

A new stingless bee from the tertiary amber of the Dominican Republic (Hymenoptera; Meliponini)

by

Alvaro Wille* and Leland C. Chandler**

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The discovery of a new stingless bee in amber from the Dominican Republic constitutes the second fossil record of this group of bees in the Western Hemisphere. The first record was from the amber of Chiapas, Mexico (WILLE, 4). The present fossil bee is related to the Old World *Hypotrigona* (*s. lat.*), especially to the group named by MOURE (2) *Liotrigona*, which includes three African species which are usually placed in *Hypotrigona*. Since the fossil differs from *Liotrigona*, as described by Moure, only in slight details, it is placed in that group which is regarded here as a subgenus of *Trigona*. There is some justification in retaining *Liotrigona* as a valid subgenus of *Trigona*, since it may represent the survival of an ancestral group which could have given origin to the other *Hypotrigona* (*s. lat.*).

SYSTEMATIC DESCRIPTION

In order to demonstrate its relation to *Liotrigona* and to facilitate comparison with other groups of *Trigona*, the description has been divided in two sections. In the first section are described only those features that have been regarded as supra-specific characters. Furthermore, these characters are grouped and treated exactly as MOURE (2) has done in his supra-specific classification of the Old World stingless bees. In the second section are described the more specific characters.

* Departamento de Entomología, Universidad de Costa Rica.

** Department of Entomology, Purdue University.

Although the specimens are excellently preserved, a few characters have been difficult to observe because of bubbles, fissures, position of the specimens, and cut angles of the amber. When a measurement or a character cannot be adequately defined, the terms "approximately", "apparently", and "about" have been used.

Trigona (Liotrigona) dominicana, n. sp.

SUPRA-SPECIFIC CHARACTERS

- a) Cuticular surface smooth and polished with punctation sparse and delicate; yellow marks or pale yellow maculations present on lower part of face, on part of legs, pronotal lobe, and very narrow stripes on lateral borders of mesoscutum and scutellum.
- b) Head approximately as wide as thorax, broader than long. Face as wide as eye length; inner orbits slightly concave, converging below. Upper alveolar tangent clearly below mid-face; interalveolar distance approximately as long as alveolorbital distance. Upper part of frons depresso-sulcate, lower part slightly elevated near antennal sockets, without frontal carina.
- c) Clypeus flat, a little broader than twice its length, and as long as one-third of clypeocellar distance ($15 \times 35: 45$); lateral portions of epistomal suture almost straight.
- d) Mandibles bidentate, teeth small. Labrum simple. Malar area a little shorter than flagellar diameter. Gena rounded, narrower than eye in profile.
- e) Vertex not raised behind ocelli, and slightly broader than ocellar diameter; preoccipital edge rounded; ocelloccipital distance a little longer than half orbitoccipital distance; interocellar distance much larger than ocellorbital distance, the latter about two thirds interocellar distance.
- f) Scape conspicuously shorter than alveolocellar distance (25: 38), ending well below lower tangent of median ocellus. Flagellar segments (Fig. 4) about as long as their diameters; second segment slightly shorter than third (5:4:5:5).
- g) Notaulus (prescutal sutures) conspicuous as a narrow line, somewhat similar to mesoscutal line (median sulcus); parapsidal lines very short. Scutellum short, scarcely overhanging metanotum, ending at the same level when seen from above.
- h) Anterior wing (Fig. 5) shorter than body length; pterostigma of moderate size, its length 3.5 times its width, parastigma very short, about half

width of pterostigma. Marginal cell about four times larger than its width, widely open by bleaching of Rs and R. Bifurcation between M. and Cu coincident with origin of cu-a (base of first median cell non-petiolated). Submarginal angle just under 90°; Cu and Cu₂ very weak; Cu₁, 1st m-cu, and submarginal cells virtually absent. Hamuli 5 per wing. Jugal lobe about half length of annal lobe.

- i) Hind tibia (Fig. 3) sub-triangular, three times as long as wide, posterior margin very slightly recurved and angled at distal corner; hairs on posterior margin simple. Corbicula shallow and relatively short. Inner surface with a broad raised pubescent area and a narrow, glabrous, gently depressed margin (3: 9). Penicillus and comb evident, hairs soft.
- j) Hind basitarsus twice as long as broad, about two-thirds width of tibia; inner surface without basal sericeous area.
- k) Propodeum large, bowed; basal area glabrous. Abdomen short, somewhat flat; anterior terga polished.

SPECIFIC CHARACTERS

SIZE: Length 2.95 mm; length of forewing 2.60 mm.

COLOR: General color black or dark brown. The following parts yellow or yellowish: the entire clypeus except for two short, subparallel, longitudinal, brownish to blackish stripes (Fig. 1); supraclypeal or interalveolar area; a triangle at each side of clypeus in space between clypeus and inner rim of compound eye (Fig. 1); ventral side of antenna (dorsal side dark brown); labrum; mandible except a narrow strip at base, which is black, and distal border, which is reddish; posterior lobe of pronotum; a very narrow band along lateral margin of mesoscutum which continues along axilla and posterior edge of scutellum; legs, except posterior and distal border of hind tibia, which is black; outer side of hind basitarsus, which is dark; anterior surface of femora (the surface where the tibia can lie along the femur when the former is bent), which is dark or black, and sometimes a dark brown spot on outer face of hind femur. The distal border of each abdominal tergum is lighter in color, giving the effect of very slight banding.

PUBESCENCE: Very short, longer on scutellum and on ventral part.

PUNCTATION: Very fine (minute) and sparse, slightly granulate, interspaces several times (about three or four) width of punctation. Punctation of front slightly denser than that of mesoscutum. Mesepisternum with middle portion as dense by punctate as mesoscutum, and with punctures becoming denser anteriorly and sparser posteriorly and ventrally.

STRUCTURE: Head broader than width of abdomen (72:53); length of eye 2.5 times breadth; eye length and interorbital distance 47:45:48:38 (length

of eye and upper, median and lower interorbital distances respectively); malar area linear (3), its length 0.6 width of flagellum; interalveolar, alveolorbital, and alveolocellar distances 9:10:38 and transverse diameter of alveolus 7; interocellar distance a little less than three times transverse diameter of median ocellus and much longer than ocellorbital distance (16:10:Ø 6); ocellocipital distance greater than diameter of ocelli, and about two thirds of orbitocipital distance (9:12:Ø 6); anterior border of pronotum slightly concave; scutellum semicircular in contour, its width twice its length (13 × 26).

TYPE LOCALITY: The amber-bearing formations in the Dominican Republic are located, according to SANDERSON and FARR (3), at two principal sites in the Cordillera Septentrional north of Santiago between Altamira and Canca. The specimens were collected below Pico Diego de Ocampo near Pedro García in the Palo Alto de la Cumbre region.

TYPE MATERIAL: Holotype and five paratypes in the Collection of the Illinois Natural History Survey. The Dominican amber is believed by Dr. P. A. Brouwer (Director general de minas y petróleo, Ciudad Trujillo) to be Oligocene in age, but, according to SANDERSON and FARR (3), exact dating remains in doubt pending current investigations.

RELATIONSHIP OF *TRIGONA DOMINICANA* AND ITS POSSIBLE PHYLOGENETIC SIGNIFICANCE

By comparing the supra-specific characters of *T. dominicana* with those of other stingless bees, it is evident that its closest relatives are to be found among the Old World *Hypotrigona* (*s. lat.*). This group has been recently divided by MOURE (2) into several genera: *Pariotrigona*, *Lisotrigona*, *Liotrigona* and *Hypotrigona* proper. Comparing the characters of these groups with those of *T. dominicana*, it is evident that *Liotrigona* stands closest to the fossil bee. *Liotrigona* includes the following three African species: *T. bottegoi* Magretti, from Okahandja (S.W. Africa), Tanganyka (Liwale, S. Province), Cameroon, S. Rhodesia (Victoria Falls), and S. Madagascar (Bekily); *Trigona madecassa* Saussure and *T. voeltzkowi*, both from Madagascar. The characters of *Liotrigona*, as given by Moure, differ very little from those of *T. dominicana*. These differences, which are shown in Table I₂, are slight details of little significance at the supra-specific level, such as those in the integument, the ocellorbital and interocellar distance, the yellow maculation on the lower part of the face, the size of the flagellar segments, the length of the anterior wing and the width of the hind tibia. All these seem too slight to be taken as subgeneric characters. There is, however, one difference which can be regarded as more significant and evident¹: the M-Cu bifurcation is coincident with cu-a in *T. dominicana* (Fig. 5)

¹ However, according to Moure (personal communication) the yellow maculation on the lower part of the face, is a very significant difference.

Table I

Minor differences between Liotrigona and Trigona dominicana

	<i>Liotrigona</i>	<i>T. dominicana</i>
Tegument	Slightly dulled by a relatively dense punctation	Rather smooth and polished
Yellow maculation on face	Absent	Present on lower part
Ocellorbital and interocellar distance	Ocellorbital distance one half interocellar distance	Ocellorbital distance about two thirds interocellar distance
Flagellar segments	Segments slightly shorter than their diameters, the second as long as third	Segments about as long as their diameters, the second slightly shorter than third
Anterior wing	As long as body	Slightly shorter than body
M-Cu bifurcation	Conspicuously after cu-a	Coincident with cu-a
Hind tibia	Two and one-half times as long as wide	three times as long as wide

and conspicuously after cu-a in *Liotrigona*. It should be pointed out, however, that there are other groups of stingless bees which include species differing by such characters. For all these reasons, it seems advisable to include *T. dominicana* in the group *Liotrigona* and to make the slight but pertinent modifications to the description of *Liotrigona*. This group can be kept as a valid subgenus of *Trigona*, since, as it stands now, it includes the fossil and three living but primitive bees, all of which may be the only known representatives of a formerly larger group, ancestral to the other *Hypotrigona*. *Hypotrigona*, taken in the broad sense of Schwarz and Cockerell, is a composite group, well represented in America, Africa, and the Oriental region. Although they all have several common characters, and there is probably some phylogenetic relationship among them, it is also likely that certain of their common characters are indicative of convergence due to small size. Within the group, five main phylogenetic lines or evolutionary levels can be recognized, all of which have been given taxonomic names by Moure: *Liotrigona*, *Hypotrigona* (*s. str.*), *Lisotrigona*, *Pariotrigona*, and the American

Hypotrigonas that can be called by the general name *Trigonisca* and which MOURE (1) further divided into the groups *Leurotrigona*, *Celetrigona*, *Dolichotrigona* and *Trigonisca*. From the evolutionary point of view, the African Hypotrigonas (*Liotrigona* and *Hypotrigona*) are the most primitive, the Oriental species intermediate, and the American ones the most highly specialized. The *Trigonisca* are probably the most divergent of all the Hypotrigonas, as indicated by the great size of the pterostigma, the basally very broad marginal cell, the very narrow clypeus, and the structure of the inner face of the hind tibia, which approaches that of the sugenera *Cephalotrigona*, *Oxytrigona*, *Dactylurina*, *Tetragona* and *Trigona*. For this reason, *Trigonisca* more than any other group of Hypotrigonas should be regarded as a valid taxonomic group. The Oriental species, *Lisotrigona* and *Pariotrigona*, are much less specialized than *Trigonisca*, but on the other hand, they are slightly more modified than the African ones. In *Pariotrigona*, for instance, the malar area is much longer than the flagellar diameter (just as in *Trigonisca*), the scape is rather long, the pterostigma rather large (approaching that of *Trigonisca*), the propodeum rather short, and the marginal cell broadened at its base (approaching that of *Trigonisca*). Furthermore, *Lisotrigona* has the lateral portions of the epistomal suture bent at the lower part, the scutellum projects for a short distance over the metanotum and basal part of propodeum, and the notaulus (prescutal sutures) is weak. The African Hypotrigonas are still less specialized, presenting just a few modified characters, all of which are found mainly in the group *Hypotrigona* proper, like the tessellate integument, larger corbicula, and the penicillus and comb which are very weak or missing. *Liotrigona*, on the other hand, lacks all the specialized characters found in the other Hypotrigonas. The yellow maculations, especially the small stripes on the lateral borders of the mesoscutum and scutellum, found in *Liotrigona*, and well evident in the fossil bee, may actually represent a primitive condition, since the same type of markings are found in the other fossil from the amber of Mexico, *Trigona silacea*, and in the subgenus *Plebeia*, another primitive group of stingless bees.

In conclusion, *Liotrigona* seems to meet all the necessary conditions to be placed at the base of all the Hypotrigonas, and the fossil *T. dominicana* suggests that it might have belonged to a once larger group represented today only by three African species, and that the group could have been the ancestral stock of all the Hypotrigona, Old World and American.

The occurrence of *T. dominicana* on the island of Hispaniola is of special interest since no member of the genus is otherwise known from the Greater Antilles.

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SUMMARY

A new stingless bee, *Trigona (Liotrigona) dominicana*, is described from the Oligocene amber of the Dominican Republic. The fossil bee is related to three living African species, and it might have belonged to a once larger group that could have been the ancestor stock of all the Hypotrigonas, Old World and American.

RESUMEN

Se describe una nueva melipónida fósil, *Trigona (Liotrigona) dominicana*. Esta abeja fósil se relaciona a tres especies africanas modernas y pudo haber pertenecido a un grupo grande y extendido durante el Oligoceno, que sirviera de tronco ancestral a todas las demás *Hypotrigona* tanto del Viejo Mundo como de la América.

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Figs. 1-5: *Trigona (Liotrigona) dominicana*, n. sp.

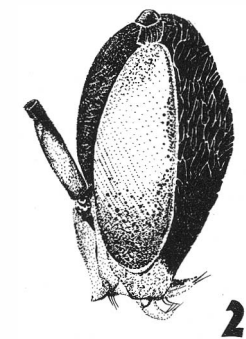
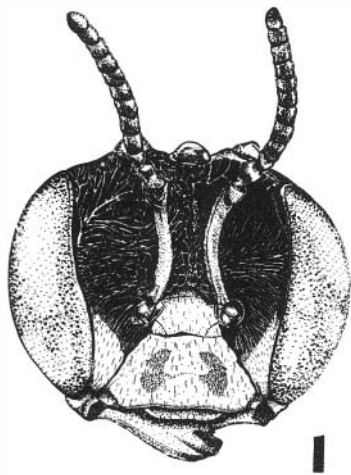
Fig. 1. Anterior view of head

Fig. 2. Lateral view of head

Fig. 3. Inner view of hind tibia

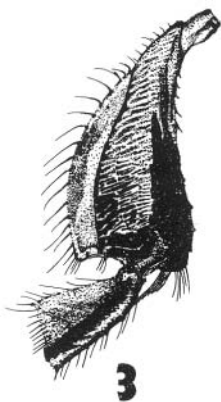
Fig. 4. Antenna

Fig. 5. Fore wing

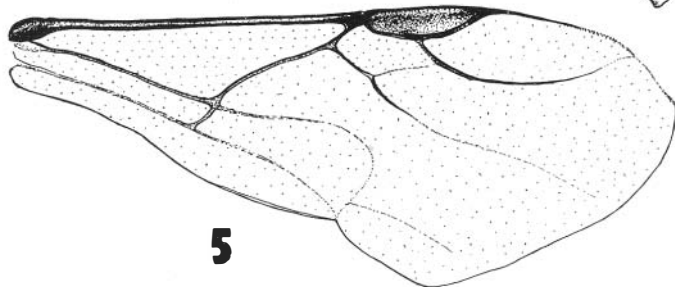


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