

***AIVALYKUS DOMINICANUS* (HYMENOPTERA: BRACONIDAE), A NEW
SPECIES FROM DOMINICAN AMBER**

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Abstract.—*Aivalykus dominicanus*, n. sp., is described from two male specimens preserved in Dominican amber, and represents the first described species of the genus from the Neotropics. The specimens are 15–45 million years old. The new species is remarkable by the elongated abdominal terga (longer than the rest of the body), and is distinguished from the four extant *Aivalykus* species by a more elongated first abdominal tergite and differences in fore wing venation.

Key Words: Braconidae, *Aivalykus dominicanus* n. sp., fossils, Dominican amber

The genus *Aivalykus* Nixon 1938 (Hymenoptera: Braconidae) is placed in the Doryctinae, tribe Hecabolini, and can be distinguished from other genera of the tribe by the following combination of characters: males with elongated abdominal terga, femora not swollen, fore wing with nervulus present, stigmal length greater than 2 times width, radius reaching wing margin, discoides and subdiscoides interstitial. The genus contains four extant species from the Indo-Pacific, Malagasy and Nearctic regions. Males are known from only two species, *A. eclecticus* Nixon (the genotype) and *A. nearcticus* Marsh, that are remarkable for their elongated abdomens (Nixon 1938, Marsh 1965). We have examined two male *Aivalykus* specimens imbedded in Dominican amber. These represent a new species, which is described below.

These specimens originated from mines located in the Cordillera Septentrional, between Santiago and Puerto Plata, in the northern portion of the Dominican Republic. These mines are in the El Mamey Formation (Upper Eocene), which is a shale-sandstone interspersed with a conglomerate

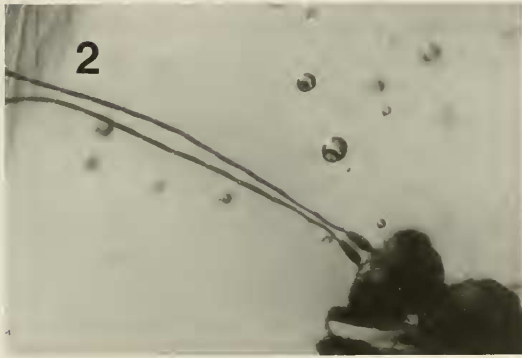
of well-rounded pebbles (Eberle et al. 1980). The exact age of the amber is unknown, but estimates based on various microfossils and chemical analyses provide a range from 15–20 million years (Iturralde-Vinent and MacPhee 1996) to 30–45 million years (Cepek in Schlee 1990).

Aivalykus is the fourth genus (along with *Hecabolus* Haliday, *Polystenus* Forster and *Promonolexis* Brues, all known from European Oligocene specimens) in the Hecabolini represented by fossil remains; additional doryctinine genera with recorded fossils include *Ecphylus* Forster (from Mexican amber, 22–26 mya), *Doryctes* Haliday (from Baltic amber, 40 mya) and *Rhacotus* Ruthe (from Florissant beds, 34 mya) (Carpenter 1992).

Terminology of wing venation follows Marsh et al. (1987). Specimens were studied immersed in corn oil.

***Aivalykus dominicanus* Zuparko and
Poinar, NEW SPECIES**
(Figs. 1–3)

Diagnosis.—Length of first abdominal tergite 2.5 times its apical width, and re-



Figs. 1–3. *Aivalykus dominicanus* (male). 1, Habitus (Scale bar = 1.0 mm). 2, Dorsal aspect of antennae. 3, Fore wings.

current vein of fore wing received into 1st cubital cell by a distance about $\frac{1}{4}$ its own length. The four other described *Aivalykus* species have length of first tergite less than 2.5 times apical width; recurrent vein of *A. eclecticus* is interstitial or received into 2nd cubital cell, that of *A. niger* Granger into the 2nd cubital cell, and that of *A. nearcticus* received into 1st cubital cell by a distance equal to about $\frac{1}{2}$ its length. Additionally, fore wing stigma of *A. dominicanus* is less than 4 times its width (greater than 4 times its width in *A. niger*), in profile dorsum of mesonotum very flat (rounded in *A. nearcticus*), and the sternaulus extends over the greater part of the mesopleuron (absent in *A. sperches* Nixon).

Description.—Male (habitus; Fig. 1):

overall length (inclusive of abdominal terga), 3.5–4.0 mm; body length (exclusive of abdominal terga posterior to last abdominal sternum), 1.5 mm. Apparently bronze, with scape, central portion of frons, propleuron, ventral portion of mesopleuron, propodeum, central portion of anterior sterna and legs (except tarsi), darkened. Head about twice as wide as long, narrower behind eyes than across vertex, vertex finely reticulate. Relative length: width of antennal segments: scape— 4×2.5 , pedicel— 3×2 , first funicular segment (F1)— 8×1 , F2— 9×1 , remaining funicle segments— $6-7 \times 1$ (antennae broken after F11); from dorsal aspect, F1 medially curved markedly inward, F2 curved slightly less so (Fig. 2).

Mesosoma approximately equal in length

to metasoma (exclusive of projecting terga which are about $3 \times$ its length). Apical margin of pronotum with short upturned transparent lamella. In profile, mesonotum anteriorly declining almost perpendicularly to pronotum, remainder of mesonotum, scutellum and anterior part of propodeum very flat, laying along one plane, posterior part of propodeum sloping down at an angle of about 30° . Small lateral dorsal tubercle on mesonotum at junction of longitudinal and perpendicular planes; notauli distinct, converging posteriorly; mesonotum finely reticulate. Mesopleuron smooth, sternaulus extending about 70% length of sclerite. No indication of metanotal spine, propodeum appearing smooth. Fore coxa globular, mid coxa about 1.5 times longer than wide, hind coxa about 2 times longer than wide; femora not swollen, 1st segment of tarsi about twice length of 2nd segment on all legs. Fore wing (Fig. 3): recurrent vein entering first cubital cell by a distance about $\frac{1}{4}$ its own length; length of stigma less than 4 times its width; parastigma appearing as a widening of the basal vein, extending from the stigma about $\frac{1}{2}$ the distance to the cubitus; 2nd abscissa of radius slightly up-curved, forming an obtuse angle of about 130° with first abscissa; nervulus faint, entering 1st discoidal cell; cubitus strongly pigmented for about 40% its length past the 1st intercubitus, very lightly pigmented thereafter; 1st brachial cell open; subdiscoideus strongly pigmented for about 30% its length past 1st recurrent vein, lightly pigmented thereafter.

Length of first abdominal tergum about 2.5 times its width, widening slightly posteriorly; smooth over most of its surface, slightly excavated posteriorly with short longitudinal striations posteriorlaterally. Second abdominal tergum about 2 times long as wide, narrowing slightly posteriorly. All succeeding terga several times longer than wide, more or less parallel sided, terminal tergum triangular, narrowing apically. Terminal sternum extending slightly past second tergum.

Female—Unknown.

Material examined—Holotype, a well-preserved male in a dark yellow piece of amber, $15 \times 7 \times 7$ mm, number H-10-93. From Cordillera Septentrional, between Santiago and Puerto Plata, in the Dominican Republic. Deposited in the Poinar amber collection maintained at Oregon State University, Corvallis, Oregon.

Paratype, 1 ♂, in very poor condition, in a very light yellow piece of amber, $20 \times 11 \times 7$ mm, number H-10-93A. Collection and deposition data same as holotype.

Etymology—The specific epithet *dominicanus*, a neolatin noun in apposition, refers to the Dominican Republic, the country of origin of the specimens.

DISCUSSION

Except for the terminal antennal segments, the holotype is virtually complete and viewable from several angles. The paratype is in extremely poor condition and is recognizable solely by the flattened extended abdominal terga.

Of the four extant *Aivalykus* species, two (*A. niger* Granger and *A. sperches* Nixon) have unknown hosts, and are described only from female specimens. The other two species (*A. eclecticus* and *A. nearcticus*) are associated with bark beetles (Coleoptera: Scolytidae) and characterized by sexually dimorphic abdominal shapes (Beeson 1941, Marsh 1965). Like *A. dominicanus*, the males have greatly elongated abdominal terga, though not to the same degree. In all four extant species the females do not have excessively elongated abdomens.

Elongated ovipositors and/or abdomens are common characteristics of female parasitoids which oviposit in or on hosts (such as bark beetles) hidden deep in a substrate, while the conspecific males often have shorter abdomens. Thus the reversal seen in *Aivalykus* (females with short abdomens and males with long abdomens) is highly unusual. This condition may reflect a male mating-behavior strategy to be the first to mate with emerging females. Similar be-

havior has been found in the Rhyssini (Hymenoptera: Ichneumonidae—parasitoids of deep-boring siricoid wood wasps). Males of *Megarhyssa* and *Rhyssella* (which have bendable abdomens) may increase their reproductive success by being able to remain on the surface of the bark and mate with females before the latter leave the emergence burrow (Godfray 1994). In the case of *Aivalykus*, we theorize the elongated male abdomen reflects the distance the male needs to cover in order to contact the female still in the host gallery. Although one would expect to find a similarly-lengthened abdomen in the female in order to oviposit to the same depth, this is in fact not a necessary condition in bark beetle parasitoids. *Roptrocercus xylophagorum* (Ratzeburg) (Hymenoptera: Pteromalidae) and *Entedon leucogramma* (Ratzeburg) enter bark beetle galleries to oviposit (Reid 1957, Beaver 1966), while *Tomicobia tibialis* Ashmead (Hymenoptera: Pteromalidae) oviposits on adult bark beetles before they enter the galleries (Reid 1957).

ACKNOWLEDGMENTS

We are grateful to P. Marsh (North Newton, Kansas) for confirming the generic identity of *A. dominicanus*. We also thank S. Heydon (University of California, Davis) for the loan of *A. nearcticus* paratypes for study, and Mike Sharkey (University of Kentucky, Lexington), and one anonymous reviewer for their useful comments.

LITERATURE CITED

- Beaver, R. A. 1966. The biology and immature stages of *Entedon leucogramma* (Ratzeburg) (Hymenoptera: Eulophidae), a parasite of bark beetles. Proceedings of the Royal Entomological Society of London (A) 41: 37–41.
- Beeson, C. F. C. 1941. The ecology and control of the forest insects of India and the neighboring countries. The Author, Dehra Dun, India. 1007 pp.
- Carpenter, F. M. 1992. Part R: Arthropoda, Vol. 4: Superclass Hexapoda. In Treatise on Invertebrate Paleontology, Geological Society of America and University of Kansas, Lawrence, Kansas.
- Eberle, W., W. Hirdes, R. Muff, and M. Pelaez. 1980. The geology of the Cordillera Septentrional. Proceedings of the 9th Caribbean Geological Conference, August 1980, Santo Domingo, pp. 619–632.
- Godfray, H. C. J. 1994. Parasitoids: Behavioral and Evolutionary Ecology. Princeton University Press, Princeton, New Jersey. 473 pp.
- Iturralde-Vinent, M. A. and R. D. E. MacPhee. 1996. Age and paleogeographical origin of Dominican amber. Science 273: 1850–1852.
- Marsh, P. M. 1965. The Nearctic Doryctinae. I. A review of the subfamily with a taxonomic revision of the tribe Hecabolini (Hymenoptera: Braconidae). Annals of the Entomological Society of America 58: 668–699.
- Marsh, P. M., S. R. Shaw, and R. A. Wharton. 1987. An identification manual for the North American genera of the family Braconidae (Hymenoptera). Memoirs of the Entomological Society of Washington 13, 98 pp.
- Nixon, G. E. J. 1938. A new genus of Hecabolinae and a note on the genus *Telebolus* Marshall (Hym., Braconidae). Proceedings of the Royal Entomological Society of London (B) 7: 152–156.
- Reid, R. W. 1957. The bark beetle complex associated with lodgepole pine slash in Alberta. Part II—Notes on the biologies of several hymenopterous parasites. The Canadian Entomologist 89: 5–8.
- Schlee, D. 1990. Das Bernstein-Kabinett. Stuttgarter Beiträger für Naturkunde, Ser. C., No. 28: 1–100.