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A New Fossil Species from Dominican Amber of the Living Australian Termite Genus *Mastotermes* (Isoptera: Mastotermitidae)

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ABSTRACT

A new fossil species of termite, *Mastotermes electrodominicus*, is described from Dominican amber. This is the second fossil record from the

New World of the genus *Mastotermes* and the second record in amber of the family Mastotermitidae.

INTRODUCTION

The family Mastotermitidae is today represented solely by the species *Mastotermes darwiniensis* Froggatt, with a natural distribution in the northern half of Australia, where it is restricted principally to moist and tropical forests. In his review of the family Mastotermitidae, Emerson (1965) included the extinct genera *Spargotermes* (Miocene-Pliocene of Brazil) and *Blattotermes* (Eocene of Queensland, Australia, and Tennessee, USA), as well as *Mastotermes*, which has an even

more extensive fossil record, represented by the following species: *M. bournemouthensis* (Upper Eocene of England), *anglicus* (Middle Oligocene of England), *heerii* (Upper Oligocene of Germany), *haidingeri* (Lower Miocene of Yugoslavia), *croaticus* (ibid.), and *minor* (ibid.). Emerson considered *Miotermes* (Miocene of Yugoslavia and Germany) of doubtful validity. More recently, Krishna and Emerson (1983) described *Mastotermes electromexicus*, from the Upper Oligocene amber

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of Chiapas, Mexico, and Nel (1986) described two additional fossil species of Mastotermitidae, *Mastotermes gallica* and *Blattotermes massiliensis*, from the Lower Oligocene of Aix-en-Provence, southern France. Thus, *Mastotermes* once had a much wider distribution than it does today. This paper expands the distribution of Tertiary *Mastotermes* with the description of a new species, *Mastotermes electrodominicus* from amber of the Dominican Republic, on the island of Hispaniola, and offers a striking example of the similarity of the insect faunas preserved in the ambers from the Dominican Republic and Chiapas, Mexico, illustrating the apparent stratigraphic equivalence of the two deposits.

A rather large series of 11 adults and 5 nymphs (entire or portions thereof), contained in 9 pieces of amber, was purchased from several people who had acquired the material in the Dominican Republic, enabling us to examine virtually the entire habitus of the adult and nymph. Unfortunately, exact locality information is missing. A reasonable estimate places the age at Lower Miocene to somewhere in the Oligocene. Sanderson and Farr (1960) originally reported on the existence of the Hispaniolan amber, from the Cordillera Septentrional, north of Santiago between Altamira and Canca; Martinez and Schlee (1984) later added more detailed information. Sanderson and Farr (1960) estimated an age of 23 million years (Upper Oligocene to Lower Miocene), a dating with which Langenheim (1969: 1161, table 1) concurred. More recently, Brouwer and Brouwer (1982) placed most of the amber deposits at the Lower Miocene, based on very cursory lithology, and Baroni-Urbani and Saunders (1982) confirmed this approximate age for one mine by using benthic foraminifera to stratigraphically date the deposits.

The Lower Miocene–Upper Oligocene, however, is a very approximate and certainly average date for the deposits of Dominican amber. Apparently the age can vary tremendously, with deposits from the easterly mines in the Cordillera Septentrional (e.g., Cotui) yielding a much softer, very light yellow “amber” that easily crazes (producing a covering of fine surface cracks). Weller and Wert (1984) and Schlee (1984) described and referred to some of this “amber” in fact as copal, per-

haps no more than 20 to 30,000 years old, and there is general agreement today that this distinctive soft, light “amber” is Recent. Though Lambert et al. (1985) estimated an age of Eocene for the deposits in particular mines (e.g., La Toca), this estimate is based on an extrapolation of chemical radical decay, as well as on color and hardness, as compared to three deposits that were stratigraphically dated. The Eocene date, the present authors feel, is excessively old, and foraminiferal stratigraphy of all of the amber-producing mines should be done to finally dispel controversy over the ages of the deposits. All of the Dominican amber pieces containing *Mastotermes electrodominicus* are quite hard and dark orange and are certainly not from Cotui. A dating of Lower Miocene for *Mastotermes electrodominicus* from the Dominican Republic presently appears reasonable.

The present study has bearing on historical biogeography. In many cases, the insect faunas of the Dominican amber are modern, with many of the species belonging to genera presently distributed throughout the Caribbean (e.g., Wilson, 1985a; Grimaldi, 1987; Baroni-Urbani and Saunders, 1982). Also, many undescribed species of termites in Dominican amber awaiting study belong to modern genera of the families Kalotermitidae, Rhinotermitidae, and Termitidae (Nasutermitinae). There are definite exceptions, however, such as the fossil ant species *Leptomyrmex neotropicus* Baroni-Urbani. Though Baroni-Urbani's (1980) original description of this species in Dominican amber was disputed by Wilson (1985b), who found it quite unlikely that a species belonging to a tribe that is presently restricted to Australia, New Guinea, and the south Pacific could be represented in this amber, later examination of more completely preserved material proved Baroni-Urbani correct (Baroni-Urbani and Wilson, 1987). This distribution pattern is also illustrated by three genera of mycetobiine woodgnats (Diptera: Anisopodidae), *Mycetobia*, *Mesochria*, and *Valeseguya* (Grimaldi, 1991). The latter two genera, in particular, are Old World tropical, with fossil representatives in Dominican amber. There are now three fine examples of groups of insects in the Dominican amber that are obviously relict (with an extant contracted range), and they have similar distri-

TABLE 1
Measurements (mm) of Imagoes of *Mastotermes electrodominicus*, New Species

	Holotype PB270	Paratype PB270	Paratype 11803	Paratype PB266	Paratype PB37	Paratype DR-2-19	Paratype DR V-2
Length of head to tip of labrum	3.27	—	—	—	—	—	2.82
Length of head to side base of mandibles	2.57	—	—	—	2.40	—	2.49
Width of head	2.66	—	—	—	2.50*	—	2.50*
Diameter of eye	0.77	—	—	—	0.74	—	0.68
Eye from lower margin of head	—	—	—	—	—	—	0.34
Length of ocellus	0.33	—	—	—	0.33	—	0.24
Width of ocellus	0.17	—	—	—	0.20	—	0.20
Median length of postclypeus	0.36	—	—	—	—	—	—
Width of postclypeus	1.04	—	—	—	—	—	—
Median length of pronotum	1.93	—	—	—	1.91	—	1.83
Maximum length of pronotum	2.07	—	—	—	2.15	—	1.99
Width of pronotum	3.07	—	—	—	3.07	—	2.62
Length of hind tibia	2.57	—	—	—	—	—	2.62
Length of forewing scale	2.41	—	2.31	—	2.50	—	2.65
Length of forewing from suture	19.75	—	19.88	—	—	—	—
Width of forewing	6.05	—	5.50	5.81	—	5.98	—
Length of hind wing from suture	—	—	19.48	—	—	—	—
Width of hind wing	—	6.14	—	6.03	—	6.05	—

* approximate

butions: *Leptomyrmex*, some mycetobiine woodgnats, and *Mastotermes*.

***Mastotermes electrodominicus*,**
new species
Figures 1–15

IMAGO (figs. 4–15): Head, pronotum dark brown; legs brownish, lighter than head or pronotum; antennae yellowish brown; wings brownish. Head moderately pilose, longest bristle about 0.12 mm long; pronotum moderately pilose, with bristles of varying length along margins and disc; wings with a row of very short hairs along costal margin and very short hairs on membrane. Head roundish, width with eyes greater than length to side base of mandibles; surface rough and slightly depressed dorsally (as in *darwiniensis* and *electromexicus*). Y-suture not visible. Fontanelle absent; small whitish spot in position of fontanelle not visible in holotype, visible in specimen AMNH DR-V-2, as in *darwiniensis*. Antennal fossa ridge almost touching eye (as in *darwiniensis*). Eyes small, roundish, moderately convex. Ocellus oval, touching eye (as in *darwiniensis*). Postclypeus shorter

than its width, front margin not clearly visible, appearing slightly angular (straight in *darwiniensis* and *electromexicus*). Antenna moniliform, incomplete, with 25-plus articles; second slightly longer than third; fourth shorter than third; fourth subequal to fifth and each remaining article. Pronotum large, flatly arched, dorsally with T-shaped marking, wider than head with eyes (as in *darwiniensis* and *electromexicus*), anterior margin shallowly concave, posterior margin straight, without indentation. Foreleg coxa with a projecting ridge as in *darwiniensis*. Tibial spurs 3:4:4 (as in *darwiniensis*). Foretibia without thick spines (as in *darwiniensis*); middle tibia with three lateral spines and one additional spine; hind tibia with at least three lateral spines (in *darwiniensis* middle tibia with two to three lateral and two additional spines, hind tibia with four to five lateral spines). Tarsus with five articles. Arolium present. Cerci with five articles (as in *darwiniensis*). Wing membranes with well-developed reticulations (archidictyon). Humeral suture arcuate, as strongly curved as in *darwiniensis*. Forewing with Sc, R₁, R₂, R₃, Rs, and M strongly and equally sclerotized to each other;

TABLE 2
Measurements (mm) of Imagoes of Eight Species of *Mastotermes*

	1*	2*	3*	4*	5*	6*	7*	8*	9*
Length of head to tip of labrum	2.82-3.27	—	3.57-3.88	3.20-4.00	3.55	—	—	—	—
Length of head to side base of mandibles	2.49-2.57	—	2.99-3.15	—	—	—	—	—	—
Width of head	2.50-2.66	4.15	3.30-3.48	2.80-3.20	3.00	—	—	—	—
Diameter of eye	0.68-0.77	0.80	0.96-1.06	—	—	—	—	—	—
Length of ocellus	0.24-0.33	0.25	0.30-0.40	—	—	—	—	—	—
Width of ocellus	0.17-0.20	0.15	0.20-0.26	—	—	—	—	—	—
Eye from base of antennal fossa	touching	0.07	touching	touching	—	—	—	—	—
Eye from ocellus	touching	0.10	touching	—	—	—	—	—	—
Median length of postclypeus	0.36	0.30	0.41-0.48	—	—	—	—	—	—
Width of postclypeus	1.04	—	1.24-1.32	—	—	—	—	—	—
Median length of pronotum	1.83-1.93	—	2.07-2.24	—	—	—	—	—	—
Maximum length of pronotum	1.99-2.15	2.50	2.49-3.15	1.90-2.00	—	—	—	—	—
Width of pronotum	2.62-3.07	—	3.48-4.06	2.80-3.80	4.25	—	—	—	—
Length of hind tibia	2.57-2.62	—	3.40-3.56	—	—	—	—	—	—
Length of forewing scale	2.31-2.65	—	2.98-3.40	2.80-3.20	—	—	—	—	—
Length of forewing from suture	19.75-19.88	—	23.59-27.00	20.80	—	—	27.00	—	—
Width of forewing	5.50-6.05	—	7.30-9.25	7.80-8.80	—	18.00	8.00	—	6.89
Length of hind wing from suture	19.48	—	23.90-26.00	—	—	—	30.50	28.00	—
Length of hind wing with suture	—	—	26.62-27.55	—	22.50	—	—	—	19.92
Width of hind wing	6.03-6.14	—	8.30-8.90	8.50-8.80	6.50	9.00	10.10	10.00	6.90
Antennal articles	25 plus	—	29-32	—	—	—	—	—	—

1* *electrodominicus*; 2* *electromexicus*; 3* *darwiniensis*; 4* *anglicus*; 5* *gallica*; 6* *minor*; 7* *haidingeri*; 8* *croaticus*; 9* *boumemouthensis*.

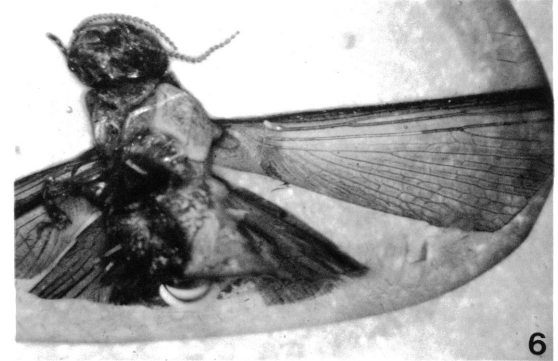
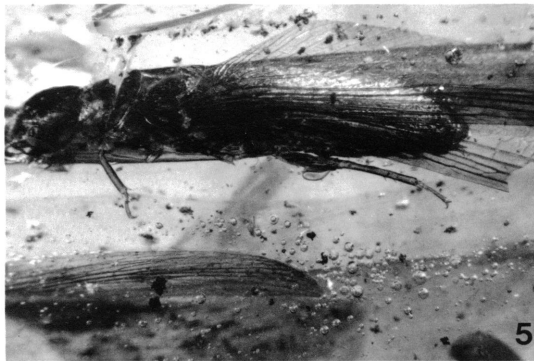
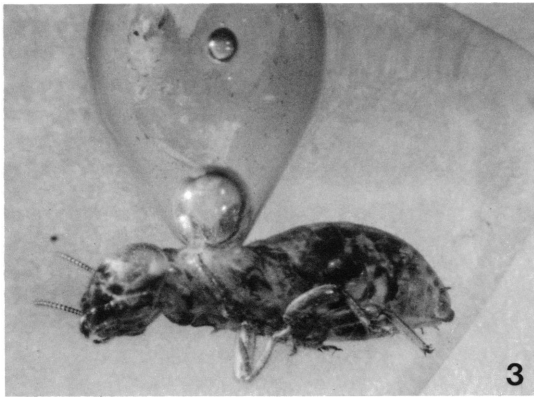
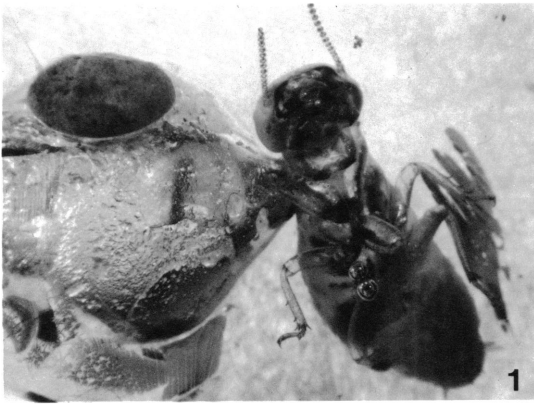
Cu weaker than all other veins; Sc short and single, in specimen AMNH 11803, 3.32 mm in length from suture; R₁, R₂, R₃ separate and single; Rs with three to five superior branches to costal margin; M almost parallel and closer to Rs than to CuA, with two su-

perior and two inferior branches joining apical margin; CuA with eight to nine inferior branches joining lower margin; CuP short, reduced. Hind wing with anal lobe, characteristic of family Mastotermitidae; Sc longer than in forewing; R₁ separate, single; R₂₊₃ fused, branching out of Rs (as in *darwiniensis*); M branching from Rs close to wing scale; CuA with five to six branches, some with secondary branches; CuP single (as in *darwiniensis*); A₁ with six to nine branches. A₂ with several branches, not clearly visible under folded anal lobe.

NYMPHS (LARVAE) (figs. 1-3): (description based on five nymphs without wing pads [larvae] belonging to different instars): Head and pronotum with several short bristles; legs with numerous hairs of varying length, bristles and several short spines. Small eye spot faintly visible. Labrum wider than long, with sides and front curved (similar to those of *electromexicus* and *darwiniensis*). Antenna moniliform, incomplete, with 19-plus articles, second article longer than third, third longer than fourth. Pronotum saddle-shaped, with a large

TABLE 3
Measurements (mm) of Nymphs of *Mastotermes electrodominicus*, New Species

	PB267	PB269
Width of head	2.49	2.82
Length labrum	0.58	0.66
Width of labrum	0.66	0.74
Length of postclypeus	0.33	0.33
Width of postclypeus	0.99	1.07
Median length of pronotum	1.16	1.24
Width of pronotum	2.08	—
Length of fore tibia	1.53	1.49
Length of middle tibia	1.58	1.49
Length of hind tibia	1.99	1.66
Length of cercus	0.36	0.32
Length of stylus	0.28	0.24



Figs. 1–6. Photomicrographs of *Mastotermes electrodominicus*, n. sp. 1–3: Nymphs. Large bubbles emanating from thorax (1,3), commonly seen in nymphs, are presumably large quantities of methane resulting from cellulose metabolism. 1: PB.267. 2: PB.533. 3: PB.269. 4–6: Imagoes. 4: Portion of PB.266 (paratype piece), showing wings and alates of a different termite. 5: Left lateral habitus of DR-V-2. 6: Ventral view of anterior half and portions of wings of PB.37.

frontal lobe (similar to those of *electromexicus* and *darwiniensis*); front margin rounded, without indentation in middle; sides straight, narrowing posteriorly; posterior margin straight. Foreleg coxa with a projecting ridge

with spiny protrusions (similar to that of *darwiniensis*; see fig. 34: pl. xvii; Silvestri, 1909). Fore and middle femora and tibia each with a longitudinal groove and two rows of short spines (15–19) along edges of groove, double



Fig. 7. Composite photomicrograph of *M. electrodominicus*, n. sp., PB.270, with an almost entire adult (holotype, right), and portion of another (left).

row of spines thicker and more dense in fore femora and tibia; middle tibia with two thick lateral spines above spurs. Tibial spurs 3:4. Tarsus with five articles. Cercus with five articles; length about 0.36 mm. Stylus long, about 0.28 mm.

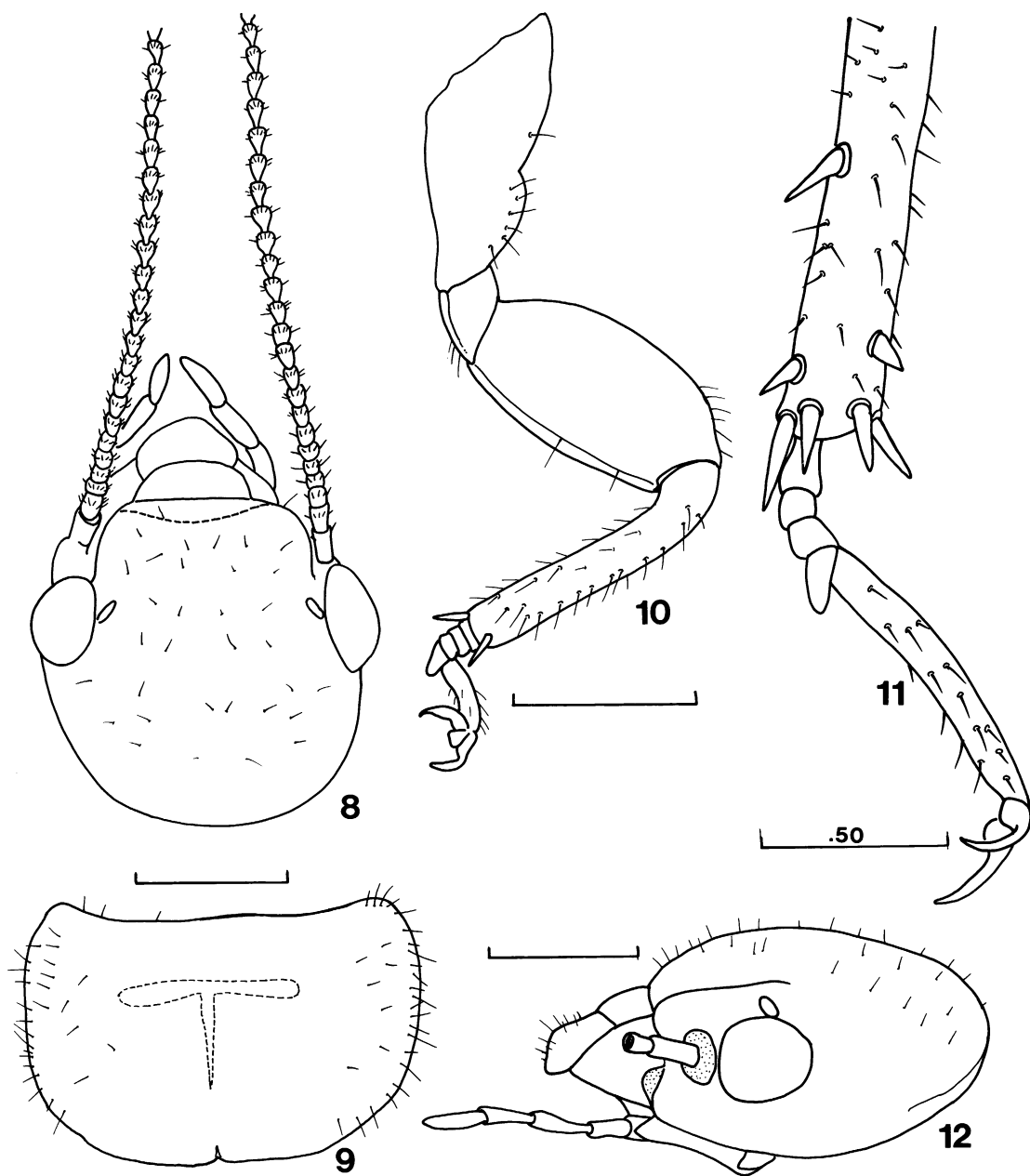
COMPARISONS AND DIAGNOSIS: The imago of *Mastotermes electrodominicus*, new species, can be distinguished from that of *M. electromexicus* Krishna and Emerson in the following respects: the head is much narrower (2.50–2.66 mm vs. 4.15 mm), the eyes are slightly smaller (0.68–0.77 mm vs. 0.80 mm), the ocellus is touching the eye (in *electromexicus* 0.10 mm from eye), the pronotum is shorter (1.99–2.15 mm vs. 2.50 mm). The imago of *M. darwiniensis* Froggatt is larger than that of *M. electrodominicus* in all measurements (see table 2). For comparisons of measurements with other species, see table 2.

SPECIMENS AND TYPE LOCALITY: Specimen AMNH PB.270, male winged imago with left wing partially missing (holotype); in addition to holotype, wing fragments of two individuals and part of lower abdomen showing cerci and parts of middle and hind leg; Dominican Republic amber, specific locality not known; purchased by Paul F. Burke in Santo Domingo. AMNH PB.37, anterior half of imago with basal portions of wings present (paratype); Dominican Republic, specific locality not known; purchased by Paul F. Burke in

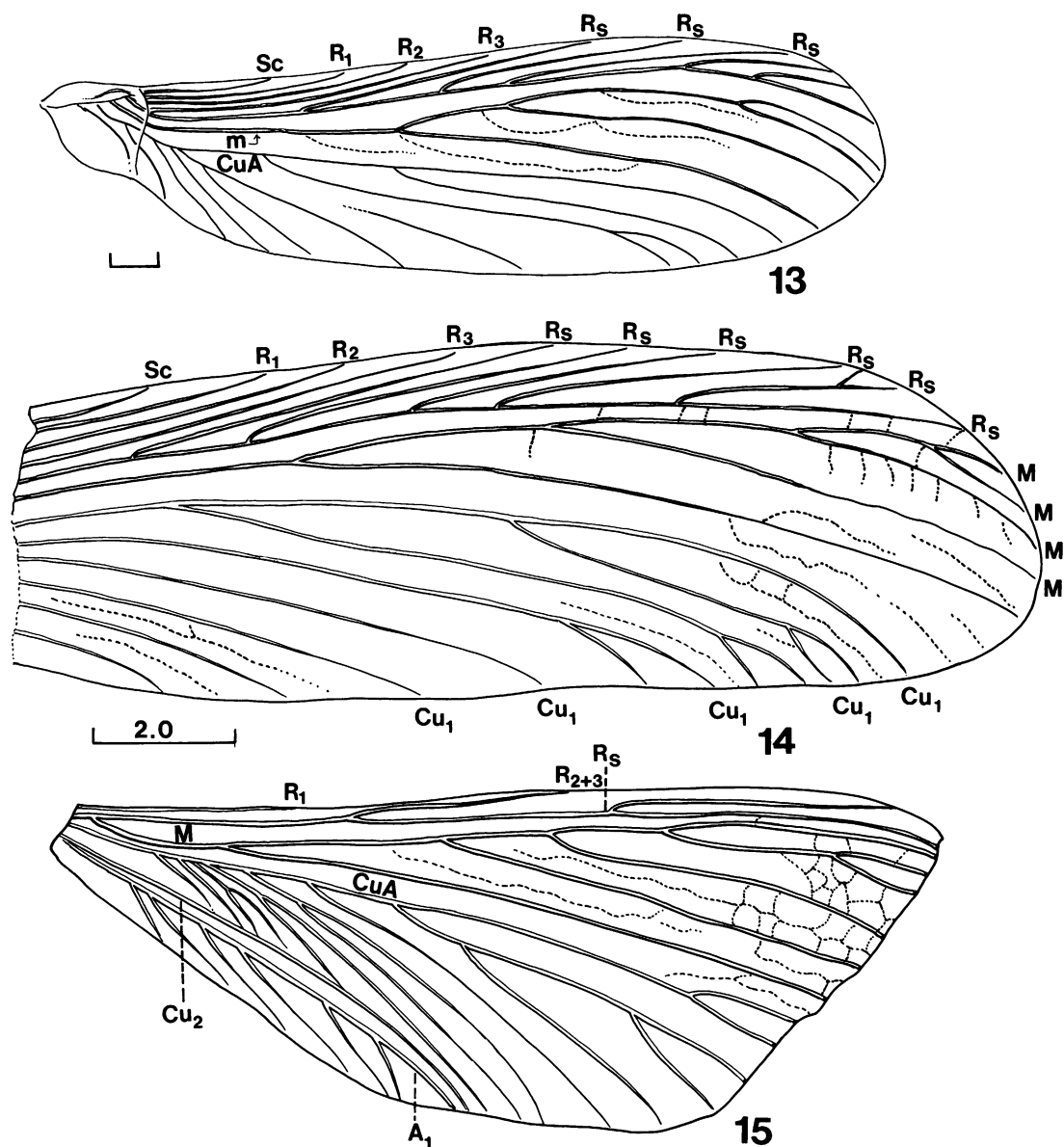
Santo Domingo. AMNH 11803, imago with head and pronotum missing (paratype); Dominican Republic, La Toca, Santiago Province; purchased from J. Brodzinsky. AMNH PB.266, portions of wings (paratype); Dominican Republic, specific locality not known; purchased by Paul F. Burke in Santo Domingo. AMNH DR-2-19, wings only (paratype); Dominican Republic, mines near Santiago, Santiago Province. AMNH DR-V-2, female imago with partial wings and abdomen (paratype); Dominican Republic, specific locality not known; purchased from Francisco Valeriano. AMNH PB.268, imago without head, pronotum or apical portion of wings missing (paratype); Dominican Republic, specific locality not known; purchased by Paul F. Burke in Santo Domingo. AMNH PB.533, three nymphs (paratypes); Dominican Republic, specific locality not known; purchased by Paul F. Burke in Santo Domingo. AMNH 267 and 269, nymphs (paratypes); Dominican Republic, specific locality not known; purchased by Paul F. Burke in Santo Domingo.

The holotype imago, and paratypes imagoes and nymphs are deposited in the American Museum of Natural History.

ETYMOLOGY: The name *electrodominicus* means fossil amber from Dominican Republic (electro is from the Greek *elektron*, "amber").



Figs. 8–12. Portions of imagoes of *M. electrodominicus*, n. sp. 8,9: Dorsal view of head and pronotum of holotype, PB.270. 10: Left foreleg of PB.37. 11: Hind leg of PB.268. 12: Left lateral view of head of DR-V-2. Scales are in mm and represent 1.0 mm unless otherwise indicated.



Figs. 13–15. Wings and portions thereof of *M. electrodominicus*, n.sp., with most crossveins omitted. 13: Holotype forewing of PB.270, scale = 1.0 mm. 14: Portion of forewing of PB.266. 15: Portion of hind wing of PB.266. Abbreviations: A₁, first anal; CuA, anterior cubitus; Cu₁, branches of CuA; Cu₂, posterior cubitus; M, media; R₁, first radius; R₂, second radius; R₃, third radius; R₂₊₃, joined second and third radius; Rs, radial sector; Sc, subcosta.

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