zoosystema

2022 • 44 • 17

An updated checklist and a DNA barcode library for the earthworms (Crassiclitellata, Oligochaeta) of Corsica, France

Daniel Fernández MARCHÁN, Sylvain GÉRARD, Mickaël HEDDE, Rodolphe ROUGERIE & Thibaud DECAËNS

art. 44 (17) — Published on 27 September 2022
www.zoosystema.com

PUBLICATIONS SCIENTIFIQUES

MUSÉUM NAL HIST NATURELLE

Couverture / *Cover* :
Open Mediterranean chaparral at Sainte-Lucie de Porto-Vecchio. In medallion: specimen of *Scherotheca portonana* Qiu & Bouché, 1998.

Zoosystema est indexé dans / Zoosystema *is indexed in:*
– Science Citation Index Expanded (SciSearch®)
– ISI Alerting Services®
– Current Contents® / Agriculture, Biology, and Environmental Sciences®
– Scopus®

Zoosystema est distribué en version électronique par / Zoosystema *is distributed electronically by:*
– BioOne® (http://www.bioone.org)

Les articles ainsi que les nouveautés nomenclaturales publiés dans *Zoosystema* sont référencés par / *Articles and nomenclatural novelties published in* Zoosystema *are referenced by:*
– ZooBank® (http://zoobank.org)

Zoosystema est une revue en flux continu publiée par les Publications scientifiques du Muséum, Paris / **Zoosystema** *is a fast track journal published by the Museum Science Press, Paris*

Les Publications scientifiques du Muséum publient aussi / *The Museum Science Press also publish:*
Adansonia, ***Geodiversitas***, ***Anthropozoologica***, ***European Journal of Taxonomy***, ***Naturae***, ***Cryptogamie*** **sous-sections** ***Algologie***, ***Bryologie***, ***Mycologie***, ***Comptes Rendus Palevol***.

Diffusion – Publications scientifiques Muséum national d'Histoire naturelle
CP 41 – 57 rue Cuvier F-75231 Paris cedex 05 (France)
Tél. : 33 (0)1 40 79 48 05 / Fax : 33 (0)1 40 79 38 40
diff.pub@mnhn.fr / https://sciencepress.mnhn.fr

ISSN (imprimé / *print*) : 1280-9551/ ISSN (électronique / *electronic*) : 1638-9387

An updated checklist and a DNA barcode library for the earthworms (Crassiclitellata, Oligochaeta) of Corsica, France

Daniel Fernández MARCHÁN
CEFE, Univ Montpellier, CNRS, EPHE, IRD,
1919 Route de Mende, 34293 Montpellier Cedex 5 (France)
danifermch@gmail.com

Sylvain GÉRARD
Mickaël HEDDE
Eco&Sols, INRAE, IRD, CIRAD, SupAgro Montpellier,
Campus SupAgro, Bâtiment 12, 2 place Viala, 34060 Montpellier Cedex 2 (France)
sylvain.gerard@ens-paris-saclay.fr, mickael.hedde@inrae.fr

Rodolphe ROUGERIE
Institut de Systématique, Évolution, Biodiversité (ISYEB),
Muséum national d'Histoire naturelle, CNRS, Sorbonne Université, EPHE,
Université des Antilles, case postale 53, 57 rue Cuvier, F-75231 Paris cedex 05 (France)
rodolphe.rougerie@mnhn.fr

Thibaud DECAËNS
CEFE, Univ Montpellier, CNRS, EPHE, IRD,
1919 Route de Mende, 34293 Montpellier Cedex 5 (France)
thibaud.decaens@cefe.cnrs.fr

Submitted on 10 January 2022 | Accepted on 18 April 2022 | Published on 27 September 2022

urn:lsid:zoobank.org:pub:77B40AEE-0398-4D6D-B880-A1A09169ABF7

Marchán D. F., Gérard S., Hedde M., Rougerie R. & Decaëns T. 2022. — An updated checklist and a DNA barcode library for the earthworms (Crassiclitellata, Oligochaeta) of Corsica, France. *Zoosystema* 44 (17): 439-461. https://doi.org/10.5252/zoosystema2022v44a17. http://zoosystema.com/44/17

ABSTRACT
Available studies of the earthworm fauna of Corsica reported a total of 36 species, but this regional diversity is probably underestimated considering the relatively modest sampling efforts achieved so far. We conducted a sampling campaign in the context of the program "Our Planet Reviewed", with the aim to increase sampling coverage and to analyze already known regional diversity with a combination of classical morpho-anatomic characters and DNA barcoding. We sampled a total of 31 locations, and identified 22 previously recorded species and eight new citations belonging to the families Acanthodrilidae Claus, 1880, Hormogastridae Michaelsen, 1900 and Lumbricidae Rafinesque-Schmaltz, 1815. We obtained 525 COI barcodes which clustered into 48 genetic lineages, highlighting the importance of molecular techniques for earthworm diversity surveys. Of these lineages, ten are supported by multiple lines of evidence and will be described in a forthcoming taxonomy paper as species new to science. Biogeographical affinities of the identified species showed a lower rate of cosmopolitan species compared to other Mediterranean islands, a certain degree of affinity with Italy and Sardinia, and a high rate of endemism (which could be mirrored by the Balearic Islands and Sardinia). Comparative phylogeographic analyses are needed to understand the history of colonization and diversification of earthworms on Mediterranean islands, and to investigate the drivers that shaped differences in their diversity.

KEY WORDS
Acanthodrilidae,
Hormogastridae,
Lumbricidae,
DNA barcoding,
endemism,
Mediterranean islands,
species list,
new records.

RÉSUMÉ

Liste actualisée et bibliothèque de codes-barres ADN pour les vers de terre (Crassiclitellata, Oligochaeta) de Corse, France.

Les études disponibles sur la faune lombricienne de la Corse font état d'un total de 36 espèces, mais cette diversité régionale est probablement sous-estimée si l'on considère les efforts d'échantillonnage relativement modestes réalisés jusqu'à présent. Nous avons mené une campagne d'échantillonnage dans le cadre du programme « La Planète Revisitée », avec comme objectif d'augmenter la couverture d'échantillonnage et d'analyser la diversité régionale en combinant l'utilisation des caractères morpho-anatomiques classiques à celle des codes-barres ADN. Nous avons échantillonné un total de 31 sites, ce qui a permis d'identifier 22 espèces précédemment citées et huit nouvelles signalisations appartenant aux familles Acanthodrilidae Claus, 1880, Hormogastridae Michaelsen, 1900 et Lumbricidae Rafinesque-Schmaltz, 1815. Nous avons obtenu 525 codes-barres ADN qui nous ont permis de délimiter 48 lignées génétiques, soulignant l'importance des techniques moléculaires pour inventorier la diversité des vers de terre. Parmi ces lignées, dix sont soutenues par la morphologie et seront décrites comme espèces nouvelles pour la science dans un article de taxonomie à venir. Les affinités biogéographiques des espèces identifiées montrent un taux relativement faible d'espèces cosmopolites par rapport à d'autres îles méditerranéennes, un degré d'affinité avec les faunes italiennes et sardes, et un taux élevé d'endémisme (qui pourrait être équivalent à celui des îles Baléares et de la Sardaigne). Des analyses phylogéographiques comparatives pourraient aider à comprendre l'histoire de la colonisation et la diversification des faunes de vers de terre des îles méditerranéennes et à comprendre les facteurs qui ont façonné les différences dans leur diversité.

MOTS CLÉS
Acanthodrilidae,
Hormogastridae,
Lumbricidae,
codes-barres ADN,
endémisme,
îles méditerranéennes,
liste d'espèces,
signalisations nouvelles.

INTRODUCTION

Corsica is the fourth-largest island in the Mediterranean Sea, with a rather complex geological history. It is composed of two geological domains, Hercynian Corsica (comprising most of the island) and Alpine Corsica (confined to the Northeastern sector) (Di Rosa *et al.* 2019). The first corresponds to the European continental margin before rifting (in the Oligocene-Miocene, 30-21.5 Ma) and drifting (in the Miocene, 20.5-15 Ma) displaced this terrane (together with Sardinia) from its inferred original position near present-day Provence to its current position (Oudet *et al.* 2010). The second domain was formed when the European margin continental unit and the Western Tethys oceanic unit were accreted during the counter-clockwise, eastwards migration of the Corso-Sardinian block during the Miocene (Di Rosa *et al.* 2019).

Corsican climate is characterized by hot and dry summers, cold winters, highly seasonal precipitations (usually as heavy storms) and heavy winds (Mouillot *et al.* 2008). Its mountainous topography allows for a large variety of habitats depending on altitude, with Mediterranean sclerophyllous woodlands and shrubs dominating the lowlands and montane broadleaf and mixed forests being found at higher altitudes (Mouillot *et al.* 2008). Human activity and climate changes during the Neolithic were associated with significant changes in the dominant vegetation of the island, which transitioned from pinewood and Ericaceous species into oak forests (Lestienne *et al.* 2020a) resulting in a higher vegetal diversity (Lestienne *et al.* 2020b). Such high plant diversity does not appear to be reflected for most animal groups: for example, mammals and bird faunas are composed of relatively few species and very few endemics, even though this could be attributed to geologically recent extinctions (Mouillot *et al.* 2008). On the other hand, other groups such as the herpetofauna or the terrestrial mollusks appear to be diverse and show high endemicity (Mouillot *et al.* 2008). Besides strictly endemic taxa, several other elements of its endemic biota appear to be shared with Sardinia, the Balearic Islands, and the Tuscan archipelago, reflecting the geological history of the region (Thomson 2005).

The earthworm fauna of Corsica is relatively well known thanks to the sampling efforts of Michaelsen (1926), Cernosvitov (1942), Pop (1947), Bouché (1972), Qiu & Bouché (1998a, b) and Szederjesi *et al.* (2021). However, besides sampling efforts from Bouché (1972), which were rather comprehensive, the other works were remarkably restricted in their geographic scope. Combining the different sources, the total of earthworm species currently recorded from Corsica is 36, distributed in 15 genera and four families (Table 2). Despite these past studies, a deep understanding of the distribution of the species accross the island is still lacking, and it is also likely that new surveys may lead to the discovery of new taxa for the island and for science.

In the context of the program "Our Planet Reviewed" ("La Planète Revisitée", coordinated by the Muséum national d'Histoire naturelle, Paris – MNHN), we sampled between March and April 2021 several sites already studied by Bouché (1972) and Qiu & Bouché (1998a, b), as well as some previously unsampled sites of potential interest (based on knowledge from other animal and vegetal taxa). The current work aims at providing an updated overview of the earthworm fauna of the island. It builds on these new sampling efforts and on the integration of DNA barcoding, a genetic approach that proved fruitful in improving our understanding of earthworm species diversity in other regions, especially through helping the detection of putative cryptic species (Decaëns *et al.* 2013, 2020).

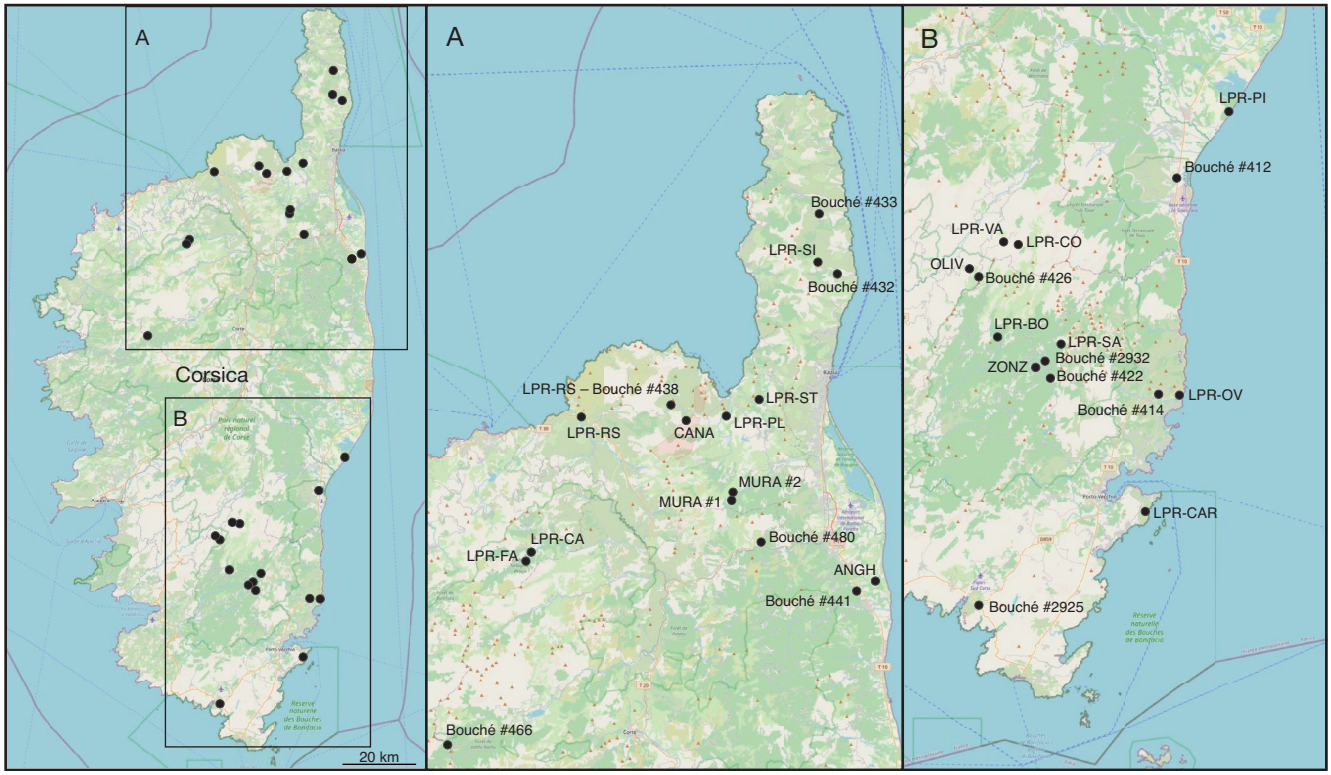

Fig. 1. — Distribution map of the sampling localities in Corsica Island. Locality codes refer to Table 1. Map base: Qgis.

METHODS

Sampling

During March-April 2021, 31 localities were sampled across the island of Corsica (Table 1; Fig. 1), including 12 of the sites featured in Bouché (1972) and Qiu & Bouché (1998a, b), and 19 sites selected for the biodiversity survey carried out within the program "Our Planet Reviewed". The later comprised most of the ecosystems of the island and represented most of its extent (even though they were less abundant in the west and central areas).

At each site, a surface of approximately ¼ ha was chosen and sampled through a combination of 25 × 25 cm soil blocks and larger surfaces. Sampling was adapted to local conditions such as vegetation diversity, soil humidity, topography, presence of roots and rocks, etc. In each case, sampling effort totaled a minimum of 1h30 by two researchers, adjusted when necessary to approach the saturation in the number of species (no more sampling was performed after the researchers did not collect new species for approximately 15 minutes). After digging and hand-sorting, all earthworms were fixed in 70% ethanol to allow for relaxation (facilitating further morphological studies) and immediately transferred after death to 100% ethanol.

Identifications and DNA barcoding

The identification of the specimens we collected was performed in three steps:

1) Adult specimens were assigned to morphospecies according to external (and if necessary, internal) morphological characters established in Bouché (1972), Qiu & Bouché (1998a, b) and Csuzdi *et al.* (2018).

2) For each locality we selected up to five adult individuals per morphospecies for DNA barcoding (up to ten for endemic species), and up to five specimens for juveniles and fragmented specimens when present in the samples. Small ventral integument tissue samples were assembled in 96-well plates and shipped for processing at the Centre for Biodiversity Genomics at the University of Guelph (Canada, Ontario). After total genomic DNA extraction using a CTAB-based approach, the standard DNA barcode for animals (Hebert *et al.* 2003) – a 658bp fragment of mitochondrial marker cytochrome c oxidase subunit 1 (COI) – was amplified using a primer cocktail C_LepFolF-C_LepFolR (Hernández-Triana *et al.* 2014). Sequencing reactions were carried out with the same primer cocktail and products went through a PureSeq-MP (Aline Biosciences, Woburn, USA) cleanup before Sanger sequencing on an ABI 3730XL DNA sequencer. Consensus sequences from automatically assembled contigs (subsequently reviewed and manually edited when needed) were uploaded to BOLD (Ratnasingham & Hebert 2007; www.boldsystems.org) along with trace files, specimen data and images. When available, sequences from the same species or the closest relatives were retrieved from BOLD and GenBank (Benson *et al.* 2013; https://www.ncbi.nlm.nih.gov/genbank/) for consideration when critically reviewing the original identifications of specimens.

TABLE 1. – Sampling localities studied within this work. Locality codes starting by "Bouché#" indicate sampling locations matching those from Bouché (1972) and Qiu & Bouché (1998a, b). Locality codes LPR correspond to sampling locations of the "Our Planet Reviewed" survey.

Locality code	Sector	Exact Site	Latitude	Longitude	Elevation (m)	Habitat
Bouché#412	Haute-Corse	Ventiseri, Vix	41.947	9.392	3	Grassland
Bouché#432	Haute-Corse	Sisco, Piano di Poraja	42.81	9.462	135	Mediterranean chaparral
Bouché#433	Haute-Corse	Cagnano	42.876	9.435	150	*Quercus suber* L. open wood
Bouché#441	Haute-Corse	Castellare-Di-Casinca	42.461	9.491	50	Grassland
Bouché#466	Haute-Corse	Albertacce, Col de Vergio	42.291	8.879	1450	Alpine grassland
Bouché#480	Haute-Corse	Volpajola	42.515	9.348	313	*Quercus suber* open wood
ANGH	Haute-Corse	Castellare-Di-Casinca, Anghione	42.472	9.519	7	Poplar plantation
CANA	Haute-Corse	Santo-Pietro-di-Tenda, Camping La Canardière	42.649	9.236	304	Mediterranean chaparral
LPR RS – Bouché#438	Haute-Corse	Santo-Pietro-di-Tenda, Casta	42.666	9.213	251	Grassland and chaparral
LPR-CA	Haute-Corse	Mausoleo	42.504	9.004	635	Mediterranean chaparral
LPR-FA	Haute-Corse	Olmi-Cappella, Mausoleo, Tartagine	42.494	8.996	779	*Pinus laricio* L. forest
LPR-OS	Haute-Corse	Palasca, les Jardins de l'Ostriconi	42.653	9.079	6	Grassland
LPR-PI	Haute-Corse	Ghisonaccia, Marais de Cattolica	42.021	9.47	8	Pine forest on sandy soil
LPR-PL	Haute-Corse	Oletta, Aliso riparian forest	42.654	9.296	24	Riparian forest
LPR-SI	Haute-Corse	Sisco, Chapelle Saint Michel	42.823	9.433	344	Mediterranean chaparral and river banks
LPR-ST	Haute-Corse	Poggio-d'Oletta, Saint-Florent	42.672	9.345	223	Mediterranean chaparral
MURA#1	Haute-Corse	Murato, Cagnanozza	42.561	9.304	715	Mediterranean chaparral
MURA#2	Haute-Corse	Murato	42.57	9.306	536	Riparian grassland and river banks
Bouché#2925	Corse du Sud	Bonifacio	41.47	9.096	70	Mediterranean chaparral
Bouché#2932	Corse du Sud	Zonza	41.743	9.195	785	*Pinus laricio* forest
Bouché#414	Corse du Sud	Cavu, Sainte-Lucie de Porto-Vecchio	41.706	9.365	38	*Quercus suber* open wood
Bouché#422	Corse du Sud	Zonza, Pacciunituli (D368 road)	41.724	9.203	940	*Pinus laricio* forest
Bouché#426	Corse du Sud	Olivese (D69 road)	41.837	9.096	1178	*Fagus sylvatica* L. forest
LPR-BO	Corse du Sud	Sorbollano – Quenza, Campu di Bonza	41.77	9.124	896	*Quercus ilex* L. forest
LPR-CAR	Corse du Sud	Porto Vecchio, Carataggio	41.575	9.345	7	Mediterranean chaparral
LPR-CO	Corse du Sud	Zicavo, Castellu d'Ornucciu	41.873	9.155	1422	Grassland
LPR-OV	Corse du Sud	Zonza – Olmucciu, Ovu Santu	41.705	9.396	2	Littoral grasslands on sandy soil
LPR-SA	Corse du Sud	Zonza, Samulaghia	41.762	9.219	975	*Pinus laricio* / *Abies* Mill. forest
LPR-VA	Corse du Sud	Zicavo, Ponte di Valpine	41.876	9.133	1248	Shrubs
OLIV	Corse du Sud	Olivese (D26 road)	41.846	9.082	1051	*Fagus sylvatica* forest
ZONZ	Corse du Sud	Zonza, Pacciunituli (D67 road)	41.736	9.181	813	*Pinus laricio* forest

3) Morpho-anatomical and genetic information were combined in order to a) confirm assignment of morphospecies to previously described species or cryptic lineages within them; and b) confirm the status of other species-level lineages as undescribed species new to science.

In order to obtain an integrative species-level lineage delimitation, we compared our assessment based on patterns of morphological differences with the results from the hierarchical clustering algorithm implemented in ASAP (Puillandre *et al.* 2021), as well as those obtained from a Barcode Gap Analysis as implemented in BOLD. ASAP clusters sequences into species-level lineages according to different interspecific divergence thresholds, providing different species delimitation hypotheses. These hypotheses were compared with the division in morphospecies defined in step I, and the one which showed the closest correspondence was chosen. This preliminary species-level delimitation was implemented as taxonomic identification for a Barcode Gap Analysis to check for the existence and magnitude of a barcode gap (thus supporting the ASAP clusters as species-level lineages). The species delimitation hypothesis was fine-tuned by the integration of morphological and Barcode Gap Analysis data: if morphological differences were found between two genetic clusters considered as a single species by ASAP, they were split; when two genetic clusters identified by ASAP displayed genetic divergence below the intraspecific interval (usually under 9% – Chang & James 2011 suggested 9% as a threshold but for the slightly higher Kimura-2-parameters distances), they were combined. Additionally, when the retained genetic lineages were not corroborated by clear morphological differences, we considered them as "cryptic lineages", whereas when they were supported by morphological evidence we qualified them as "non-cryptic lineages". As non-cryptic lineages were found within species complexes known to be Corsican endemics, they were also considered as species putatively new to science. It is worth noting that cryptic lineages detected in this work could also constitute independent species, but without support from additional mitochondrial and nuclear markers or detailed examination of inconspicuous morphological characters it is not adviseable to do so.

For easier visualization of the species-level (genetic) lineages found within Corsican earthworms, DNA barcode sequences were analyzed through Bayesian Inference using MrBayes v.3.2.6 (Ronquist *et al.* 2012) as implemented in CIPRES Science Gateway V. 3.3 (Miller *et al.* 2010). GTR + I + G was selected as best-fitting evolutionary model for the COI alignment. The analysis was performed with default parameters, and each of the two independent runs was set

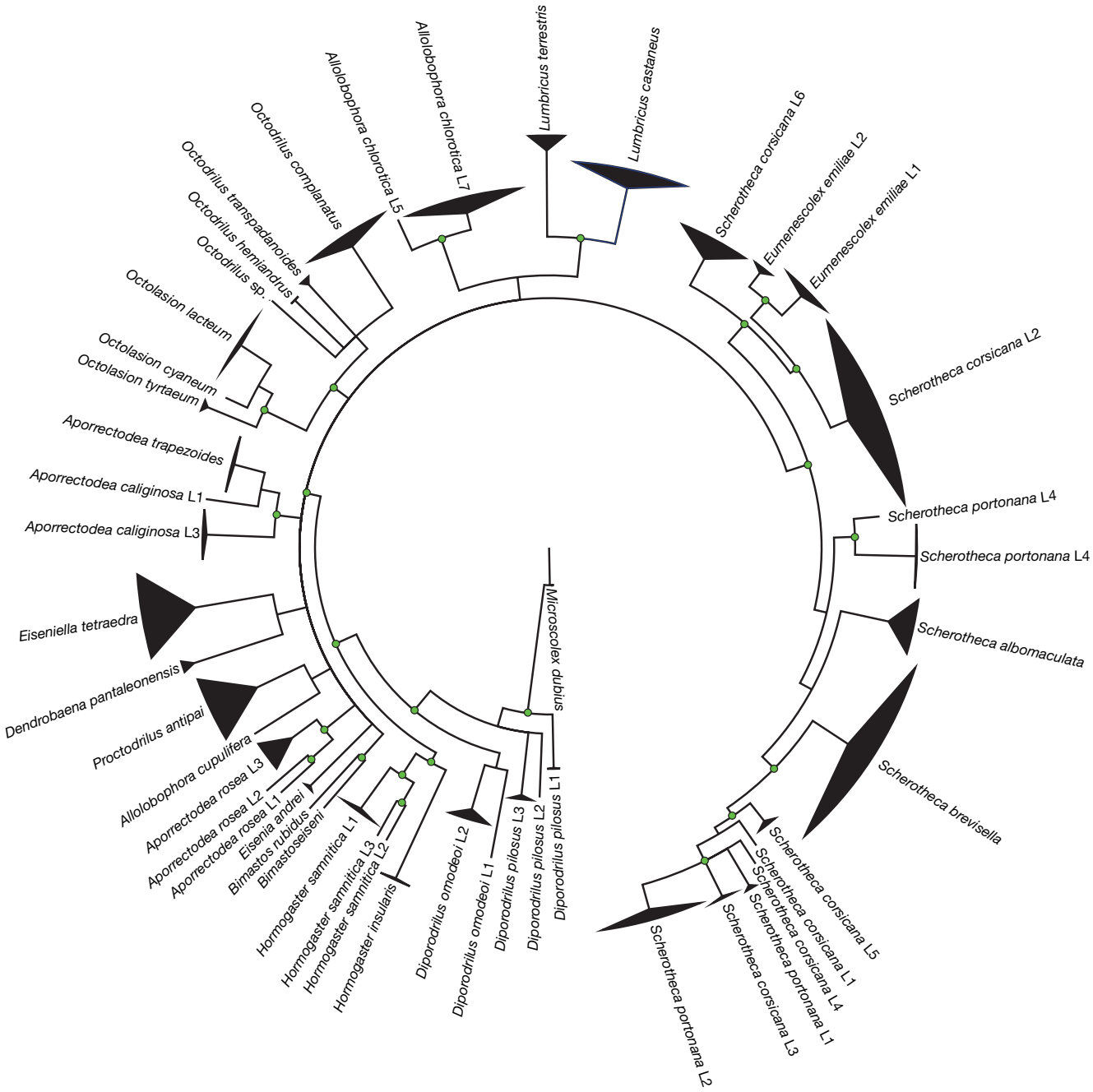

FIG. 2. — Bayesian inference of the phylogenetic relationships of earthworms from Corsica based on their COI sequences. Species-level genetic lineages (as delimited by ASAP, barcode gap analysis and morphological data) are shown as **black triangles** in order to facilitate visualization and to display the amount of intra-lineage genetic divergence (indicated by the height of the triangle). **Green circles**: posterior probability values over 90; all the species-level clades showed values close to 100.

to 50 million generations sampling every 5,00 th generation (10 000 trees). Twenty-percent of the trees were discarded as burn-in, with remaining trees combined and summarized on a 50% majority-rule consensus tree.

All the data will be made public and disseminated within the framework of the "Inventaire national du Patrimoine naturel" National Inventory of Natural Heritage (https://inpn.mnhn.fr/) and, where applicable, via the collections portal of the MNHN (https://science.mnhn.fr/institution/mnhn/item/search/form?lang=fr_FR). All DNA barcode sequences generated from the collected material, the GenBank accession numbers and the associated metadata, are available on BOLD in the public dataset "Earthworms from Corsica" (DS-EWCORS; https://doi.org/10.5883/DS-EWCORS).

The specimens collected in the framework of this study will be deposited partly at the Muséum national d'Histoire naturelle (MNHN, Paris, France) and partly in the earthworm collections of the Eco&Sols laboratory (Montpellier, France).

TABLE 2. — List of earthworm species known from Corsica. Species sampled and studied in this work are shown in bold. Symbol: * indicate species found in Corsica and closely related areas (Sardinia or Tuscany), with at least one lineage/putative species being endemic to Corsica.

Species	Source	Distribution	COI-based genetic lineages
Acanthodrilidae Claus, 1880			
Microscolex dubius (Fletcher, 1887)	Bouché 1972; this work	Cosmopolitan	–
Microscolex phosphoreus (Dugès, 1837)	Bouché 1972	Cosmopolitan	–
Hormogastridae Michaelsen, 1900			
Hormogaster insularis Bouché, 1970	Bouché 1972; this work	Endemic	–
Hormogaster samnitica Cognetti, 1914	Bouché 1972; this work	Endemic*	Three genetic lineages
Lumbricidae Rafinesque-Schmaltz, 1815			
Allolobophora chlorotica (Savigny, 1826)	Bouché 1972; this work	Cosmopolitan	Two genetic lineages
Aporrectodea cupulifera (Tétry, 1937)	This work, new citation	European	–
Aporrectodea caliginosa (Savigny, 1826)	Cernosvitov 1942; Bouché 1972; this work	Cosmopolitan	Two genetic lineages
Aporrectodea rosea (Savigny, 1826)	Pop 1947; Bouché 1972; this work	Cosmopolitan	Three genetic lineages
Aporrectodea trapezoides (Dugés, 1828)	This work, new citation	Cosmopolitan	–
Bimastos eiseni (Levinsen, 1884)	This work, new citation	Cosmopolitan	–
Bimastos parvus (Eisen, 1874)	Pop 1947	Cosmopolitan	–
Bimastos rubidus (Savigny, 1826)	Cernosvitov 1942, this work	Cosmopolitan	–
Dendrobaena byblica (Rosa, 1898)	Pop 1947; Bouché 1972	Circum-Mediterranean	–
Dendrobaena octaedra (Savigny, 1826)	Cernosvitov 1942; Pop 1947	Cosmopolitan	–
Dendrobaena pantaleonensis (Chinaglia, 1913)	Bouché 1972; this work	European	Two genetic lineages
Dendrobaena pygmaea (Savigny, 1826)	Bouché 1972; this work	Cosmopolitan	–
Diporodrilus omodeoi Bouché, 1970	Bouché 1972; this work	Endemic	Two putative species
Diporodrilus pilosus Bouché, 1970	Bouché 1972; this work	Endemic*	Three putative species
Eisenia andrei (Bouché, 1972)	This work, new citation	Cosmopolitan	–
Eiseniella tetraedra (Savigny, 1826)	Cernosvitov 1942; Bouché 1972; this work	Cosmopolitan	–
Eumenescolex emiliae Qiu & Bouché, 1998	Qiu & Bouché 1998b; this work	Endemic	Two genetic lineages
Eumenescolex heideti Qiu & Bouché, 1998	Qiu & Bouché 1998b	Endemic	–
Eumenescolex zoltani Szederjesi, 2021	Szederjesi *et al.* 2021	Endemic	–
Lumbricus castaneus (Savigny, 1826)	Cernosvitov 1942; Bouché 1972; this work	Cosmopolitan	–
Lumbricus rubellus Hoffmeister, 1843	Pop 1947	Cosmopolitan	–
Lumbricus terrestris Linnaeus, 1758	Pop 1947; Bouché 1972; this work	Cosmopolitan	–
Octodriloides sp.	This work, new citation	?	–
Octodrilus complanatus (Dugés, 1828)	Pop 1947; Bouché 1972; this work	Circum-Mediterranean	–
Octodrilus hemiandrus (Cognetti, 1901)	This work, new citation	Italo-Balkanic	–
Octodrilus transpadanoides Zicsi, 1981	This work, new citation	Italo-Austrian	–
Octodrilus transpadanus (Rosa, 1884)	Pop 1947	Trans-Aegean	–
Octolasion cyaneum (Savigny, 1826)	Bouché 1972; this work	Cosmopolitan	–
Octolasion lacteum (Örley, 1881)	Cernosvitov 1942; Bouché 1972; this work	Cosmopolitan	–
Octolasion tyrtaeum (Savigny, 1826)	This work, new citation	Cosmopolitan	–
Proctodrilus antipai (Michaelsen, 1891)	Bouché 1972; this work	European	–
Prosellodrilus amplisetosus Bouché, 1972	Bouché 1972	European	–
Scherotheca albomaculata Qiu & Bouché, 1998	Qiu & Bouché 1998a; this work	Endemic	–
Scherotheca brevisella Bouché, 1972	Bouché 1972; this work	Endemic	–
Scherotheca corsicana (Pop, 1947)	Pop 1947; Bouché 1972; this work	Endemic	Six putative species
Scherotheca cyrnea (Michaelsen, 1926)	Michaelsen 1926; Cernosvitov 1942	Endemic	–
Scherotheca dugesi (Rosa, 1895)	Cernosvitov 1942; Pop 1947	Italo-French	–
Scherotheca hexatheca (Michaelsen, 1926)	Michaelsen 1926	Endemic	–
Scherotheca portonana Qiu & Bouché, 1998	Qiu & Bouché 1998a; this work	Endemic	Three putative species + one genetic lineage
Megascolecidae Rosa, 1891			
Amynthas corticis (Kinberg, 1866)	Bouché 1972	Cosmopolitan	–

Analysis of diversity patterns

The species diversity at the scale of Corsica was analyzed by plotting rarefaction and extrapolation curves with the number of sampled localities as a measure of sampling intensity, and by calculating the Chao index, which estimates the lower bound for the expected asymptotic species richness (Gotelli & Chao 2013). This was done comparatively for a dataset that considered all the lineages delineated by ASAP, for those lineages that were supported by morphological differences (i.e., all non-cryptic lineages), and for all lineages that were considered as endemics for Corsica island. These analyses were done using the 'iNEXT' package for R v.3.5.3 (Hsieh *et al.* 2019; R Core Team 2019).

RESULTS

Species delimitation and diversity

A total of 528 individuals were retained for DNA extraction and sequencing, from which 525 COI barcode sequences were obtained (99.4% success rate). The most conservative clustering hypothesis obtained by ASAP (51 lineages, Supplementary File 1) was chosen due to its close match with morphological divergence patterns. These COI lineages could be considered species-level lineages as they showed a barcode gap and their intraspecific and interspecific genetic divergences mostly corresponded with the intervals usually found for earthworms (i.e.,

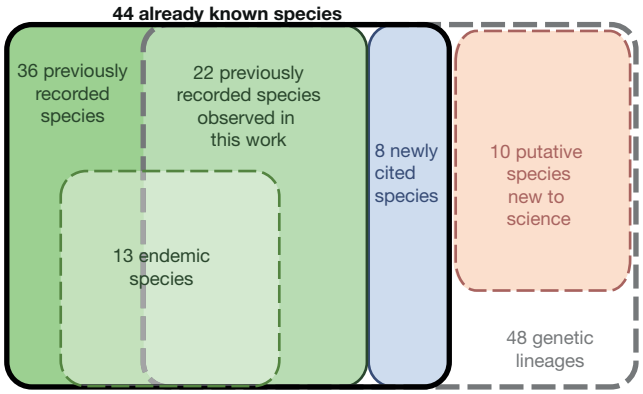

FIG. 3. — Graphical representation of the number of earthworm species known from Corsica. Rectangle surfaces are proportional to species numbers.

Chang & James 2011; Decaëns *et al.* 2013) (Supplementary File 2). However, the species-level lineage delimitation required marginal adjustments to better match morphological and Barcode Gap Analysis information. For instance, morphological differences (Supplementary File 1) supported the split of two moderately divergent DNA barcode lineages of *Scherotheca corsicana* (Pop, 1947) while three pairs of genetic lineages (within *Aporrectodea rosea* (Savigny, 1826), *Eumenescolex emiliae* Qiu & Bouché, 1998 and *Dendrobaena pantaleonis* (Chinaglia, 1913)) identified by ASAP were grouped together as the level of divergence separating them (< 9%) fell within the intraspecific genetic variability interval (Supplementary File 2). These adjustments resulted in 48 species-level lineages (Fig. 2).

Overall, our analysis resulted in the morphological identification of 29 species (plus one unidentified species within the genus *Octodriloides* Zicsi, 1986) belonging to three distinct families, i.e., Lumbricidae Rafinesque-Schmaltz, 1815 (27 species), Hormogastridae Michaelsen, 1900 (two species), and Acanthodrilidae Claus, 1880 (one species) (Table 2; Fig. 3). The difference between species and genetic lineage numbers is primarily explained by the fact that some identified species were composed of several well differentiated genetic lineages. This was the case for already documented complexes of cryptic species such as *Allolobophora chlorotica* (Savigny, 1826) or *Aporrectodea rosea*, but also for two Corsican endemics hitherto lacking such information, i.e., *Hormogaster samnitica* (Cognetti de Martiis, 1914) and *Eumenescolex emiliae* (Table 2; Fig. 2). In addition, we found that some endemic taxa previously considered as valid species are in fact composed of several distinct lineages otherwise supported by consistent morphological characters. This is the case for *Scherotheca corsicana*, *Scherotheca portonana* Qiu & Bouché, 1998, *Diporodrilus omodeoi* Bouché, 1970 and *Diporodrilus pilosus* Bouché, 1972 (Table 2; Fig. 2).

The rarefaction curves show that the sampling effort produced in our study was not sufficient to cover the entire species diversity of the island, and the extrapolation curves show that doubling the sampling effort would still not suffice to reach the inflection point (Fig. 5A). Similarly, Chao's asymptotic index predicts a total number of lineages of 105, a number of non-cryptic lineages of 64, and a total number of endemic lineages of 43 (Fig. 5B). All together, these results highlight the impressive diversity of earthworms on the island of Corsica, and how sampling intensification would substantially contribute to biodiscovery.

LIST OF SPECIES COLLECTED IN THIS STUDY

Family ACANTHODRILIDAE Claus, 1880
Genus *Microscolex* Rosa, 1887

Microscolex dubius (Fletcher, 1887)

Eudrilus dubius Fletcher, 1887: 378.

Microscolex dubius – Michaelsen 1899: 97; 1900: 140; 1913: 495, 1933: 429. — Pickford 1937: 429. — Ljungström 1972: 5. — Reynolds & Cook 1976: 96. — Zicsi 1998: 70. — Plisko 2010: 291.

DISTRIBUTION. — Cosmopolitan species, unknown origin.

HABITATS. — Low altitude Mediterranean grasslands and chaparrals.

MATERIAL COLLECTED. — **France** • 4 adult specimens, 1 juvenile specimen; Corse du Sud, Cavu, Sainte-Lucie de Porto-Vecchio; 41°42'21"N, 9°21'54"E; 38 m a.s.l.; 5.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0256) • Haute-Corse, Poggio-d'Oletta, Saint-Florent; 42°40'19"N, 9°20'42"E; 223 m a.s.l.; 1.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0420) • Haute-Corse, Santo-Pietro-di-Tenda, Casta; 42°39'57"N, 9°12'46"E; 251 m a.s.l.; 30.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0284, DFM-0285, DFM-0320).

Family HORMOGASTRIDAE Michaelsen, 1900
Genus *Hormogaster* Rosa, 1887

Hormogaster insularis Bouché, 1970
(Fig. 4G, H)

Hormogaster redii insularis Bouché, 1970: 247.

Hormogaster insularis – Marchán *et al.* 2018b: 89.

DISTRIBUTION. — Corsican endemic.

HABITAT. — Low altitude cork-oak open woods.

MATERIAL COLLECTED. — **France** • 6 adult specimens, 3 juvenile specimens; Haute-Corse, Volpajola; 42°30'54"N, 9°20'52"E; 313 m a.s.l.; 1.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0139, DFM-0140, DFM-0141), MNHN (BOLD Sample ID: DFM-0142, DFM-0144, DFM-0145, DFM-0146, DFM-0147, DFM-0231).

Hormogaster samnitica Cognetti de Martiis, 1914

Hormogaster praetiosa samnitica Cognetti de Martiis, 1914: 2.

Hormogaster samnitica lirapora Bouché, 1970: 247.

DISTRIBUTION. — Corso-Sardo-Tuscan endemic.

HABITATS. — Cork-oak open woods and Mediterranean chaparrals at low altitudes.

GENETIC LINEAGES. — We found three distinct species-levels lineages corresponding to the morphological description of *Ho. samnitica*:

Hormogaster samnitica L1

MATERIAL COLLECTED. — **France** • 7 adult specimens; Corse du Sud, Cavu, Sainte-Lucie de Porto-Vecchio; 41°42'21"N, 9°21'54"E; 38 m a.s.l.; 5.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0249, DFM-0250, DFM-0251), MNHN (BOLD Sample ID: DFM-0252, DFM-0253, DFM-0254, DFM-0255).

Hormogaster samnitica L2

MATERIAL COLLECTED. — **France** • 2 adult specimens; Corse du Sud, Bonifacio; 41°28'11"N, 9°5'45"E; 70 m a.s.l.; 5.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0259), MNHN (BOLD Sample ID: DFM-0260).

Hormogaster samnitica L3

MATERIAL COLLECTED. — **France** • 2 adult specimens, 1 juvenile specimen; Haute-Corse, Cagnano; 42°52'33"N, 9°26'6"E; 150 m a.s.l.; 31.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0126), MNHN (BOLD Sample ID: DFM-0127, DFM-0137).

REMARKS

Hormogaster samnitica lirapora Bouché, 1970 and *Ho. samnitica lirapora* var. *magna* were described from Corsica (Bouché 1970), but *magna* is an unavailable name according to ICZN rules (infrasubspecific name established after 1962). A more detailed study will be necessary to clarify the relationships between these lineages and those found in Sardinia, Elba and mainland Italy (Novo *et al.* 2015), as well as to identify clear morphological differences that would allow to describe them as distinct species. Conservatively, and given the uncertainties regarding the identity of the different genetic lineages found in our work, we prefer to refer only to *Ho. samnitica* in this checklist until further taxonomic work can clarify the taxonomy of this complex.

Family LUMBRICIDAE Rafinesque-Schmaltz, 1815
Genus *Allolobophora* Eisen, 1873

Allolobophora chlorotica (Savigny, 1826)

Enterion chloroticum Savigny, 1826: 182.

Allolobophora chlorotica – Vejdovsky 1884: 60. — Michaelsen 1890: 13. — Wilcke 1952: 177. — Zuck 1951: 127. — Graff 1953: 26. — Omodeo 1956: 333. — Bouché 1972: 263. — Easton 1983: 475. — Sims & Gerard 1999: 50. — Csuzdi & Zicsi 2003: 50. — Blakemore 2008: 15.

Allolobophora chlorotica chlorotica – Csuzdi & Zicsi 2003: 50.

DISTRIBUTION. — Cosmopolitan species, European origin.

HABITATS. — Mediterranean to humid grasslands, riparian forests, Mediterranean chaparrals, cork-oak open woods, pine forests; at low altitudes.

GENETIC LINEAGES. — We found two distinct species-levels lineages corresponding to the morphological description of *A. chlorotica*:

Allolobophora chlorotica L5

MATERIAL COLLECTED. — **France** • 1 adult specimen; Haute-Corse, Sisco, Piano di Poraja; 42°48'36"N, 9°27'43"E; 135 m a.s.l.; 31.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0114).

Allolobophora chlorotica L7

MATERIAL COLLECTED. — **France** • 32 adult specimens, 1 juvenile specimen; Haute-Corse, Cagnano; 42°52'33"N, 9°26'6"E; 150 m a.s.l.; 31.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0118, DFM-0119, DFM-0120, DFM-0121, DFM-0122) • Haute-Corse, Castellare-Di-Casinca; 42°27'39"N, 9°29'27"E; 50 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0093, DFM-0094, DFM-0095, DFM-0096, DFM-0097, DFM-0099) • Haute-Corse, Ghisonaccia, Marais de Cattolica; 42°1'15"N, 9°28'12"E; 8 m a.s.l.; 2.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0430, DFM-0431, DFM-0432, DFM-0433) • Haute-Corse, Oletta, Aliso riparian forest; 42°39'14"N, 9°17'45"E; 24 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0519) • Haute-Corse, Palasca, les Jardins de l'Ostriconi; 42°39'10"N, 9°4'44"E; 6 m a.s.l.; 30.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0561, DFM-0562, DFM-0563, DFM-0564, DFM-0565) • Haute-Corse, Poggio-d'Oletta, Saint Florent; 42°40'19"N, 9°20'42"E; 49 m a.s.l.; 1.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0421, DFM-0422, DFM-0423) • Haute-Corse, Santo-Pietro-di-Tenda, Casta; 42°39'57"N, 9°12'46"E; 251 m a.s.l.; 30.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0291, DFM-0292, DFM-0293, DFM-0294, DFM-0295, DFM-0296) • Haute-Corse, Sisco, Chapelle Saint Michel; 42°49'22"N, 9°25'58"E; 344 m a.s.l.; 31.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0381, DFM-0382, DFM-0383).

REMARKS

Five species-level lineages were previously described within *A. chlorotica* (Dupont *et al.* 2011) with the geographically restricted L5 (Switzerland and Southeastern France) suggested to be divided into three mitochondrial lineages (L5, L6 and L7). Marchán *et al.* (2020) attributed the *A. chlorotica* individuals found in the Hyères Archipelago to L5 (without considering the further subdivision). Specimens collected in Corsica cluster together with this same lineage, except for one specimen more closely related to specimens from Provence and the Alps. Upon closer inspection, both groups appear to be separate cryptic lineages which would correspond to L5 and L7 (as defined by Dupont *et al.* 2011).

Fig. 4. — Some examples of endemic earthworm species sampled in Corsica and their habitats (to their right): **A**, *Scherotheca portonana* L4 Qiu & Bouché, 1998; **B**, alpine pasture at Col de Vergio (Bouché#466); **C**, *Scherotheca albomaculata* Qiu & Bouché, 1998; **D**, open Mediterranean chaparral at Sainte-Lucie de Porto-Vecchio (Bouché#414); **E**, *Eumenescolex emiliae* L1 Qiu & Bouché, 1998; **F**, *Pinus laricio* L. forest at Zonza (Bouché#2932); **G**, *Hormogaster insularis* Bouché, 1970; **H**, *Quercus suber* L. open wood at Volpajola (Bouché#480). Scale bars: 5 cm.

Aporrectodea cupulifera (Tetry, 1937)

Allolobophora cupulifera Tetry, 1937: 120.

Allolobophora (*sensu lato*) *cupulifera* – Bouché 1972: 428.

DISTRIBUTION. — European species.

HABITAT. — Low altitude riparian forests.

MATERIAL COLLECTED. — **France** • 1 adult specimen; Haute-Corse, Oletta, Aliso riparian forest; 42°39'14"N, 9°17'45"E; 24 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0541).

Genus *Aporrectodea* Orley, 1885

Aporrectodea caliginosa (Savigny, 1826)

Enterion caliginosum Savigny, 1826: 180.

Allolobophora turgida Eisen, 1874: 46.

Nicodrilus (*Nicodrilus*) *caliginosus caliginosus* – Bouché 1972: 326.

Allolobophora caliginosa – Zicsi & Michalis 1981: 247; 1993: 302. — Michalis 1982: 350; 1983: 58; 1987: 61; 1995: 15. — Michalis *et al.* 1985: 38; 1989: 5.

Aporrectodea (*Aporrectodea*) *caliginosa* – Michalis 1993: 17.

DISTRIBUTION. — Cosmopolitan species, European origin.

HABITATS. — Pine and fir forests, poplar plantations, humid grasslands, riparian forests; from sea level to nearly 1000 m of altitude.

GENETIC LINEAGES. — We found two distinct species-level lineages corresponding to the morphological description of *Aporrectodea caliginosa* (Savigny, 1826):

Aporrectodea caliginosa L1

MATERIAL COLLECTED. — **France** • 1 adult specimen; Corse du Sud, Zonza, Samulaghia; 41°45'43"N, 9°13'8"E; 975 m a.s.l.; 4.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0488).

Aporrectodea caliginosa L3

MATERIAL COLLECTED. — **France** • 20 adult specimens; Haute-Corse, Castellare-Di-Casinca; 42.461, 9.491; 50 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0098) • Haute-Corse, Castellare-Di-Casinca, Anghione; 42°28'19"N, 9°31'8"E; 7 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0352, DFM-0353, DFM-0354, DFM-0355, DFM-0356) • Haute-Corse, Oletta, Aliso riparian forest; 42°39'14"N, 9°17'45"E; 24 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0520, DFM-0521, DFM-0522, DFM-0523, DFM-0524) • Haute-Corse, Palasca, les Jardins de l'Ostriconi; 42°39'10"N, 9°4'44"E; 6 m a.s.l.; 30.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0566, DFM-0567, DFM-0568) • Haute-Corse, Ventiseri, Vix; 41°56'49"N, 9°23'31"E; 3 m a.s.l.; 2.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0152, DFM-0153) • Corse du Sud, Zonza – Olmucciu, Ovu Santu; 41°42'17"N, 9°23'45"E; 2 m a.s.l.; 5.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (DFM-0500, DFM-0501, DFM-0502, DFM-0503).

REMARKS

Porco *et al.* (2013) and Shekhovtsov *et al.* (2016) identified three species-level cryptic lineages within *Ap. caliginosa*. The specimens collected in Corsica corresponded to lineages L1 and L3.

Aporrectodea rosea (Savigny, 1826)

Enterion roseum Savigny, 1826: 182.

Allolobophora rosea – Zicsi & Michalis 1981: 249; 1993: 302. — Michalis 1982: 350; 1983: 58; 1987: 62. — Michalis *et al.* 1985: 38.

Allolobophora rosea bimastoides – Zicsi & Michalis 1981: 249. — Michalis 1982: 350.

Aporrectodea (*Aporrectodea*) *rosea* – Michalis 1993: 17.

Aporrectodea rosea – Szederjesi 2015: 144.

DISTRIBUTION. — Cosmopolitan species, European origin.

HABITATS. — Pine forests, poplar plantations, humid grasslands, riparian forests and Mediterranean chaparrals; from sea level to 785 m of altitude.

GENETIC LINEAGES. — We found three distinct species-levels lineages corresponding to the morphological description of *Ap. rosea*:

Aporrectodea rosea L1

MATERIAL COLLECTED. — **France** • 1 adult specimen; Corse du Sud, Zonza; 41°44'34"N, 9°11'42"E; 785 m a.s.l.; 4.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0229).

Aporrectodea rosea L2

MATERIAL COLLECTED. — **France** • 2 adult specimens; Haute-Corse, Castellare-Di-Casinca, Anghione; 42°28'19"N, 9°31'8"E; 7 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg. (2 specimens); MNHN (BOLD Sample ID: DFM-0366, DFM-0367).

Aporrectodea rosea L3

MATERIAL COLLECTED. — **France** • 13 adult specimens, 1 juvenile specimen; Haute-Corse, Oletta, Aliso riparian forest; 42°39'14"N, 9°17'45"E; 24 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0530) • Haute-Corse, Palasca, les Jardins de l'Ostriconi; 42°39'10"N, 9°4'44"E; 6 m a.s.l.; 30.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0543, DFM-0544) • Haute-Corse, Santo-Pietro-di-Tenda, Casta; 42°39'57"N, 9°12'46"E; 251 m a.s.l.; 30.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0297, DFM-0298, DFM-0299, DFM-0300, DFM-0301, DFM-0302, DFM-0303, DFM-0304, DFM-0305, DFM-0306, DFM-0323).

Remark

Three different cryptic lineages were detected among the samples of *Ap. rosea* collected in Corsica, corresponding to L1, L2 and L3 as described in Porco *et al.* (2013).

Aporrectodea trapezoides (Dugès, 1828)

Lumbricus trapezoides Dugès, 1828: 289.

Lumbricus capensis Kinberg, 1867: 100.

Lumbricus novaehollandiae Kinberg, 1867: 99.

Allolobophora caliginosa trapezoides – Rosa 1893. — Zicsi & Michalis 1981: 248. — Zicsi 1982: 440. — Michalis 1982: 51; 1987: 62.

Allolobophora beddardi – Ribaucourt 1896: 53.

Helodrilus (*Allolobophora*) *caliginosus trapezoides* – Michaelsen 1900: 483.

Dendrobaena samarigera var. *graeca* – Cernosvitov 1938: 191.

Allolobophora iowana Evans, 1948: 515.

Allolobophora caliginosa forma trapezoides – Omodeo 1956: 335.

Nicodrilus caliginosus meridionalis – Bouché 1972 (part): 334.

Aporrectodea (*Aporrectodea*) *caliginosa trapezoides* – Zicsi 1985: 330. — Mršic & Šapkarev 1988: 29.

Nicodrilus trapezoides – Perez Onteniente & Rodriguez Babio 2009: 212.

Aporrectodea trapezoides – Fernández *et al.* 2012: 376.

Distribution. — Cosmopolitan species, European origin.

Habitats. — Mediterranean chaparrals, poplar plantations, low elevation to Alpine grasslands, pine forests; from sea level to above 800 m of altitude.

Material collected. — **France** • 30 adult specimens, 2 juvenile specimens; Haute-Corse, Cagnano; 42°52’33”N, 9°26’6”E; 150 m a.s.l.; 31.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0134) • Haute-Corse, Castellare-Di-Casinca, Anghione; 42°28’19”N, 9°31’8”E; 7 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0351) • Haute-Corse, Murato; 42°34’12”N, 9°18’21”E; 536 m a.s.l.; 1.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0403, DFM-0404, DFM-0405, DFM-0406, DFM-0407) • Haute-Corse, Oletta, Aliso riparian forest; 42°39’14”N, 9°17’45”E; 24 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg. MNHN (BOLD Sample ID: DFM-0531, DFM-0532, DFM-0533, DFM-0534, DFM-0535) • Haute-Corse, Palasca, les Jardins de l’Ostriconi; 42°39’10”N, 9°4’44”E; 6 m a.s.l.; 30.III.2021; T. Decaëns, D. Fernández Marchán leg. MNHN (BOLD Sample ID: DFM-0546, DFM-0547, DFM-0548, DFM-0549, DFM-0550) • Corse du Sud, Porto Vecchio, Carataggio; 41°34’30”N, 9°20’42”E; 7 m a.s.l.; 5.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0506) • Haute-Corse, Santo-Pietro-di-Tenda, Camping La Canardière; 42°38’56”N, 9°14’9”E; 304 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0332, DFM-0333, DFM-0334, DFM-0335, DFM-0336) • Haute-Corse, Santo-Pietro-di-Tenda, Casta; 42°39’57”N, 9°12’46”E; 251 m a.s.l.; 30.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0315, DFM-0316, DFM-0317, DFM-0318, DFM-0319, DFM-0325) • Haute-Corse, Ventiseri, Vix; 41°56’49”N, 9°23’31”E; 3 m a.s.l.; 2.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0154, DFM-0155) • Corse du Sud, Zonza, Pacciunituli (D67 road); 41°44’9”N, 9°10’51”E; 813 m a.s.l.; 3.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0438).

Remarks

The identified individuals could be assigned morphologically to *Aporrectodea caliginosa meridionalis* Bouché, 1972, which was cited from Corsica by Bouché (1972) together with *Ap. caliginosa caliginosa*. However, specimens collected in our study were found to be identical to the most widespread clone within lineage II of *Aporrectodea trapezoides* (Dugès, 1828) according to their COI sequence (Fernández *et al.* 2011). Our work therefore suggests a possible synonymy of *Ap. caliginosa meridionalis* and *Ap. trapezoides*, which will have to be confirmed in the future in the light of additional data. Further molecular barcoding of continental populations previously assigned to *Ap. caliginosa meridionalis* will be necessary to confirm if the synonymy applies to its whole range.

Genus *Bimastos* Moore, 1893

Bimastos eiseni (Levinsen, 1884)

Lumbricus eiseni Levinsen, 1884: 241.

Eisenia parva – Zicsi 1959: 182. — Plisko 1963: 427.

Bimastus beddardi – Mihailova, 1966: 193.

Allolobophoridella eiseni – Mršic 1991: 255. — Reynolds 1995: 10. — Csuzdi & Zicsi 2003: 69; 1999: 999. — Blakemore 2010: 499.

Bimastos eiseni – Fender 1985: 110. — Qiu & Bouché 1998: 197. — Paoletti *et al.* 2013: 31. — Csuzdi *et al.* 2017: 13.

Distribution. — Cosmopolitan species, European origin.

Habitats. — Mountain pine forests at 940 m of altitude.

Material collected. — **France** • 1 adult specimen; Corse du Sud, Zonza, Pacciunituli (D368 road); 41°43’26”N, 9°12’10”E; 940 m a.s.l.; 4.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0158).

Bimastos rubidus (Savigny, 1826)

Enterion rubidium Savigny, 1826: 182.

Allolobophora subrubicunda Eisen 1874: 51.

Lumbricus terrestris var. *rubida* – Örley 1881: 584.

Allolobophora constricta Rosa, 1884: 38.

Allolobophora darwini Ribaucourt, 1896: 18.

Helodrilus (*Dendrobaena*) *rubidus* – Michaelsen 1900: 490.

Helodrilus (*Bimastus*) *constrictus* – Michaelsen 1900: 503.

Dendrobaena magnesia Tzelepe, 1943: 38.

Dendrobaena rubida – Pop 1949: 490.

Dendrobaena (*Dendrodrilus*) *rubida* – Omodeo 1956: 175.

Dendrobaena constricta – Michalis 1977: 287.

Dendrodrilus rubidus – Perel 1979: 200. — Mršic 1991: 263. — Csuzdi & Pop 2008: 148. — Pop *et al.* 2012: 63.

Bimastos rubidus – Csuzdi *et al.* 2017: 20.

DISTRIBUTION. — Cosmopolitan species, European origin.

HABITATS. — Mountain beech forests at nearly 1000 m of altitude.

MATERIAL COLLECTED. — **France** • 1 adult specimen; Corse du Sud, Olivese (D26 road); 41°50'45"N, 9°4'55"E; 1051 m a.s.l.; 6.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0515).

Genus *Dendrobaena* Eisen, 1873

Dendrobaena pantaleonis (Chinaglia, 1913)

Helodrilus (*Bimastus*) *pantaleonis* Chinaglia, 1913: 5.

Dendrobaena pantaleonis balagnensis Bouché, 1972: 400.

Dendrobaena pantaleonis – Szederjesi 2017: 92.

DISTRIBUTION. — European species.

HABITATS. — Low altitude grasslands and Mediterranean chaparrals.

MATERIAL COLLECTED. — **France** • 7 adult specimens; Haute-Corse, Castellare-Di-Casinca; 42°27'39"N, 9°29'27"E; 50 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0087, DFM-0088, DFM-0089), MNHN (BOLD Sample ID: DFM-0090, DFM-0091, DFM-0092) • Haute-Corse, Sisco, Chapelle Saint Michel; 42°49'22"N, 9°25'58"E; 344 m a.s.l.; 31.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0384).

REMARKS

Two different subspecies are recognized within *Dendrobaena pantaleonis* (Chinaglia, 1913), with *Dendrobaena pantaleonis balagnensis* (Bouché, 1972) differing from the nominal subspecies by the reduction of the tubercula pubertatis and the absence of spermathecae. Based on these characters, material collected in our study rather resembled *D. pantaleonensis balagnensis*, except for a single individual which showed a single, empty spermathecae. Further material would be necessary to confirm the synonymy of both taxa.

Genus *Diporodrilus* Bouché, 1970

Diporodrilus omodeoi Bouché, 1970

Diporodrilus omodeoi Bouché, 1970: 252.

DISTRIBUTION. — Corsican endemic.

HABITATS. — Cork-oak open woods, holm-oak, pine and beech forests, Mediterranean chaparrals; from 150 m to above 1000 m of altitude.

GENETIC LINEAGES. — We found two distinct species-levels lineages corresponding to the morphological description of *D. omodeoi*:

Diporodrilus omodeoi L1

MATERIAL COLLECTED. — **France** • 1 adult specimen; Haute-Corse, Cagnano; 42°52'33"N, 9°26'6"E; 150 m a.s.l.; 31.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0128).

Diporodrilus omodeoi L2

MATERIAL COLLECTED. — **France** • 27 adult specimens, 3 juvenile specimens; Corse du Sud, Olivese (D26 road); 41°50'45"N, 9°4'55"E; 1051 m a.s.l.; 6.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0507, DFM-0508, DFM-0509, DFM-0510, DFM-0511) • Corse du Sud, Sorbollano – Quenza, Campu di Bonza; 41°46'12"N, 9°7'26"E; 896 m a.s.l.; 3.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0454, DFM-0455, DFM-0456, DFM-0457, DFM-0458, DFM-0459, DFM-0460, DFM-0461, DFM-0462, DFM-0463) • Corse du Sud, Zonza; 41°44'34"N, 9°11'42"E; 785 m a.s.l.; 4.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0195, DFM-0196, DFM-0197, DFM-0198, DFM-0199, DFM-0200, DFM-0201, DFM-0202, DFM-0203, DFM-0204, DFM-0205, DFM-0206, DFM-0240, DFM-0242, DFM-0247).

REMARKS

The two species-level lineages found within *D. omodeoi* showed slight morphological differences in the position of the clitellum. Thus, at least one of them is susceptible of being considered as a new species, or even both if none matches the type material of the species. More detailed work and additional sampling for L1 will be necessary to confirm the status of both taxa and allow further taxonomic acts.

Diporodrilus pilosus Bouché, 1972

Diporodrilus pilosus Bouché, 1970: 251.

DISTRIBUTION. — Corso-Sardinian endemic.

HABITATS. — Riparian forests, Mediterranean chaparrals, pine forests; from sea level to 785 m of altitude.

GENETIC LINEAGES. — We found three distinct species-levels lineages corresponding to the morphological description of *D. pilosus*:

Diporodrilus pilosus L1

MATERIAL COLLECTED. — **France** • 3 adult specimens; Haute-Corse, Oletta, Aliso riparian forest; 42°39'14"N, 9°17'45"E; 24 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (Sample ID: DFM-0517) • Haute-Corse, Poggio-d'Oletta, Saint-Florent; 42°40'19"N, 9°20'42"E; 223 m a.s.l.; 1.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (Sample ID: DFM-0418, DFM-0419).

Diporodrilus pilosus L2

MATERIAL COLLECTED. — **France** • 6 adult specimens, 5 juvenile specimens; Corse du Sud, Zonza; 41°44'34"N, 9°11'42"E; 785 m a.s.l.; 4.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0216, DFM-0217, DFM-0218, DFM-0219, DFM-0220, DFM-0221, DFM-0222, DFM-0223, DFM-0224, DFM-0225, DFM-0226).

Diporodrilus pilosus L3

MATERIAL COLLECTED. — **France** • 7 adult specimens; Haute-Corse, Sisco, Chapelle Saint Michel; 42°49'22"N, 9°25'58"E; 344 m a.s.l.; 31.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0375, DFM-0376, DFM-0377, DFM-0378, DFM-0379, DFM-0380) • Haute-Corse, Sisco, Piano di Poraja; 42°48'36"N, 9°27'43"E; 135 m a.s.l.; 31.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0101).

REMARKS

The three species-level lineages found within *D. pilosus* showed slight morphological differences in the position of genital papillae and spermathecae; unfortunately, one of them was represented by a single juvenile specimen (precluding any relevant morphological study). Thus, at least two of those lineages could be considered as new species, or up to all of them if none matches the type material of the species. More detailed work and additional sampling will allow to perform further taxonomic acts.

Genus *Eisenia* Malm, 1877

Eisenia andrei Bouché, 1972

Eisenia fetida andrei Bouché, 1972: 381.

Eisenia andrei – Pérez-Losada *et al.* 2005: 320.

DISTRIBUTION. — Cosmopolitan species, European origin.

HABITATS. — Low altitude riparian forests.

MATERIAL COLLECTED. — **France** • 5 adult specimens; Haute-Corse, Oletta, Aliso riparian forest; 42°39'14"N, 9°17'45"E; 24 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0536, DFM-0537), MNHN (BOLD Sample ID: DFM-0538, DFM-0539, DFM-0540).

Genus *Eiseniella* Michaelsen, 1900

Eiseniella tetraedra (Savigny, 1826)

Enterion tetraedrum Savigny, 1826: 184.

Lumbricus tetraedrus – Dugès 1837: 17.

Allurus tetraedrus – Rosa 1893: 10.

Eiseniella tetraedra f. typica – Michaelsen 1900: 471.

Allurus tetraedrus flavus Michaelsen, 1902: 16.

Eiseniella intermedia Jackson, 1931: 123.

Eiseniella tetraedra – Bodenheimer 1935: 393.

Eiseniella tetraedra tetraedra – Easton 1983: 491. — Csuzdi & Zicsi 2003: 153.

DISTRIBUTION. — Cosmopolitan species, European origin.

HABITATS. — Riparian forests and grasslands, humid grasslands, pine forests, poplar plantations, at low altitudes.

MATERIAL COLLECTED. — **France** • 15 adult specimens; Haute-Corse, Castellare-Di-Casinca, Anghione; 42°28'19"N, 9°31'8"E; 7 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0362, DFM-0363, DFM-0364, DFM-0365) • Haute-Corse, Ghisonaccia, Marais de Cattolica; 42°1'15"N, 9°28'12"E; 8 m a.s.l.; 2.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (DFM-0429) • Haute-Corse, Murato; 42°34'12"N, 9°18'21"E; 536 m a.s.l.; 1.IV.2021; T. Decaëns, D. Fernández Marchán leg. MNHN (BOLD Sample ID: DFM-0413, DFM-0414, DFM-0415, DFM-0416, DFM-0417) • Haute-Corse, Palasca, les Jardins de l'Ostriconi; 42°39'10"N, 9°4'44"E; 6 m a.s.l.; 30.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (DFM-0545) • Haute-Corse, Sisco, Chapelle Saint Michel; 42°49'22"N, 9°25'58"E; 344 m a.s.l.; 31.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0385, DFM-0386, DFM-0387, DFM-0388).

Genus *Eumenescolex* Qiu & Bouché, 1998

Eumenescolex emiliae Qiu & Bouché, 1998
(Fig. 4E, F)

Eumenescolex emiliae Qiu & Bouché, 1998: 5.

DISTRIBUTION. — Corsican endemic.

HABITATS. — Mountain pine and holm-oak forests, at 785 to above 1000 m of altitude.

GENETIC LINEAGES. — We found two distinct species-levels lineages corresponding to the morphological description of *Eu. emiliae*:

Eumenescolex emiliae L1

MATERIAL COLLECTED. — **France** • 19 adult specimens; Corse du Sud, Zonza; 41°44'34"N, 9°11'42"E; 785 m a.s.l.; 4.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0207, DFM-0208, DFM-0209, DFM-0210, DFM-0211, DFM-0212, DFM-0213, DFM-0214, DFM-0215) • Corse du Sud, Zonza, Samulaghia; 41°45'43"N, 9°13'8"E; 975 m a.s.l.; 4.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0489, DFM-0490, DFM-0491, DFM-0492, DFM-0493, DFM-0494, DFM-0495, DFM-0496, DFM-0497, DFM-0498).

Eumenescolex emiliae L2

MATERIAL COLLECTED. — **France** • 9 adult specimens, 2 juvenile specimens; Corse du Sud, Sorbollano – Quenza, Campu di Bonza; 41°46'12"N, 9°7'26"E; 896 m a.s.l.; 3.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-

0471, DFM-0472, DFM-0473), MNHN (BOLD Sample ID: DFM-0468, DFM-0469, DFM-0474, DFM-0475, DFM-0476, DFM-0477, DFM-0478, DFM-0479).

REMARK

The two identified species-level lineages showed no conspicuous morphological differences. Thus, *Eu. emiliae* can be considered to comprise two cryptic lineages.

Genus *Lumbricus* Linnaeus, 1758

Lumbricus castaneus (Savigny, 1826)

Enterion castaneum Savigny, 1826: 180.

Lumbricus castaneus – Bouché 1972: 362. — Mršic 1991: 466. — Pop *et al.* 2012: 64.

DISTRIBUTION. — Cosmopolitan species, European origin.

HABITATS. — Grasslands, riparian forests, poplar plantations, pine forests, Mediterranean chaparrals; from sea level to up to nearly 1000 m of altitude.

MATERIAL COLLECTED. — **France** • 35 adult specimens, 1 juvenile specimen; Haute-Corse, Castellare-Di-Casinca; 42°27'39"N, 9°29'27"E; 50 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0078, DFM-0079, DFM-0080, DFM-0081, DFM-0082, DFM-0083, DFM-0084, DFM-0085, DFM-0086, DFM-0100) • Haute-Corse, Castellare-Di-Casinca, Anghione; 42°28'19"N, 9°31'8"E; 7 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0357, DFM-0358, DFM-0359, DFM-0360, DFM-0361) • Haute-Corse, Murato; 42°34'12"N, 9°18'21"E; 536 m a.s.l.; 1.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0408, DFM-0409, DFM-0410, DFM-0411, DFM-0412) • Haute-Corse, Oletta, Aliso riparian forest; 42°39'14"N, 9°17'45"E; 24 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0542) • Haute-Corse, Palasca, les Jardins de l'Ostriconi; 42°39'10"N, 9°4'44"E; 6 m a.s.l.; 30.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0556, DFM-0557, DFM-0558, DFM-0559, DFM-0560) • Haute-Corse, Santo-Pietro-di-Tenda, Casta; 42°39'57"N, 9°12'46"E; 251 m a.s.l.; 30.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0286, DFM-0287, DFM-0288, DFM-0289, DFM-0290) • Haute-Corse, Ventiseri, Vix; 41°56'49"N, 9°23'31"E; 3 m a.s.l.; 2.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0151) • Corse du Sud, Zonza; 41°44'34"N, 9°11'42"E; 785 m a.s.l.; 4.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0194) • Corse du Sud, Zonza, Samulaghia; 41°45'43"N, 9°13'8"E; 975 m a.s.l.; 4.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0480, DFM-0481, DFM-0482).

Lumbricus terrestris Linnaeus, 1758

Lumbricus terrestris Linnaeus, 1758: 647. — James *et al.* 2010: e15629.

Enterion terrestre – Savigny 1822: 103.

Lumbricus agricola Hoffmeister, 1842: 24.

Lumbricus infelix Kinberg, 1867: 98.

Lumbricus americanus Perrier, 1872: 44.

Lumbricus studeri Ribaucourt, 1896: 5.

DISTRIBUTION. — Cosmopolitan species, European origin.

HABITATS. — Low altitude grasslands.

MATERIAL COLLECTED. — **France** • 5 adult specimens; Haute-Corse, Palasca, les Jardins de l'Ostriconi; 42°39'10"N, 9°4'44"E; 6 m a.s.l.; 30.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0551, DFM-0552), MNHN (BOLD Sample ID: DFM-0553, DFM-0554, DFM-0555).

Genus *Octodrilus* Omodeo, 1956

Octodrilus complanatus (Dugès, 1828)

Lumbricus complanatus Dugès, 1828: 289.

Octolasium complanatum – Reynolds & Cook 1976: 89.

Octodrilus complanatus – Zicsi & Michalis 1981: 256. — Easton 1983: 483. — Pavlicek *et al.* 2003: 457. — Csuzdi *et al.* 2006: 24.

DISTRIBUTION. — Mostly circum-Mediterranean species.

HABITATS. — Grasslands, riparian forests, poplar plantations, pine forests, Mediterranean chaparrals, cork-oak open woods; from sea level to 785 m of altitude.

MATERIAL COLLECTED. — **France** • 26 adult specimens, 1 juvenile specimen; Haute-Corse, Cagnano; 42°52'33"N, 9°26'6"E; 150 m a.s.l.; 31.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0129, DFM-0130, DFM-0131, DFM-0132, DFM-0133) • Haute-Corse, Castellare-Di-Casinca; 42°27'39"N, 9°29'27"E; 50 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0070, DFM-0071, DFM-0072, DFM-0073, DFM-0074, DFM-0075, DFM-0076, DFM-0077) • Haute-Corse, Castellare-Di-Casinca, Anghione; 42°28'19"N, 9°31'8"E; 7 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0339, DFM-0340) • Corse du Sud, Cavu, Sainte-Lucie de *Porto*-Vecchio; 41°42'21"N, 9°21'54"E; 38 m a.s.l.; 5.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0257) • Haute-Corse, Oletta, Aliso riparian forest; 42°39'14"N, 9°17'45"E; 24 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0525, DFM-0526, DFM-0527, DFM-0528, DFM-0529) • Haute-Corse, Santo-Pietro-di-Tenda, Camping La Canardière; 42°38'56"N, 9°14'9"E; 304 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0331) • Haute-Corse, Sisco, Chapelle Saint Michel; 42°49'22"N, 9°25'58"E; 344 m a.s.l.; 31.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0368) • Haute-Corse, Ventiseri, Vix; 41°56'49"N, 9°23'31"E; 3 m a.s.l.; 2.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0156) • Corse du Sud, Zonza; 41°44'34"N, 9°11'42"E; 785 m a.s.l.; 4.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0227, DFM-0228) • Corse du Sud, Zonza – Olmucciu, Ovu Santu; 41°42'17"N, 9°23'45"E; 2 m a.s.l.; 5.IV.2021; T. Decaëns, D. Fernández Marchán leg. MNHN (BOLD Sample ID: DFM-0499).

Octodrilus hemiandrus (Cognetti de Martiis, 1901)

Octolasium hemiandrum Cognetti de Martiis, 1901: 3.

Octodrilus hemiander – Paoletti *et al.* 2013: 34 (misspelling).

DISTRIBUTION. — Italo-Balkanic species.

HABITATS. — Low altitude Mediterranean chaparrals.

MATERIAL COLLECTED. — **France** • 2 adult specimens; Haute-Corse, Sisco, Chapelle Saint-Michel; 42°49'22"N, 9°25'58"E; 344 m a.s.l.; 31.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0369) • Haute-Corse, Sisco, Piano di Poraja; 42°48'36"N, 9°27'43"E; 135 m a.s.l.; 31.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0102).

Octodrilus transpadanoides Zicsi, 1981

Octodrilus transpadanoides Zicsi, 1981: 161.

DISTRIBUTION. — Italo-Austrian species.

HABITATS. — Low elevation poplar plantations.

MATERIAL COLLECTED. — **France** • 5 adult specimens; Haute-Corse, Castellare-Di-Casinca, Anghione; 42°28'19"N, 9°31'8"E; 7 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0346, DFM-0347), MNHN (BOLD Sample ID: DFM-0348, DFM-0349, DFM-0350).

Genus *Octodriloides* Zicsi, 1986

Octodriloides sp.

DISTRIBUTION. — Unknown.

HABITATS. — Low elevation Mediterranean chaparrals.

MATERIAL COLLECTED. — **France** • 1 adult specimen; Haute-Corse, Sisco, Piano di Poraja; 42°48'36"N, 9°27'43"E; 135 m a.s.l.; 31.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0103).

REMARKS

Initially identified as *Octodrilus hemiandrus* (Cognetti de Martiis, 1901), this specimen appears to belong to the genus *Octodriloides* Zicsi, 1986, showing a certain affinity to *Octodriloides poklonensis* Mrsic, 1991 from Croatia, but additional material would be necessary to corroborate its identity.

Genus *Octolasion* Örley, 1885

Octolasion cyaneum (Savigny, 1826)

Enterion cyaneum Savigny, 1826: 181.

Allolobophora profuga Rosa, 1884: 47.

Allolobophora cyanea profuga Protz, 1895: 255.

Octolasion cyaneum – Michaelsen 1900: 506. — Edwards & Lofty 1972: 214.

DISTRIBUTION. — Cosmopolitan species, European origin.

HABITATS. — Alpine grasslands at 1450 m of altitude.

MATERIAL COLLECTED. — **France** • 1 adult specimen, 1 juvenile specimen; Haute-Corse, Albertacce, Col de Vergio; 42°17'27"N, 8°52'44"E; 1450 m a.s.l.; 28.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0055, DFM-0058).

Octolasion lacteum (Orley, 1881)

Lumbricus terrestris var. *lacteum* Örley, 1881: 584.

Allolobophora profuga – Rosa 1884: 47.

Octolasium lacteum – Cernosvitov 1932: 534. — Mihailova 1966: 193. — Šapkarev 1978: 72. — Zicsi 1982: 431.

DISTRIBUTION. — Cosmopolitan species, European origin.

HABITATS. — Poplar plantations, riparian forests, riparian and Alpine grasslands; from sea level to above 1400 m of altitude.

MATERIAL COLLECTED. — **France** • 18 adult specimens, 1 juvenile specimen; Haute-Corse, Castellare-Di-Casinca, Anghione; 42°28'19"N, 9°31'8"E; 7 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0342, DFM-0343, DFM-0344, DFM-0345) • Haute-Corse, Murato; 42°34'12"N, 9°18'21"E; 536 m a.s.l.; 1.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0396, DFM-0397, DFM-0398, DFM-0399, DFM-0400) • Corse du Sud, Zicavo, Castellu d'Ornucciu; 41°52'22"N, 9°9'17"E; 1422 m a.s.l.; 3.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0453) • Corse du Sud, Zonza; 41°44'34"N, 9°11'42"E; 785 m a.s.l.; 4.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0170, DFM-0171, DFM-0172, DFM-0173, DFM-0174, DFM-0175, DFM-0176, DFM-0177, DFM-0239).

Octolasion tyrtaeum (Savigny, 1826)

Enterion tyrtaeum Savigny, 1826: 180.

Octolasion tyrtaeum – Gates 1972: 125.

DISTRIBUTION. — Cosmopolitan species, European origin.

HABITATS. — Low altitude poplar plantations and humid grasslands.

MATERIAL COLLECTED. — **France** • 2 adult specimens; Haute-Corse, Castellare-Di-Casinca, Anghione; 42°28'19"N, 9°31'8"E; 7 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0341) • Haute-Corse, Ventiseri, Vix; 41°56'49"N, 9°23'31"E; 3 m a.s.l.; 2.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0157).

Genus *Proctodrilus* Zicsi, 1985

Proctodrilus antipai (Michaelsen, 1891)

Allolobophora antipae Michaelsen, 1891: 16.

Helodrilus (*Helodrilus*) *antipae* – Michaelsen 1900: 498.

Dendrobaena riparia Bretscher, 1901: 218.

Allolobophora (*Microeophila*) *antipain* Omodeo, 1956: 184.

Allolobophora cuginii helodriloides Chandebois, 1957: 410.

Allolobophora antipai forma *typica* – Zicsi 1959: 283; 1968: 151, 1982: 444.

Proctodrilus antipai – Zicsi 1985: 285; 1991: 188.

DISTRIBUTION. — European species.

HABITATS. — Mediterranean chaparrals, holm-oak and pine forest; from sea level to above 800 m of altitude.

MATERIAL COLLECTED. — **France** • 23 adult specimens, 6 juvenile specimens; Corse du Sud, Porto Vecchio, Carataggio; 41°34'30"N, 9°20'42"E; 7 m a.s.l.; 5.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0504) • Corse du Sud, Sorbollano – Quenza, Campu di Bonza; 41°46'12"N, 9°7'26"E; 896 m a.s.l.; 3.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0464, DFM-0465, DFM-0466, DFM-0467, DFM-0470) • Corse du Sud, Zonza; 41°44'34"N, 9°11'42"E; 785 m a.s.l.; 4.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0178, DFM-0179, DFM-0180, DFM-0181, DFM-0182, DFM-0183, DFM-0184, DFM-0185, DFM-0186, DFM-0187, DFM-0188, DFM-0189, DFM-0190, DFM-0191, DFM-0192, DFM-0193, DFM-0241, DFM-0243, DFM-0244, DFM-0245, DFM-0246) • Corse du Sud, Zonza, Pacciunituli (D67 road); 41°44'9"N, 9°10'51"E; 813 m a.s.l.; 3.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0436, DFM-0437).

Genus *Scherotheca* Bouché, 1972

Scherotheca albomaculata Bouché, 1972
(Fig. 4C, D)

Scherotheca (*Scherotheca*) *corsicana albomaculata* Bouché, 1972: 296.

Scherotheca (*Corsicadrilus*) *albomaculata* – Qiu & Bouché 1998: 128.

DISTRIBUTION. — Corsican endemic.

HABITATS. — Low altitude Mediterranean chaparrals and cork-oak open woods.

MATERIAL COLLECTED. — **France** • 6 adult specimens, 1 juvenile specimen; Corse du Sud, Bonifacio; 41°28'11"N, 9°5'45"E; 70 m a.s.l.; 5.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID:, DFM-0261, DFM-0262, DFM-0263), MNHN (BOLD Sample ID: DFM-0264, DFM-0265) • Corse du Sud, Cavu, Sainte-Lucie de Porto-Vecchio; 41°42'21"N, 9°21'54"E; 38 m a.s.l.; 5.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0258) • Corse du Sud, Porto Vecchio, Carataggio; 41°34'30"N, 9°20'42"E; 7 m a.s.l.; 5.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0505).

Scherotheca brevisella Bouché, 1972

Scherotheca (*Scherotheca*) *dugesi brevisella* Bouché, 1972: 291.

DISTRIBUTION. — Corsican endemic.

HABITATS. — Mediterranean grasslands and chaparrals, riparian forests; from sea level to above 700 m of altitude.

MATERIAL COLLECTED. — **France** • 26 adult specimens, 7 juvenile specimens; Haute-Corse, Murato, Cagnanozza; 42°33'39"N, 9°18'14"E; 715 m a.s.l.; 1.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0389, DFM-0390) • Haute-Corse, Oletta, Aliso riparian forest; 42°39'14"N, 9°17'45"E; 24 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0518) • Haute-Corse, Santo-Pietro-di-Tenda, Camping La Canardière; 42°38'56"N, 9°14'9"E; 304 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0330) • Haute-Corse, Santo-Pietro-di-Tenda, Casta; 42°39'57"N, 9°12'46"E; 251 m a.s.l.; 30.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0307, DFM-0308, DFM-0309, DFM-0310, DFM-0311, DFM-0312, DFM-0313, DFM-0314, DFM-0321, DFM-0322, DFM-0324) • Haute-Corse, Sisco, Chapelle Saint Michel; 42°49'22"N, 9°25'58"E; 344 m a.s.l.; 31.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0370, DFM-0371, DFM-0372, DFM-0373, DFM-0374) • Haute-Corse, Sisco, Piano di Poraja; 42°48'36"N, 9°27'43"E; 135 m a.s.l.; 31.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0104, DFM-0105, DFM-0106, DFM-0107, DFM-0108, DFM-0109, DFM-0110, DFM-0111, DFM-0112, DFM-0113, DFM-0115, DFM-0116, DFM-0117).

Scherotheca portonana Qiu & Bouché, 1998
(Fig. 4A, B)

Scherotheca (*Corsicadrilus*) *portonana* Qiu & Bouché, 1998: 127.

DISTRIBUTION. — Corsican endemic.

HABITATS. — Mediterranean chaparrals, riparian grasslands, cork-oak open woods, Alpine grasslands; from 300 to above 1400 m of altitude.

GENETIC LINEAGES. — We found four distinct species-levels lineages corresponding to the morphological description of *S. portonana*:

Scherotheca portonana L1

MATERIAL COLLECTED. — **France** • 2 adult specimens; Haute-Corse, Santo-Pietro-di-Tenda, Camping La Canardière; 42°38'56"N, 9°14'9"E; 304 m a.s.l.; 29.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0338), MNHN (BOLD Sample ID: DFM-0337).

Scherotheca portonana L2

MATERIAL COLLECTED. — **France** • 10 adult specimens, 1 juvenile specimen; Haute-Corse, Murato; 42°34'12"N, 9°18'21"E; 536 m a.s.l.; 1.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0401, DFM-0402) • Haute-Corse, Murato, Cagnanozza; 42°33'39"N, 9°18'14"E; 715 m a.s.l.; 1.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0391, DFM-0392, DFM-0393, DFM-0394, DFM-0395) • Haute-Corse, Volpajola; 42°30'54"N, 9°20'52"E; 313 m a.s.l.; 1.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0148, DFM-0149), MNHN (BOLD Sample ID: DFM-0143, DFM-0150).

Scherotheca portonana L3

MATERIAL COLLECTED. — **France** • 1 sub-adult specimen, 1 juvenile specimen; Haute-Corse, Albertacce, Col de Vergio; 42°17'27"N, 8°52'44"E; 1450 m a.s.l.; 28.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0047, DFM-0061).

Scherotheca portonana L4

MATERIAL COLLECTED. — **France** • 10 adult specimens, 11 juvenile specimens; Haute-Corse, Albertacce, Col de Vergio; 42°17'27"N, 8°52'44"E; 1450 m a.s.l.; 28.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0041, DFM-0042, DFM-0043), MNHN (BOLD Sample ID: DFM-0044, DFM-0045, DFM-0046, DFM-0049, DFM-0050, DFM-0051, DFM-0052, DFM-0056, DFM-0059, DFM-0060, DFM-0062, DFM-0063, DFM-0064, DFM-0065, DFM-0066, DFM-0067, DFM-0068, DFM-0069).

REMARKS

We found several species-level genetic lineages that broadly match the morphological description of *Sc. portonana*. At the type locality of the species (i.e., Albertacce, Col de Vergio; Qiu & Bouché 1998a; Fig. 4B), we found two species-level lineages (L3 and L4). Unfortunately, L3 was represented by two juvenile specimens, preventing any testing of the existence of morphological differences between both lineages. We therefore conservatively consider L3 and L4 as cryptic lineages until further material is collected.

Two additional species-level lineages were also detected (L1 and L2). While they were initially assigned to *Sc. portonana*, they differ from each other and from the topotypes in significant morphological characters, thus they can be considered as new species. Interestingly, these two species are more closely related genetically to some lineages of *Scherotheca corsicana* (Pop, 1947) (see *infra*) than to *Sc. portonana sensu stricto* (Suplementary File 1).

Scherotheca corsicana (Pop, 1947)

Allolobophora dugesi corsicana Pop, 1947: 4.

Scherotheca (*Scherotheca*) *corsicana corsicana* – Bouché 1972: 292.

DISTRIBUTION. — Corsican endemic.

HABITATS. — Beech, pine and fir forests, cork-oak open woods, Mediterranean chaparrals, grasslands; from sea level to above 1400 m of altitude.

GENETIC LINEAGES. — We found six distinct species-levels lineages corresponding to the morphological description of *Sc. corsicana*:

Scherotheca corsicana L1

MATERIAL COLLECTED. — **France** • 2 adult specimens, 1 juvenile specimen; Haute-Corse, Albertacce, Col de Vergio; 42°17'27"N, 8°52'44"E; 1450 m a.s.l.; 28.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0053), MNHN (BOLD Sample ID: DFM-0054, DFM-0057).

Scherotheca corsicana L2

MATERIAL COLLECTED. — **France** • 21 adult specimens, 9 juvenile specimens; Corse du Sud, Olivese (D69 road); 41.837, 9.096; 1178 m a.s.l.; 6.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN(BOLD Sample ID: DFM-0273) • Corse du Sud, Zicavo, Ponte di Valpine; 41°52'33"N, 9°7'58"E; 1248 m a.s.l.; 3.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0441, DFM-0442) • Corse du Sud, Zonza; 41°44'34"N, 9°11'42"E; 785 m a.s.l.; 4.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0230, DFM-0232, DFM-0233), MNHN (BOLD Sample ID: DFM-0234, DFM-0235, DFM-0236, DFM-0237, DFM-0238, DFM-0248) • Corse du Sud, Zonza, Pacciunituli (D368 road); 41°43'26"N, 9°12'10"E; 940 m a.s.l.; 4.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0159, DFM-0160, DFM-0161, DFM-0162, DFM-0163, DFM-0164, DFM-0165, DFM-0166, DFM-0167, DFM-0168, DFM-0169) • Corse du Sud, Zonza, Pacciunituli (D67 road); 41°44'9"N, 9°10'51"E; 813 m a.s.l.; 3.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0434, DFM-0435) • Corse du Sud, Zonza, Samulaghia; 41°45'43"N, 9°13'8"E; 975 m a.s.l.; 4.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0483, DFM-0484, DFM-0485, DFM-0486, DFM-0487).

Scherotheca corsicana L3

MATERIAL COLLECTED. — **France** • 5 adult specimens; Haute-Corse, Ghisonaccia, Marais de Cattolica; 42°1'15"N, 9°28'12"E; 8 m a.s.l.; 2.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0424, DFM-0426), MNHN (BOLD Sample ID: DFM-0424, DFM-0425, DFM-0426, DFM-0427, DFM-0428).

Scherotheca corsicana L4

MATERIAL COLLECTED. — **France** • 3 adult specimens, 3 juvenile specimens; Haute-Corse, Cagnano; 42°52'33"N, 9°26'6"E; 150 m a.s.l.; 31.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0124, DFM-0135), MNHN (BOLD Sample ID: DFM-0123, DFM-0125, DFM-0136, DFM-0138).

Scherotheca corsicana L5

MATERIAL COLLECTED. — **France** • 4 adult specimens, 1 juvenile specimen; Haute-Corse, Mausoleo; 42°30'14"N, 9°0'14"E; 635 m a.s.l.; 28.III.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0516) • Haute-Corse, Olmi-Cappella, Mausoleo, Tartagine; 42°29'38"N, 8°59'45"E; 779 m a.s.l.; 28.III.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0326, DFM-0328), MNHN (BOLD Sample ID: DFM-0327, DFM-0329).

Scherotheca corsicana L6

MATERIAL COLLECTED. — **France** • 18 adult specimens, 12 juvenile specimens; Corse du Sud, Olivese (D26 road); 41°50'45"N, 9°4'55"E; 1051 m a.s.l.; 6.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0512, DFM-0513, DFM-0514) • Corse du Sud, Olivese (D69 road); 41°50'13"N, 9°5'45"E; 1178 m a.s.l.; 6.IV.2021; T. Decaëns, D. Fernández Marchán leg.; Eco&Sols (BOLD Sample ID: DFM-0266, DFM-0267, DFM-0268) and MNHN (BOLD Sample ID: DFM-0269, DFM-0270, DFM-0271, DFM-0272, DFM-0274, DFM-0275, DFM-0276, DFM-0277, DFM-0278, DFM-0279, DFM-0280, DFM-0281, DFM-0282, DFM-0283) • Corse du Sud, Zicavo, Castellu d'Ornucciu; 41°52'22"N, 9°9'17"E; 1422 m a.s.l.; 3.IV.2021;

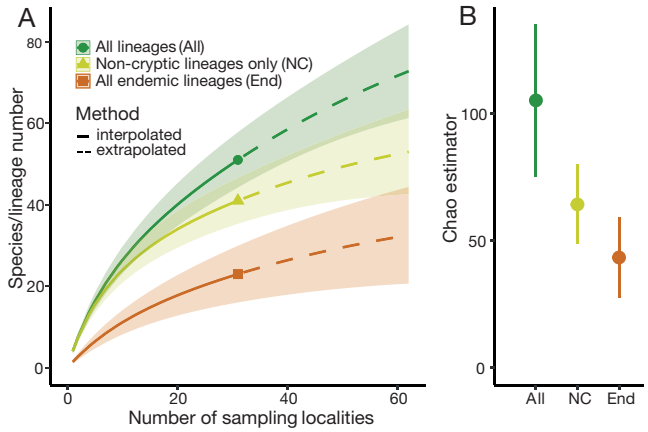

FIG. 5. — Observed and estimated species diversity of earthworms in the island of Corsica: **A**, incidence-based rarefaction and extrapolation curves of species numbers; **B**, Chao asymptotic estimator of species numbers. The figure compares the results obtained when considering all species-level lineages obtained with DNA barcodes (**All**), when considering non-cryptic lineages only (**NC**) and when considering all endemic lineages (**End**). Solid lines represent rarefaction curves, whereas dashed lines represent extrapolation curves; shaded areas are 95% and error bars confidence intervals based on a bootstrap with 200 replications.

T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0446, DFM-0447, DFM-0448, DFM-0449, DFM-0450, DFM-0451, DFM-0452) • Corse du Sud, Zicavo, Ponte di Valpine; 41°52'33"N, 9°7'58"E; 1248 m a.s.l.; 3.IV.2021; T. Decaëns, D. Fernández Marchán leg.; MNHN (BOLD Sample ID: DFM-0443, DFM-0444, DFM-0445).

REMARKS

These six lineages are supported by morphological differences in average body size and pigmentation, position of the clitellum and tubercula pubertatis, position of genital papillae and number and position of spermathecae and seminal vesicles. They have been provisionnaly assigned to *Sc. corsicana*, based on a relative similarity to the characters described in Pop (1947). However, it should be noted that Pop's description is approximate, with four different localities designated as type localities, a single complete adult, and a wide morphological variability. It should also be noted that, although showing an undeniable degree of similarity to *Sc. corsicana*, none of the lineages found in our study matched all the characters highlighted by Pop. Hence, all six of those species-level lineages are susceptible of being described as new species.

DISCUSSION

Our study has revealed a remarkable species diversity of earthworms in the island of Corsica. Twenty-two of the 36 previously recorded species were sampled in this work (Michaelsen 1926; Cernosvitov 1942; Pop 1947; Bouché 1972; Qiu & Bouché 1998a, b; Szederjesi *et al.* 2021) and eight species were newly cited, raising the total number of taxa for the island to 44. This highlights the richness of the species pool on a regional scale (with more diversity than countries such as Bosnia-Herzegovina – 28 –, Czech Republic – 34 – or Algeria – 35; http://taxo.drilobase.org/), which can be explained by the island's indented terrain which has probably been favorable to local speciation events, as supported by the high level of local endemism observed in most Corsican taxa.

Despite this significant contribution to the knowledge of Corsican earthworm fauna, our survey missed 14 species that were cited in previous work. Most of them correspond to epigeic taxa (*Dendrobaena octaedra* (Savigny, 1826), *Dendrobaena byblica* (Rosa, 1893), *Dendrobaena pygmaea* (Savigny, 1826), *Bimastos parvus* (Eisen, 1874) and *Lumbricus rubellus* Hoffmeister, 1843) which are usually restricted to very specific habitats (e.g. compost piles, leaf litter accumulation, decaying logs) that received a proportionally weaker sampling effort during our work. *Amynthas corticis* (Horst, 1885) is another allegedly introduced species which is expected to inhabit highly anthropized habitats which were not included in our sampling campaign. *Scherotheca dugesi* (Rosa, 1895), *Octodrilus transpadanus* (Rosa, 1884) and *Prosellodrilus amplisetosus* Bouché, 1972 are cited from single locations in Corsica and are likely to have been transported from Italy (the former two) and France (the latter), where they are relatively common. As *Oc. transpadanus* and *Oc. traspadanoides* are morphologically very similar but the latter was described after Pop's checklist, it is possible that both his and our citations refer to the same species. *Allolobophora cyrnea* Michaelsen, 1926 and *Allolobophora hexatheca* Michaelsen, 1926 are two species with an unresolved taxonomic status as they both have been tentatively proposed as synonyms of *Scherotheca corsicana* by Bouché (1972). The lack of sampling around the unprecise type localities stated by Michaelsen makes it difficult to assign these species to any of the *Scherotheca* lineages found within this work. Finally, *Eumenescolex heideti* Qiu & Bouché, 1998 and *Eumenescolex zoltani* Szederjesi, 2021 are narrowly distributed endemics which we failed to sample due to unsuitable sampling conditions (i.e., very dry soils in the type locality) and being described after our sampling campaign, respectively.

In our work, we identified 29 formally described species and one still undetermined *Octodriloides* sp., but taking into account COI-based species-level lineages (which would require further evidence to be formally recognized as species) raised the total up to 48. This highlights the importance of genetic diversity assessment to accurately reflect the taxonomic diversity of earthworms, which is usually overlooked when relying on morphology alone (Decaëns *et al.* 2013). While many of species-level lineages found in our study are morphologically cryptic (and thus difficult to be formally described as species new for science, but see Marchán *et al.* 2018a, 2020a), at least ten of them show clear morphological differences that make them suitable for further taxonomic descriptions. This represents a remarkable number of new species for science, especially considering the relatively modest sampling effort of our study. Yet, it is likely that the island's diversity was previously underestimated by the even lower sampling effort from past campaings. In addition, our study is the first integrating DNA barcoding in a survey of Corsican earthworm biodiversity, which has allowed us to

reconsider the taxonomic significance of several morphological characters whose variability was previously considered of little diagnostic significance.

The identified species offer some insight into the biogeographic relationships of the earthworm fauna of Corsica. When considering only the morphologically recognizable and currently described species, and both previous citations and our work, 20 species reported from Corsica (i.e., 45.5% of the total known regional diversity) correspond to cosmopolitan species. This is similar but slightly lower than the proportion of cosmopolitan species found in the Mediterranean island of Cyprus, where Pavlíček & Csuzdi (2008) found 10 species out of 18 (i.e., 55.5%) to be cosmopolitan. Another four species showed roughly European ranges. All these wide-ranging species were likely recently introduced in Corsica by human activities. On the other hand, the species *Oc. hemiandrus*, *Oc. transpadanoides* and *Octodriloides* sp., which represent new records for Corsica, could have recently been introduced from Italy by anthropochory or by natural dispersion (either active or passive) due to the proximity of the Tuscan archipelago. Interestingly, all the new citations in Corsica correspond to cosmopolitan or widely distributed species: this suggests that these earthworms could have arrived on the island posteriously to the most exhaustive previous works (Pop 1947; Bouché 1972). Comparative phylogeographic analyses (such as in Marchán *et al.* 2020b) could help explain the patterns of colonization of continental islands by incorporating the genetic diversity of the insular populations in a wider framework.

Finally, 13 species found in our study (nine) and in the literature (four) can be considered as Corsican endemics. This represents an endemism rate of 29.5% (of a total of 44 already known species), which is higher than in other Mediterranean islands such as Cyprus, where a single endemic species has been reported so far (Szederjesi *et al.* 2016), and the Hyères archipelago, where two endemics out of a total of 15 known species have been found (Decaëns *et al.* 2020). While no comprehensive nor updated checklist is available for the earthworm fauna of the Balearic Islands and Sardinia (but see Omodeo 1984), they also possess a potentially high level of endemism, with at least five and nine endemic/near-endemic species, respectively (Perez-Losada *et al.* 2011; Omodeo & Rota 2008; Marchán *et al.* 2018b). Considering species-level genetic lineages, the endemism rate in Corsica increases to 48%, mirroring the results of Perez-Losada *et al.* (2011), who found that the diversity of Balearic *Postandrilus* rises from five to 11 species when following a similar approach. Unusually high endemism levels in Corsica, Balearic Islands and Sardinia can originate in their paleogeographic history, as they were all part of a continuous terrane corresponding to the European continental margin from circa 112 to 21 million years ago (Advokaat *et al.* 2014), which has proven to be an evolutionary cradle for many earthworm taxa (Fernández *et al.* 2016). Yet, more comprehensive work on the earthworm communities of Mediterranean islands would be necessary to understand the relative roles of paleogeography, island size, distance to the continent, environmental factors and biotic interactions in their actual species diversity.

CONCLUSIONS

More comprehensive sampling and genetic diversity data has revealed the high diversity of the earthworm fauna of Corsica, with 8 new citations increasing the already known Corsican species list to 44. DNA barcodes allowed the delineation of 48 species-level genetic lineages, of which ten displayed enough morphological differences to be suitable for future descriptions as new species. A remarkably high endemic rate could be related to the complex geological history of the island and the historical biogeography of Western Mediterranean earthworms. The moderate degree of overlap between the previously recorded list of Corsican earthworm species and the species identified in this work, together with the large number of undescribed new taxa and the large areas which have not been systematically sampled yet, suggest that Corsica diversity is still underestimated. This was supported by rarefaction curves, which estimated a high number of undiscovered species (including endemic species). Further sampling of the central and western sectors, and a stronger focus in mountain grasslands (which showed higher diversity than usually found in such habitat) and typical habitats for epigeics (leaf litter and decaying logs) will be necessary to increase the completeness in the sampling of Corsican earthworm diversity and to understand the importance of this island in the evolution of Western Mediterranean earthworms. Finally, the authors thank two anonymous reviewers, and the editorial team of *Zoosystema*, for usefull comments an early version of the manuscript.

Acknowledgements
All the material treated during this study was collected during the naturalist expedition, "Our Planet Reviewed – Corsica 2019-2021". This survey was organized by the Muséum national d'Histoire naturelle (MNHN, Paris) in collaboration with and funded by the Collectivité de Corse (CdC) and the Office français de la Biodiversité (OFB). We are grateful to logistical partners who assisted with fieldwork: the Office de l'Environnement de la Corse (OCIC and CBNC), the Office national des Forêts (ONF), the Direction régionale de l'Environnement de l'Aménagement et du Logement (DREAL) and the Conservatoire du Littoral (CdL) and the communes of Alta Rocca (Serra di Scopamène, Zonza and Zicavo) and Tartagine (Olmi-Capella and Mausoléo). We also thank Evgeny Zakharov, director of Canadian Centre for DNA barcoding at CBG (University of Guelph, Canada), Nadya Nikolova, Suresh Naik and the laboratory staff for their support in ensuring proper and careful treatment of the samples processed in this study. DFM was funded by a Make Our Planet Great Again Postdoctoral grant from Campus France (mopga-postdoc-3–6111272103). We are grateful to the leaders of the expedition Julien Touroult, François Dusoulier and Jean Ichter, as well as to the entire research team who have made this survey one of a kind. Finally, the authors thank two anonymous reviewers, and the editorial team of *Zoosystema*, for usefull comments an early version of the manuscript.

REFERENCES

ADVOKAAT E., VAN HINSBERGEN D. J., MAFFIONE M., LANGEREIS C. G., VISSERS R. L., CHERCHI A., SCHROEDER R., MADANI H. & COLUMBU S. 2014. — Eocene rotation of Sardinia, and the paleogeography of the western Mediterranean region. *Earth and Planetary Science Letters* 401: 183-195. https://doi.org/10.1016/j.epsl.2014.06.012

BENSON D.A., CAVANAUGH M., CLARK K., KARSCH-MIZRACHI I., LIPMAN D.J., OSTELL J. & SAYERS E.W. 2013. — GenBank. Nucleic Acids Research 41 (Database issue): D36-42. https://doi.org/10.1093/nar/gks1195

BLAKEMORE R. J. 2008. — British and Irish earthworms – A checklist of species, *in* BLAKEMORE R. J. (ed.) *A series of searchable texts on earthworm biodiversity, ecology and systematics from various regions of the World* (3rd Ed.) 1: 14.

BLAKEMORE R. J. 2010. — *Cosmopolitan earthworms*. VermEcology, Yokohama, Japan (4th Ed., CD publication), 750 p.

BODENHEIMER F. S. 1935. — *Animal Life in Palestine – An introduction to the problems of animal ecology and zoogeography*, Mayer L., Jerusalem, 507 p.

BODENHEIMER F. S. 1937. — Prodromus faunae Palestinae – Essai sur les éléments zoogeographiques et historiques du sud-ouest du sous-règne Paléarctique. *Mémoires présentés à l'Institut d'Égypte* 33: 1-286.

BOUCHÉ M. B. 1970. — Observations sur les lombricides (Troisième série : VII, VIII, IX). *Revue d'Écologie et de Biologie du Sol* 7: 533-547.

BOUCHÉ M. B. 1972. — *Lombriciens de France. Écologie et systématique*. Vol. 72, No. HS. INRA Editions, 671 p.

BRETSCHER K. 1901. — Beobachtung uber Oligochaeten der Schweiz. *Revue suisse de Zoologie* 9: 189-223. https://doi.org/10.5962/bhl.part.82517

CERNOSVITOV L. 1932. — Die Oligochaetenfauna der Karpathen. II. Die Lumbriciden und ihre Verbreitung. Zoologische Jahrbücher, Zoologische Jahrbücher. *Abteilung für Systematik, Geographie und Biologie der Tiere* 63: 525-546.

CERNOSVITOV L. 1938. — Zur Kenntnis der Oligochatenfauna des Balkans. V. Oligochaten aus Jugoslawien und Albanien. *Zoologischer Anzeiger* 122: 285-289.

CERNOSVITOV L. 1942. — Revision of Friend's types and descriptions of British Oligochaeta. *Proceedings of the Zoological Society of London Series B* 111: 237-280. https://doi.org/10.1111/j.1469-7998.1942.tb00051.x

CHANDEBOIS R. 1957. — Sur la présence en Corse d'une forme nouvelle d'*Allolobophora cuginii* Rosa et sur une mode d'evolution des Lumbricides. *Bulletin de la Société Zoologique de France* 82: 410-412.

CHANG C. H. & JAMES S. 2011. — A critique of earthworm molecular phylogenetics. *Pedobiologia* 54: S3-S9. https://doi.org/10.1016/j.pedobi.2011.07.015

CHINAGLIA L. 1913. — Escursioni zoologiche del Dr. E. Festa. Lumbricidae. *Bollettino dei Musei di zoologia ed anatomia comparata della R. Università di Torino* 28 (667): 1-6.

COGNETTI DE MARTIIS L. 1901. — Res Italicae I. *Octolasium hemiandrum* nov. sp. ed altri Lumbricidi raccolti del Dott. E. Festa nei dintorni della Spezia. *Bolletino dei Musei di Torino* 15 (383): 8 p.

COGNETTI DE MARTIIS L. 1914 — Escursioni Zoologiche del Dr. Enrico Festa nei monti della Vallata del Sangro (Abruzzo). Nota sugli Oligocheti degli Abruzzi. *Bolletino dei Musei di Zoologia ed Anatomia Comparata della R. Universitá di Torino* 689 (29).

CSUZDI C. & POP V. V. 2008. — New data on the earthworm fauna of the Maramures Mts (Eastern Carpathians, Romania) (Oligochaeta, Lumbricidae). *Studia Universitatis Vasile Goldiş* 18 (Suppl. 1): 145-152.

CSUZDI C. & ZICSI A. 2003. — *Earthworms of Hungary (Annelida: Oligochaeta: Lumbricidae)*. Hungarian Natural History Museum, Budapest: 271 p.

CSUZDI CS., ZICSI A. & MISIRLIOĞLU M. 2006. — An annotated checklist of the earthworm fauna of Turkey (Oligochaeta: Lumbricidae). *Zootaxa* 1175 (1): 1-29. https://doi.org/10.11646/zootaxa.1175.1.1

CSUZDI C., CHANG C.-H., PAVLÍČEK T., SZEDERJESI T., ESOPI D. & SZLAVECZ K. 2017. — Molecular phylogeny and systematics of native North American lumbricid earthworms (Clitellata: Megadrili). *PLoS ONE* 12 (8): e0181504. https://doi.org/10.1371/journal.pone.0181504

CSUZDI C., SZEDERJESI T., MARCHÁN D. F., DE SOSA I., GAVINELLI F., DORIGO L., PAMIO A., DREON A. L., FUSARO S., MORETTO E. & PAOLETTI M. G. 2018. — DNA barcoding of the Italian anecic *Octodrilus* species in rural (vineyard) and forested areas with description of *Octodrilus zicsiniello* sp. nov. (Clitellata, Megadrili). *Zootaxa* 4496 (1): 43-64. https://doi.org/10.11646/zootaxa.4496.1.5

DECAËNS T., PORCO D., ROUGERIE R., BROWN G. G. & JAMES S. W. 2013. — Potential of DNA barcoding for earthworm research in taxonomy and ecology. *Applied Soil Ecology* 65: 35-42. https://doi.org/10.1016/j.apsoil.2013.01.001

DECAËNS T., LAPIED E., MAGGIA M. E., MARCHAN D. F. & HEDDE M. 2020. — Diversité des communautés d'annélides terrestres dans les écosystèmes continentaux et insulaires et du Parc national de Port-Cros. *Scientific Reports of the Port-Cros national Park* 34: 69-99.

DI ROSA M., FRASSI C., MENEGHINI F., MARRONI M., PANDOLFI L. & DE GIORGI A. 2019. — Tectono-metamorphic evolution of the European continental margin involved in the Alpine subduction: New insights from Alpine Corsica, France. *Comptes Rendus Geoscience* 351 (5): 384-394. https://doi.org/10.1016/j.crte.2018.12.002

DONNELLY R. K., HARPER G. L., MORGAN A. J., OROZCO-TERWENGEL P., PINTO-JUMA G. A. & BRUFORD M. W. 2013. — Nuclear DNA recapitulates the cryptic mitochondrial lineages of *Lumbricus rubellus* and suggests the existence of cryptic species in an ecotoxological soil sentinel. *Biological Journal of the Linnean Society* 110 (4): 780-795. https://doi.org/10.1111/bij.12171

DUGÈS A. L. 1828. — Recherche sur la circulation, la respiration, et la reproduction des Annélides sétigéres abranches. *Annales des Sciences naturelles, Paris Série 1* 15: 284-337.

DUGÈS A. L. 1837. — Nouvelles observations sur la zoologie et l'anatomie des annelides abranches setigeres. *Annales des Sciences naturelles Paris Série 2 Zoologie* 8: 15-35.

DUPONT L., LAZREK F., PORCO D., KING R. A., ROUGERIE R., SYMONDSON W. O. C., LIVET A., RICHARD B., DECAËNS T., BUTT K. R. & MATHIEU J. 2011. — New insight into the genetic structure of the *Allolobophora chlorotica* aggregate in Europe using microsatellite and mitochondrial data. *Pedobiologia* 54 (4): 217-224. https://doi.org/10.1016/j.pedobi.2011.03.004

EASTON E. G. 1983. — A guide to the valid names of Lumbricidae (Oligochaeta), *in* SATCHELL J. E. (ed.), *Earthworm Ecology from Darwin to Vermiculture*. Chapman and Hall, London: 475-485.

EDWARDS C. A. & LOFTY J. R. 1972. — *Biology of earthworms*. Chapman and Hall, London, 283 p.

EISEN G. 1874. — New Englands och Canadas Lumbricides. *Ofversigt af Kongliga Vetenskaps-Akademiens Forhandligar Stockholm* 31 (2): 41-49.

EVANS A. C. 1948. — On some earthworms from Iowa, including a description of a new species. *The Annals and Magazine of Natural History London Series 11* 14: 514-516.

FENDER W. M. 1985. — Earthworms of the western United States. Part I. Lumbricidae. *Megadrilogica* 4 (5): 93-129.

FERNÁNDEZ R., ALMODÓVAR A., NOVO M., GUTIÉRREZ M. & DÍAZ COSÍN D. J. 2011. — A vagrant clone in a peregrine species: phylogeography, high clonal diversity and geographical distribution in the earthworm *Aporrectodea trapezoides* (Dugès, 1828). *Soil Biology and Biochemistry* 43 (10): 2085-2093. https://doi.org/10.1016/j.soilbio.2011.06.007

Fernández R., Almodóvar A., Novo M., Simancas B. & Díaz Cosín D. J. 2012. — Adding complexity to the complex: New insights into the phylogeny, diversification and origin of parthenogenesis in the *Aporrectodea caliginosa* species complex (Oligochaeta, Lumbricidae). *Molecular Phylogenetics and Evolution* 64 (2): 368-379. https://doi.org/10.1016/j.ympev.2012.04.011

Fernández R., Novo M., Marchán D. F. & Díaz Cosín D. J. 2016. — Diversification patterns in cosmopolitan earthworms: similar mode but different tempo. *Molecular Phylogenetics and Evolution* 94: 701-708. https://doi.org/10.1016/j.ympev.2015.07.017

Fletcher J. J. 1887. — Notes on Australian earthworms, part III. *Proceedings of the Linnean Society of New South Wales* (2) 2: 377-402.

Folmer O., Black M., Hoeh W., Lutz R. & Vrijenhoek R. 1994. — DNA primers for amplification of mitochondrial cytochrome c oxidase subunit I from diverse metazoan invertebrates. *Molecular Marine Biology and Biotechnology* 3 (5): 294-299.

Gates G.E. 1972. — Toward a revision of the earthworm family Lumbricidae. IV. The trapezoids species complex. *Bulletin of Tall Timbers Research* 12: 1-146.

Gotelli N. & Chao A. 2013. — Measuring and Estimating Species Richness, Species Diversity, and Biotic Similarity from Sampling Data: 195-211, *in* Levin S. A. (ed.), Encyclopedia of Biodiversity (2nd ed., Vol. 5). Waltham, MA, Academic Press: 195-211 https://doi.org 10.1016/B978-0-12-384719-5.00424-X

Graff O. 1953. — Zur Berechtigung des Artnames *Lumbricus terrestris* Linnaeus, 1758. *Zoologischer Anzeiger* 161: 324-326.

Hebert P. D. N., Cywinska A., Ball S. L. & deWaard J. R. 2003. — Biological Identifications through DNA Barcodes. *Proceedings of the Royal Society B: Biological Sciences* 270 (1512): 313-321. https://doi.org/10.1098/rspb.2002.2218

Hernández-Triana L. M., Prosser S. W., Rodríguez-Perez M. A., Chaverri L. G., Hebert P. D. N. & Gregory T. R. 2014. — Recovery of DNA barcodes from blackfly museum specimens (Diptera: Simuliidae) using primer sets that target a variety of sequence lengths. *Molecular Ecology Ressources* 14: 508-518. https://doi-org.inee.bib.cnrs.fr/10.1111/1755-0998.12208

Hoffmeister W. F. L. 1842. — *De vermibus quibusdam genus Lumbricorum perinentibus*. Holmquist, Berlin, 28 p.

Hsieh T. C., Ma K. H. & Chao A. 2019. — iNEXT: iNterpolation and EXTrapolation for species diversity. R package version 2.0.19.

Jackson A. 1931. — The Oligochaeta of south-western Australia. *The Journal of the Proceedings of the Royal Society of Western Australia* 17: 71-137.

James S. W., Porco D., Decaëns T., Richard B., Rougerie R. & Erseus C. 2010. — DNA barcoding reveals cryptic diversity in *Lumbricus terrestris* L., 1758 (Clitellata): resurrection of *L. herculeus* (Savigny, 1826). *PloS ONE* 5 (12): e15629. https://doi.org/10.1371/journal.pone.0015629

Kinberg J. G. H. 1867. — Annulata nova. *Ofversigt af Kongliga Vetenskaps-Akademiens Forhandlingar* 23: 97-103.

Lestienne M., Hely C., Curt T., Jouffroy-Bapicot I. & Vannière B. 2020a. — Combining the monthly drought code and paleoecological data to assess holocene climate impact on Mediterranean fire regime. *Fire* 3 (2): 8. https://doi.org/10.3390/fire3020008

Lestienne M., Jouffroy-Bapicot I., Leyssenne D., Sabatier P., Debret M., Albertini P. J., Colombaroli D., Didier J., Hély C. & Vannière B. 2020b. — Fires and human activities as key factors in the high diversity of Corsican vegetation. *The Holocene* 30 (2): 244-257. https://doi.org/10.1177/0959683619883025

Levinsen G. M. R. 1884. — Systematisk-geografisk öfverssigt över de norddiske Annulata, Gephyrea, Chaetognathi og Balanoglossi, II. *Videnskabelige Meddelser fra den Naturhistoriske Forening i Kjöbenhavn* 45: 9-350.

Linnaeus C. 1758. — *Systema naturæ per regna tria naturæ, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. Editio decima reformata 1758, Holmiæ, Impensis direct*. Laurentii Salvii (Salvius publ.). https://doi.org/10.5962/bhl.title.542

Ljungström P. O. 1972. — Introduced earthworms of South Africa. On their taxonomy, distribution, history of introduction and on the extermination of endemic earthworms. Zoologische Jahrbucher *Abteilung fur Systematik Okologie und Geographie der Tiere* 99: 1-81.

Marchán D. F., Díaz Cosín D. J. & Novo M. 2018a. — Why are we blind to cryptic species? Lessons from the eyeless. *European Journal of Soil Biology* 86: 49-51. https://doi.org/10.1016/j.ejsobi.2018.03.004

Marchán D. F., Fernández R., Sanchez N., de Sosa I. D., Díaz Cosín D. J. & Novo M. 2018b. — Insights into the diversity of Hormogastridae (Annelida, Oligochaeta) with descriptions of six new species. *Zootaxa* 4496 (1): 65-95. https://doi.org/10.11646/zootaxa.4496.1.6

Marchán D. F., Fernández R., Domínguez J., Díaz Cosín D. J. & Novo M. 2020. — Genome-informed integrative taxonomic description of three cryptic species in the earthworm genus *Carpetania* (Oligochaeta, Hormogastridae). *Systematics and biodiversity* 18 (3): 203-215. https://doi-org.inee.bib.cnrs.fr/10.1080/14772000.2020.1730474

Marchán D. F., Hedde M., Lapied E., Maggia M. E., Novo M., Domínguez J. & Decaëns T. 2020. — Contrasting phylogeographic patterns of earthworms (Crassiclitellata, Lumbricidae) on near-shore mediterranean islands. *European Journal of Soil Biology* 101, 103242. https://doi.org/10.1016/j.ejsobi.2020.103242

Martinsson S. & Erséus C. 2017. — Cryptic speciation and limited hybridization within *Lumbricus* earthworms (Clitellata: Lumbricidae). *Molecular Phylogenetics and Evolution* 106: 18-27. https://doi.org/10.1016/j.ympev.2016.09.011

Michaelsen W. 1890. — Oligochaeten des Naturhistorischen Museums zu Hamburg, III. *Mitteilungen aus dem Naturhistorischen Museum in Hamburg* 7: 53-62.

Michaelsen W. 1891. — Oligochaeten des Naturhistorischen Museums in Hamburg IV. *Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten* 8: 299-340. https://www.biodiversitylibrary.org/page/25210196

Michaelsen W. 1899. — Terricolen von verschiedenen Gebieten der Erde. *Mitteilungen des Naturhistorische Museums in Hamburg* 16: 1-122.

Michaelsen W. 1900. — *Oligochaeta, in* Das Tierreich, volume *10*. R. Frielander and Sohn, Berlin, 575 p. https://doi.org/10.5962/bhl.title.11605

Michaelsen W. 1902. — Neue Oligochaeten und neue Fundorte alt-bekannter. *Mitteilungen aus dem Naturhistorischen Museum in Hamburg* 19: 1-54.

Michaelsen W. 1913. — Die Oligochäten des Kaplandes. *Zoologische Jahrbücher, Abteilung für Systematik, Jena* 34: 473-556.

Michaelsen W. 1926. — Beiträge zur Kenntnis der Land-und Süsswasserfauna Korsikas. 3. Lumbriciden. *Mitteilungen aus dem Museum für Naturkunde in Berlin* 12: 223-227.

Michalis K. 1977. — Die Oligochaetenfauna der Halbinsel von Athos (Chalkidiki). *Scientific Annals, Faculty of Physics and Mathematics, University of Thessaloniki* 17: 285-298.

Michalis K. 1982. — Katalog der Oligochaetenfauna Griechenlands. *Biologia Gallo-Hellenica* 9: 343-362.

Michalis K. 1983. — New biotopes of the species *Allolobophora dofleini* (Ude, 1922) and the subspecies *Bimastus antiquus bouchei* (Zicsi-Michalis, 1981) (Oligochaeta-Lumbricidae). *Ecologia Mediterranea* 9 (1): 57-61. https://doi.org/10.3406/ecmed.1983.1017

Michalis K. 1987. — Contribution to the systematic and ecological study of the earthworms (Oligochaeta, Lumbricidae) of the Western Thrace. *Arquivos do Museu Bocage* 1 (5): 59-69.

Michalis K. 1993. — *Criodrilus lacuum* Hoffmeister, 1845 (Oligochaeta: Criodrilidae) – earthworm species new to Greece. *Acta Zoologica Cracoviensia* 36 (1): 15-21.

Michalis K. 1995. — Oligochaeten – Funde aus Thessalien (Griechenland) nebst Beschreibung der Art *Octodrilus peleensis* sp. nov. *Bios (Macedonia, Greece)* 3: 15-20.

MICHALIS K., FRAGOULIS A. & PANIDIS S. 1985. — Earthworms (Oligochaeta: Lumbricidae) from the montainous mas of Pella province: southwest region, and Imathias province, northwest region: a systematical and ecological study. *Ecologia Mediterranea* 11 (4): 37-42.

MICHALIS K., FRAGOULIS A. & PANIDIS S. 1989. — Notes on the earthworms (Oligochaeta, Lumbricidae) from central west Macedonia. *Acta zoologica cracoviensia* 32: 3-14.

MIHAILOVA P. 1966. — Notes on some Lumbricidae species from Bulgaria. *Annuaire de Université de Sofia* 60: 129-139.

MILLER M. A., PFEIFFER W. & SCHWARTZ T. 2010. — Creating the CIPRES Science Gateway for inference of large phylogenetic trees: 1-8, *in* 2010 gateway computing environments workshop (GCE), Ieee.

MRŠIC N. 1991. — *Monograph on Earthworms (Lumbricidae) of the Balkans*. Akademija Znanosti Umetnosti, Ljubljana, Slovenia, 757 p.

MRŠIC N. & ŠAPKAREV J. 1988. — Revision of the Genus *Allolobophora* Eisen 1874 (emend. Pop 1941) (Lumbricidae, Oligochaeta). *Acta Musei Macedonici Scientiarum Naturalium* 154 (1): 1-38.

MOUILLOT F., PARADIS G., ANDREI-RUIZ M. C. & QUILICHINI A. 2008. — Corsica: 220-244, *in Mediterranean Island Landscapes.* Springer, Dordrecht.

NOVO M., FERNÁNDEZ R., MARCHÁN D. F., TRIGO D., DÍAZ COSIN D. J. & GIRIBET G. 2015. — Unearthing the historical biogeography of Mediterranean earthworms (Annelida: Hormogastridae). *Journal of Biogeography* 42 (4): 751-762. https://doi.org/10.1111/jbi.12447

OMODEO P. 1956. — Contributo alla revisione dei Lumbricidae. *Archivio Zoologico Italiano* 41: 129-212.

OMODEO P. 1984. — The earthworm fauna of Sardinia. *Revue d'Ecologie et Biologie du Sol* 21: 115-126.

OMODEO P. & ROTA E. 2008. — Earthworm diversity and land evolution in three Mediterranean districts. *Proceedings of the California Academy of Sciences* 59(suppl. 1): 65-83.

ÖRLEY L. 1881. — A Magyarorszagi Oligochaetak faunaja. I. Terricolae. *Mathematikai es Termeszettudomanyok Korebol* 16: 562-611.

OUDET J., MÜNCH P., VERATI C., FERRANDINI M., MELINTE-DOBRINESCU M., GATTACCECA J., CORNÉE J. J., OGGIANO G., QUILLÉVÉRÉ F., BORGOMANO J. & FERRANDINI J. 2010. — Integrated chronostratigraphy of an intra-arc basin: 40Ar/39Ar datings, micropalaeontology and magnetostratigraphy of the early Miocene Castelsardo basin (northern Sardinia, Italy). *Palaeogeography, Palaeoclimatology, Palaeoecology* 295 (1-2): 293-306. https://doi.org/10.1016/j.palaeo.2010.06.007

PAOLETTI M.G., SOMMAGGIO D. & FUSARO S. 2013. — Proposta di Indice di qualità biologica del suolo (QBS-e) basato sui Lombrichi e applicato agli agroecosistemi. *Biologia Ambientale* 27 (2): 25-43.

PAVLÍČEK T. & CSUZDI C. 2008. — Does the autochthonous earthworm fauna emigrate from the Levant to Cyprus. *Advances in Earthworm Taxonomy* 3: 189-200.

PAVLIČEK T., CSUZDI CS. & NEVO E. 2003. — Species richness and zoogeographic affinities of earthworms in the Levant. *Pedobiologia* 47: 452-457. https://doi.org/10.1078/0031-4056-00212

PEREL T. S. 1979. — [Range and Regularities in the Distribution of Earthworms of the USSR Fauna]. Nauka, Moscow (in Russian), 272 p.

PÉREZ-LOSADA M., EIROA J., MATO S. & DOMÍNGUEZ J. 2005. — Phylogenetic species delimitation of the earthworms *Eisenia fetida* (Savigny, 1826) and *Eisenia andrei* Bouche, 1972 (Oligochaeta, Lumbricidae) based on mitochondrial and nuclear DNA sequences. *Pedobiologia* 49: 317-324. https://doi.org/10.1016/j.pedobi.2005.02.004

PEREZ-LOSADA M., BREINHOLT J. W., PORTO P. G., AIRA M. & DOMINGUEZ J. 2011. — An earthworm riddle: systematics and phylogeography of the Spanish lumbricid *Postandrilus*. *PLoS ONE* 6 (11): e28153. https://doi.org/10.1371/journal.pone.0028153

PERRIER E. 1872. — Recherches pour servir à l'histoire des lombriciens terrestres. *Nouvelles Archives du Muséum d'Histoire naturelle de Paris* 8: 5-198. https://www.biodiversitylibrary.org/page/12475125

PICKFORD G. E. 1937. — *A monograph of the Acanthodrilinae earthworms of South Africa*. W. Heffer & Sons Ltd., Cambridge, 612 p.

PLISKO G. 1963. — Materialien zur Kenntnis der Regenwürmer (Oligochaeta, Lumbricidae) Bulgariens. *Fragm. Faun., Warsawa* 10: 425-440. https://doi.org/10.3161/00159301FF1963.10.29.425

PLISKO J.D. 2010. — Megadrile earthworm taxa introduced to South African soils (Oligochaeta: Acanthodrilidae, Eudrilidae, Glossoscolecidae, Lumbricidae, Megascolecidae, Ocnerodrilidae). *African Invertebrates* 51 (2): 289-312. https://doi-org.inee.bib.cnrs.fr/10.5733/afin.051.0204

POP V. V. 1947. — Lombriciens de la Corse. *Archives de Zoologie expérimentale et générale* 85: 18.

POP V. V. 1949. — Lumbricids of Romania [Lumbricidele din Romania]. *Analele Academiei Republicii Populare Romane* 1 (9): 383-505 (in Romanian).

POP V. V., POP A. A. & CSUZDI C. 2012. — An annotated checklist of the Romanian earthworm fauna (Oligochaeta,Lumbricidae). Zoology in the Middle East 4: 59-70. https://doi-org.inee.bib.cnrs.fr/10.1080/09397140.2012.10648985

PORCO D., DECAËNS T., DEHARVENG L., JAMES S. W., SKARŻYŃSKI D., ERSÉUS C., BUTT K. R., RICHARD B. & HEBERT P. D. 2013. — Biological invasions in soil: DNA barcoding as a monitoring tool in a multiple taxa survey targeting European earthworms and springtails in North America. *Biological Invasions* 15 (4): 899-910. https://doi.org/10.1007/s10530-012-0338-2

PROTZ A. 1895. — Bericht über meine vom 11. Juni bis zum 5. Juli 1894 ausgeführte zoologische Forschungsreise im Kreise Schwetz. *Schriften Gesellschaft Danzig, IX 254-268* IX: 254-268.

PUILLANDRE N., BROUILLET S. & ACHAZ G. 2021. — ASAP: assemble species by automatic partitioning. *Molecular Ecology Resources* 21 (2): 609-620. https://doi-org.inee.bib.cnrs.fr/10.1111/1755-0998.13281

QIU J. P. & BOUCHÉ M. 1998a. — Révision morphologique, chorologique et taxonomique du genre *Scherotheca* Bouché, 1972 (Oligochaeta: Lumbricidae). *Documents pédozoologiques et intégrologiques* 4 (12): 117-139.

QIU J. P. & BOUCHÉ M. B. 1998b. — *Eumenescolex*, new genus of Lumbricidae (Annelida, Oligochaeta). *Documents pédozoologiques et integrologiques* 4 (1): 3-7.

QIU J. P. & BOUCHÉ M. B. 1998c. — Liste classée des taxons valides de lombriciens (Oligochaeta: Lumbricoidea) après l'étude des trois cinquièmes d'entre eux. *Documents pédozoologiques et intégrologiques* 4: 181-200.

R CORE TEAM. 2019. — R: A language and environment for statistical computing. Version 3.5.3. R Foundation for Statistical Computing. https://www.R-project.org/

RATNASINGHAM S. & HEBERT P. D .N. 2007. — BOLD: The Barcode of Life Data System (www.barcodinglife.org). Molecular Ecology Notes 7 (3): 355-364. https://doi.org/10.1111/j.1471-8286.2007.01678.x

REYNOLDS J. W. & COOK D. G. 1976. — *Nomenclatura Oligochaetologica. A catalogue of names, descriptions and type specimens of the Oligochaeta*. The University of New Brunswick, Fredericton, 217 p.

REYNOLDS J. W. 1995. — Status of exotic earthworm systematics and biogeography in North America, *in* HENDRIX P. (ed.), *Earthworm Ecology and Biogeography in North America*. CRC Press, Inc, Boca Raton, Florida: 1-28.

RIBAUCOURT E. DE 1896. — Étude sur la faune lombricide de la Suisse. *Revue suisse de Zoologie* 4: 1-110. https://doi.org/10.5962/bhl.part.35505

RONQUIST F., TESLENKO M., VAN DER MARK P., AYRES D. L., DARLIBNG A., HÖHNA S., LARGET B., LIU L., SUCHARD M. A., […] & HUELSENBECK J. P. 2012. — MrBayes 3.2: efficient Bayesian phylogenetic inference and model choice across a large model space. *Systematic biology* 61 (3): 539-542. https://doi.org/10.1093/sysbio/sys029

ROSA D. 1884. — *I lumbricidi dei Piemonte*. Unione Tipografi co-Editrice, Torino: 54 p.
ROSA D. 1893. — Revisione dei Lumbricidi. *Memorie della Reale Accademia delle Scienze di Torino Serie 2* 43: 399-476.
ŠAPKAREV J. 1978. — Kišne gliste Jugoslavije. Sadašnja taksonomska proučenost i njihova dalja istraživanja. *Biosistematika* 4: 293-304.
SAVIGNY J.-C. 1822. — *Système des annélides, principalement de celles des côtes de l'Égypte et de la Syrie, offrant les caractères tant distinctifs que naturels des Ordres, Familles et Genres, avec la Description des Espèces. Description de l'Égypte ou Recueil des Observations et des Recherches qui ont été faites en Égypte pendant l'Expédition de l'Armée Française, publié par les Ordres de sa Majesté l'Empereur Napoléon le Grand, Histoire Naturelle, Paris.* Paris, Imprimerie impériale 1 (3): 1-128. http://biodiversitylibrary.org/page/41329897
SAVIGNY J.-C. 1826. — Analyses des travaux de l'Académie Royale des Sciences pendant l'année 1821, partie physique, *in* CUVIER G. (ed.), *Mémoires de l'Académie des Sciences de l'Institut de France Paris* 5: 176-184.
SHEKHOVTSOV S. V., GOLOVANOVA E. V. & PELTEK S. E. 2016. — Different dispersal histories of lineages of the earthworm *Aporrectodea caliginosa* (Lumbricidae, Annelida) in the Palearctic. *Biological Invasions* 18 (3): 751-761. https://doi.org/10.1007/s10530-015-1045-6
SIMS R. W. & GERARD B. M. 1999. — *Earthworms: Notes for the identification of British species (*4th Ed). The Linnean Society of London and The Estuarine and Coastal Sciences Association by Field Studies Council, Montford Bridge, Shrewsbury, UK, 169 p.
SZEDERJESI T. 2015. — New earthworm records from various parts of Greece (oligochaeta: lumbricidae, acanthodrilidae, megascolecidae, ocnerodrilidae). *Opuscula Zoologica* (Budapest) 46 (2): 143-152. https://doi.org/10.18348/opzool.2015.2.143
SZEDERJESI T. 2017. — Earthworms of Crete (Oligochaeta: Lumbricidae, Acanthodrilidae): new records, remarks and biogeographical review. *North-Western Journal of Zoology* 12: e161803.
SZEDERJESI T., PAVLÍČEK T. & CSUZDI C. 2016. — Description of the first endemic earthworm species from Cyprus (Oligochaeta: Lumbricidae). *Zoology in the Middle East* 62 (2): 158-163. https://doi-org.inee.bib.cnrs.fr/10.1080/09397140.2016.1182778
SZEDERJESI T., PAVLÍČEK T. & CSUZDI C. 2021a. — Description of a new *Eumenescolex* species (Clitellata: Megadrili, Lumbricidae) with new data to the earthworm fauna of Corsica and Sardinia. *Opuscula Zoologica* (Budapest) 52 (2): 141-147. https://doi.org/10.18348/opzool.2021.2.141
SZEDERJESI T., PAVLÍČEK T. & CSUZDI C. 2021b. — Earthworms from the French Pyrenees, with description of a new *Scherotheca (Opothedrilus)* species (Clitellata: Megadrili: Lumbricidae). *Acta Zoologica Bulgarica* 73 (1): 13-20.
TÉTRY A. 1937. — Description d'une nouvelle espèce de Lombricien (Allolobophora cupulifera). *Bulletin de la Société des Sciences de Nancy* 10: 119-123.
THOMPSON J. D. 2005. — Plant evolution in the Mediterranean. Oxford University Press: New-York, 293 p.
TZELEPE N. D. 1943. — *Greek symbols in Hungarian Lumbricidae (Oligochaeta)*. University of Athens, Dissertation University of Athens (in Romanian), 60 p.
VEJDOVSKY F. 1884. — *System und Morphologie der Oligochaeten*. F. Rivnae, Prague, 136 p.
WILCKE D.E. 1952. — Zur Kenntnis der Lumbricidenfaunen Deutschlands. *Zoologischer Anzeiger* 151: 104-106.
ZICSI A. & MICHALIS K. 1981. — Übersicht der Regenwurm-fauna Griechenlands (Oligochaeta: Lumbricidae). *Acta Zoologica Hungarica* 27: 239-264.
ZICSI A. & MICHALIS K. 1993. — Zwei neue Dendrobaena-Arten aus Grichenland (Oligochaeta: Lumbricidae). *Acta Zoologica Hungarica* 39 (1-4): 301-310.
ZICSI A. 1959. — Faunistisch-systematische und okologische Studien uber die Regenwurmer Ungarns. I. *Acta Zoologica Hungarica* 5: 165-189.
ZICSI A. 1982. — Revised guide to the taxa of the family Lumbricidae (Oligochaeta) described until 1971. *Acta Zoologica Hungarica* 28: 421-454.
ZICSI A. 1985. — Regenwürmer (Oligochaeta: Lumbricidae) aus Israel und den benachbarten Ländern. *Revue suisse de Zoologie* 92: 323-331. https://doi.org/10.5962/bhl.part.81620
ZICSI A. 1998. — Neue und seltene terrestrische Oligochaeten aus Südafrika. *Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut* 95: 59-77.
ZUCK W. 1951. — Untersuchungen uber das Vorkommen und die Biotope einheimischer Lumbriciden. *Jahreshefte des Vereins fur vaterlandische Naturkunde in Wurttemberg (Stuttgart)* 107: 95-132.

Submitted on 10 January 2022;
accepted on 18 April 2022;
published on 27 September 2022.

SUPPLEMENTARY FILES

Supplementary File 1. — ASAP species delimitation estimates based on the analysis of uncorrected pairwise genetic distances between DNA barcode sequences. Thick black lines indicate the most conservative models, chosen as a reference for species-level lineage delimitation. Red and blue empty rectangles indicate two *Scherotheca* Bouché, 1972 lineages which were split according to their morphological differences (in this case choosing the delimitation suggested by the other estimates). Green empty rectangles indicate linage pairs which were combined according to pairwise genetic distances being exceedingly lower than the usual threshold for interspecific divergence (< 9%). https://doi.org/10.5852/zoosystema2022v44a17_s1. https://sciencepress.mnhn.fr/sites/default/files/documents/en/zoosystema2022v44a17_suppl_file_1.pdf

Supplementary File 2. — Barcode Gap Analysis based on the COI uncorrected pairwise genetic distances within each species and with the nearest neighbor of each species. https://doi.org/10.5852/zoosystema2022v44a17_s2. https://sciencepress.mnhn.fr/sites/default/files/documents/en/zoosystema2022v44a17_suppl_file_2.pdf