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A new species of the beetle genus *Brachypsectra*
from the Dominican Republic, with fossil connections
(Coleoptera: Brachypsectridae)

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ABSTRACT. With the description of *Brachypsectra vivafosile* n. sp., from the Cabo Rojo desert area of Hispaniola, the beetle family Brachypsectridae now contains 4 described species. The family was originally known from the Dominican Republic by Miocene amber fossils of larvae. Genitalia are illustrated for the first time for the family. Relationships of the family within the Elateroidea are briefly discussed.

Introduction

The family Brachypsectridae has been an enigmatic one since discovery and description of the first species, *Brachypsectra fulva* (LeConte 1874). Originally described in the family Dascillidae, it was placed in a new family Brachypsectridae by Horn (1881). Although larvae had been collected as early as 1892 (Anonymous, 1908), they were not recognized or associated with adults until nearly 40 years later. Blair (1930) described 2 new species of *Brachypsectra* from India and Singapore, based partly on specimens reared from larvae collected from beneath tamarind bark. This association confirmed the unique body form of these strange larvae. The following year, Böving and Craighead (1931) described and illustrated the larva of *B. fulva* LeConte. These were actually mentioned much earlier (but not identified) by Barber (1905).

Brachypsectra vivafosile Woodruff, new species

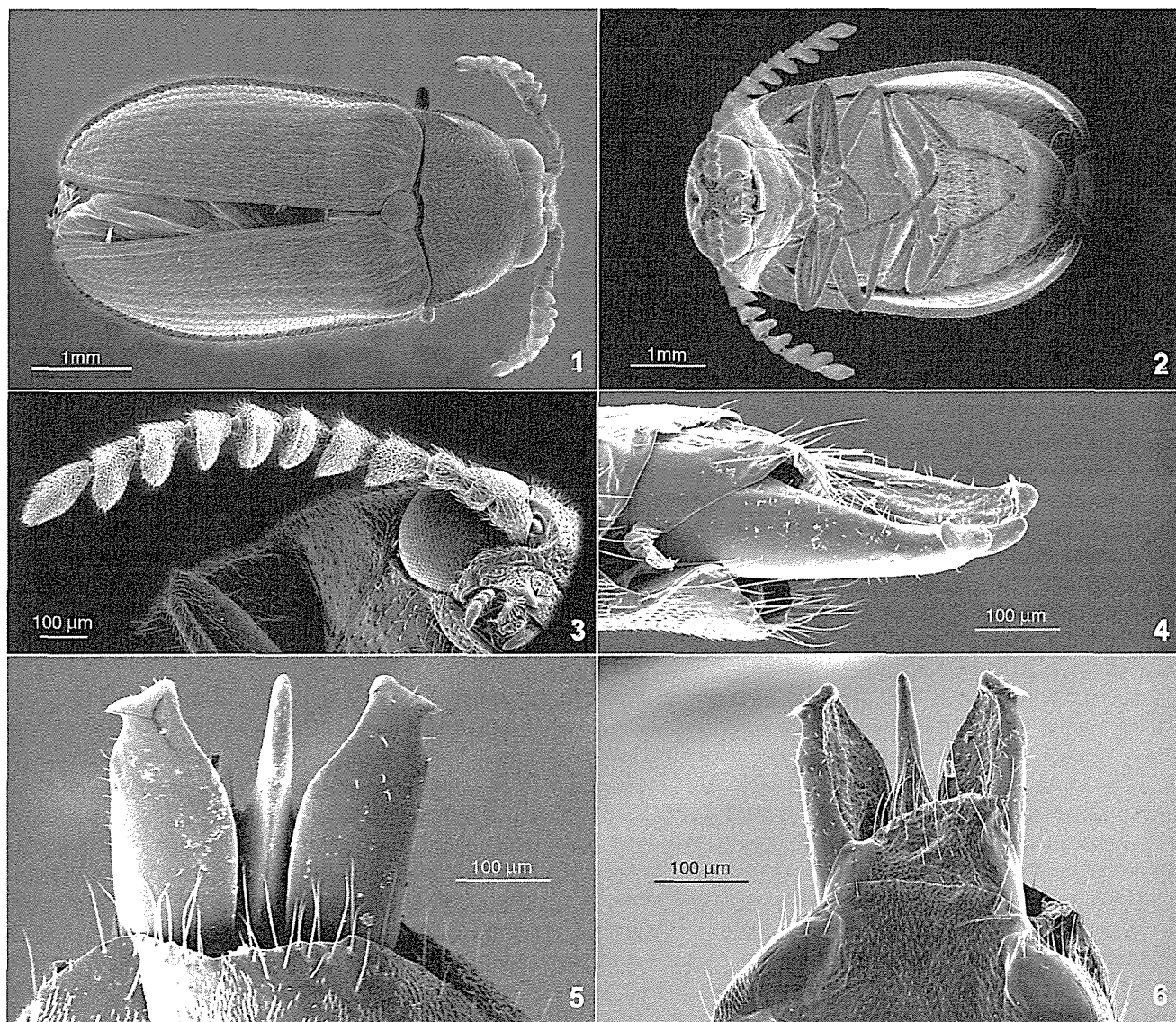
Holotype male: Dominican Republic: Province of Pedernales, Cabo Rojo, Alcoa Headquarters, 3-VII-1998, R.E. Woodruff & R.M. Baranowski, blacklight trap.

Description. General Form (Fig. 1-2). Similar in nearly all respects to the type of the genus (*B. fulva* LeConte). Color uniformly chestnut brown. Resembling members of the family Elateridae, but lacking a well-developed "click" mechanism. Length 4.0mm (total, including head), width 2mm. Body widest behind middle, color uniformly testaceous, with fine, sparse golden vestiture.

Head (Fig. 1,2,7,8). Visible from above; short, broad, with central depression, slightly carinate above eyes; surface moderately punctate. Clypeal suture moderately impressed (Fig. 7,8). Antennae (Fig. 3,7) 11 segmented, antennomeres 4-10 serrate to nearly pectinate; terminal antennomere ovoid. Antennal base inserted under narrowed frons in depression in front of the eyes. Head vestiture consisting of recurved setae, forward projecting, nearly evenly spaced (about 0.75 distance of setal length). Mouthparts (Fig. 3) inconspicuous from above; labrum small, oval; mandibles compact, blunt, densely punctate at base, not projecting; maxillary palpi extending beyond clypeus (Fig. 7-8), apical segment elongate (2.5 times length of previous segment) and acute. Labial and maxillary palpi bright yellow in contrast to darker mandibles and remainder of venter. Eyes large, noticeable from above, nearly round.

Pronotum (Fig. 1). Convex, broader than long, generally trapezoidal in outline, with front narrower. Posterior angles projecting (as in Elateridae), basally accompanied by an angular, slightly curved, carinate ridge for nearly one third pronotal length. Basal line or depression not evident; outline undulating, with noticeable broad indentation at scutellum. Lateral margins complete, sharply carinate as in Elateridae. Vestiture similar to head, but varying in direction as a "cow lick" pattern. Punctures shallow, nearly uniform in size and shape, separated by their diameter or slightly more.

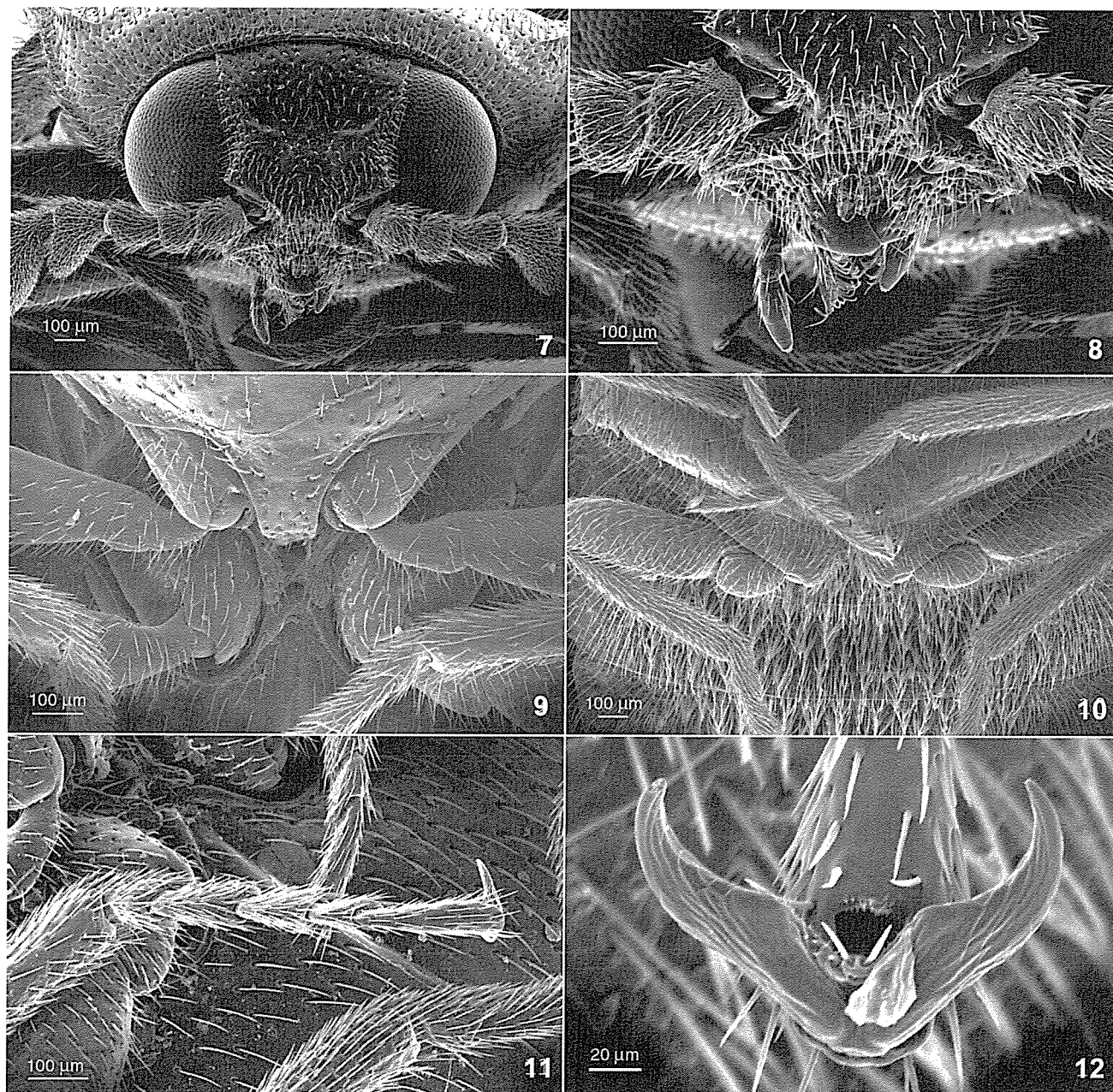
Elytra (Fig. 1). Entire, ovoid, widest in posterior two thirds; not acuminate. Striae numbering 9, sutural one forming continuous groove and connecting to marginal one. All striae terminating before apex, except sutural and marginal. Strial intervals weakly



Figures 1-6. Scanning electron microscope photographs of *Brachypsectra vivafosile* n. sp., holotype male: 1) Habitus, dorsal view; 2) Habitus, ventral view; 3) Right antenna, ventral view; 4) Male genitalia, lateral view (ventral at top); 5) Male genitalia, dorsal view; 6) Male genitalia, ventral view.

convex, more so near humeri, the 7th weakest in anterior 2/3, intervals punctate as pronotum, from which arise about 2 rows of setae each. Shoulders prominent, rounded, striae deeper near base. Scutellum slightly convex, nearly triangular or shield-shaped, angles rounded, fitting under a central, basal depression of pronotal margin. Vestiture of elytra and scutellum similar in size to that of head and pronotum; somewhat denser and projecting posteriorly. Epipleural fold prominent, entire, widest and more concave at basal 1/3. Elytral tips not projecting or acuminate, but gently tapering to apex.

Venter. (Fig. 2, 9,10). Prosternum relatively large, nearly as long as broad, forming the typical "chin piece" below the mouthparts. Intercoxal process well-developed (Fig. 9), projecting posteriorly between procoxa, terminating in truncate apex, appearing to articulate with mesosternal fossa, but not forming the so called "click mechanism" of Elateridae (appearance only, no observation of living beetles). Mesosternum short, fossa narrow, the sides setate, projecting posteriorly for half the length of the metacoxa; cavities open behind, separated. Mesosternum (Fig. 2) long and broad, with central line. Posterior margin



Figures 7-12. Scanning electron microscope photographs of *Brachypsectra vivafosile* n. sp., holotype male: 7) Head, anterior view, showing antennal insertions; 8) Mouthparts, anterior view, showing clypeus, mandibles, maxillary palpi; 9) Venter, showing base of legs, procoxae and intercoxal projection, mesocoxae and narrow fossa; 10) Venter, showing posterior legs and abdomen, metacoxae (transverse), trochanter (oval), setation of legs and abdomen; 11) Enlargement of right foretarsus, showing 5 segments and setation; 12) Posterior tarsal claw, ventral view, showing "bull horn" shape and sculpture.

diagonal, forming a depression at junction of abdomen, coxae grooved for reception of posterior femora.

Legs (Fig. 2, 9-12) long and slender. Femora broader than tibiae, flattened cylindrical, posterior ones shorter and more convex. Tibiae all narrow, elongate (as long as or longer than femora), pro- and mesotibiae longer than posterior tibiae; terminal

spurs absent, vestiture similar throughout (Fig. 10). Tarsi all 5 segmented; claws not cleft, but widely separated, "bull horn" shaped, with noticeable sculpture (at high magnification) on each claw (Fig. 12); tarsal vestiture similar to tibiae.

Abdomen (Fig. 2, 10). Abdomen with 5 free visible sternites, first slightly keeled between meta-

coxae. Vestiture denser and more obvious than that of dorsum; setae more closely spaced and numerous in central portion of first 4 sternites; setae on 5th less numerous and finer, surface shinier beneath. Ultimate visible tergite margin clothed with about 15 exceptionally long setae (at point of genitalic exsertion; about length of parameres; Fig. 5).

Male Genitalia (Fig. 4-6). Of the typical elaterid type. Parameres broad at base, terminating in truncate apex, with diagonally, posteriorly projecting hook. Clothed with sparse short setae on dorsum and venter. Central piece (intromittent organ) narrow, cylindrical, acute, projecting barely beyond paramere tips. In lateral view (Fig. 4, venter at top) tips of both structures curved slightly ventrally. Compare with Elateridae (Fig. 15, 16).

Variation. The type series is remarkably similar in appearance and in all salient characters. Variation was noted in total length (3.5 to 4.8 mm, with most about 4 mm) and width (1.6 to 2.5 mm). The width measurements are imprecise, because most specimens were mounted from alcohol and elytra often separate on drying. Lawrence (in litt.) recorded length measurements from 32 male *B. fulva* varying from 3.7 to 6.3 mm, with most over 5 mm. The 4 females he examined were from 5 to 7.7 mm long. The color is quite uniform and darker (chestnut) than the *B. fulva* (fulvous) examined. These differences may be due to age or preservation. Minor variation was noted in vestiture.

Types. Holotype and 27 (male) paratypes (all from type locality; numbers of specimens in brackets): [4] 1-VII-1998, [17] 3-VII-1998, [2] 20-VI-1999, [1] 21-VI-1999, [2] 23-VI-1999, [2] 24-VI-1999, all collected by R.E. Woodruff and R.M. Baranowski. All are deposited in the Florida State Collection of Arthropods, except 1 paratype in each of the following: Australian National Insect Collection, Canberra; U.S. National Museum, Washington; American Museum of Natural History, New York; Museo Nacional de Historia Natural, Santo Domingo; and Museu de Zoologia da Universidade de São Paulo, Brazil.

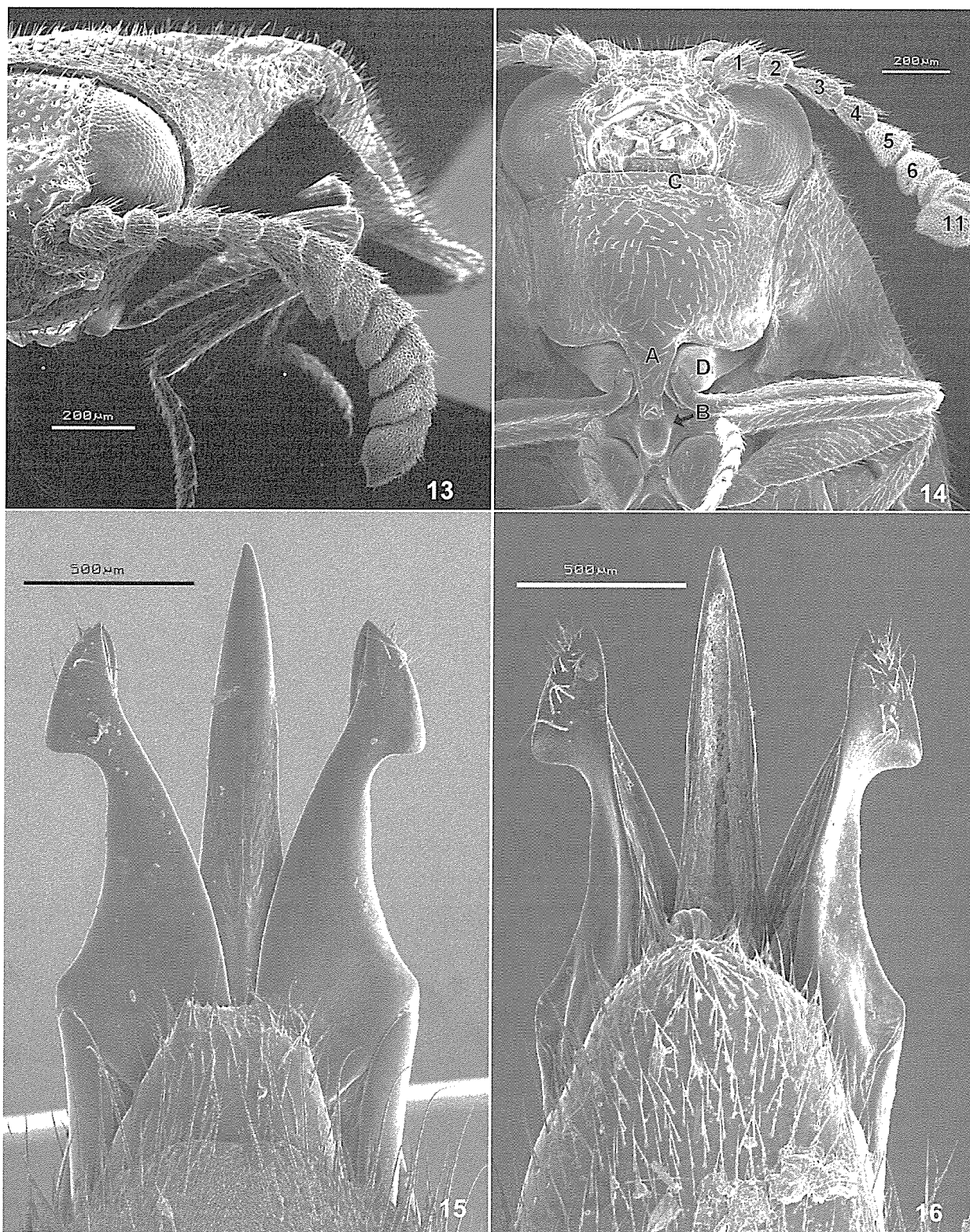
Larvae. Although modern larvae were not discovered during our searches, the unusual shape will undoubtedly be similar to that illustrated by the photograph (Fig. 17) of one of the amber fossils (courtesy of Rafael Wu). Although 3 larval amber fossils have been figured in publications (Poinar, 1992; Wu, 1996), all are unavailable for study. That figured by Poinar (p. 136) is in the private collection of Cardoen (in Miami, Florida or Chile). Those shown by Wu (Fig. 198, 225) were sold to private collections

in Europe (Brodzinsky, pers. comm.), and exact whereabouts are unknown.

Comparison with *B. fulva*. [Since 2 of the 3 known species are Asian and extremely rare, they were not available for comparison]. Although *B. vivafosile* is slightly smaller and slightly darker, it is extremely similar to *B. fulva*. The third antennomere is much longer than the fourth in *B. fulva*, and the serration begins on antennomere 5 (Fig. 13-14). In *B. vivafosile* the third and fourth are similar in length, but the serration begins on antennomere 4 (Fig. 3). All specimens of *B. fulva* that I have seen are pale yellow or straw colored; this may be natural, or it may be due to factors of collection or preservation or desert bleaching of dead specimens (several are partial bodies). All *B. vivafosile* are uniformly chestnut brown and vary little; they are all fresh and were collected into 70% isopropyl alcohol and later dry mounted. Length averaging about 1 mm longer in *B. fulva*.

Etymology: The name *vivafosile* is a corruption of the Spanish/Latin *viva* and *fosile*, in reference to the antiquity of this species, which appears to be a true "living fossil".

Taxonomy: There seems to be no disagreement among modern workers (Beutel, Crowson, Lawrence) that Brachypsectridae is a valid and unique family. Its exact placement within the Coleoptera is less certain. A revision of the family is under way by Cleide Costa, et al., and the description of this new species is being made available to expedite that study. As mentioned, *Brachypsectra* has been placed in the Dascillidae (LeConte, 1874), a part of the Dascilloidea (Chu, 1949), Dryopoidea (White, 1983), Cantharoidea (Lawrence, 1991), Armatopoda (Crowson, 1973), although current placement is in the Elateroidea (Beutel, 1995; Crowson, 1955; Kasap and Crowson, 1975; Lawrence 1982, 1987; Lawrence and Newton, 1995; Young, 2002). The prosternal process (Fig. 9), although appearing to not form the "click" mechanism with the mesosternal fossa, appears to be the precursor of such an arrangement. The size of the fossa and prosternal process apex vary slightly in specimens of the new species. It may represent the more primitive condition within the Elateroidea. The male genitalia have not been illustrated previously. Blair (1930:47) briefly characterized them for the genus as "genital armature consisting of a median lobe (penis) and two lateral lobes (parameres). The latter sharply reflexed outwards at apex." Young (2002) stated that parameres had "excurved apices".



Figures 13-14. Scanning electron microscope photos of *Brachypsectra fulva* LeConte. 13) Frontal view; note 3rd antennomere longer than 4th and serration starting on 5th. 14) Ventral view; A: prosternal process; B: mesosternal fossa; C: chin piece; D: procoxa; Antennomeres numbered 1-6, 11. Figures 15-16. Scanning electron microscope photo of male genitalia of an undetermined species of Elateridae from Guatemala. 15) Dorsal view; 16) Ventral view. [Compare with Brachypsectridae in Fig. 5-6].

The basic shape (Fig. 4-6) is similar to that of the typical form of many Elateridae (Fig. 15-16).

Although the 3 described species of *Brachypsectra* (*fulva* LeConte, *lamproyoides* Blair, and *fuscula* Blair) are seldom collected and poorly represented in collections, Fleenor and Taber (1999) collected more than 50 adults of *B. fulva* in light traps in Bastrop County of east central Texas. Besides the new species described here, a new species has been mentioned from Winjana Gorge, Western Australia (Lawrence, 1991; Lawrence & Britton, 1991). Because it is known from only the larva, it has not yet been described (Lawrence, pers. comm.). Ironically, the first record of the family Brachypsectridae from the Caribbean, was based on larvae that I identified from Dominican Republic amber, and illustrated by Poinar (1992) and Wu (1996). One of these is illustrated here in Fig. 17. This species has not been formally described because it was known from only the larva. Recently, Marc Branham (pers. comm.) indicated that an adult has been discovered in Dominican amber. Only a direct comparison with the new species described herein will determine if they are conspecific.

Because I had identified the larva of the family from Dominican amber, I knew that it was at least present in Hispaniola during the Miocene (15-30 million years before present), and I was familiar with modern specimens from Arizona in the Florida State Collection of Arthropods. Knowing the disjunct, relictual distribution of the species, Dr. R.M. Baranowski and I were elated to collect adults in a blacklight trap at Cabo Rojo, Dominican Republic in 1998 and 1999. Jokingly, I suggested to my companion that this was "The longest life cycle recorded in the animal kingdom; from the larva in the Miocene to the present adults." Although we cannot be certain that the fossil larvae are conspecific with modern adults, their relictual nature suggests this may be possible. In the sandfly genus *Phlebotomus* (Diptera: Psychodidae), Dr. David Young studied my amber fossils, as well as modern species in the Dominican Republic. Even though male genitalia in this genus are very diagnostic, he was unable (pers. comm.) to distinguish some fossils from modern specimens.

Biology. Unfortunately we could make no observations on biology or behavior of the new species, except that adults were attracted to blacklight (UV). The traps were located behind a house located on the far tip of Cabo Rojo, which is one of the driest points in the Dominican Republic (average rainfall is about 4 inches, with some years having none). It is located high on a rock outcrop (karst) just above the sea. The habitat

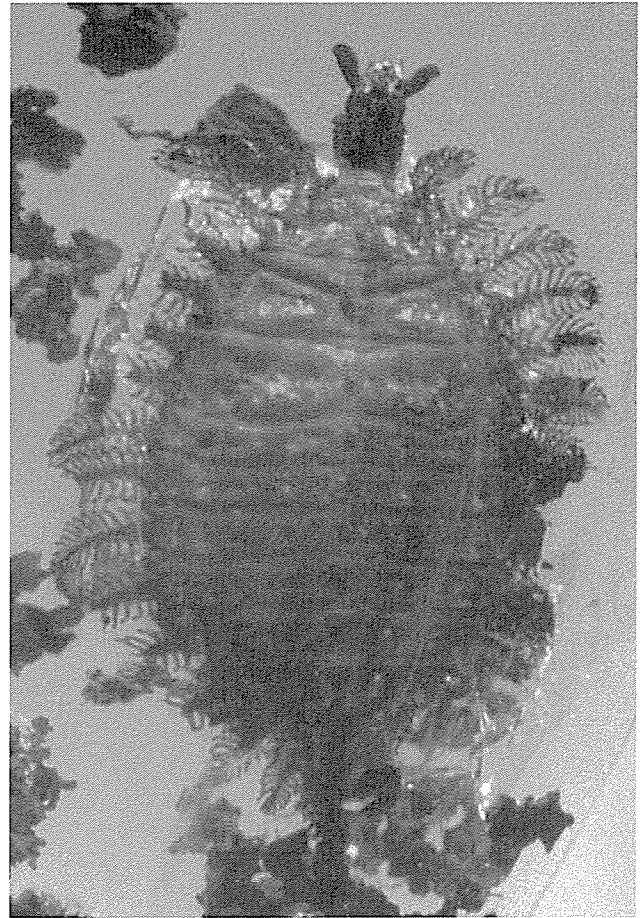


Figure 17. *Brachypsectra* sp. larva in Dominican Republic amber (photo by and courtesy of Rafael Wu).

is desert, with an almost impenetrable jumble of thorns and spines of several endemic cacti. The general habitat is shown in Fig. 18. There is often a very strong sea breeze (traps blew down on occasion). An isolated lime tree was support (about 5 ft. above ground) for an 8 watt trap in the open, and a 15 watt trap was sheltered next to the building at ground level. The elevation here is about 50 ft.

Once adults were captured, a special effort was made to locate larvae. Most of the desert trees here are dwarfed, and no loose bark was found in the area. Another area (at 300 meters elev.) of dead wood (mahogany trees harvested for lumber) was examined with negative results. A new species of Cerambycidae (*Parandraceps turnbowi* Giesbert) was described from the same general area of our traps (the cut area leading to the water tower of Alcoa). It is also home to a giant, endemic land iguana and the rare endemic mammal, *Selenodon*. A single *Hatiella* palm was the only tree visible above the cactus desert.

The first specimens (4) were collected on July 1, and 17 more were taken on July 3, 1998. On July 4 was the first rain of the year. We had operated traps there several days before without collecting this species. It appeared that beetles somehow detected the pending rain for their flight activity. Our schedule did not permit a longer stay, so little can be said of the flight period. However, in 1999 we returned to the same site in June and obtained 7 specimens from the following 5 day collections: 20-VI, 2 were found in the 15 watt trap; 21-VI, 1 in 15 watt; 22-VI, none; 23-VI, 1 in each trap; 24-VI, 1 in each trap. Thus, 5 were taken in the protected area of the 15 watt trap, while 2 were taken in the open in the 8 watt trap. Another trap located near the cafeteria produced no specimens during this time.

All records I have seen for *B. fulva* are from May through July. Fleenor and Taber (1999) found that in Texas the flight period started on July 24 (8 adults in 2 blacklight traps), with subsequent weekends recording 38, 5, and 4 respectively; for nearly a month of activity. It is not known if beetles emerged at these times, or if rains triggered activity. Barber (1905) kept a larva in the laboratory for over 2 years, before it apparently died of starvation. This suggests that desert populations may survive for long periods without food or rain. Obviously, if this beetle has been around since the Miocene, it must have adapted to many drastic changes of environment and is a hardy survivor of an ancient fauna.

The first real work on larval behavior was by Schlinger (quoted in Crowson, 1973). Under bark of eucalyptus trees in California, he found that larvae impaled spiders with their tails. Recent papers by Neck (1993) and Fleenor and Taber (1999) have summarized known feeding habits and behavior.

They seem to be opportunistic predators (feeding on ants, pseudoscorpions, immature solpugid, roaches, and especially spiders). Their habitat under bark is also frequented by many other insects which are likely prey. Larvae of many predaceous Elateridae frequent this habitat also.

One element of behavior requires observation of living specimens. None were collected live in this study. Published reports, by those observing living adults, fail to mention an important consideration. It has been presumed that the well known clicking habit is correlated with the structure of the intercoxal process and its articulation with the mesosternal fossa. We do not know if *Brachypsectra* has the ability to "click" or to snap and right itself if placed on its back. Comparing the Elateridae, they appear to have a tighter articulation and "click" by snapping the intercoxal process into the fossa. Lawrence (in litt.) indicated that "...some features are correlated with the elaterid clicking mechanism which can be seen. The most obvious would be the more or less globular procoxae without large, movable trochantins."

Distribution. *B. vivafosile* is known only from the type locality of Cabo Rojo, Province of Pedernales, Dominican Republic, nearly at sea level. This locality is only a few miles from Haiti, and since the habitat is similar there, it would also be expected in that country.

The term "The Texas Beetle" was first coined by my good friend Dr. Ross H. Arnett, Jr. (1962), because he wanted to use common names for each of the families in his "Beetles of the United States". Although it was originally described from "Texas" without further locality, its much wider distribution makes the common name inappropriate. It appears to



Figures 18-19. Type locality and general habitat at Cabo Rojo, Prov. Pedernales, Dominican Republic. Karst topography with pitted limestone and cactus desert.

me, because it seems to occupy such a unique position, that "Enigmatic Beetles" would be a better name for the family. Arnett (1985) recorded *B. fulva* from Texas, California, and Utah. Since there are few published records, I have recorded the following information from specimens examined during this study: **ARIZONA** (although Arizona was mentioned in White, 1983, no specific records have previously been published). **New state records:** Santa Catalina Mts., Sabino Canyon, 15-16-VI-1968, Menke & Flint [1, USNM]; Santa Catalina Mts., foothills, 21-VII-70, K. Stephan [2 damaged, possibly from rodent nests, FSCA]; Santa Catalina Mts., Molino Cyn., 23-VI-68, K. Stephan (1 damaged, FSCA); Pima Co., Tucson, 1-V-70, K. Stephan [1 damaged, FSCA]; Nogales, June 8-19, 1919, F.J. Dyer [1, USNM]; Youngsberg, 16-V-26, E.V. Walter (T#6574) [1 larva, USNM; pinned, with a note in the corner of the tray: "Elateroid!! (?) Not Helodid, Parnidae or Dascillidae. Forbes 1925"]; Cochise Co., 1 mi. S. Portal, 5-VIII-65, 4800ft., at light, L.L. Lampert [2 FSCA]; Cochise Co., Chiricahua Mts., 5000 ft., 23-VI-73, K. Stephan [1, FSCA]; Santa Cruz Co., Adobe Cyn., April 14, 1974, K. Stephan [1 larva, FSCA]; Pima Co., Redington Pass, June 16, 1972, K. Stephan [1, FSCA]; **MEXICO (new country record):** Lower California [Baja], San Fernando, 31-VII-38, Michelbacher & Ross [2, USNM; 1 male dissected by H.S. Barber]; **UTAH:** St. George, 11-VII-55, G.F. Knowlton 7795 [1, FSCA, from the R.H. Arnett collection and probably that used for the illustration in his book (1960)]; **CALIFORNIA:** Imperial Co., 1.4 mi. SW Glamis, 10 Feb. 1974, under bark of *Cercidium floridum* [1 pinned larva, FSCA]; **TEXAS:** (labelled "1 Entopotype, from coll. Belfrage HSB 1939") [1, USNM]. Presumably the latter is a part of the original collection from which LeConte described the species.

Acknowledgments

The Cabo Rojo area was originally the base of operations for the Alcoa mining company (now under management of Ideal Dominicana). The area is being mined for fine limonite, under contract with the government, although it is in the Parque Nacional Jaragua. We thank the above companies and especially Ramon Caceres, Rafael Reyes, and Hans Leiter for many favors and logistical assistance while there. They also have hosted a variety of other entomologists for many years. Thanks are due to the late Prof. Eugenio Marcano and Hector Ludovino Dominguez, for introducing me to this site nearly 30 years ago.

The scanning electron microscope (SEM) work, done at the Smithsonian, was assisted by Elisabeth Roberts and Walter R. Brown. I thank Paul Skelley for assistance with SEM work on *B. fulva* and Elaterid genitalia. For preparation of the plates from the digital images in Fig. 1-12, I thank my good friend and compleat artist, George Venable. For logistical support and many kindnesses, while studying the National Collection, I thank friends Jill and Warren Steiner and Eric Grissell. The offices of Vida Silvestre and Ministerio de Agricultura, in the Dominican Republic graciously provided collecting and export permits for my many expeditions there. The National Park Service provided collecting permits and also facilitated our trips. Over the years, many staff members of the Museo Nacional de Historia Natural (Santo Domingo) and Grupo Jaragua have assisted our field work in various ways. I thank R.M. Baranowski and T.J. Henry for their considerable contributions and companionship in the field. I thank John Lawrence and Mark Branham for providing reviews of an earlier version, improving several aspects of the manuscript.

I thank my dear friend, the late Jake Brodzinsky, who first brought the larva in amber to my attention and for his diligence in providing such unusual fossils to the scientists who study them. I also thank Rafael Wu for use of his photograph of the larva in amber, used here in Fig. 17. This is Entomology Contribution No. 956, Bureau of Entomology, Nematology and Plant Pathology, Division of Plant Industry, Florida Department of Agriculture & Consumer Services.

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