SOIL ORGANISMS 95 (1) · April 2023 pp. 17–22

Megalopinus lingafelteri spec. nov. from Arizona, U.S.A (Coleoptera: Staphylinidae: Megalopsidiinae)

Tobias Mainda

Friedrich-Loeffler-Straße 56, 17489 Greifswald, Germany
E-mail: tobias.mainda@gmx.de

Received 30 January 2023 | Accepted 28 February 2023
Published online at www.soil-organisms.de 1 April 2023 | Printed version 15 April 2023
DOI 10.25674/so95iss1id309

Abstract

A new species of the genus *Megalopinus* Eichelbaum, 1915 from the Huachuca Mountains in Arizona, U.S.A., *Megalopinus lingafelteri* spec. nov., is described and illustrated. It is the northernmost member of the *Megalopinus peploides* (Sharp, 1886) species group. Its habitat is illustrated, comparing it to presumptive closely related species.

Keywords Rove beetles | new species | Huachuca Mountains | Madrean region | biodiversity

1. Introduction

According to Puthz (2012), three species of the genus *Megalopinus* Eichelbaum, 1915 (Coleoptera: Staphylinidae: Megalopsidiinae) are known from the U.S.A so far: *Megalopinus caelatus* (Gravenhorst, 1802), *Megalopinus punctatus* (Erichson, 1840) and *Megalopinus rufipes* (LeConte, 1863). All three are rather widely distributed.

An additional species has been discovered by the US American entomologist Steven W. Lingafelter in Arizona, Cochise County, in the town of Hereford next to the Huachuca Mountains. It is described below.

The new species belongs to the species group of *Megalopinus peploides* (Sharp, 1886), mainly characterized by the short body-length and small head, compared to the width of the elytra (see Puthz 1994 for a detailed description of the group). *Megalopinus lingafelteri* spec. nov. is the northernmost member of this species group (Puthz 1994, 2012).

2. Material and methods

Material. The material mentioned below is deposited in the following collection: **cTM** – private collection Tobias Mainda, Greifswald, Germany.

Methods. The holotype of the new species was caught using a V-shaped flight intercept trap (V-FIT), which is figured and described by Löbl et al. (2021). The morphological studies were carried out using a stereoscopic microscope (Euromex DZ 1105) and a compound microscope (Euromex BB.1153.PLI). High-resolution extended-focus image of the holotype of the new species was obtained using the BK PLUS Lab system with a customized Canon MPE 65 mm 1–5x micro-photography lens mounted on a Canon 6D camera. Image stacks were captured with Adobe Lightroom and processed using Zerene Stacker. The images were edited using Adobe Photoshop CS6. The image of the aedeagus was obtained using a Touptek microscope camera (ToupCam 14MP). Image stacks were captured with ToupView Lite (MacOS) and processed using Zerene Stacker. The aedeagus is embedded in Euparal on a transparent plate attached to the insect pin under the holotype (soluble in alcohol). The description of the elytral puncture-rows follows Mainda (2022). Only the

ISSN 1864-6417 (print) · **ISSN** 2509-9523 (online)

existing rows are indicated with puncture numbers and no mention is made of the non-existing rows. The description of colors is based on Syme (1821).

The following abbreviations are used: **BL** – length of body, **DE** – central distance between eyes, **dsr** – dorsal row, **EL** – maximal length of elytra, **EW** – maximal width of elytra, **FBL** – length of forebody (from the anterior margin of the clypeus to the posterior margin of the elytra), **HW** – head width, **PL** – pronotal length, **PW** – pronotal width, **shr** – subhumeral row, **SL** – sutural length of elytra.

3. Results

***Megalopinus lingafelteri* spec. nov.**
(Figs. 1, 3, 4, 5)
http://zoobank.org/urn:lsid:zoobank.org:pub:48D9D8A3-D166-48D6-B1FE-29D9A50B6530

Type specimen: Holotype male, 'U.S.A: Arizona, Cochise Co., Hereford: 8920 S. Bryerly Ct., 31°24'14"N 110°13'52"W, 1,500 m, 15 Aug – 15 Sept 2021, V-FIT, leg. Steven W. Lingafelter' / red label 'male HOLOTYPE *Megalopinus lingafelteri* nov. sp., design. Mainda 2023' [cTM].

Description: Measurements of the Holotype (in mm): BL: 2.45, DE: 0.36, FBL: 1.63, EL: 0.80, EW: 0.93, HW: 0.61, PL: 0.56, PW: 0.66, SL: 0.69.

Habitus as in Fig. 1. Dark chestnut-brown, without microsculpture; elytra lightened anteriorly and on the sides of each elytron, with only two rows of punctures; antennae orange-colored brown, antennal clubs clearly darkened; legs orange-colored brown, tarsi lightened.

Head 0.66 times narrower than elytra, frons finely and quite widely punctured; shiny; with few indistinct setae.

Pronotum 1.18 times as broad as long, broadest in anterior third, with sides narrowed towards posterior margin, with Y-shaped impunctate area in middle of posterior half, at posterior end of Y-shaped area connected to narrow sickle-shaped impunctate area, concave side of which is directed anteriorly; posterior end of pronotum separated from sickle-shaped area by a row of distinctly separated punctures; punctures always separate, biggest diameter on sides and in posterior third. Each side of pronotum with two small denticles in anterior third, and two indistinct ones in posterior third. Some barely visible but long white setae present.

Elytra 1.16 times as broad as long; humeral calli prominent. Puncture on left elytron: shr (13), dsr (14); puncture on right elytron: shr (14), dsr (12). Broadest in posterior half; sides slightly concave towards anterior margin, convexly narrowed towards posterior margin.

Abdomen broader than head, shiny, with distinct paratergites. Basolateral striae of tergite V extends nearly to posterior margin of tergite; tergite VII with a distinct membranous fringe at posterior margin (the species is fully winged).

Male: Antennomere XI 0.14 mm long, 0.13 mm broad; antennomere X 0.04 mm long, 0.09 mm broad. Aedeagus (Fig. 3) with acuminate apical portion, internal structure without distinct sclerites. Parameres about as long as median lobe, with several short subapical setae, anteriorly pinet-shaped dilated, ending in a point (only visible in lateral view). Sternite IX spatula-shaped, 0.31 mm long, 0.14 mm broad (Fig. 4A). Tergite X extremely finely punctate, shiny (Fig. 4B). Sternite VIII almost indistinctly impressed at posterior margin (Fig. 4C). Tergite VIII without special features (Fig. 4D).

Female: Unknown.

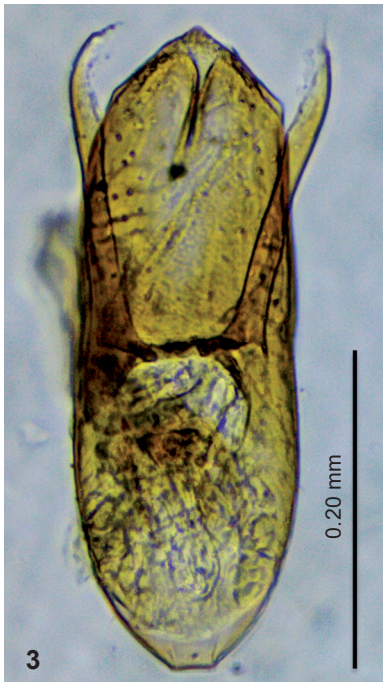
Distribution: *M. lingafelteri* spec. nov. is known only from the oak savanna in the foothills of the Huachuca Mountains in the Cochise County, Arizona, U.S.A.

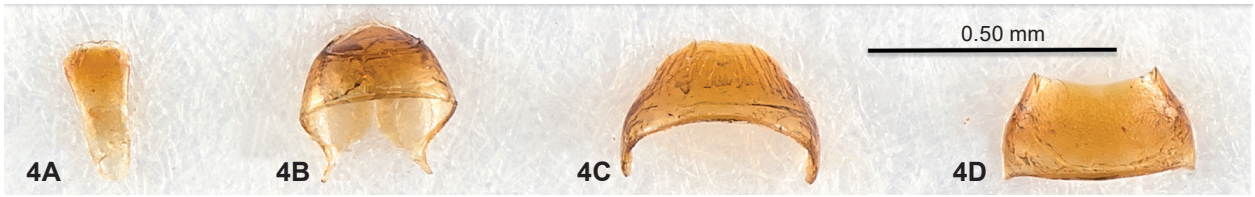
Comparative notes: The new species is distinguished from *Megalopinus ashei* Puthz, 1994 by the elytral punctures and the anteriorly wider median lobe of the aedeagus (Fig. 6; Fig. 5 in Puthz 1994). It is distinguished from *Megalopinus morator* Puthz, 1994 by the elytral

Figure 1. Holotype of *M. lingafelteri* spec. nov., Arizona, U.S.A.

punctures (Fig. 7) and longer basolateral stria on the tergite V. It differs from *Megalopinus pusillus* Puthz, 1994 by its distinctly different elytral and pronotal punctures (Fig. 8). *Megalopinus lingafelteri* spec. nov. may be distinguished from the other species of the group following the key in Puthz (1994).

Etymology: With the choice of the epithet '*lingafelteri*' (Latinized noun, derived from the surname 'Lingafelter', genitive) the species is dedicated to Steven W. Lingafelter (Hereford, Arizona, U.S.A.), who collected it on his property and kindly provided the holotype.





Figures 2–4. Habitat of *M. lingafelteri* spec. nov. in Hereford (Arizona, U.S.A), property of Steven W. Lingafelter, with view towards the Huachuca Mountains, December 2022 (**2**); aedeagus of *M. lingafelteri* spec. nov. (**3**); abdominal segments of *M. lingafelteri* spec. nov., sternite IX (**4A**), tergite X (**4B**), sternite VIII (**4C**), tergite VIII (**4D**).

Figures 5–8. Comparison of the forebodies of *M. lingafelteri* spec. nov. (**5**), male paratype of *M. ashei*, Mexico: San Luis Potosi, El Naranjo (**6**), female paratype of *M. morator*, Mexico: Veracruz, Catemaco (**7**) and female paratype of *M. pusillus*, Mexico: Jalisco, Autlán de Navarro (**8**), scale = 0.5 mm.

4. Discussion

Cochise County is located in the southeasternmost part of Arizona, and contains the intergradation between the Sonora desert to the west and Chihuahua desert to the east. It encompasses some isolated mountain ranges, such as the Huachuca Mountains (Fig. 2), Dragoon Mountains and Chiricahua Mountains. The following climate data are given for the nearest larger city, Sierra Vista (1,400 m above sea level), adjacent to Hereford: average annual temperature 17.5°C, annual precipitation 322 mm, rainiest months are July and August with around 70 mm precipitation each (climate-data.org). According to the Köppen-Geiger climate classification system, the climate of the region is classified as cold-semiarid (BSk).

The region is known as the Madrean Sky Island Archipelago because of its isolated mountain ranges like the Huachuca Mountains that form 'sky islands' with a more humid and cooler climate, compared to the desert surrounding area (Warshall 1994). In these isolated mountain ranges, the deciduous forests grow alongside coniferous ones. During the Pleistocene ice ages (around 90,000–20,000 years BP), temperatures in the region were cooler, and the area was covered by a largely continuous forest connecting mountain ranges. The region warmed between about 20,000 and 10,000 years BP, resulting in formation of large desert areas, isolating the mountain ranges and its species (Favé et al. 2015).

These isolated mountain ranges are inhabited by endemic beetles, such as the Carabid *Scaphinotus petersi* Roeschke, 1907, with six different subspecies. *Scaphinotus petersi biedermani* Roeschke, 1907 is found in the Huachuca Mountains, where it occurs exclusively in moist coniferous forests at elevations above 1,800 m (Ober et al. 2011). Another example for an endemic species of the Madrean Archipelago is the longhorn cactus beetle *Moneilema appressum* LeConte, 1852 (Smith & Farrell 2005), or the recently described wingless species of Cryptophagidae, *Cryptophagus coombsi* Esser, 2018 (Santa Catalina Mts., Chiricahua Mts., Santa Rita Mts.), *C. stephani* Esser, 2018 (Santa Catalina Mountains) and *C. grahammontanus* Esser, 2018 (Pinaleño Mts.) (Esser 2018).

However, the Sky Islands also seem to yield undiscovered Staphylinidae, as evidenced by the description of *Baeocera arizonensis* Löbl, 2021 and *Baeocera obscura* Löbl, 2021 from the Huachuca Mountains (Löbl et al. 2021). Both species were discovered using a V-shaped flight intercept trap, as was used in the discovery of *Megalopinus lingafelteri* spec. nov..

The discovery of *Megalopinus lingafelteri* spec. nov. seems to be another example for the diversity of Staphylinidae in the Madrean Sky Islands Archipelago, even though it was not discovered directly on a sky island, but in the foothills of one. However, since *Megalopinus* species live and hunt on tree fungi (Leschen & Newton 2003), the deciduous and coniferous forests of the Sky Islands may be suitable habitats. The habitat of this species, however, may be restricted to the oak savannas surrounding the Sky Islands.

A comparison with the collecting circumstances of the related species possibly help to find out what the natural habitat of *M. lingafelteri* nov. spec. could be:

M. morator was discovered in August 1983 at the Los Tuxtlas tropical field station (Veracruz, Mexico), located in a tropical rainforest. According to the label, the specimens were extracted from litter at tree-base. According to Soto & Gama (1997), the area is covered by evergreen tropical rainforest with high precipitation throughout the year. From June to February there is a rainy season in the area. The rainiest month is September. The temperatures range is from 24°C–26°C throughout the year.

The female holotype of *M. pusillus* was caught in June 1991 in Cañón del Sumidero National Park (Chiapas, Mexico) at 700 m in a flight intercept trap. The area contains three different forest types: Low deciduous forests, semievergreen rainforests and evergreen rainforests. The average temperature is 28.2°C. The rainy season is from May to October (Muñóz et al. 2008). The female paratype of *M. pusillus* was caught in September 1973 in the surroundings of Autlán (Jalisco, Mexico) at 4400 ft (1,340 m) by sifting litter under oaks, in a tropical deciduous forest.

The male holotype of *M. ashei* was collected in July 1989 in Jalisco, Mexico (Chamela Cuixmala Biosphere Reserve), by a flight intercept trap. The area is located on the Pacific Coast and consists mainly of dry tropical forests (unesco.org). The male paratype of *M. ashei* was collected in July 1990 in the Mexican state San Luis Potosi at the Cascada El Salto (El Naranjo) by a flight intercept trap. For the nearby Reserva de la Biosfera Sierra del Abra Tanchipa, Painter et al. (2022) indicate that it is a dry tropical deciduous forest with an annual average temperature of 25.7°C.

Most specimens of the related species were caught with a flight intercept trap during the rainy season, as *M. lingafelteri* nov. spec. Notable is the distributional gap of 1,500 km between the northernmost locality of *M. ashei*, Cascada El Salto, San Luis Potosi, and the type locality of the new species.

Most importantly, the habitats are very different. All related species have been discovered in moist tropical forests, absent in Arizona, and *Megalopinus* species live in moist forests and live on tree fungi (Leschen & Newton 2003, Mainda 2022). The type locality of *M. lingafelteri* spec. nov. is characterized as follows

'*Our property in the foothills of the Huachuca Mountains is at the upper transition zone of the oak savanna. So we have a mixture of grassland and oaks, but a higher density of oak trees than found lower in the transition zone. If you go up in elevation just by a few hundred feet, the grasslands mostly disappear and the oak density increases quickly.*' (pers. comm. Steven W. Lingafelter; January 3, 2023).

Further studies in the Huachuca Mountains would probably provide more insight into the life history of the new species. Since forests are also present in the other mountain ranges of the Madrean Sky Island Archipelago, the distribution range of the new species could possibly extend over the entire area, possible even beyond. Forests are also present in the 1,500 km gap of records to the nearest known occurrence of a representative of the species group. Investigations there could also be worthwhile, possibly yielding additional, previously undiscovered *Megalopinus* species.

5. Acknowledgements

I thank Lara Lopardo (University of Greifswald, Greifswald, Germany) for taking the image of the new species. Moreover, I am once again thankful to Volker Puthz (Schlitz, Germany) and Ivan Löbl (Geneve, Switzerland) for discussing my results and improving the manuscript. Furthermore, I would like to thank Steven W. Lingafelter (Hereford, Arizona, U.S.A) for the friendly contact, the holotype of *M. lingafelteri* spec. nov. for my collection and for proofreading the English text of the manuscript. In addition, I thank Arnaud Faille (Staatliches Museum für Naturkunde, Stuttgart, Germany) for providing me images of the paratypes of *M. ashei* and *M. morator*. In addition, I would like to thank the team of the Field Museum of Natural History Chicago U.S.A (Maureen Turcatel, Stephanie Ware and Alfred Newton) for providing me an image of the paratype of *M. pusillus*. Finally, I would like to thank the two anonymous reviewers for their time and helpful comments.

6. References

Climate-data.org: Climate: Arizona. – Accessible online via: [https://en.climate-data.org/north-america/united-states-of-america/arizona-922/] (last accessed 09 December 2022).

Esser, J. (2018): New *Cryptophagus* Herbst, 1792 (Coleoptera: Cryptophagidae) from Arizona (United States of America). – Linzer Biologische Beiträge **50**(2): 1067–1071.

Favé, M.-J., R. A. Johnson, S. Cover, S. Handschuh, B. D. Metscher, G. B. Müller, S. Gopalan & E. Abouheif (2015): Past climate change on Sky Islands drives novelty in a core developmental gene network and its phenotype. – BMC Evolutionary Biology **15**: 183 [https://doi.org/10.1186/s12862-015-0448-4].

Leschen, R. A. B. & A. F. Newton (2003): Larval description, adult feeding behavior, and phylogenetic placement of *Megalopinus* (Coleoptera: Staphylinidae). – The Coleopterists Bulletin **57**(4): 469–493.

Löbl, I., Leschen, R. A. B. & W. B. Warner (2021): Scaphisomatini of Arizona (Coleoptera, Staphylinidae, Scaphidiinae) collected by V-Flight Intercept Traps. – Revue Suisse de Zoologie **128**(1): 173–185.

Mainda, T. (2022): Contribution to the knowledge of the genus *Megalopinus* Eichelbaum, 1915 in the Oriental region (Coleoptera: Staphylinidae). – Journal of Tropical Coleopterology **3**(1): 45–54.

Muñóz, D., A. Estrada & Y. García del Valle (2008): Survey and conservation of a relict population of spider monkeys (*Ateles geoffroyi*) in the Sumidero Canyon, Mexico. – Tropical Conservation Science **1**(2): 151–162 [https://doi.org/10.1177/194008290800100207].

Ober, K., B. Matthews, A. Ferrieri & S. Kuhn (2011): The evolution and age of populations of *Scaphinotus petersi* Roeschke on Arizona Sky Islands (Coleoptera, Carabidae, Cychrini). – ZooKeys **147**: 183–197 [https://doi.org/10.3897/zookeys.147.2024].

Painter, E. J., O. Rosas Rosas, L. C. Bender, L. A. Tarango-Arambula, J. F. Martínez-Montoya, J. de Dios Guerrero-Rodríguez & A. Silva-Caballero (2022): Land use change and its implications for biodiversity and jaguar conservation. – Therya **13**(3): 277–286 [https://doi.org/10.12933/therya-22-2114].

Puthz, V. (1994): Die Gruppe des *Megalopinus peploides* (Sharp) (Coleoptera, Staphylinidae). – Entomologische Blätter **90**: 16–34.

Puthz, V. (2012): Über die neuweltlichen *Megalopinus*-Arten (Coleoptera, Staphylinidae). – Linzer Biologische Beiträge **44**(1): 613–834.

Puthz, V. (2015): Two new Staphylinid Species from Mexico (Coleoptera, Staphylinidae). – Dugesiana **22**(1): 5–7.

Smith, C. I. & B. D. Farrell (2005): Historical biogeography of longhorn cactus beetles: the influence of Pleistocene climate changes on American desert communities. – In: Gottfried, G., G. Gebow, L. Eskew & C. Edminster (eds): Connecting mountain islands and desert seas: Biodiversity and management of the Madrean Archipelago II, Proceedings RMRS-P-36. – Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station (631 pp): 135–139.

Soto, M. & L. Gama (1997): Climas. – In: Gónzalez-Soriano, E., R. Dirzo & R. C. Vogt (eds): Historia natural de Los Tuxtlas. Comisión Nacional para el Conocimiento y Uso

de la Biodiversidad, México City: Instituto de Biología, Instituto de Ecología, UNAM: 7–23.

Syme, P. (1821): Werner‘s Nomenclature of Colours: Adapted to Zoology, Botany, Chemistry, Minerology, Anatomy and the Arts (2nd ed.). – The Natural History Museum, London 2018: 80 pp.

Unesco.org: Biosphere Chamela Cuixmala. – Accessible online via: [https://en.unesco.org/biosphere/lac/chamela-cuixmala] (last accessed 21 January 2023).

Warshall, P. (1994): The Madrean Sky Island Archipelago: a planetary overview. – In: DeBano, L., P. Ffolliott, A. Ortega-Rubio, G. Gottfried, R. Hamre & C. Edminster (eds): Biodiversity and Management of the Madrean Archipelago: The Sky Islands of Southwestern United States and Northwestern Mexico. – Fort Collins: US Department of Agriculture, Forest Service: 6–18.