

Original article

## Species abundance and zoogeographic affinities of Chinese terrestrial earthworms

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### Abstract

Terrestrial earthworm variously reported from China number amounts to 298 species with 84 of these, or 28%, non-natives for which 67% are Asiatic Megascolecidae and 22.6% are Lumbricidae of Holarctic origin. All the 298 species belong to 8 families and 27 genera. Among of them, 59 species are new species or new records after 1992. Using SPSS 12.0 to establish the distributional relationships among genera and species, we could draw a conclusion that the numbers and abundances of species in the South of China were more abundant and richer than that in the North of China. Megascolecidae was dominant in China, amounting to 243 species. The numbers of wide-range species and wide-range genera were 11 and 6, respectively, and about 3.7% of total species and 22.2% of total genera. Most species only are distributed in one or two Provinces, which indicates most genera and species have a bias to limitation of distribution. That Lumbricidae distributes in Oriental region still could not define its origin. It is not clear that the origin of earthworms among the seven Provinces, but the species abundance in Oriental region is much richer than that in Palaearctic region. Molecular (DNA and RNA) methods may solve the problems of identification and origin.

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### 1. Introduction

As early as in 1872, Perrier named the first earthworm species, *Pheretima aspergillum*, in China. From then on, many species were found in China [3,5,7,10]. Since Chen [4] listed 122 Chinese earthworm species studies from China have increased rapidly. Zeng et al. [20] recorded 171 species. Feng [6] counted 178 species. Zhong and Qiu [21] appended 51 species. After

then, many new species were reported [12–15,18,19]. Shih et al. [16] and Blakemore et al. [1] summarized the various earthworm faunas in Taiwan. By now, species number has amounted to 298. However, all the reports just described morphology and/or distribution of individuals without discussion of endemic or introduced species and systemic distribution.

Thus, the purpose of this paper is to discuss distribution of species, genera and families, species richness and autochthonous/peregrine species of Chinese terrestrial earthworm. The ability to accurately identify species is fundamental to ecological research, particularly studies of comparative ecology and biological diversity.

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Unfortunately, many species had been misidentified. So we corrected some misidentification in this work.

## 2. Materials and methods

According to our collections and literature records, total 298 species are known. Since different taxonomic systems are used by different taxonomists. Many known species are frequently switched into another genera without being checked through the specimens themselves, which frequently causes confusion. In order to solve the problem, we conducted a thorough revision (including examination of possibly all taxa described from China). All the species are agreed with International Code of Zoological Nomenclature (ICZN, [8]).

In order to expatiate on the distributional relationships among Chinese terrestrial earthworms, we divided China into seven Zoogeographic Provinces (Fig. 1). The East of China Province (ECP) includes Xin'an Mountains and Songliao plain. The North of China Province (NCP) includes Huanghuai plain and Huangtu plateau. The Mongolia-Xinjiang Province (MXP) includes Mongolia province and Xinjiang province. The Qinzang Provinces (QZP) includes Qinhai province, Tibet province and west of Sichuan province. The Southwest of China Provinces (WCP) includes parts of Yunnan, Gansu provinces and south of Himalaya Mountains. The Middle of China Provinces (MCP) includes Sichuan, Yunnan provinces and the valleys of Yangzi River. The South of China Provinces (SCP) includes Fujian province, Guangdong province, Hainan province, Hong Kong, Macao, Taiwan district and archipelagos of South China Sea. Each species has its own distribution in the seven Provinces.

The SPSS-12 statistical package was used for all data analyses in this paper. Hierarchical cluster analysis was applied. The first step was proximities (We defined two Variable Values, "0" and "1". "1" meant a species distributed in a Province, we defined the Variable Label as "Yes". "0" meant a species did not distribute in a Province, we defined the Variable Label as "No".) Proximity matrix was also used in Display Item. And then, we employed Variable Item in Cluster (Furthest Neighbor) Method. At last, we got the results by choosing Dendrogram in Plots. To make the figures more manageable, we put the species whose zoogeographical distributions are identical into one group. The 24 groups therefore represent the 298 species (Fig. 3).

## 3. Results

The 298 species reported in China are divided into 8 families and 27 genera according to Sims and Easton [17] and ICZN [8]. They are as follow: Moniligastridae (2 genera and 20 species): *Desmogaster* (1 species) and *Drawida* (19 species). Megascolecidae (9 genera and 243 species): *Amyntas* (163 species), *Lampito* (1 species), *Metaphire* (68 species), *Perionyx* (1 species), *Pithemera* (2 species), *Planapheretima* (4 species) and *Polypheretima* (1 species), *Argilophilus* (1 species) and *Pontodrilus* (2 species). Ocnodrilidae (3 genera and 3 species): *Malabaria* (1 species), *Ocnodrilus* (1 species) and *Ilyogenia* (1 species). Acanthodrilidae (1 genus and 1 species): *Microscolex* (1 species). Octochaetidae (2 genera and 3 species): *Dichogaster* (2 species) and *Ramiella* (1 species). Glossoscolecidae (1 genus and 1 species): *Pontoscolex* (1 species). Almididae (1 genus and 2 species): *Glyphidrilus* (2 species).

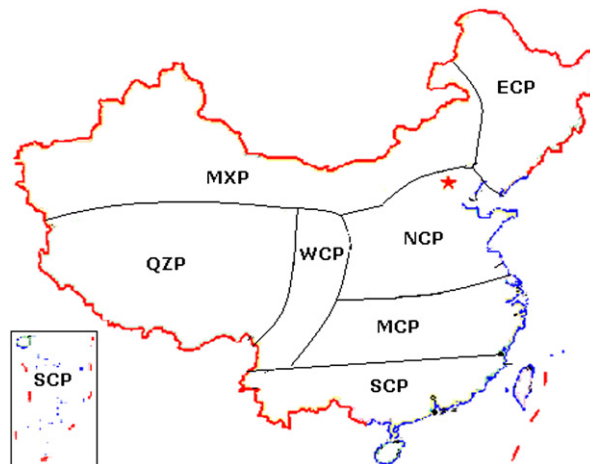


Fig. 1. Seven Zoogeographic Provinces in China.

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