

Two new genera of the Evaniidae (Insecta: Hymenoptera) from Late Cretaceous New Jersey amber

Hasan H. Basibuyuk

Department of Biology, Imperial College, Silwood Park, Ascot Berkshire, SL5 7PY, UK, and

Department of Entomology, Natural History Museum, London SW7 5BD, UK

Present address: Department of Biology, Cumhuriyet University, 58140-Sivas, Turkey

Michael G. Fitton

Research Scientist, Department of Entomology, Natural History Museum, London SW7 5BD, UK

Alexander P. Rasnitsyn

Principal Researcher, Paleontological Institute, Russian Academy of Sciences, 117647 Moscow, Russia

Donald L.J. Quicke

Senior Lecturer, Department of Biology, Imperial College, Silwood Park, Ascot, Berkshire SL5 7PY, UK, and

Department of Entomology, Natural History Museum, London SW7 5BD, UK

Abstract

Three new species of Evaniidae (Hymenoptera: Insecta) in two new genera are described and figured from Late Cretaceous, New Jersey amber. The species are *Grimaldivania ackermanni*, *Newjersevania casei* and *N. nascimbenei*, and they are the oldest known evaniids. The affinities of the new genera within the family are discussed.

Introduction

The superfamily Evanioidea includes three extant families: Aulacidae, Gasteruptiidae and Evaniidae (Crosskey, 1951; Riek, 1970; Gauld & Bolton, 1988; Goulet & Huber, 1993; Hanson & Gauld, 1995), although some authors consider the Aulacidae as a subfamily within the Gasteruptiidae (Townes, 1950; Rasnitsyn, 1980, 1988). The systematic position of the Evaniidae has long been a subject of disagreement. Within the Apocrita, the Evaniidae were sometimes included within the Ichneumonidea (e.g., Kieffer, 1912), treated as a family closely related to Proctotrupoidea s.l. (Townes, 1949) or placed with a mixture of taxa including various proctotrupoids, ichneumonoids,

stephanoids, trigonaloids and megalyroids (see Bradley, 1908). Rasnitsyn (1980) classified the Evanioidea within an infraorder, the Evaniomorpha in the Apocrita, initially comprising the Megalyroidea, Trigonalioidea, Ceraphronoidea and Evanioidea (Rasnitsyn, 1980), but later with the Stephanioidea also included (Rasnitsyn, 1988). The Evaniomorpha was based on a single autapomorphy, the articulation of the midcoxae with the mesopostepisternum in which the mesopostepisternum overlays the midcoxae and joins with its surface instead of its base. At least one further study has provided some additional support for this concept (Johnson, 1988).

In addition to the extant Evaniidae, Gasteruptiidae and Aulacidae, two extinct fami-

lies, the Praeaulacidae (Rasnitsyn, 1972) and the Cretevaniidae (Rasnitsyn, 1975), known from Upper Jurassic-Lower Cretaceous and Lower-Middle Cretaceous strata respectively, have been placed in the Evanioidea. The synapomorphy which has been proposed to unite both extinct and extant families is the possession of a small propodeal foramen placed far above coxal foramina (e.g., Königsmann, 1978; Rasnitsyn, 1988). However, the high attachment of metasoma to mesosoma may be homoplasious as it also occurs in several ichneumonoid, cynipoid and chalcidoid lineages. The loss of all functional metasomal spiracles except for the eighth was also proposed for grouping the Evanioidea (Gauld & Bolton, 1988), but this is also the case in Stephanoidea, Megalyroidea and in many other parasitic wasps (Gibson, 1986; Rasnitsyn, 1988).

Unfortunately, the relationship of Evaniidae to the other evanioid families is ambiguous. Whitfield et al. (1989) reported that the presence of two large submedial third phragmal lobes is a synapomorphy for the Gasteruptiidae and Aulacidae but failed to find any evidence uniting these with the Evaniidae. Quicke & Fitton (1995) described similar and possibly synapomorphic ovipositor bending mechanisms in both Gasteruptiidae and Aulacidae but again this was not found in evaniids. Gibson (1985) suggested that the Evaniidae may be more closely related to some proctotrupoids than any other group and the unique structure of the antennal cleaner suggests a close relationship between the Evaniidae and Trigonalidae (Basibuyuk & Quicke, 1995). However, recent molecular studies have provided some evidence for the monophyly of the Evanioidea (Dowton & Austin, 1994; Dowton et al., 1997).

Evaniidae are distinguishable from the rest of the Hymenoptera by the following combination of characters: large head adpressed to prothorax; more or less elbowed antenna with long scape; short and high, strongly sclerotized mesosoma; presence of a jugal lobe in both wings; lack of 2m-cu and 3rs-m in fore wing; short, usually laterally compressed metasoma with first segment forming a petiole, high attachment of petiole (1st metasomal segment) to propodeum and short,

mostly concealed, ovipositor (Bradley, 1908; Townes, 1949; Riek, 1970; Rasnitsyn, 1980, 1988; Gauld & Bolton, 1988). The family contains some 17 genera and 500 described species and is cosmopolitan in distribution, though the majority of species occur in the tropics (Huben, 1995). The classification of the group is still largely based on Kieffer (1912) and the validity of many genera is questionable (Huben, 1995). Several extinct species have been described belonging to *Brachygaster* (Brischke, 1886) and *Evania* (*Parevania*) (Burmeister, 1832; Brues, 1933) from Baltic amber (Upper Eocene) and a Mesozoic fossil (Aptian), *Praevania*, which could be assigned to Evaniidae has been described by Rasnitsyn (1991). Members of the family are also reported from the Mexican and Dominican (Miocene or, possibly, uppermost Oligocene) amber deposits (Poinar, 1992).

Here, we describe three new species belonging to two new genera from New Jersey amber which are Turonian in age and therefore the oldest known evaniids. The specimens are generally well-preserved, forewing venation and antennal segmentation are features that can be seen best, parts of the heads, legs and metasomas, are obscured by either a thick layer of foggy material or the remains of other biological objects, rendering many important features invisible. Nevertheless, those characters that are visible are sufficient to distinguish them from all other known evaniid taxa.

Family Evaniidae Latreille, 1802

GRIMALDIVANIA BASIBUYUK, FITTON & RASNITSYN, NEW GENUS

Diagnosis: (Female and male). Size small (body length less than 3 mm) (fig. 1a, 2a). Head almost as wide as mesosoma. Antenna 13-segmented, elbowed in female (though this could be an artifact), with scape long, first flagellar segment longer than following segments (flagellum slightly thickened beyond middle in female) (fig. 1a); inserted below mid height of eye, with toruli closer to each other than to eye margin. Occipital carina present and complete. Forewing with 7

closed cells (fig. 1b). Vein Rs&M more or less straight, not strongly angled at junction of Rs and M, meeting R well before pterostigma; meeting M+Cu much closer to pterostigma than to wing base, with Rs&M junction only slightly closer to R than to M+Cu (fig. 1b). Veins Rs+M and 1m-cu meet before junction of veins Rs and M thus forming a second, short horizontal abscissa of Rs+M. Vein 1m-cu straight. First subdiscoidal cell slightly higher than its width (fig. 1b). Vein 2cu-a very short. Pterostigma with vein 2r-rs arising slightly beyond its mid length. Vein 2r-rs short, as long as height of pterostigma basally (fig. 1b). Vein 1m-cu slightly outwardly convex. First submarginal cell much larger than first discoidal cell. Second submarginal cell short, almost quadrate. Marginal cell short, slightly longer than pterostigma, far distant to wing apex, with Rs curving evenly at 2rs-m toward fore margin of wing. Hind wing jugal lobe present (fig. 2b). Notauli indicated (definitely present in male but not observed in female) (fig. 2a). Mesopleuron possibly crenulate posteriorly (difficult to observe). Metanotum short, hidden under mesoscutellum. Propodeum with reticulate rugose sculpturing. Mid- and hind coxae adjacent, separated from each other by less than 0.5 times of mid coxa length (fig. 1a, 2a). Hind legs not very elongate; hind tibia not swollen (fig. 1d); tarsi rather thick basally and thin apically, with small claws. Metasoma of moderate size, longer than mesosoma and hind trochanter combined, spindle-shaped, not laterally compressed, with petiole stout, shorter than mesoscutellum. Ovipositor not exerted.

Type species: *Grimaldivania ackermani* Basibuyuk, Fitton & Rasnitsyn, new species

Etymology: Combining Grimaldi with *Evania*; in recognition of Dr David Grimaldi's contribution to fossil insect studies.

Discussion: The new genus could be related to *Evaniella* on the basis of three characters used to key out *Evaniella*: forewing with 6-7 enclosed cells (see fig. 3a-e), close mid- and hind coxae and face not striate (Huben, 1995). The first two

characters are not autapomorphies of *Evaniella* and are shared with few other genera, and only the last character defines the genus. Although we cannot see the full face of fossils described here, the part seen is smooth and this may indicate that the face is without striate sculpturing. However, the distance between the mid- and hind coxae is much shorter in the new taxon and the wing venation features described above do not permit inclusion in *Evaniella* (fig. 3a cf. 3d). A new genus is, therefore, erected to accommodate a distinct set of plesiomorphic and apomorphic characters and give recognition to transition of these features. Some of the characters are features of putatively archaic evanioids, e.g., Praeaulacidae, Baissinae (Gasteruptiidae), Cretevaniidae and living Aulacidae, such as (i) the large 1st submarginal cell (fig. 3a, 3e cf. 3f-h) (ii) more or less straight vein Rs&M (Fig. 3a, 3e cf. 3f-h), (iii) vein Rs&M reaching vein R far from the pterostigma (fig. 3a, 3e cf. 3f-h), (iv) vein Rs&M joining vein M+Cu closer to pterostigma than to wing base (fig. 3a, 3e cf. 3f-h), (v) metasoma comparatively long, spindle-shaped, not laterally compressed and with short and stout petiole. In contrast, the 13-segmented, more or less elbowed female antenna with a long scape; the short, high thorax that would seem to permit only limited head mobility; the absence of veins 2m-cu and 3rs-m (fig. 3a, 3e cf. 3b-d); the upwardly curved forewing vein Rs; and presence of a hind wing jugal lobe, are all derived features of the Evaniidae. However, some of these distinguishing characters are not as definitive as implied in the family diagnosis. For example, in some species of a few extant genera (*Szepligetella*, *Brachygaster*, *Evaniella*, *Brachevania* and *Evaniiscus*) vein Rs&M meets vein R before the pterostigma (e.g., fig. 3d), though generally far less so than in the new genus. On the other hand, vein Rs is angled forward at vein 2rs-m in various Gasteruptiidae. Despite these shared characters, the fossil under description can be assigned to the Evaniidae, because all the character states shared with Aulacidae and other lower Evanioidea (Praeaulacidae, Gasteruptiidae: Baissinae) are plesiomorphic. Within the Evaniidae the new genus differs from all others in the characters discussed

above, and additionally differs from putatively more primitive genera (those retaining larger body size and more complete wing venation), concealed metanotum, relatively short hind legs, small claws, and a forewing with vein Rs curving evenly at 2rs-m toward fore margin of wing.

Grimaldivania ackermanni Basibuyuk,
Fitton & Rasnitsyn, new species
Figs. 1, 2, 3a

Description: Holotype. Female. Head smooth, not coarsely sculptured dorsally. Antenna with scape twice as long as pedicel, first flagellar segment longest, remaining segments becoming gradually shorter distally, the penultimate being approximately two-thirds the length of first; apical segment slightly shorter than first flagellar segment (fig. 1a). Lateral ocellus separated from margin of eye by its diameter (fig. 1c). Eye large (almost 2/3 as long as head), widening slightly ventrally. Temples narrow (fig. 1a). Forewing vein M+Cu arched. Abscissa of vein Rs+M distinct. Vein M nebulous basally. Anal vein nebulous along posterior margin of first subdiscoidal cell. Vein 2rs-m spectral. Second submarginal cell narrow, its height and width more or less equal (fig. 1b). Femur and tarsi more or less equal in length, tibia only slightly shorter; fore- and mid coxae long, slightly longer than half length of femur. Petiole hardly twice as long as wide, shorter than mesoscutellum; arising less than its own length from anterior margin of propodeum. Metasoma elongate, spindle-shaped, more than twice as long as deep, deepest behind its midlength (fig. 1a).

Measurements (mm): Length of head and body 2.60, forewing 1.55, scape 0.25, pedicel 0.12, 1st, ultimate and penultimate flagellomeres 0.17, 0.14 and 0.11 respectively, hind femur 0.72, hind tarsus 0.72, hind femur height 0.15, metasoma length 1.20, height 0.55.

Male: Similar to female, except forewing vein 1m-cu relatively straight. Hind wing vein M+Cu present (fig. 2b) but cannot be observed in female because of hind wing orientation. **Measurements (mm):** Length of head and body 2.65, forewing 1.62, scape 0.18, pedicel 0.08, 1st, ultimate and penultimate flagellomeres 0.15,

0.14 and 0.10 respectively, hind femur 0.74, hind tarsus 0.74, hind femur height 0.16, metasoma length 1.20, height 0.45.

Types: Holotype, female: American Museum of Natural History no. NJ-253. Locality and horizon: USA, New Jersey, Middlesex Co., Sayreville, White Oaks Pit. Turonian. In 20x8x4 mm, yellow-brownish, embedded and polished amber piece.

Paratype, male: American Museum of Natural History no. NJ-690. Locality and horizon: USA, New Jersey, Middlesex Co., Sayreville, White Oaks Pit. Turonian. In 10x10x2 mm, pale yellow, embedded and polished amber piece.

Etymology: Named after Fred Ackerman, collector of the holotype.

NEWJERSEVANIA BASIBUYUK,
QUICKE & RASNITSYN, NEW GENUS

Diagnosis: Male. Small size (body length less than 5 mm) (fig. 4a, 5a, 6a). Head wider than mesosoma. Antenna 13-segmented, slightly elbowed, not conspicuously thickened beyond middle. Scape wider than pedicel, flagellar segments more or less equal in length, slightly shortened towards apex (e.g., fig. 4b, 5c). Antennal insertions at about mid point of eye (fig. 5a), with toruli closer to each other than to eye margin. Occipital carina present. Forewing with 6 or 7 enclosed cells (fig. 4c, 5b). Vein 2rs-m complete (fig. 5b) or retained only as a very short anterior stub (fig. 4c), nebulous when complete (fig. 5b). Vein M nebulous basally. Rs&M vein more or less straight, meeting R before pterostigma; meeting M+Cu closer to pterostigma than to wing base. Vein Rs&M arising much closer to R than to M+Cu. First discoidal cell not smaller than first submarginal cell. First subdiscoidal cell quadrate or only slightly shorter than high (fig. 4d, 5b). Vein 2cu-a conspicuously long (fig. 4d, see arrow). Vein Rs meeting Rs+M before 1m-cu, forming a short abscissa at the junction of first and second submarginal and first discoidal cell (fig. 4d, 5b). Vein 1m-cu straight. Vein 1cu-a interstitial to slightly post-furcal. Marginal cell

approximately 1.5 times longer than pterostigma, almost reaching wing apex; vein Rs bending at 2rs-m toward wing fore margin, otherwise more or less straight. Second submarginal cell long, about 1.5 times longer than high (fig. 4d, 5b). Hind wing jugal lobe present (fig. 5a). Notauli present (fig. 4a, 5a). Metanotum evident but short. Metasoma moderately sized, not much longer than mesosoma, spindle-shaped, not laterally compressed.

Type species: *Newjersevania casei* Basibuyuk, Quicke & Rasnitsyn, new species.

Etymology: Combining New Jersey with *Evania*; in reference to the type locality.

Composition: *Newjersevania casei* Basibuyuk, Quicke & Rasnitsyn, new species and *N. nascimbenei* Basibuyuk, Quicke & Rasnitsyn, new species.

Discussion: This new genus has several characters that are shared with primitive evanioids such as *Grimaldivania*, new genus, including (i) forewing with long basal cell, (ii) vein Rs&M meeting vein R far from the pterostigma, (iii) vein Rs&M joining vein M+Cu closer to pterostigma than to wing base, (iv) relatively large 1st submarginal cell, (v) long, spindle-shaped, not laterally compressed metasoma with relatively short and stout petiole. The new genus differs from *Grimaldivania* in several characters: forewing with relatively long marginal and 2nd submarginal cells, vein 2cu-a long (as in extant genera) (fig. 4d, arrow), vein 1m-cu straight, joining M after division of Rs and M, metanotum conspicuous but short, and relatively longer petiole. Within the Evaniidae the new genus differs from all others in several characters. In other evaniids, the 1st subdiscoidal cell is always much longer than high, the 1st discoidal cell is shorter than the 1st submarginal cell, and vein 1m-cu curves outwards (*Grimaldivania*) or arches inwards (extant genera) but is never as straight as in *Newjersevania*. Apart from several supposed autapomorphies which defines the family as discussed above, 13-segmented, more or less

elbowed antenna with long scape, short and high mesosoma, absence of vein 2m-cu and 3rs-m, and upwardly curved forewing vein Rs are features shared with other Evaniidae, and are putative synapomorphies for the family and therefore, this new genus can be assigned to the Evaniidae (see above for more detailed discussion).

Newjersevania casei Basibuyuk,
Quicke & Rasnitsyn, new species
Fig. 4

Description: Holotype. Male. Head large, wider than mesosoma. Antenna with scape about four times longer than pedicel, flagellar segments more or less equal in length but slightly shortened towards apex, first and apical flagellar segments equal in length (fig 4b). Distance of lateral ocellus to margin of eye greater than its diameter (fig. 4a). Notauli present. Forewing with 6 enclosed cells; vein 2rs-m incomplete, only a very short anterior stub of it retained. Vein Cu curved notably posteriorly towards apex. Hind wing with vein M+Cu, with 6 distal hamuli. Petiole moderately long, about three times as long as wide, much longer than mesoscutellum (fig 4c). Metasoma more or less oval-shaped, slightly less than twice as long as high; highest beyond midlength. Aedeagus visible (tip of metasoma is obscured by air bubble).

Measurements (mm): Length of body 4.70, forewing 3.10, scape 0.40, pedicel 0.10, length of 1st and ultimate flagellomeres 0.27, penultimate, 0.20, hind femur and tarsi 1.50, hind femur height 0.32, metasoma length 2.10 (including petiole, 0.80), height 1.10.

Type: Holotype, male: American Museum of Natural History no. NJ-78. Locality and horizon: USA, New Jersey, Middlesex Co., Sayreville, White Oaks Pit. Turonian. In somewhat triangular, 20 mm long, yellow, embedded and polished amber piece.

Etymology: Named after Gerard R. Case, collector of the holotype.

Newjersevania nascimbenei Basibuyuk,
Quicke & Rasnitsyn, new species
Figs 5, 6

Description: Holotype. Male. Head moderate in size, only slightly wider than mesosoma (fig. 5a, 6a). Antenna with scape twice as long as pedicel, second flagellar segment longer than first, remaining segments gradually shortened except apical segment; apical segment as long as second flagellar segment (fig. 6b) or longer (fig. 5c). Ocelli small, distance of lateral ocellus to eye margin twice its diameter. Forewing with 7 enclosed cells; vein 2rs-m complete and nebulous (fig. 5b, 6c). Hind wing with 5 distal hamuli; with vein M+Cu. Petiole enlarged distally, almost twice as long as wide distally; slightly longer than mesoscutellum (fig. 6a). Metasoma spindle-shaped, less than twice as long as high; highest approximately at midlength. Aedeagus visible (fig. 5a, 6d).

Measurements (mm): Holotype. Length of body 2.80, forewing 1.90, scape 0.16, pedicel 0.08, 1st, 2nd, ultimate, and penultimate flagellomeres 0.13, 0.14, 0.18 and 0.10, respectively, hind femur 0.72, hind tarsus 0.86, hind femur height 0.17, metasoma length 1.30, height 0.66.

Paratype: Length of body 2.90, forewing 2.10, scape 0.16, pedicel 0.08; 1st, 2nd, ultimate, and penultimate flagellomeres 0.15, 0.17, 0.16 and 0.10 respectively; hind femur 0.78, hind tarsus 0.81, hind femur height 0.16; metasoma length 1.27, height 0.64.

Type: Holotype, male: American Museum of Natural History no. NJ-706. Locality and horizon: USA, New Jersey, Middlesex Co., Sayreville, White Oaks Pits. Turonian. In approximately 10x10x3 mm, pale yellow, embedded and polished amber piece.

Paratype, male: AMNH no. NJ-427E, same deposit as holotype. In approximately rectangular, 10 mm long, dark yellow, embedded and polished amber piece.

Etymology: Named after Paul Nascimbene, collector of the paratype.

Discussion

Most fossil evaniids are known from Baltic (Burmeister, 1832; Brischke, 1886; Brues, 1933), Dominican and Mexican ambers (Poinar, 1992) which date back 15-40 million years (Ma). All these are much younger than *Grimaldivania* and *Newjersevania*, which are approximately 90 Ma. An older fossil that may belong to the Evaniidae has recently been described from the middle Lower Cretaceous of Mongolia (Rasnitsyn, 1991), but its affinity cannot be stated with certainty because of its poor state of preservation. The limited evidence available therefore indicates that the Evaniidae originated early in the Mesozoic, perhaps in the Jurassic.

The fossil specimens under consideration were collected from the same locality and strata and share several characters. However, they are significantly different in several other characters and require classification into two genera. Differences between the new genera include shape and size of the marginal and second submarginal cell of the forewing and vein 1m-cu of the forewing and metanotum and petiole. These differences are too great to be considered as sexual dimorphism by implication from extant genera. Sexual dimorphism is only known in the shape of the antennae, and body coloration (Huben, 1995).

The condition of the fossil specimens, which does not permit observation of many characters, limits discussion on the positions of new genera within Evaniidae. However, the new genera do display several character states which are considered to be plesiomorphic for the Evanioidea as a whole, and also several derived character states shared with the extant and other fossil Evaniidae. In addition, *Grimaldivania* displays some putative autapomorphies such as a concealed metanotum, relatively short hind legs, small claws, and forewing with small marginal cell and with vein Rs curving evenly. It is possibly the sister group to the rest of Evaniidae because of the synapomorphies discussed above combined with its unique features. We were unable to identify any autapomorphies for *Newjersevania*, therefore, at present, it can best be considered as part of the ancestral grade leading to other evaniids.

References

- Basibuyuk, H.H. & D.L.J. Quicke 1995. Morphology of the antenna cleaner in the Hymenoptera with particular reference to non-aculeate families (Insecta). *Zoologica Scr.* 24: 157-177.
- Bradley, J.C. 1908. The Evaniidae, ensign-flies, an archaic family of Hymenoptera. *Trans. Am. Ent. Soc.* 34: 101-194.
- Brischke, D. 1886. Die Hymenopteren des Bernsteins. *Schr. Naturf. Ges. Danzig* 6: 278-279.
- Brues, C.T. 1933. The parasitic Hymenoptera of the Baltic Amber. *Am. Nat.* 67: 385-406.
- Burmeister, H. 1832. Kerfe der Urwelt. *Handb. Ent.* 1: 632-640.
- Crosskey, R.W. 1951. The morphology, taxonomy and biology of the British Evanioidea (Hymenoptera). *Trans. R. Ent. Soc. Lond.* 102: 247-301.
- Dowton, M. & A.D. Austin 1994. Molecular phylogeny of the insect order Hymenoptera: Apocritan relationships. *Proc. Natl. Acad. Sci. USA* 91: 9911-9915.
- Dowton, M., A.D. Austin, N. Dillon & E. Bartowsky 1997. Molecular phylogeny of the apocritan wasps: the Proctotrupomorpha and Evaniomorpha. *Syst. Entomol.* 22: 245-255.
- Gauld, I.D. & B. Bolton (eds). 1988. *The Hymenoptera*. London: British Museum (Natural History)/Oxford Univ. Press.
- Gibson, G.A.P. 1985. Some pro- and mesothoracic structures important for phylogenetic analysis of Hymenoptera, with a review of terms used for the structures. *Can. Ent.* 117: 1395-1443.
- Goulet, H. & J.T. Huber (eds.) 1993. *Hymenoptera of the world: an identification guide to families*. Ottawa: Agriculture Canada, Research Branch.
- Gibson, G.A.P. 1986. Evidence for monophyly and relationships of Chalcidoidea, Mymaridae, and Mymarommatidae (Hymenoptera: Terebrantes). *Can. Ent.* 118: 205-240.
- Hanson, P.E. & I.D. Gauld 1995. *The Hymenoptera of Costa Rica*. Oxford Univ. Press, Oxford.
- Huben, M. 1995. Evaniidae. In: P.E. Hanson and I.D. Gauld (eds.), *The Hymenoptera of Costa Rica*, Oxford Univ. Press, pp. 195-199.
- Kieffer, J.J. 1912. Evaniidae. *Das Tierreich* 30: 1-432.
- Königsmann, E. 1978. Das phylogenetische System der Hymenoptera. Teil 3: Terebrantes (Unterordnung Apocrita). *Deutsche Ent. Zeitschrift* 25: 1-55.
- Johnson, N.F. 1988. Midcoxal articulations and the phylogeny of the order Hymenoptera. *Ann. Ent. Soc. Am.* 81: 870-881.
- Poinar, G.O., Jr. 1992. *Life in Amber*. Palo Alto, CA: Stanford Univ. Press.
- Quicke, D.L.J. & M.G. Fitton 1995. Ovipositor steering mechanisms in parasitic wasps of the families Gasteruptiidae and Aulacidae (Hymenoptera). *Proc. R. Soc. Lond. B* 261: 99-103.
- Rasnitsyn, A.P. 1972. Praeaulacidae (Hymenoptera) from the Upper Jurassic of Karatau. *Paleont. Zh.* 1: 72-87 [in Russian, English translation in *Paleontol. J.* 6 (1): 62-77].
- Rasnitsyn, A.P. 1975. Hymenoptera Apocrita of mesozoic. *Trudy Paleont. Inst. Acad. Nauk. SSSR* 147: 1-134 (In Russian).
- Rasnitsyn, A.P. 1980. Origin and evolution of Hymenoptera. *Trudy Paleont. Inst. Acad. Nauk. SSSR* 174: 1-191 [English translation 1984. Agriculture Canada, Ottawa].
- Rasnitsyn, A.P. 1988. An outline of evolution of the hymenopterous insects (Order Vespida). *Orient. Insects* 22: 115-145.
- Rasnitsyn, A.P. 1991. Early Cretaceous members of Evaniomorphous hymenopteran families Stigmaphronidae, Cretevaniidae, and subfamily Kotujellitinae (Gasteruptiidae). *Paleont. Zh.* 4: 128-132 [in Russian, English translation in *Paleontol. J.* 25 (4): 172-179].
- Riek, E.F. 1970. Hymenoptera. In: *The Insects of Australia*. Melbourne: Melbourne Univ. Press, pp. 867-959.
- Townes, H. 1949. The Nearctic species of Evaniidae (Hymenoptera). *Proc. U.S. Natn. Mus.* 99: 525-539.
- Townes, H. 1950. The Nearctic species of Gasteruptiidae (Hymenoptera). *Proc. U.S. Natn. Mus.* 100: 85-145.
- Whitfield, J.B., N.F. Johnson & M.R. Hamerski 1989. Identity and phylogenetic significance of the metapostnotum in nonaculeate Hymenoptera. *Ann. Ent. Soc. Am.* 82: 663-673.

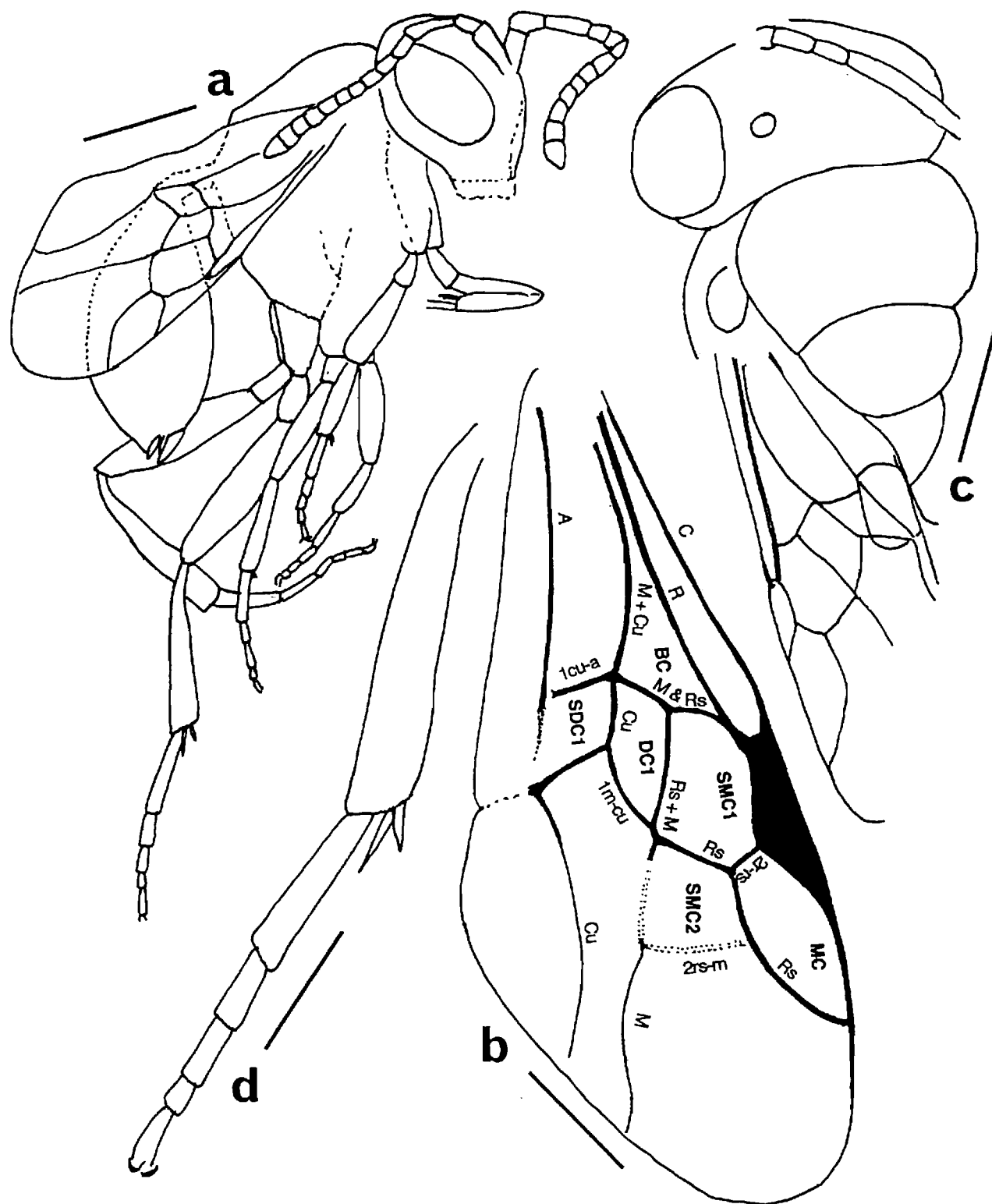


Fig. 1. *Grimaldivania ackermani* new species, holotype (Scales: 0.5 mm). a. Lateral aspect. b. Forewing veins and cells. c. Dorsal aspect. d. Hind tibia and tarsus. Cell names. BC: basal cell. DC: discoidal cell. MC: marginal cell. SDC: subdiscoidal cell. SMC: submarginal cell.

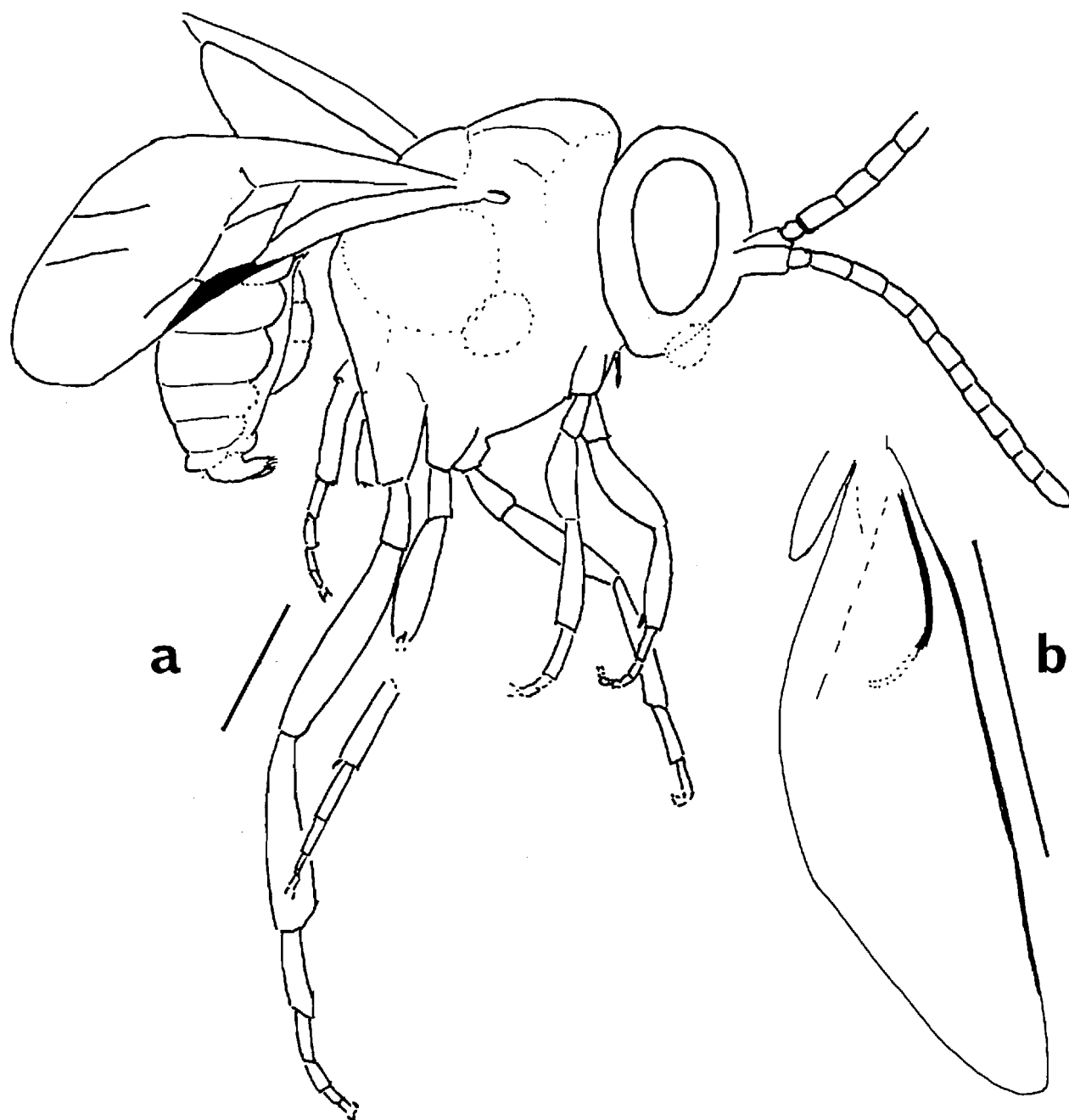


Fig. 2. *Grimaldivania ackermani* new species, paratype (Scales: 0.5 mm). a. Lateral aspect. b. hind wing.

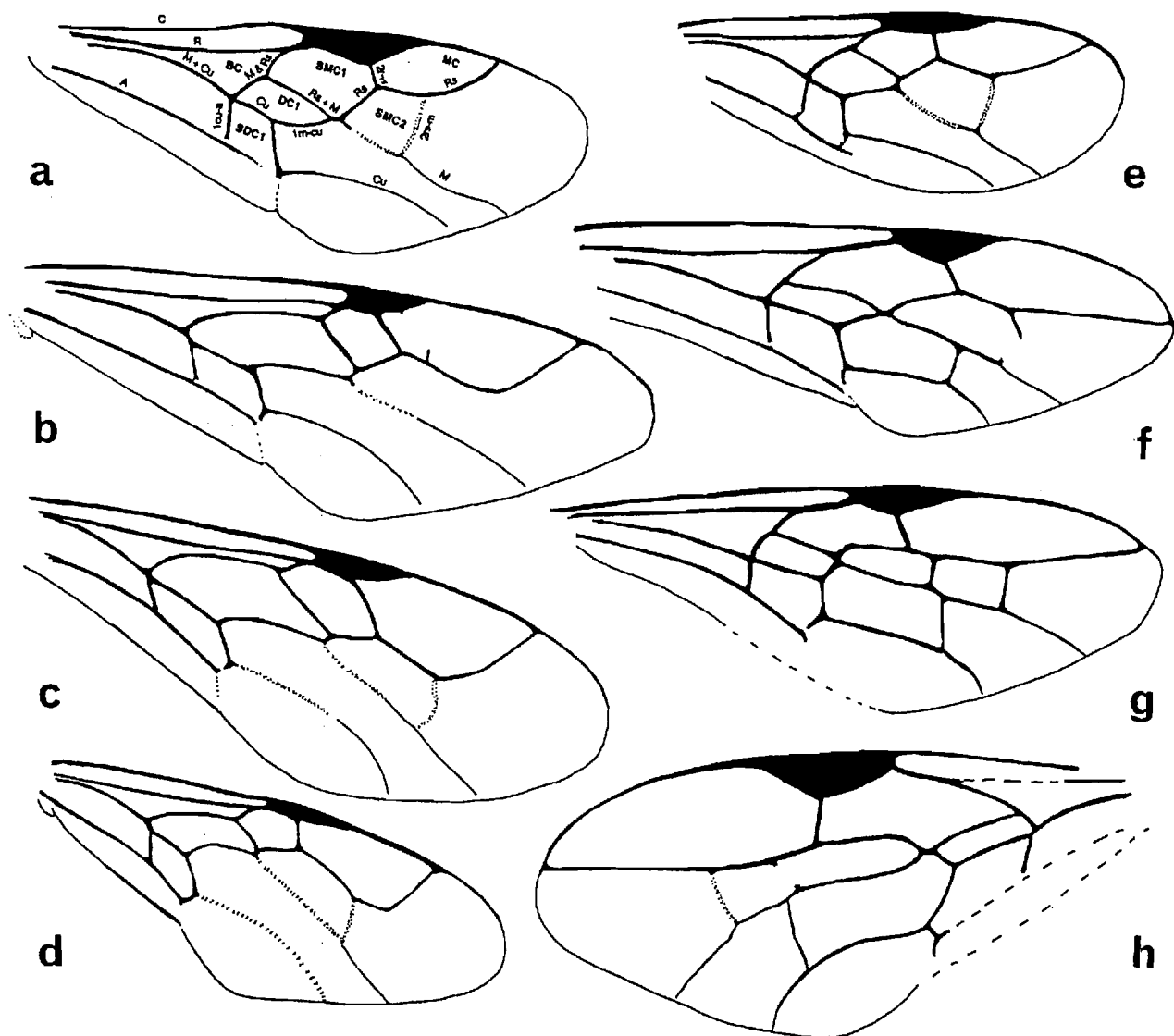


Fig. 3. Forewing venation in some selected taxa of Evanioidea. a. *Grimaldivania ackermani* new species. b. *Evania appendigaster*. c. *Prosevania* sp. d. *Evaniella* sp. e. *Newjersevania nascimbenei* new species. f. *Aulacus* sp. g. gen. sp. (Praeaulacinae, Paleontological Institute, Moscow no. 4270-1544: Lower Cretaceous). h. *Baissa magna* Rasnitsyn, 1991 (Gasteruptiidae s.l.).

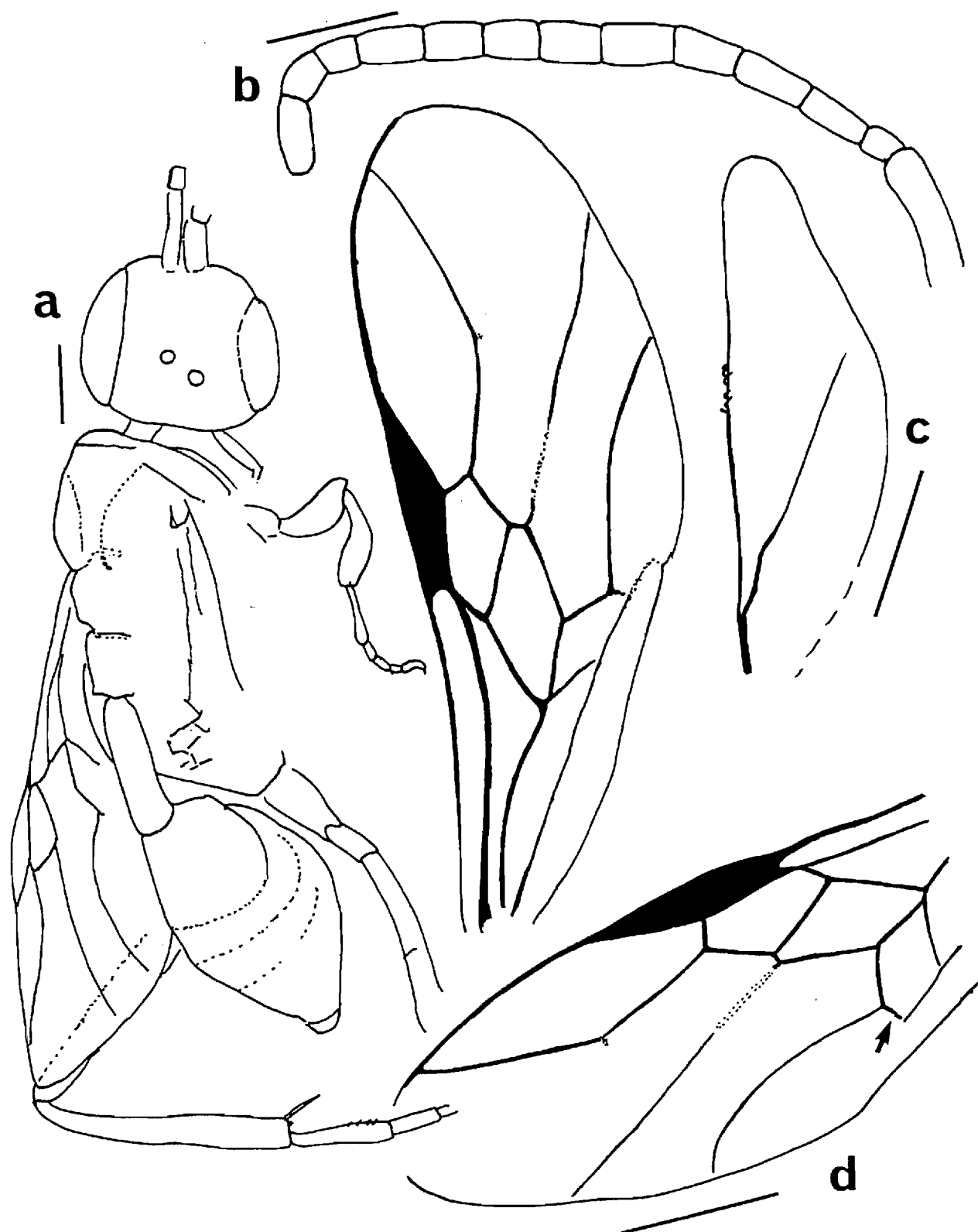


Fig. 4. *Newjersevania casei* new species, holotype (Scales: 0.5 mm). a. Dorso-lateral aspect. b. Antennae. c. Wings. d. Apical aspect of forewing.

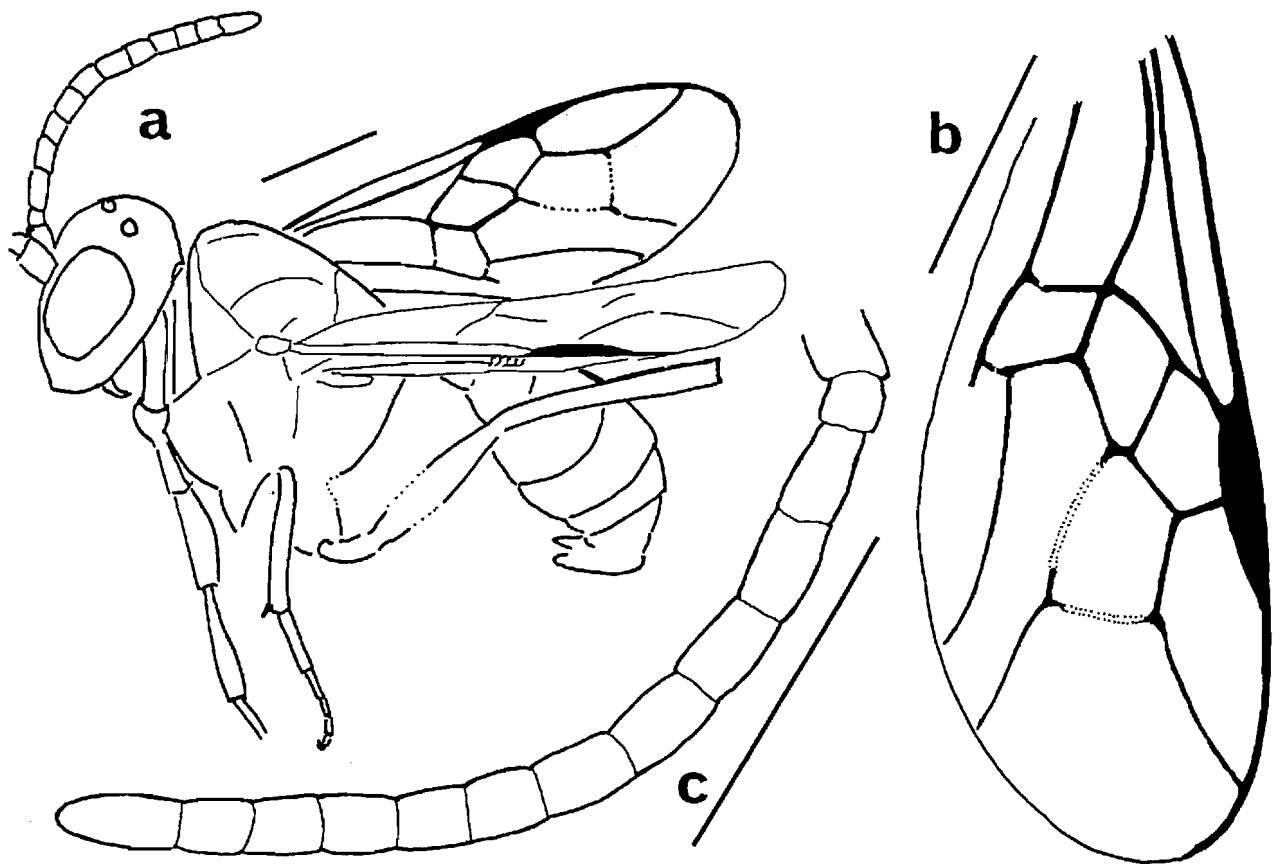


Fig. 5. *Newjersevania nascimbenei* new species, holotype (Scales: 0.5 mm). a. Lateral aspect. b. Forewing. c. Antennae.

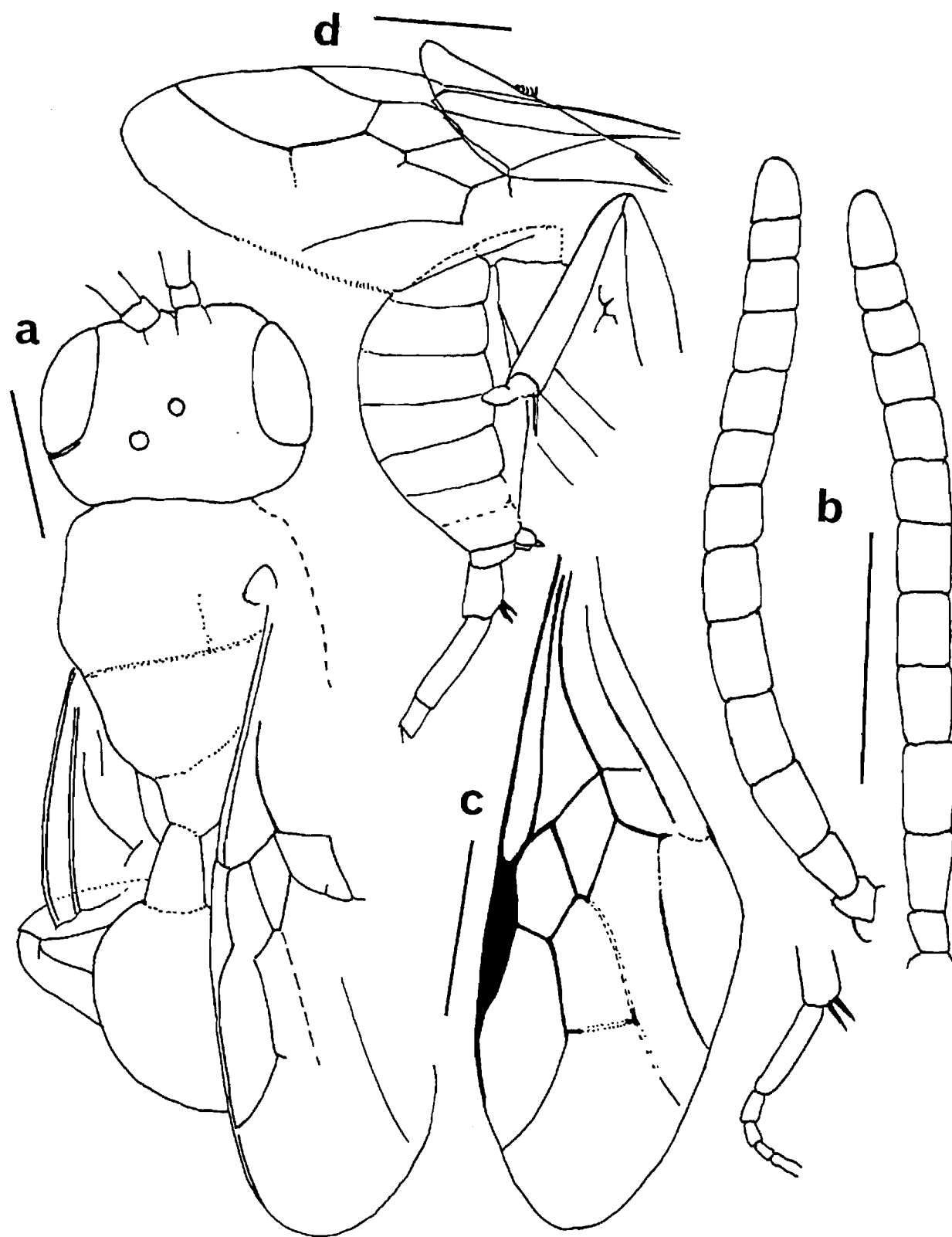


Fig. 6. *Newjersevania nascimbenei* new species, paratype (Scales: 0.5 mm). a. Dorso-lateral aspect. b. Antenna. c. Forewing. d. Metasoma and wings (lateral aspect).