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RESEARCH ARTICLE

First records of enchytraeids from Arsi Mountains National Park (Ethiopia)

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Abstract

First records of enchytraeids from Ethiopia: four species in three genera, all previously known from Europe. In addition to the species list, the paper discusses possible pathways by which typically Holarctic taxa could have reached tropical Africa.

Keywords Soil fauna | potworms | Africa | highlands | shrubland

1 Introduction

African fauna of enchytraeids (Annelida: Clitellata: Enchytraeidae) remains largely understudied (Schlaghamerský et al. 2025). Enchytraeids in Ethiopia in particular have not been investigated, with the exception of a single record of *Fridericia humicola* Bretscher, 1900 from Mount Gara Muleta, about 50 km from the city of Harar (Michaelsen 1903). Because Ethiopian climate is predominantly hot and arid (Beck et al. 2018), the most favorable conditions for enchytraeids occur in mountainous areas supporting subalpine vegetation, primarily moderately humid heath shrubland (Girma et al. 2018, Kidane et al. 2022). Here we present a short checklist of enchytraeid species extracted from soil collected in Arsi Mountains National Park, Ethiopia. To confirm the identification of one species, molecular analysis of the COI marker was used in addition to morphological characters, whereas the histone H3 fragment was treated as supplementary evidence.

2 Material and methods

Soil for subsequent enchytraeid extraction was collected on 31 October 2022 in Oromia Region, Arsi Zone, Arsi Mountains National Park, on a mountain near the town of Digelu (07°49′13″ N, 39°23′29″ E, 3738 m a.s.l.). The sampling site was a bush thicket dominated by *Erica arborea*, peat soil covered by the moss *Breutelia borbonica* and patches of *Alchemilla* sp. (collector: L.B. Rybalov). After collection, samples were transported to the laboratory of the A.N. Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences, Moscow, Russia, and stored at approximately 10 °C

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until extraction. Enchytraeids were extracted using the modified O'Connor method (the Graefe method; see Graefe in Dunger & Fiedler 1997). Specimens were identified *in vivo* following Schmelz & Collado (2010) under an Olympus BX43F microscope equipped with a Zeiss AxioCam ERc 5s. Taxonomy follows WoRMS (2026). Molecular methods used correspond to those described in Degtyarev et al (2025).

3 Results

Four enchytraeid species representing three genera were identified:

Fridericia perrieri (Vejdovský, 1878) – 5 specimens;
Fridericia bulboides (Nielsen & Christensen, 1959) – 10 specimens;
Enchytraeus cf. *buchholzi* Vejdovský, 1878 – 1 specimen;
Enchytronia longispermatheca Chalupský, 1991 – 2 specimens.

Additionally, 3 juvenile *Enchytraeus* specimens and approximately 10 juvenile *Fridericia* specimens were found. For the single specimen of E. cf. *buchholzi*, the newly obtained COI sequence, deposited in GenBank under accession number PZ639036, showed the closest BLAST match to a record deposited as "*Enchytraeus buchholzi* complex sp. CEC voucher CE23824" from Sweden (PP180556.1), with 99.65% identity and 100% query coverage. Other close matches with available locality data included records from the United Kingdom (voucher CE11042, PP180536.1; 99.64% identity, 100% query coverage) and Norway (vouchers CE19151 and CE19149, PP180542.1 and PP180541.1; both 97.35% identity, 100% query coverage). These results indicate that the Ethiopian specimen is genetically close to European records deposited as members of the *E. buchholzi* species complex. An H3 fragment was also obtained, but because of low query coverage (21%) and insufficient sequence quality, it was treated only as supplementary evidence and was not used for species-level confirmation.

4 Discussion

Surprisingly, all species encountered are also known from Europe. The largest species found was *F. perrieri*. This taxon is widespread and has previously been reported from Africa (Kenya and South Africa (Michaelsen 1913, 1915) as well as Cameroon (Schlaghamerský et al. 2025)). Interestingly, Michaelsen, who identified enchytraeids from Ethiopia as *F. humicola*, noted that *F. humicola* might possibly have to be united with *F. perrieri*, because the differences between these species were at the time rather minor and could be interpreted as interspecific variability. Thus, it is entirely possible that Michaelsen was actually observing *F. perrieri*, i.e., the same species that we found.

The most abundant species in our samples was *F. bulboides*, which was also reported in large numbers from Mount Cameroon, although the specimens were designated as *F.* cf. *bulboides* because their COI sequences differed by more than 10% from those of European specimens (Schlaghamerský et al. 2025). Our specimens differ slightly from typical European representatives in having a spermatheca with a somewhat less developed ectal gland, although some morphological variability is known in this species (Degtyarev et al. 2020). *Enchytraeus buchholzi* is a cosmopolitan taxon and represents a species complex (Schmelz & Collado 2010); therefore we applied molecular methods to corroborate its identification. Thus, we demonstrated that our specimen of *E.* cf. *buchholzi* is genetically close to certain European populations. The single specimen we collected showed the following morphological characteristics: chaetae 2 – 3 : 3 – 3; preclitellar nephridia from 6/7 – 9/10; refractile granula of coelomocytes absent; sperm funnel and copulatory organ small; spermathecal ectal duct slightly shorter than ampulla, with crown of glands around ectal pore. *Enchytronia longispermatheca* was the most unexpected species encountered; until now, it had been known only from two localities in the Czech Republic (Chalupský 1991). Our specimens differ from the original description in the position of the abrupt widening of intestine (VI rather than 5/6). Nevertheless, the diagnostic large spermathecae, seminal vesicles and sperm funnels allow us to identify these specimens as *E. longispermatheca*.

Recent work has shown that the high elevation enchytraeid fauna of Mount Cameroon resembles the European fauna (Schlaghamerský et al. 2025). Our results indicate the same pattern for the Arsi Mountains. These findings raise the question how Holarctic taxa, such as *F. perrieri* and *F. bulboides,* came to inhabit high mountains of tropical Africa. Three scenarios are plausible: human mediated introduction, disjunction of a formerly continuous range, and accidental long distance dispersal (e.g., by birds). The first scenario appears unlikely because the Arsi Mountains have experienced minimal anthropogenic disturbance. We cannot exclude the second scenario, but favor the third, since studies of the Afroalpine flora, occupying the same soil as the Arsi mountains enchytraeids, indicate a predominance of long-distance dispersal events from Eurasia (Brochmann et al. 2021).

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Competing Interests

The authors declare no competing interests.

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