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The first record of the jumping bristletail *Pedetontus gershneri* Allen, 1995 (Microcoryphia: Machilidae) from Alabama, USA significantly extends its known range

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Abstract. The jumping bristletail *Pedetontus gershneri* Allen, 1995 (Microcoryphia: Machilidae) is reported from the state of Alabama, USA, for the first time, extending its known range east-southeast by roughly 588 km. The first partial mtDNA barcode was generated for the species. Notes on color variation and sampling needs of Microcoryphia are briefly discussed.

Key words. DNA barcode, new record, Wallacean shortfall.

ZooBank registration. urn:lsid:zoobank.org:pub:45BD0D2A-C59B-4393-A825-BDCF0B643AD7

Introduction

The Microcoryphia (=Archaeognatha, or jumping bristletails) are a small order of insects with about 500 nominal species worldwide (Mendes 1990). The North American fauna includes 30 named species (De Jong 2020), with additional species expected to be discovered and described (Bowser 2019). Numerous records of species in the southeastern United States were recently published (De Jong 2020), including *Pedetontus gershneri* Allen 1995, presently known only from its type locality on Magazine Mountain, Arkansas (Allen 1995). Here we report a new distribution record for this species from northern Alabama. In addition, we briefly discuss color variation in the species and provide the first partial DNA barcode for this little-known jumping bristletail species.

Materials and Methods

Collection and Identification

One adult male specimen of *P. gershneri* was collected in deciduous forest habitat in Bankhead National Forest, Alabama. The specimen was collected by hand at roughly 10:30 pm in the furrow of a tree trunk about two meters above the base. It is stored in 95% ethanol at the Florida State Collection of Arthropods (FSCA). Collection data are as follows:

USA. Alabama: Winston County, Bankhead National Forest, On tree 10 meters from bank of Clear Creek, below confluence with Moccasin Branch, 182 m a.s.l., [N34°02'09.60", W87°22'40.80"] A. Orfinger coll., 16/iv/2021, 1 male, (FSCA E2021-4124), **New State Record.**

Identification was accomplished by consulting the original description and illustrations by Allen (1995), and by comparison with identified material collected from the type locality, which had been deposited at the Mississippi Entomological Museum (MEM).

DNA extraction and sequencing were conducted at the Canadian Centre for DNA Barcoding, Biodiversity Institute of Ontario, University of Guelph, Canada. Briefly, a single leg was used to harvest and amplify DNA based on standard protocols by Ivanova et al. (2006). The 658 bp barcoding fragment of the mitochondrial gene cytochrome oxidase I (COI) was targeted following protocols described by deWaard et al. (2008). The resulting sequence was queried via the NCBI's Basic Local Alignment Search Tool (BLAST) and the Barcode of Life Database (BOLD) ID engine, neither of which yielded existing congruent specific identifications.

Results and Discussion

Remarks on Identification and Color Variation

The specimen has exsertile vesicles on abdominal segments II through VII, being paired on segments II through V only, which places it in the subgenus *Verhoeffilis* Paclt 1972. Separating it from the other species in *Pedetontus* (*Verhoeffilis*) are the lack of strong spines on apical segments of the maxillary and labial palpi, key characteristics of *P. gershneri*. In contrast to the published description of *P. gershneri*, the Alabama specimen has little dark pigmentation on the basal segments of the maxillary palpi and on the legs; however, with the exception of these aberrant pigmentation patterns, the specimen agrees with the original description (Allen 1995) and other specimens collected at the type locality. Pigmentation in some species of Microcoryphia is known to be somewhat variable (Dejaco et al. 2016), and morphological characters such as shapes of structures and spine patterns are more conservative, so we are identifying this specimen as *P. gershneri*.

Molecular Data

The partial DNA barcode sequence data are deposited in BOLD under BOLD Sequence ID ORFIN397-21. A 122 bp portion of the 658 bp COI DNA barcode fragment was successfully sequenced. These represent the first molecular data for the species and, in concert with the growing body of Nearctic Microcoryphia barcode data (Bowser 2019), can help with identifying undescribed taxa, new distributional records, phylogenetic patterns, and construction of haplotype networks to evaluate population structures.

Future Sampling Needs

This represents the first record of the species from Alabama, extending the species' known range east-southeast by roughly 588 km (Fig. 1). The present record is based on a single specimen, although additional attempts were made to collect in the vicinity and find more specimens without success. *Pedetontus gershneri* was previously thought to be an Arkansas Interior Highlands endemic (Robison et al. 2008). Considering this new report from Alabama, it is expected that the species likely occurs in northern Mississippi and perhaps in southwestern Tennessee, as well.

While COI DNA barcode sequences should ideally be longer for sufficient species identification and delimitation utility (i.e., at least 200 bp *sensu* Yeo et al. 2020), the partial fragment provided here may serve as a comparison for COI sequences of *P. gershneri* deposited in the future. While less informative than longer sequences, such "mini-barcodes" of around 100 bp can still produce correct species identifications in up to 90% of cases (Meusnier et al. 2008). Relying on DNA barcoding alone in Microcoryphia is insufficient, however, and efforts should be made to incorporate integrative approaches in addressing this taxon's challenging specific taxonomy (Dejaco 2012, 2016). Future integrative taxonomy using additional specimens collected in or around northern Alabama, morphology, and additional molecular data would be useful in confirming the identification of the *P. gershneri* specimen reported here.

The difficulty in sampling some Microcoryphia such as *P. gershneri* coupled with the lack of many taxonomic experts in the group have likely influenced the significant distributional gaps observed in the fauna. For example, De Jong (2020) recently reported numerous new state records for not only species but the entire order in many cases, based on a single collection's (MEM) holdings. There is little doubt that additional sampling and identification of other collection material will uncover additional new records and likely undescribed taxa. These

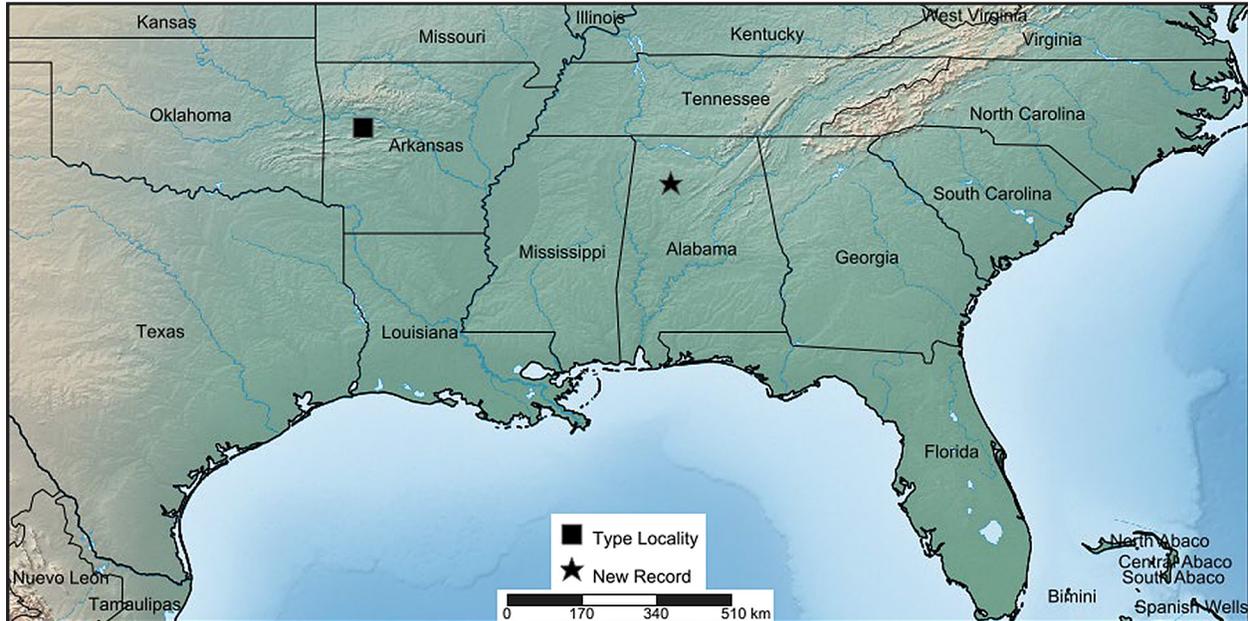


Figure 1. Map showing the known distribution of *Pedetontus gershneri* Allen 1995. Square represents the previous distribution records from the type locality of Magazine Mountain, Arkansas. Star represents the new record reported here from Bankhead National Forest, Alabama.

steps are important in combatting the apparently sizeable Wallacean shortfall (*sensu* Hortal et al. 2015) seen in our knowledge of the Nearctic jumping bristletails.

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Literature Cited

- Allen RT. 1995. *Pedetontus gershneri*, a new species of Machilidae from the interior highlands of North America (Insecta: Microcoryphia). *Entomological News* 106: 195–198.
- Bowser M. 2019. Archaeognatha of Canada. *Zookeys* 819: 205–209.
- Dejaco T, Arthofer W, Sheets HD, Moder K, Thaler-Knoflach B, Christian E, Mendes LF, Schlick-Steiner BC, Steiner FM. 2012. A toolbox for integrative species delimitation in *Machilis* jumping bristletails (Microcoryphia: Machilidae). *Zoologischer Anzeiger-A Journal of Comparative Zoology* 251(4): 307–316.
- Dejaco T, Gassner M, Arthofer W, Schlick-Steiner BC, Steiner FM. 2016. Taxonomist's nightmare . . . evolutionist's delight: An integrative approach resolves species limits in jumping bristletails despite widespread hybridization and parthenogenesis. *Systematic Biology* 65: 947–974.
- De Jong GD. 2020. Jumping bristletail (Insecta: Apterygota: Microcoryphia) records in the southeastern United States. *Insecta Mundi* 755: 1–8.
- deWaard JR, Ivanova NV, Hajibabaei M, Hebert PDN. 2008. Assembling DNA barcodes: analytical protocols. p. 275–293. In: Martin CC (ed.). *Methods in molecular biology: Environmental Genomics*. Humana Press Inc.; Totowa, NJ. 364 p.
- Hortal J, de Bello F, Diniz-Filho JAF, Lewinsohn TM, Lobo JM, Ladle RJ. 2015. Seven shortfalls that beset large-scale knowledge of biodiversity. *Annual Review of Ecology, Evolution, and Systematics* 46: 523–549.
- Ivanova NV, Dewaard JR, Hebert PD. 2006. An inexpensive, automation-friendly protocol for recovering high-quality DNA. *Molecular Ecology Notes* 6: 998–1002.

- Mendes LF. 1990.** An annotated list of generic and specific names of Machilidae (Microcoryphia, Insecta) with identification keys for the genera and geographic notes. *Estudos, Ensayos e Documentos* 155: 1–127.
- Meusnier I, Singer GA, Landry JF, Hickey DA, Hebert PD, Hajibabaei M. 2008.** A universal DNA mini-barcode for biodiversity analysis. *BMC Genomics* 9(1): 1–4.
- Paclt I. 1972.** Grundsatzliches zur Chorologie und Systematik der Felsenspringer. *Zoologischer Anzeiger* 188: 422–429.
- Robison H, McAllister C, Carlton C, Tucker G. 2008.** Arkansas Endemic Biota: An Update with Additions and Deletions. *Journal of the Arkansas Academy of Science* 62: 84–96.
- Yeo D, Srivathsan A, Meier R. 2020.** Longer is not always better: Optimizing barcode length for large-scale species discovery and identification. *Systematic Biology* 69(5): 999–1015.

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