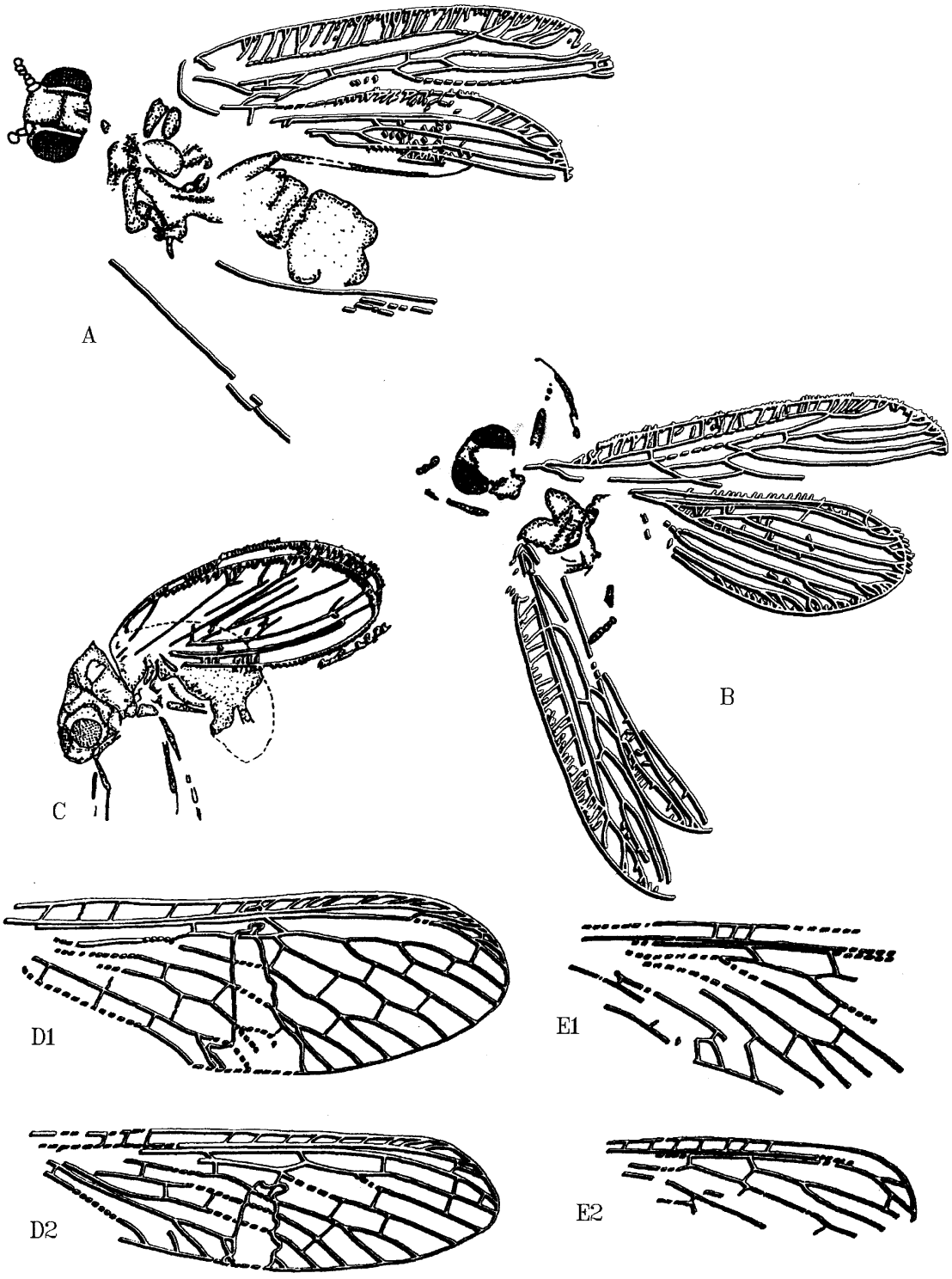

Figure 10. A) *Carariberotha martinsi* MARTINS-NETO AND VULCANO 1990b, general view of the holotype. B) *Araripeberotha fairchildi* MARTINS-NETO AND VULCANO 1990b, general view of the holotype. C) *Cratosisyrops gonzagai* MARTINS-NETO 1997, general view of the holotype. D) *Cratochrysa wilmanni* MARTINS-NETO 1994, respectively fore wing (D1) and hind wing (D2), of the holotype. E) *Cratochrysa sublapsa* MARTINS-NETO 1997, respectively fore wing (E1) and hind wing (E2), of the holotype.

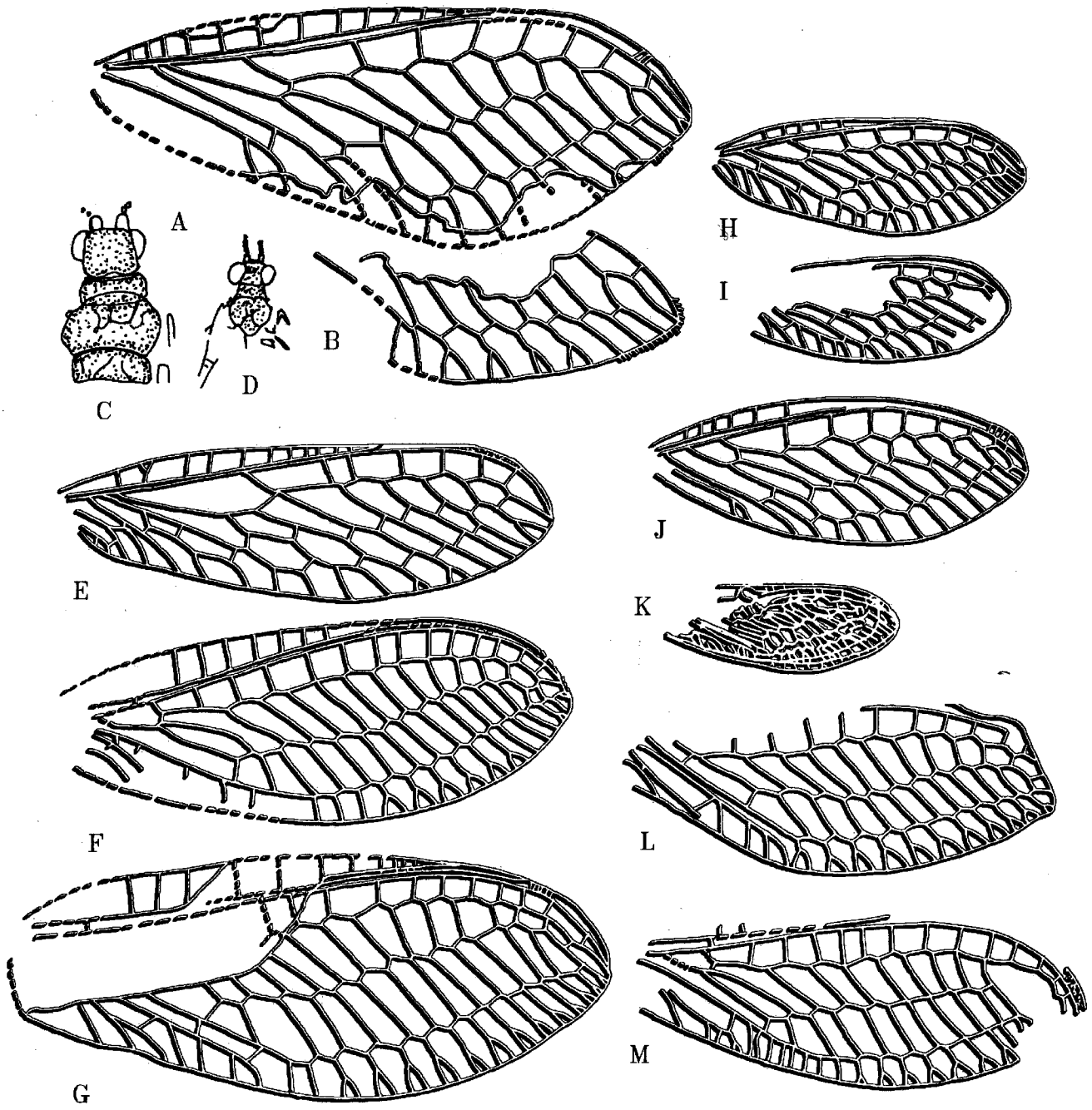

Figure 11. A, B, D, and J) *Limaia conspicua* MARTINS-NETO AND VULCANO 1989b, respectively fore wing, hind wing and body details, of the holotype. J) fore wing drawing of additional material. C and E) *Araripechrysa magnifica* MARTINS-NETO AND VULCANO 1989b, respectively body and fore wing details. F, G, L, and M) *Mesypochrysa criptovenata* MARTINS-NETO 1992a: F and L) respectively fore wing and hind wing, drawing of additional material; G) fore wing, of the holotype; M) fore wing of another specimen; H and I) *Limaia adicotomica* MARTINS-NETO 1997, respectively fore wing and hind wing, of the holotype; K) *Mesypochrysa confusa* MARTINS-NETO 1992a, fore wing and hind wing overlapped, of the holotype.

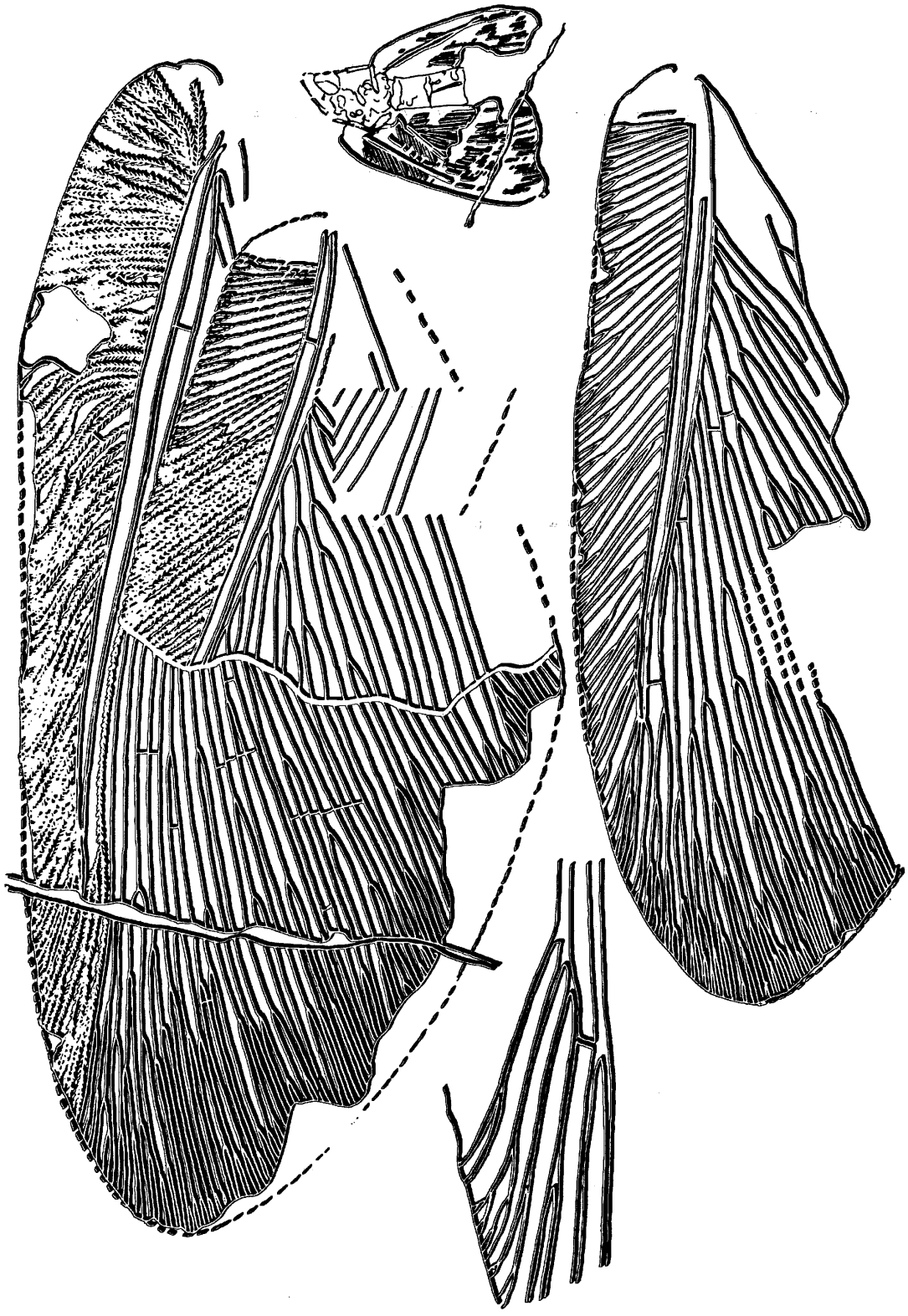

Figure 12. *Pulchroptilonia espatifata* MARTINS-NETO 1997, respectively fore wing and hind wing left, overlapped; right hind wing reversed by convenience, ScP and RA fusion point and general view; drawing of the holotype.

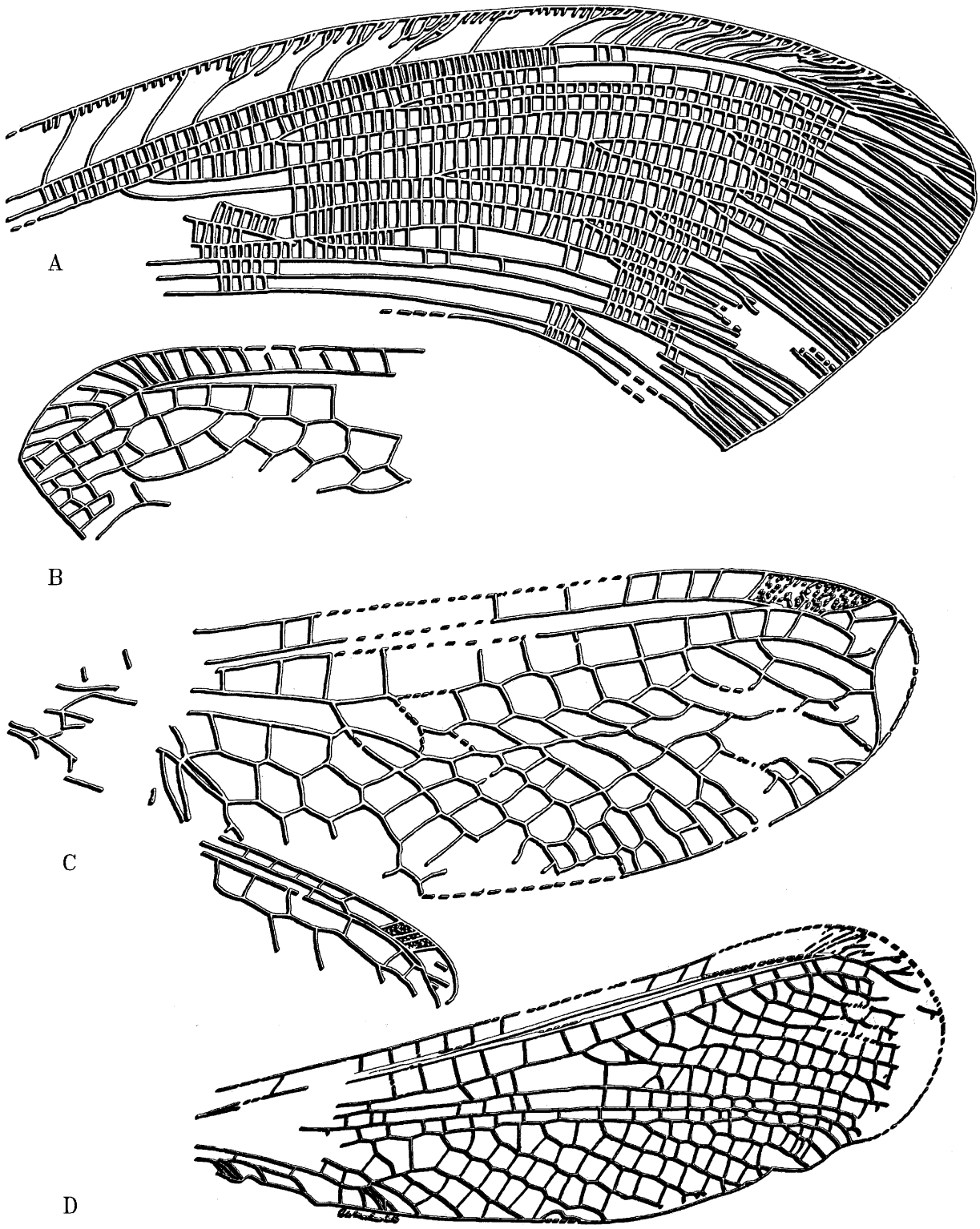

Figure 13. A) *Makarkinia adamsi* MARTINS-NETO 1997, fore wing of the holotype; B and C) *Karenina breviptera* MARTINS-NETO 1997, respectively left fore wing apical detail and right fore wing, of the holotype; D) *Cratoscalapha electroneura* MARTINS-NETO AND VULCANO 1997, fore wing, of the holotype.

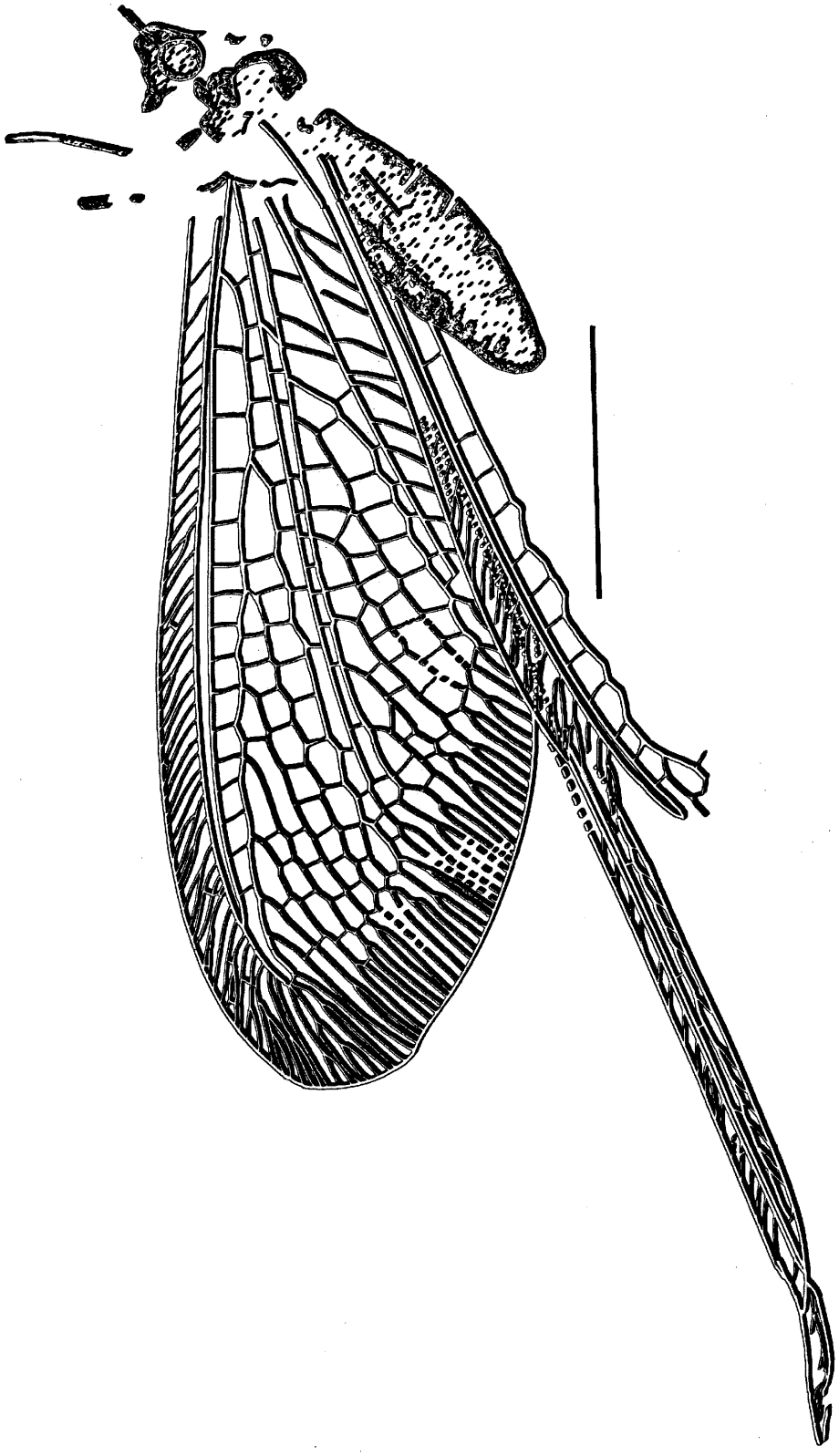

Figure 14. *Roesleriana exotica* MARTINS-NETO AND VULCANO 1989c, general view, drawing of additional material.

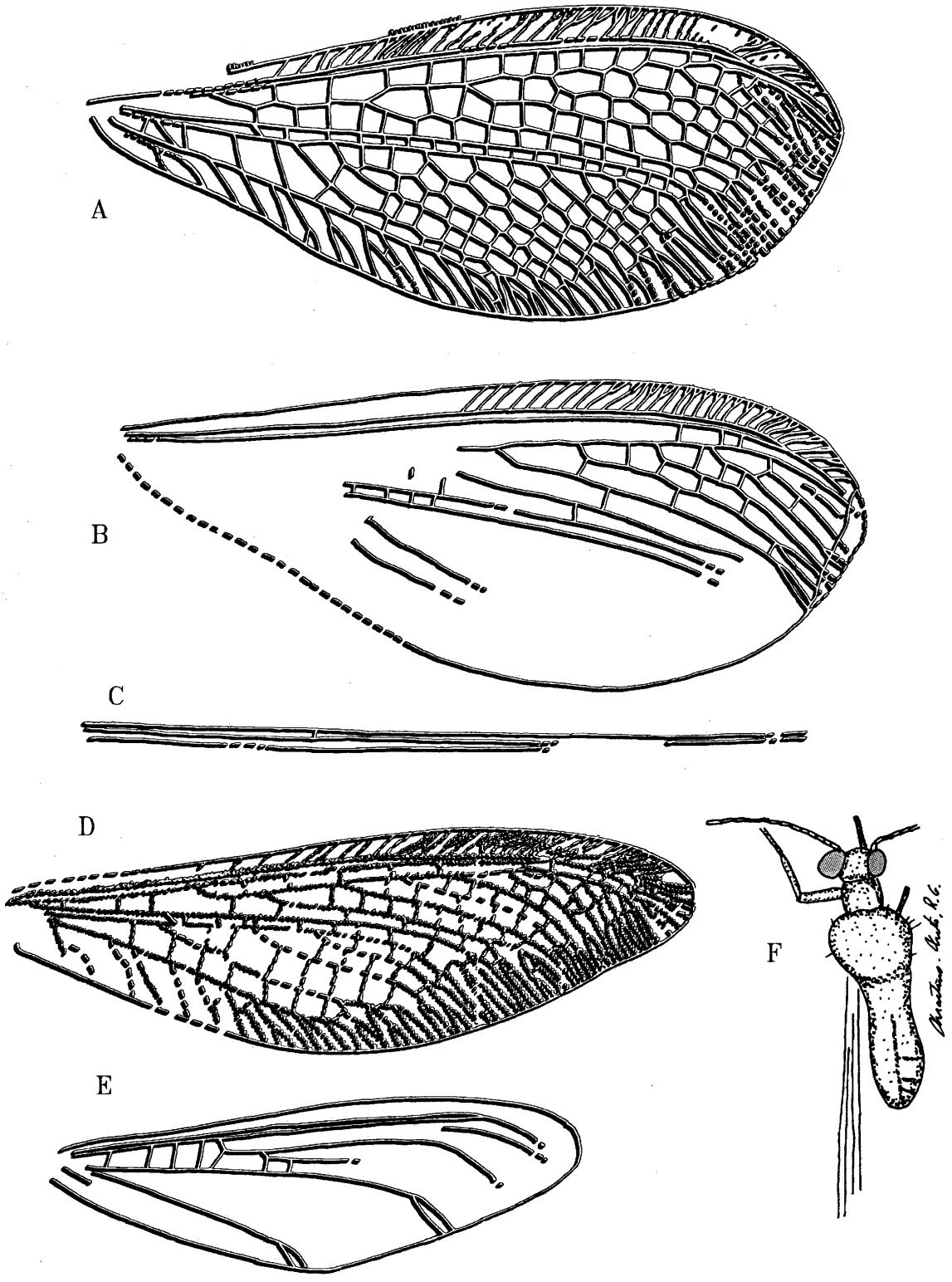

Figure 15. A-C) *Roesleriana exotica* MARTINS-NETO AND VULCANO 1989c. A) fore wing, of the holotype; B and C) respectively fore wing and hind wing, drawing of additional material. D-F) *Krika pilosa* MARTINS-NETO 1992b. D) fore wing, of the holotype; E and F) respectively forewing and body detail, drawing of additional material.

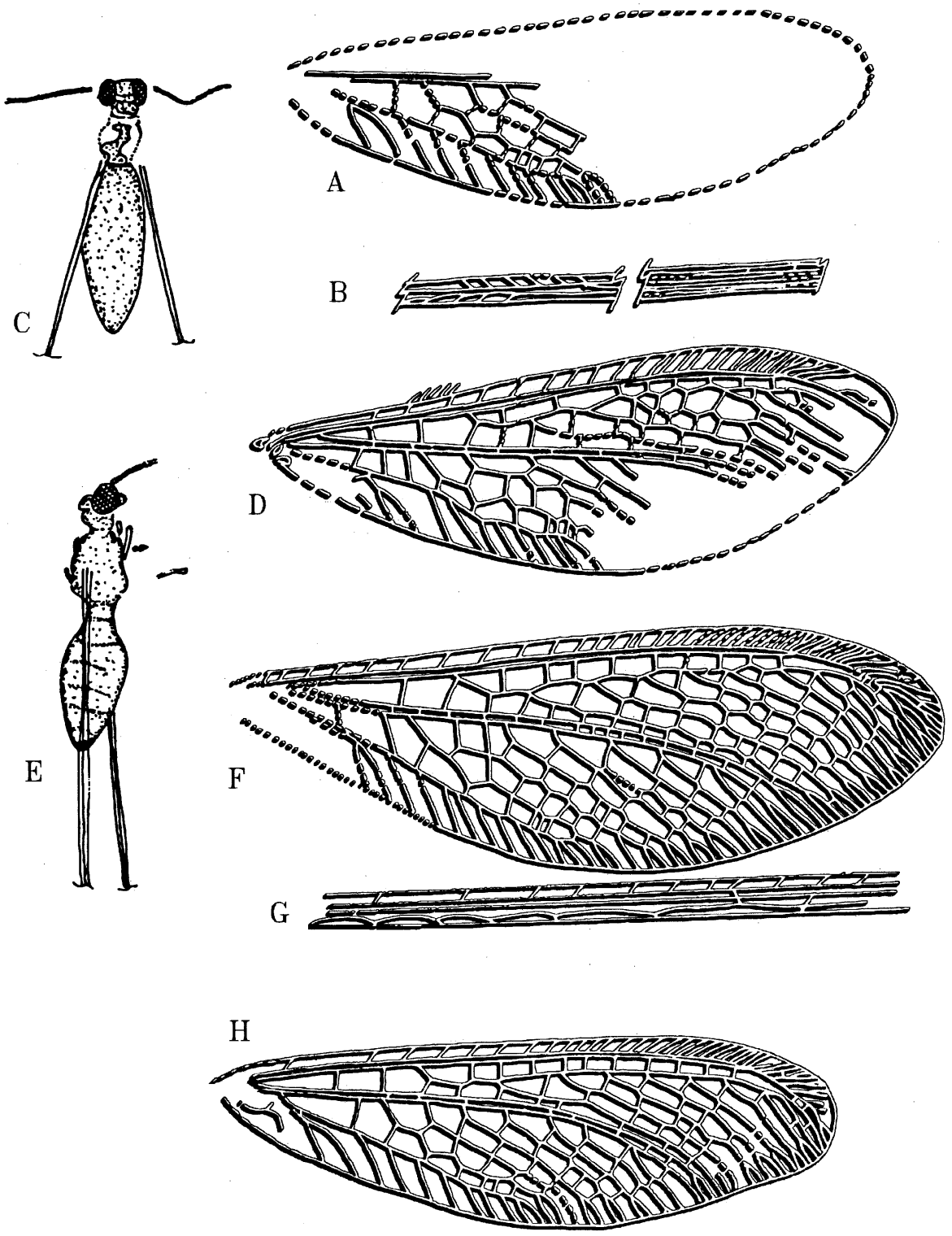

Figure 16. A-C, H) *Cratonemopteryx robusta* MARTINS-NETO 1992a. A-C) respectively fore wing, hind wing and body detail, of the holotype; H) fore wing, drawing of additional material. D and E) *Cratonemopteryx audax* MARTINS-NETO 1992a, respectively fore wing and body detail, of the holotype. F and G) *Cratonemopteryx speciosa* MARTINS-NETO AND VULCANO 1997, respectively fore wing and hind wing, of the holotype.

(14) Fore wing base as wide as the apical margin. Less than 10 cr. Banksian-line absent… *Araripeneura* (2 sp.)… 30
- Fore wing leaf-like shaped with acuminated apex. More than 15 cr. Banksian-line present at least in AS. *Cratoneura* (3 sp.) 31

(15) Fore wing apical margin wider than the wing base. Banksian-line absent. *Caririneura* (3 sp.) 33
- Fore wing leaf-like shaped with acuminated apex. Continuous banksian-line in both ACU and AS… *Cratoalloneura* (1 sp. *Cratoalloneura acuminata*, Figs. 6A, B, F).

(16) Fore wing with less than five cr 17
- Fore wing with more than ten cr 18

(17) Antenna short, as long as the thorax… *Pseudonymphes* (3 sp.) 35
- Antenna long, longer than the thorax… *Cratopteryx* (1 sp. *Cratopteryx robertosantosi*, Figs. 5D, E, I).

(18) Fore wing with MA multi branched. oma after the mid length of the wing 19
- Fore wing with MA unbranched. oma at one-third of the wing base… *Blittersdorffia* (5 sp.) 38

(19) Fore wing three times longer than wide… *Paracaririneura* (1 sp. *Paracaririneura priscila*, Figs. 4K, L).
- Fore wing five times longer than wide… *Caldasia* (1 sp. *Caldasia cretacea*, Figs. 7F, G).

(20) Fore wing with more than 50 cr… *Neurastenyx* (3 sp.) 42
- Fore wing with less than 20 cr… *Paraneurastenyx* (1 sp. *Paraneurastenyx ascalaphix*, Fig. 7E).

(21) Fore wing without ps… *Roesleriana* (1 sp. *Roesleriana exotica*, Figs. 14, 15A-C).
- Fore wing with at least two ps…*Krika* (1 sp. *Krika pilosa*, Fig. 15D-F).

(22) Fore wing without pterostigma. More than 16 cr… *Cratoscalapha* (1 sp. *Cratoscalapha electroneura*, Figs. 13D).
- Fore wing with pterostigma. Less than 14 cr… *Karenina* (1 sp. *Karenina breviptera*, Figs. 13B, C).

(23) Fore wing with four ps… *Babinskaia* (2 sp.) . . . 44
- Fore wing with seven ps… *Neliana* (2 sp.) . . . 45

(24) Fore wing with less than 10 cr. Both psm and psc absent 25
- Fore wing with more than 10 cr. Both psm and psc present… *Mesypochrysa* (2 sp.) 46

(25) Fore wing with seven to ten cr 26
- Fore wing with two to three cr… *Cratochrysa* (2 sp.) 7

(26) Fore wing with cr1 as long as cr2… *Limaia* (2 sp.) 48
- Fore wing with cr1 at least twice longer than cr2… *Araripechrysa* (1 sp. *Araripechrysa magnifica*, Figs. 11C, E).

(27) Fore wing with the AC wider than ASC. Head longer than wide… *Caririberotha* (1 sp. *Caririberotha martinsi*, Fig. 10 A).
- Forewing with the AC as wide as ASC. Head rounded, as long as wide… *Araripeberotha* (1 sp. *Araripeberotha fairchildi*, Fig. 10B).

Key to the species

(28) Fore wing with two ps 29
- Fore wing with one ps… *Cratonemopteryx speciosa*, Fig. 16F).

(29) Fore wing with one pcu… *Cratonemopteryx robusta*, Figs. 16A-C, H.
- Fore wing with three pcu… *Cratonemopteryx audax*, Figs. 16E-G.

(30) Fore wing around 19 mm long and relatively wide. Body short, around 14 mm long. Anal margin curved. CuP with long secondary branches. Apex acute… . . . . . *Araripeneura regia*, Figs. 3F-G, M, N, P.
- Fore wing around 15 mm long, relatively narrow. Body elongated, around 17 mm long. Anal margin straight. CuP with short secondary branches. Apex rounded… *Araripeneura gracilis*, Figs. 3E, H-I, O.

(31) Fore wing with MA with less than five distal secondary branches 32
- Fore wing with MA with more than eight distal secondary branches… *Cratoneura longissima*, Figs. 6D, I.

(32) Fore wing with h without cross veins… *Cratoneura pulchella*, Figs. 6E, G.
- Fore wing with h with at least one cross vein… *Cratoneura dividens*, Figs. 6C, H.

(33) Head smaller than the thorax… *Caririneura microcephala*, Figs. 4C-D, J.
- Head greater than the thorax 34

(34) Great eyes, occupying 2/3 of the head area… *Caririneura crassatella*, Figs. 4E-G.
- Small eyes, occupying less than 1/5 of the head area… . . . . . *Caririneura damianii*, Figs. 4 A, B, H-I.

(35) Fore wing around 15 mm long 36
- Fore wing around 6 mm long… *Pseudonymphes zambonii*, Fig. 5F.

(36) Mesothorax anterior margin rounded and little wider than the posterior margin 37
- Mesothorax anterior margin quite straight and two times wider than the posterior margin… *Pseudonymphes araripensis*, Figs. 5 A-C, K.

(37) Abdomen robust as wide as thorax… *Pseudonymphes brunherottae*, Figs. 5J, M.
- Abdomen thin, narrower than thorax… *Pseudonymphes ponomarenkoi*, Figs. 5G, H, L.

(38) Fore wing with CuA2 distally branched 39
- Fore wing with CuA2 unbranched 41

(39) Fore wing with o after ocua. Apex acuminated. Collor pattern… *Blitterdorffia pulcherrima*, Fig. 3K.
- Fore wing with o at ocua. Apex rounded. Without collor pattern… *Blittersdorffia pleoneura*, Figs. 3 A, C.

(40) Fore wing with CuP long, reaching the anal margin at 1/3 from the wing base 41
- Fore wing with CuP short, reaching the anal margin near of the wing base… *Blittersdorffia dicotomica*, Fig. 3J.

(41) Fore wing with AAN as narrow as ACU… B*littersdorffia volkheimeri*, Fig. 3B.
- Fore wing with AAN wider than ACU… *Blittersdorffia polyplusia*, Figs. 3D, L.

(42) Fore wing around 90 mm long. *Neurastenyx gigas*, Fig. 7D.
- Fore wing with 40 to 60 mm long 43

(43) Fore wing around 60 mm long… *Neurastenyx araripensis*, Figs. 7 A, B.
- Fore wing around 40 mm long… *Neurastenyx polyhymnia*, Fig. 7C.

(44) Fore wing with cr1 smaller than cr2. Five CuP secondary branches… *Babinskaia pulchra*, Figs. 9B-F, H, I.
- Fore wing with cr1 greater than cr2. Four CuP secondary branches… *Babinskaia formosa*, Figs. 9 A, G.

(45) Fore wing with five to six cp. and color pattern… *Neliana maculata*, Figs. 8 A, D, E.
- Fore wing with only one cp cell. Without color pattern… . . . . . *Neliana impolluta*, Figs. 8B, C.

(46) Fore wing around 20 mm long… *Mesypochrysa criptovenata*, Figs. 11F-G, L-M.
- Fore wing around 10 mm long… *Mesypochrysa confusa*, Fig. 11K.

(47) Fore wing with MA distally unbranched… *Cratochrysa sublapsa*, Fig. 10E.
- Fore wing with MA distally branched… *Cratochrysa willmanni*, Fig. 10D.

(48) Hind wing with four marginal dichotomies… *Limaia conspicua*, Figs. 11A, B,D, J.
- Hind wing with two marginal dichotomies… *Limaia adicotomica*, Figs. 11H, I.

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