








Research Article

# Collection Records of Geotrupinae Species (Coleoptera: Scarabaeidae) in Chiapas, Mexico

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## Abstract

Knowledge of the entomofauna associated with a specific geographic region is considered of ecological, economic and social importance; for decision making in the productive processes carried out by man to obtain resources; either for the conservation of agroecosystems or for the use of natural resources. In this sense, the present work was carried out in several municipalities of the central depression of Chiapas and with specimens that are deposited in the entomological collection of the Faculty of Agronomic Sciences of the Autonomous University of Chiapas, with the purpose of ordering and determining the new collection sites for specimens of the Geotrupinae subfamily; To achieve the objective, 54 specimens of the subfamily Geotrupinae from the tribes Bolboceratini (2), Geotrupini (1) and Athyreini (3) were reviewed, obtained in sporadic collections with fluorescent light, in public lighting and by reviewing cattle excrement; In addition, the specimens deposited from the entomological Collection of the Faculty of Agronomic Sciences (CACH) were reviewed and separated, which were collected in various municipalities of the state of Chiapas. The species *Bolbelasmus arcuatus*, *Bolbelasmus variabilis*, *Haplogeotrupes* (*Geotrupes*) *guatemalensis unidentatus*, *Neoathyreus excavatus*, *Neoathyreus fissicornis* and *Neoathyreus mexicanus* were determined. It is important and necessary to carry out collection studies of specimens of the Geotrupinae subfamily in other regions of the state to determine their distribution and abundance.

## Keywords

Review, Coleoptera, Bolboceratini, Geotrupini, Athyreini

## 1. Introduction

In the classification of insects of the Order Coleoptera, there is the subfamily Geotrupinae that has antennae with 11 antennomeres, with the club formed of three segments,

clypeus delimited by the vertex with a tubercle, labrum and mandibles visible dorsally, large pygidium partially or totally hidden by the elytra (Deloya and Ponce, 2016), with the gen-

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ital capsule sclerosed; This subfamily is represented by four tribes in the world that bring together approximately 1,000 species; Of these, three tribes are registered for the American continent, covering 227 species and subspecies, distributed in the tribes Athyreini (98), Bolboceratini (91) and Geotrupini (38), according to Deloya and Ponce in 2016, for America they have been described close of 235 species [1]; The specimens of these tribes have very different habitats, finding that individuals of the Athyreini tribe develop in tropical areas and have two or three lateral lobes on the right jaw, the narrow and elongated scutellum, the elytra with apparent setae and are distributed from 50 to 1,400 m. The specimens of the Bolboceratini tribe are located in arid areas and have a convex body, dorsally reddish brown and black or dark brown, triangular scutellum and elytra with few silks in the large points and are found from sea level to 1700 m. The specimens of the Geotrupini tribe present a distribution in different environmental conditions from 1500 to 3200 meters above sea level and are characterized by having an elongated oval body shape, antennal club, profemur with an oval setose area. In Mexico, 45 species included in nine genera are reported [2-4]; However, Deloya and Ponce in the 2016, report 46 species of which seven of them are found in the state of Chiapas [4]; Under this expectation, the present work was proposed with the purpose of publicizing the new locations and collection dates of the determined.

## 2. Materials and Methods

Sporadic collections of specimens of the Geotrupinae subfamily (Coleoptera: Scarabaeidae) were carried out in some municipalities of the state of Chiapas, checking cattle manure, using fluorescent light traps and in public lighting; In addition, the specimens that are deposited in the Entomological Collection of the Faculty of Agricultural Sciences, Campus V, Villaflores Chiapas were reviewed. A total of 54 specimens of the Geotrupinae subfamily were reviewed, which were examined with a Carl Zeiss brand electronic stereoscope, to observe the distinctive taxonomic morphological characters that determine each species according to the dichotomous keys of this subfamily and the published works by Howden (1964), Krikken (1977), Howden and Gill (1984), Deloya and collaborators (1993), Morón (1994), Deloya and collaborators (2007), Howden (2003), Trotta-Moreu and collaborators (2008), Deloya and Ponce (2016) [1, 2, 4-9]; Likewise, these references were used to know the distribution of the determined species. and collaborators.

## 3. Results and Discussion

Of the 54 specimens of the Geotrupinae subfamily reviewed, six species included in three tribes were determined, which have been cited by [3] for the state of Chiapas. In studies carried out by Trotta-Moreu y colaboradores en el

2008, Deloya y Ponce en el 2016, recorded seven species for the state of Chiapas [4, 1], of which six are deposited in the Entomological Collection of the Faculty of Agronomic Sciences, Campus V, Villaflores, Chiapas.

*Bolbelasmus arcuatus* (Bates, 1887) (Geotrupinae: Bolboceratini)

The species *Bolbelasmus arcuatus* Bates, 1887 (Figure 1), has a Neotropical distribution, which extends in the Mexican Republic through the central and southern region, showing a potential distribution that significantly expands its known area [4]. Individuals of this species have been collected in the states of Chiapas (Tuxtla Gutiérrez), Morelos, Oaxaca, Veracruz and Yucatán [2, 7, 9]; in addition to Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama [2, 5].

Reviewed material: four specimens were reviewed, is preserved in the Entomological Collection of the Faculty (CACH). Mexico: Chiapas: Ocozocoautla: La Encañada, 865 msnm, (2) 9, October 14, 1991; September 19, 1999, C. J. Morales.

*Bolbelasmus variabilis* Howden, 1964 (Geotrupinae: Bolboceratini).

In the studies carried out by Trotta-Moreu and collaborators in the 2008, comment that this species has a wide distribution in Mexico, including the Nearctic and Neotropical region, being more abundant towards the west coast, where its potential distribution would expand [4]. With the studies of Howden (1964, 2003), Krikken (1977) and Deloya and Ponce (2016) report this species for the states of Coahuila, Colima, Guanajuato, Guerrero, Jalisco, Michoacán, Morelos, Nayarit, Nuevo León, Oaxaca, Puebla, Sinaloa, Sonora and Veracruz; in addition to Arizona (United States). According to the literature consulted, this species is considered a new record for the state of Chiapas [1-3, 5].

Reviewed material: Only one specimen of the species *B. variabilis* (Figure 2), is preserved in the Entomological Collection of the Faculty of Agronomic, Chiapas (CACH). Collected in Mexico: Chiapas: Tapachula: La Joya Canton: 106 meters above sea level, September 6, 2002, C. J. Morales.

*Haplogeotrupes guatemalensis unidentatus* Howden, 1974 (Geotrupinae: Geotrupini)

Of this species it is reported that only precise works are known for San Cristobal de las Casas, Chiapas; although its distribution extends to Guatemala [4]. However, Howden in the years of 1964 and 2003, mentions that this species can be collected in the mountains of Chiapas (Figure 3).

Reviewed material: Three specimens were reviewed.

Mexico: Chiapas: Pantelho: 1300 meters above sea level, July 16, 1999, C. J. Morales; San Cristóbal de las Casas: 2200 meters above sea level, October 4, 2011, S. I. Ordoñez; Los Laureles: 2234 meters above sea level, April 14, 2000, L. E. Morales Vázquez.

*Neoathyreus excavatus* (Laporte de Castelnau, 1840) (Geotrupinae: Athyreini)

According to Trotta-Moreu and collaborators in 2008, comment that this species has a more southern distribution, barely exceeding the potential distributions of the Transversal

Volcanic System [4]. According to Howden (1964, 2003) cites this species for the states of Chiapas (Ocozocoautla, Tuxtla Gutiérrez, Santo Domingo, and Simojovel), Oaxaca, San Luis Potosí and Veracruz; in addition to Honduras, Costa Rica, El Salvador and Panama [2, 6, 10].

Material reviewed: 37 specimens of *N. excavates* (Figure 4), collected in the municipalities of Berriozábal were reviewed: 911 meters above sea level, (2) (4), (3) September 6, 1998, C. J. Morales. Ocozocoautla: 865 meters above sea level, Ocuilapa: 940 meters above sea level, June 18, 1987, April 18, 1990, La Encañada: 865 meters above sea level, October 14, 1991, Finca Santa Fe: 754 meters above sea level, June 26, 1991, June 23 -1990; July 6, 1992; September 10, 1999, (2) October 4, 19, 1999, C. J. Morales (the data that is underlined corresponds to three specimens that Dr. Donald B. Thomas described as *N. quadridentatus* Howden); (2) September 19, 2002, E. Morales León; July 6, 1999, August 1, 1999, C. J. Morales; Colonia Natividad: (3) June 28, 2002, C. J. Morales. Tuxtla Gutiérrez: El Bosque: 522 meters above sea level, (2) June 22, 1996, C. J. Morales. Villaflores: 560 meters above sea level, October 14, 1987, C. J. Morales; Cerro Nambiyigua: 568 meters above sea level, November 10, 2003, (2) May 17, 2004, (4) 20, June 26, 2004, C. J. Morales; Rancho San Francisco: October 16, 2008, K. Y. S. T.; San Ramón: November 1, 2009, G. Jiménez Torres; October 23, 2011, M. A. Molina Molina; Veracruz: Cosamaloapan: June 24, 2008, C. J. Morales.

*Neothyreus fissicornis* (Harold, 1880) (Geotrupinae: Athyreini).

Studies conducted by Trotta-Moreu and collaborators in 2008, indicate that this species reach higher latitudes and have a more extensive distribution in the Mexican territory [4]. The area of potential distribution notably its range to the east and northwest of the country; It has been collected in various localities away from the center and southern Mexico that, potentially, could inhabit extensive areas of the country, except the northernmost region. Works carried out by Howden (1964), Howden and Gill (1984) and Morón (1994, 1997), mention that in Mexico this species has been collected in the states of Campeche, Chiapas, Hidalgo, Oaxaca, Jalisco, Puebla, Tamaulipas, Veracruz and Yucatán; as well as in Guatemala and Costa Rica [2, 6, 11].

Revised material: eight specimens of *N. fissicornis*, collected in the municipalities of Ocozocoautla were reviewed (Figure 5): 837 meters above sea level, 19-October 1999, 16 and 19-November 1999 (1 and 2), C. J. Morales; El Aguacero: 753 meters above sea level, 9-Julio-1993, C. J. Morales; The Moral: 865 meters above sea level, 20 and 22-Julio-1994 (2), F. Pimentel Zepeda. Simojovel: 10-October-1989, Mendoza.

*Neothyreus mexicanus* (Klug, 1845) (Geotrupinae: Athyreini)

The records of Howden in 1964 and 2003, Howden and Gill in 1984, Trotta-Moreu and collaborators in 2008, mention that, in Mexico, the species *N. mexicanus* (Figure 6), has been collected in the states of Chiapas, Guerrero, Oaxaca, Puebla and Veracruz; in addition to Guatemala, El Salvador, Nicaragua, Panama and Costa Rica, which are located at an aver-

age altitude of 923 m [2, 3, 4, 6].

Reviewed material: in the entomological collection there is only one specimen of this species. Mexico: Chiapas: Ocozocoautla: La Encañada, 865 meters above sea level, September 18, 1999, F. Pimentel Zepeda.



Figure 1. *Bolbelasmus arcuatus* (Bates, 1887).



Figure 2. *Bolbelasmus variabilis* (Howden, 1964).



Figure 3. *Haplogeotrupes guatemalensis unidentatus* (Howden, 1974).



**Figure 4.** *Neoathyreus excavatus* (Laporte de Castelnau, 1840).



**Figure 5.** *Neoathyreus fissicornis* (Harold, 1880).



**Figure 6.** *Neoathyreus mexicanus* (Klug, 1845).

## 4. Conclusions

Of the 54 specimens of the subfamily Geotrupinae that are deposited in the Entomological Collection of the Faculty, three tribes and six species were determined: *Bolbelasmus arcuatus* (Bates, 1887), *Bolbelasmus variabilis* Howden, 1964 (Bolboceratini), *Haplogeotrupes* (Geotrupes) *guatemalensis unidentatus* Howden, 1974 (Geotrupini), *Neoathyreus*

*excavatus* (Laporte de Castelnau, 1840), *Neoathyreus fissicornis* (Harold, 1880) and *Neoathyreus mexicanus* (Klug, 1845) (Athyreini); of the seven that are reported for Chiapas reached 85.7% representativeness. The species *Bolbelasmus variabilis* Howden is a new distribution record for the state of Chiapas. It is important and necessary to carry out collection studies of specimens of the Geotrupinae subfamily in other regions of the state to determine their distribution and abundance.

## Abbreviations

CACH: Faculty of Agronomic Sciences of Chiapas

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## Author Contributions

**Carlos Joaquin Morales Morales:** Conceptualization, Formal Analysis, Methodology

**Eduardo Aguilar Astudillo:** Conceptualization, Formal Analysis, Writing - review & editing

**Reynerio Adrián Alonso Bran:** Validation, Visualization

**Sabino Honorio Martínez Tomas:** Conceptualization, Resources, Supervision, Validation

**Mariano Solís López:** Conceptualization, Validation, Methodology, Visualization

**Beatriz Zambrano Castillo:** Conceptualization, Supervision, Validation, Methodology

**José Manuel Cena Velázquez:** Conceptualization, Supervision, Validation

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## Data Availability Statement

The results and the specimens determined in this work are available in the Entomology laboratory of the Faculty of Agricultural Sciences; information must be requested from the corresponding author upon request.

## Conflicts of Interest

The authors declare no conflicts of interest.



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