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A Remarkable New Species of *Ogcodes* (Diptera: Acroceridae) in Dominican Amber

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ABSTRACT

Four specimens of a distinctive new species of acrocerine fly are described as *Ogcodes exotica*, preserved in Oligo-Miocene amber of the Dominican Republic. The fossil species appears most closely related to several Old World species of *Ogcodes*, based on distinctive, clavate hind tibiae

and tergal mounds (structure of the antennae and wing venation unquestionably places it in the cosmopolitan genus *Ogcodes*). However, features of its cervical region are found in the African genera *Meruia* and *Sabroskya*.

INTRODUCTION

The family of obligate internal parasitoids of spiders, the Acroceridae, is one of contrasts. Although the family has only 500 known species and 50 genera, its morphology is exceptionally diverse. It is undoubtedly a monophyletic lineage, based not only on the distinctive life history, but also on a suite of morphological characters: adult flagellomeres fused into a single flagellum; lower calypter extremely large; and a wing membrane with very fine pleating. Woodley (1989) grouped the acrocerids with the nemestrinids on the basis of hypermetamorphosis. Nemestrinid larvae are also parasitoids (but on

grasshoppers and beetles). The bee flies (family Bombyliidae) have the same life history.

Nemestrinids were described by Rohdendorf (1968), in Jurassic sediments of Russia, so this would imply that the acrocerids are equally ancient, based on sister-group dating. In fact, an acrocerid has been described from the same Jurassic beds of Karatau (Ussatchov, 1968), but the preservation of *Archocyrtus gibbosus* is not complete, especially for the head. The venation of *Archocyrtus* is most similar to that of certain acrocerines, especially *Acrocera*, but there are some features unlike any found in living members of the

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family. Huge gaps exist in the fossil record: the next oldest fossils are in the Baltic amber from the upper Eocene-lower Oligocene, ca. 40 million years old (Hennig, 1966, 1968).

In a family of such apparent antiquity, a fossil from the Oligo-Miocene (25–30 million years old) contributes little toward understanding basal relationships. Rather, the importance of such a young fossil provides information on the origins and stasis of species-level taxa, and biogeography.

Amber from the Dominican Republic lies in marine sediments northeast of Santiago, in extensively uplifted terrain. The only mine to have been stratigraphically dated (with benthic Foraminifera) is the Palo Alto mine, dated as 23 million years old (Baroni-Urbani and Saunders, 1980). Since the amber obviously does not lie in its original milieu, this is a minimum age, although it can safely be assumed that the age is hardly greater than this.

MATERIALS AND METHODS

Most Dominican amber specimens available for study to the scientific community are purchased from dealers, who themselves acquire the specimens from the campesinos who mine the material. With the exception of a few dealers, virtually all of the amber pieces become mixed, so that it is nearly impossible to trace the source of an amber piece to one of dozens of mines. The exception is that the light, soft "copal" from the eastern mines (Bayaguana, Cotui) is easily distinguished from the darker, heavily polymerized material (true amber) from the hills surrounding Santiago. Chemical fingerprinting, using pyrolysis-gas chromatography, has not revealed any consistent differences among amber from the different mines. Thus, the best and most conservative estimate is that any true Dominican amber is approximately 25 million years old. Certainly, published claims (e.g., Scarbrough and Poinar, 1992) that particular fossils sold commercially originate from the La Toca mines (based simply on color) and are, therefore, Eocene in age, have virtually no basis. Methods for preparation, microscopic examination, and photography of the amber specimens are given in Grimaldi (1993). Morphological terminology follows

that established in the Manual of Nearctic Diptera; wing vein nomenclature follows that of Hennig (1968). Length of the wing was taken from the very base of the wing to the tip.

ACKNOWLEDGMENTS

Thanks are extended to Dieter Schlee and Ettore Morone, for loaning specimens of *O. exotica* in their care; to Norman Woodley (USDA/SEL) and Evert Schlinger for original discussions on the placement of this bizarre species; and to Manuel Perez and Jake Brodzinsky, for allowing me to sort through their amber fossil caches. NSF grant BSR 9020102 funded the field and laboratory work on Diptera living in the Caribbean and those fossilized in Dominican amber. David Barraclough kindly lent the types of *Sabroskya*. He, Norman Woodley, and Evert Schlinger provided helpful critiques of the manuscript.

DESCRIPTION

Ogcodes exotica, new species

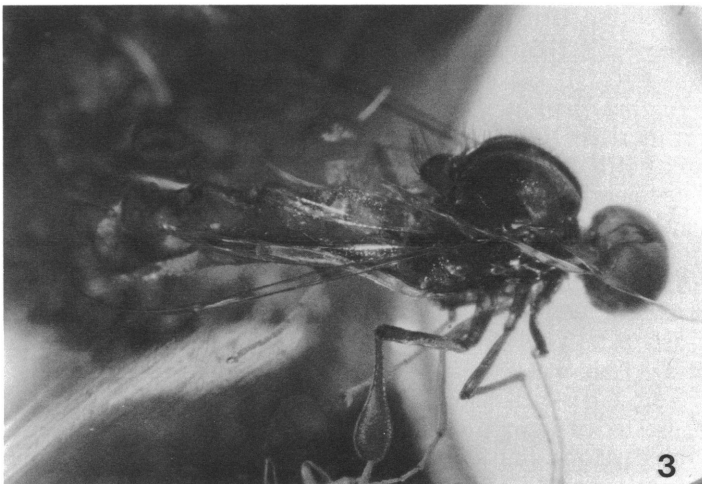
Figures 1–4, 10–13

DIAGNOSIS: Thorax relatively small and not extremely arched; distinct cervical region present; abdomen slender (not dorsoventrally flattened), abdominal tergites 2–5 each with a central mound, bearing tuft of fine, erect setae (e.g., figs. 2, 4); venation typical of *Ogcodes*, with crossvein m-cu present; hind tibia clavate, with apical half enlarged to 3–4 × diameter of proximal end. Proboscis vestigial. Known from four males.

DESCRIPTION: Measurements: see table 1.

Head: Ocellar triangle slightly raised, median ocellus lost. Dorsal margins of eyes contiguous to level of antennae; hind margin of eye with slight indentation, dorsal and ventral facets undifferentiated in size. Proboscis vestigial. Antenna with long, thin flagellum having slightly swollen apex; apical setulae unapparent; antennae situated ventrally, almost near oral margin.

Thorax: Distinct cervical region present, this area not hidden behind the head; positioned between enlarged postpronotal lobes. Postpronotal lobes widely separated. Mesonotum not strongly arched; with black me-



Figs. 1-3. Photomicrographs of *Ogcodes exotica*, n. sp. 1. AMNH DR 8-88. 2. Morone Coll. no. 853. 3. Holotype, AMNH DR-11-8.

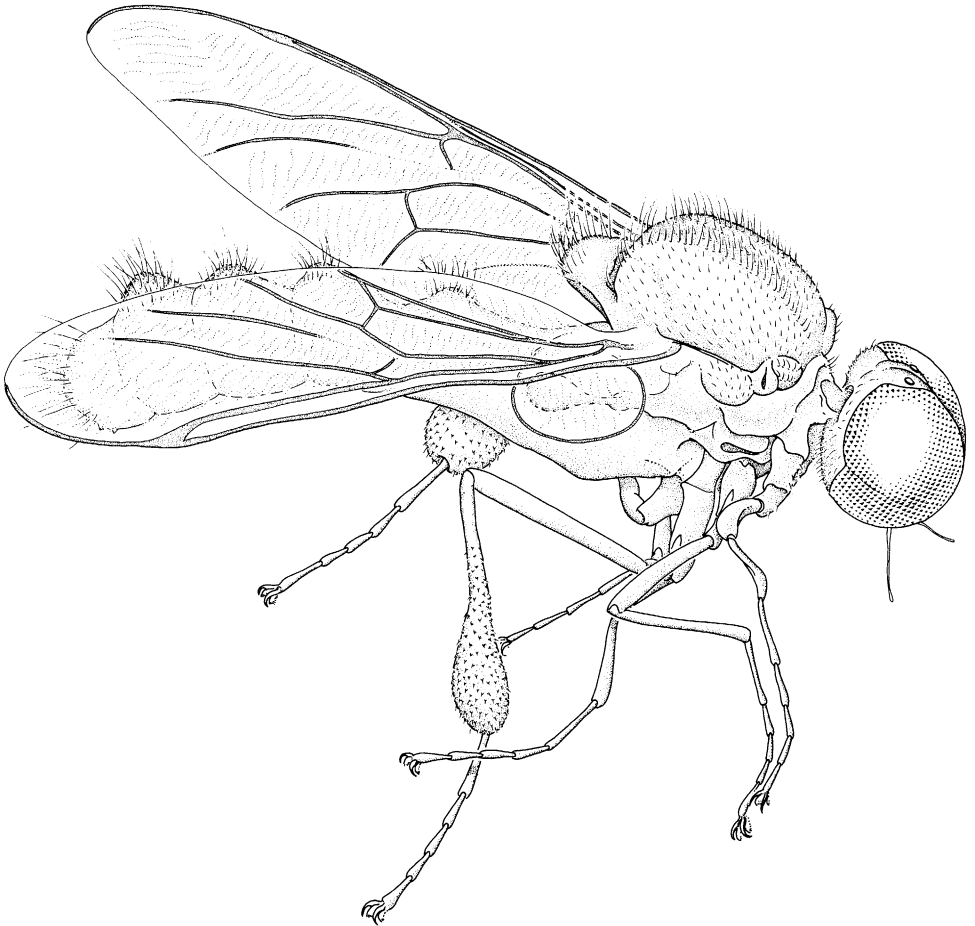


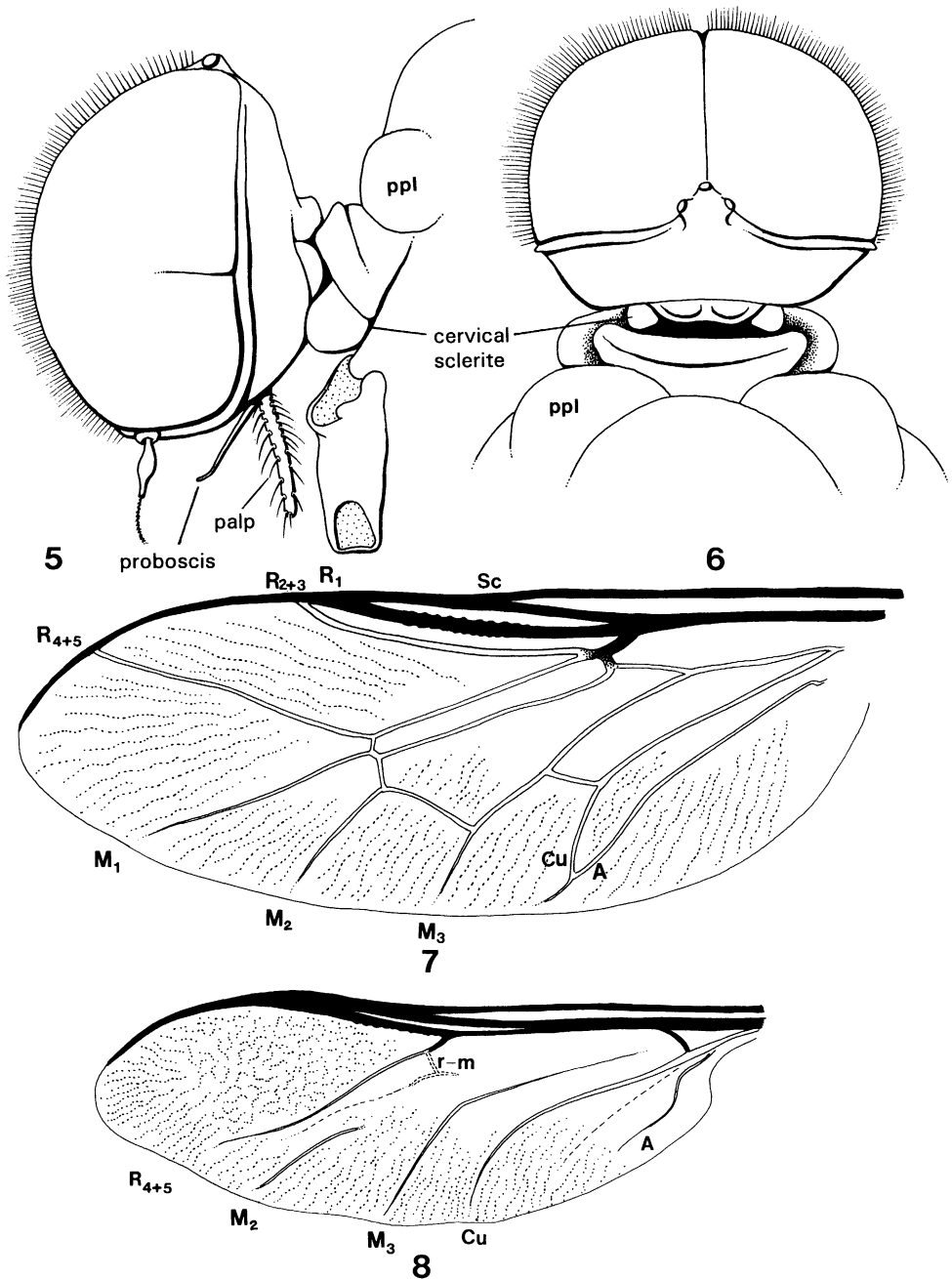
Fig. 4. Habitus illustration of holotype, AMNH DR-11-8.

dian stripe and several rows of fine, erect acrostichal setae that increase in length posteriorly. Posterior rim of scutellum with similar fine, erect setae. Legs slender. Hind tibia clavate, the diameter of the apical half 3–4× that of the proximal half; with numerous fine, stiff setulae on short, tubercular bases. Claws and pulvilli large. Wing with fine pleating typical of acrocerids; costal vein extended to tip of wing, slight swelling where vein $R_1 +$ meets costal vein. Vein R_{4+5} with slight kink, not quite reaching posterior margin of wing. Crossvein r-m slanted strongly anteriorly; incomplete, not reaching vein M_3 . Vein M_2 incomplete: not reaching wing margin, present only as a fold at level of crossvein r-m. Apex of vein M_3 not reaching margin of wing;

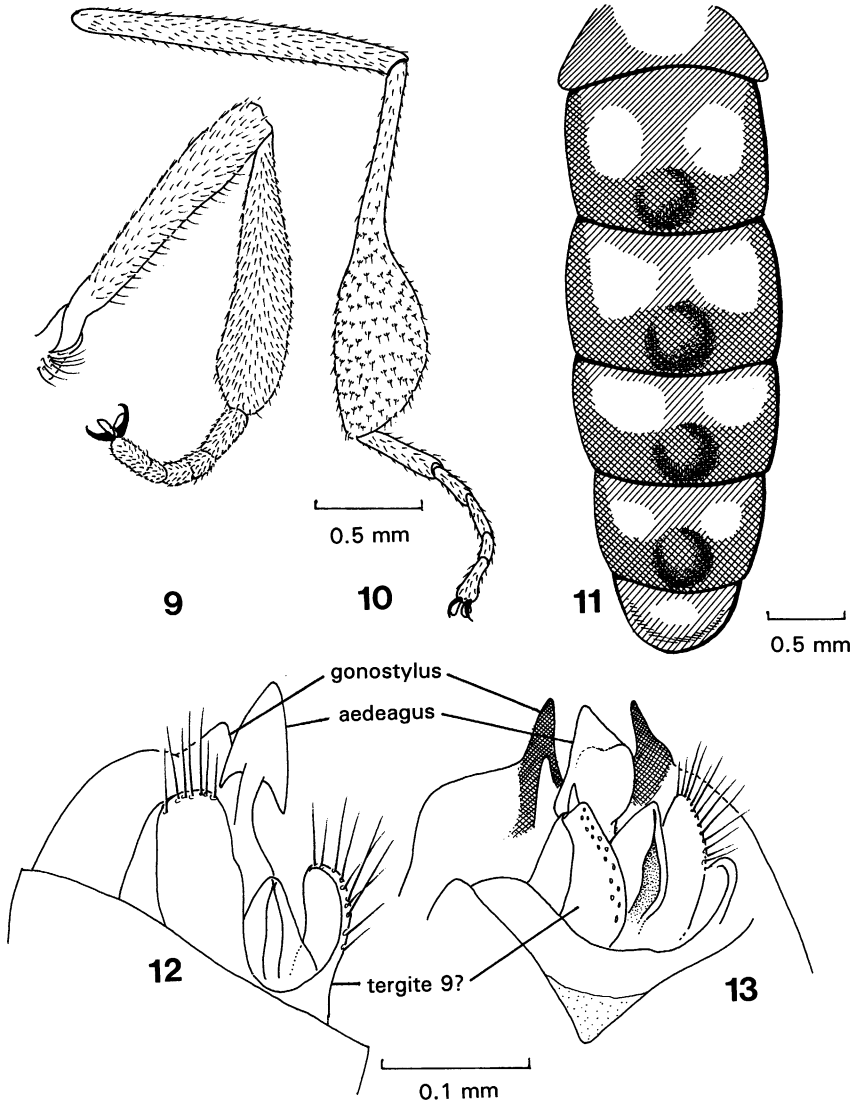
crossvein m-cu present, well developed. Vein Cu meeting anal vein before wing margin, forming a long triangular cell, cup.

Abdomen: Rather long and slender, with tergites 2–5 each raised with central mound bearing tuft of long, fine, erect setae. Apical tergite also with tuft of long, fine setae. Color pattern seen on Stuttgart specimen, as shown in figure 11. Genitalia observed on two specimens, as figured (figs. 12, 13): Distiphallus arrowhead-shaped.

TYPES: Holotype: AMNH DR-11-8, a male in a drop-shaped piece of clear yellow amber from Dominican Republic, 16 × 10 mm (figs. 3, 4). Paratypes: AMNH DR-8-88 (fig. 1), in a large chunk of yellow amber, with several unpolished surfaces; Staatliches Museum für



Figs. 5–8. Comparative structures on extant Acroceridae. 5–7: *Sabroskya palpalis* (holotype). 5, 6. Head and anterior portion of thorax (lateral view, 5; dorsal view, 6). ppl, postpronotal lobe. 7. Wing, *Ogcodes clavatus*. Drawing based on a specimen in the Smithsonian Institution from Naivasha, Kenya. The dotted r-m crossvein was not observed in this specimen but it was reported as present in a specimen from Pretoria, South Africa (Schlinger, 1960a: fig. 11). A trace of r-m was reported (Schlinger 1960b: pl. 3, fig. 10), in probably the same specimen as this one from Naivasha.



Figs. 9–13. Features of *Ogcodes exotica* (figs. 10–13) and *O. clavatus* (fig. 9). 9, 10: Hind tibiae. 11. Dorsal view of Stuttgart paratype (DO-5374-H), showing color pattern and position of tergal mounds. 12, 13: Male genitalia. 12. Morone collection, no. 853. 13. Holotype, AMNH DR-11-8.

Naturkunde, Stuttgart DO-5374-H (17 × 9 mm); Morone Collection no. 853(private), in a hemispherical piece 12 × 14 mm.

ETYMOLOGY: From the Greek, *exotikos*, meaning from the outside, alien, foreign, and exotic; in reference to its apomorphic features and apparent Old World relationships.

RELATIONSHIPS

The fossil species is unequivocally placed into the genus *Ogcodes*, on the basis of the

following characters: antennal flagellum with a slight apical swelling (plesiomorphically there is no swelling); antenna located ventrally, near the oral margin (a feature also occurring in *Sabroskya*, *Meruia*, and some other acrocerines); mouthparts (proboscis and palps) absent or vestigial; eyes bare (dense pilosity is plesimorphic and widespread among Acrocerinae); venation highly reduced, such that crossvein r-m is incomplete or entirely absent, and vein M_2 is incomplete

(not reaching the wing margin or to level of crossvein r-m) (e.g., fig. 8).

In fact, several apomorphic features of *O. exotica* link it with a few Old World species. The clavate hind tibia is found in *O. clavatus* Becker (from South and East Africa) and *O. respersus* Séguy (from northern China). I was able to compare the hind tibia of the fossil only with *clavatus* (based on a specimen in the Smithsonian Institution from Naiivasha, Kenya [H.J.A. Turner, coll., 4-40, C.I.E. 12838]). The hind tibia in *clavatus* is not as abruptly swollen as in *exotica* (cf. figs. 9, 10), and *clavatus* also has a cervical region more extended than in other *Ogcodes* (but not to the extent seen in *exotica*). *Ogcodes clavatus*, however, has the stout abdomen typical of virtually all *Ogcodes*, and it lacks tergal mounds. Only three *Ogcodes* species, in fact, have mounds on the tergites: *O. hirtus* Sack (from Iran) with "bituberculate swellings on tergites II-IV" [Schlinger, 1960b: 271]), *O. guttatus* Costa (widespread from South Africa to Italy and India), and *O. orientalis* Schlinger (from Cambodia) (with tergites II and III swollen in the middle). From the cursory accounts of *O. hirtus* and *O. orientalis*, the tergal mounds are fewer than in *O. exotica*, and they are certainly not bituberculate in the fossil. Tergal mounds are common in some philopotine acrocerids, such as *Oligoneura*. This subfamily has a suite of features plesiomorphic to the Acrocerinae, so this dis-

TABLE 1
Measurements (in mm) of *Ogcodes exotica*
Specimens

	Total length	Thorax length	Wing length
AMNH DR-11-8	5.08	1.55	3.73
AMNH DR-8-88	5.05	1.50	3.75
M-853	5.33	1.68	4.33
DO-5374-H	6.21	1.96	4.65

tinctive character has arisen several times in the family. Likewise, the widely separated postpronotal lobes and protrudent pronotal collar seen in the fossil are certainly convergent with what is seen in *Sabroskya* (e.g., *palpalis*, figs. 5, 6) and *Meruia*. In virtually every other respect, such as eye pile, well-developed mouthparts (fig. 5), and the complete wing venation (fig. 7), *Sabroskya* and *Meruia* are plesiomorphic with respect to the fossil and other *Ogcodes*.

The Acroceridae are notorious for rarely being encountered. Thus, it is uncertain if species of *Ogcodes* similar to the fossil will be found living in the Western Hemisphere. At present, the only definitive relationships of the fossil are with Oriental and African species. This is a biogeographic connection that is slowly emerging with the study of organisms fossilized in Dominican amber.

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