

Earthworms (Annelida: Lumbricidae) biodiversity affected by pyrogenic carbon emissions at the “Maritsa-Iztok” basin (Bulgaria)

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Abstract. The paper provides the first exploration of earthworm populations from region of thermal power plant Maritsa East 2 (Bulgaria). During the investigation was observed low biodiversity, count and biomass of lumbricid earthworms in reclaimed soils from coal mining. Five earthworm species were registered from the studied area: *Aporrectodea caliginosa* (Savigny, 1826), *Aporrectodea rosea* (Savigny, 1826), *Aporrectodea trapezoides* (Dugès, 1828), *Aporrectodea jassyensis* (Michaelsen, 1891) and *Cernosvitovia rebeli* (Rosa, 1897). First record of endemic species *Cernosvitovia rebeli* (Rosa, 1897) from Thracian Lowland.

Key words: earthworms, soil reclamation, coal mining.

Introduction

Maritsa Iztok-2 is the largest thermal power plant in the Balkans. It is located both at the Thracian Lowland and the Sakar Mountain, South Bulgaria. It consists of three lignite-fired thermal power stations. The complex is located in a large lignite coal basin, which includes several mines. Open cast coal mining is inevitably accompanied by a significant interference in the environment. This requires the due restoration of the disrupted balance and the forming of a new environment consistent.

This part of Thracian Lowland, which surrounds Maritsa Iztok basin wasn't investigated for earthworm biodiversity yet. The first study of earthworm fauna in the Thracian Lowland from Bulgaria was published by Mihailova (1964; 1966). Since then her work was continued by Šapkarev (1986). Recently Valchovski & Szederjesi (2016), Valchovski & Misirlioglu (2017) added new records of lumbricid biodiversity of the region. According to these studies 17 lumbricid species were recorded from Thracian Lowland.

Material and Methods

The field investigations were carried out during the autumn of 2018. Earthworms were collected with digging and hand-sorting. All the specimens were killed in 96% ethanol, fixed in 4% formalin solution and in 96% ethanol, then transferred into 75% ethanol. The

materialis deposited in the Institute of Soil Science, Agrotechnologies and Plant Protection “N. Poushkarov”, Sofia, Bulgaria. Identification of species was done in accordance to Mršić (1991).

Collecting sites:

1. Scalitsa village, meadow, 152 m a.s.l., 42° 16'28N 26° 15' 10E.
2. Scalitsa, cultivated land, 159 m a.s.l., 42° 16' 24N 26° 15' 40E.
3. Kovachevo village, meadow, 128 m a.s.l., 42° 13' 41N 26° 04' 00E.
4. Maritsa Iztok basin, reclaimed land, 154 m a.s.l., 42° 14'53N 26° 07' 23E.°
5. Maritsa Iztok basin, reclaimed land, 173 m a.s.l., 42° 14'37N 26° 06' 42E.
6. Maritsa Iztok basin, reclaimed land, 137 m a.s.l., 42° 14'00N 26° 05' 34E.

Results and Discussion

During the investigation of studied area five earthworm species were collected altogether, belonging to two genera: *Aporrectodea caliginosa* (Savigny, 1826), *Aporrectodea rosea* (Savigny, 1826), *Aporrectodea trapezoides* (Dugès, 1828), *Aporrectodea jassyensis* (Michaelsen, 1891) and *Cernosvitovia rebeli* (Rosa, 1897). The collected specimens are presented in Tab. 1.

Tab. 1. Earthworm species, count and biomass from collected sites.

Locality	Species	Average count (n/m ²)	Average biomass (g/m ²)
1	<i>Aporrectodea rosea</i> (Savigny, 1826) <i>Aporrectodea trapezoides</i> (Dugès, 1828) <i>Aporrectodea jassyensis</i> (Michaelsen, 1891)	74	24
2	<i>Aporrectodea rosea</i> (Savigny, 1826) <i>Aporrectodea trapezoides</i> (Dugès, 1828)	42	17
3	<i>Cernosvitovia rebeli</i> (Rosa, 1897) <i>Aporrectodea caliginosa</i> (Savigny, 1826) <i>Aporrectodea rosea</i> (Savigny, 1826)	57	19
4	<i>Aporrectodea caliginosa</i> (Savigny, 1826) <i>Aporrectodea rosea</i> (Savigny, 1826)	13	7
5	<i>Aporrectodea caliginosa</i> (Savigny, 1826) <i>Aporrectodea rosea</i> (Savigny, 1826)	24	10
6	<i>Aporrectodea caliginosa</i> (Savigny, 1826) <i>Aporrectodea rosea</i> (Savigny, 1826)	15	8

During the investigation observed lower biodiversity in the reclaimed soils. Only the most adaptable peregrine species survives in that area: *Aporrectodea caliginosa* and *Aporrectodea rosea*. Biodiversity in control sample sites was twice bigger - four taxa: *Aporrectodea trapezoides*, *Aporrectodea jassyensis*, *Aporrectodea rosea* and *Cernosvitovia rebeli*. This is the first finding of endemic species *Cernosvitovia rebeli* in Thracian Lowland. Abundance in control sample sites ranged from 42 to 74 exemplars per m² with a general average of 57.66 exemplars per m². In reclaimed soils near the thermal plant earthworm density ranged from 13 to 24 exemplars per m² with a general average of 17.33 exemplars per m². Biomass although was significantly higher in undisturbed plots (from 17 to 24 g/m²), than that in reclaimed plots (from 7 to 10 g/m²).

Conclusion

In reclaimed soils (Spolic Technosols), are registered only peregrine species. Near the thermal power plant survives only the most adaptive and ecologically plastic earthworm species. In genetically old soils (Pellic Vertisols), the Balkan endemic *Cernosvitovia rebeli* is found, which is the first record from Thracian Lowland.

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