HYDROGEN SULPHID SPRINGS ARE HOSTPOSTS OF PENETRATION OF SOIL INVERTEBRATES IN THE EUROPEAN NORTHEAST OF RUSSIA

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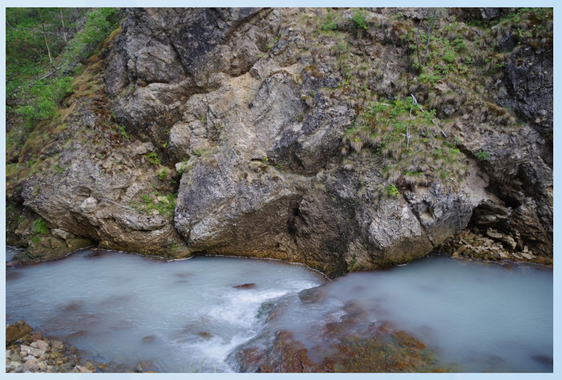
The main problem of ecology and biogeography is the dispersal of species in regions outside of their native range (Dgebaudze, 2014; Sax et al., 2007). The identification of the invertebrates migration scale is still at the initial stage (Khansky, 2010), but soil biologists are faced with the problem of invasive species (Bohlen et al., 2004; Tiunov et al., 2006). The main attention is focused on the colonization of soil ecosystems by foreign species of earthworms and beetles, at less – Collembola

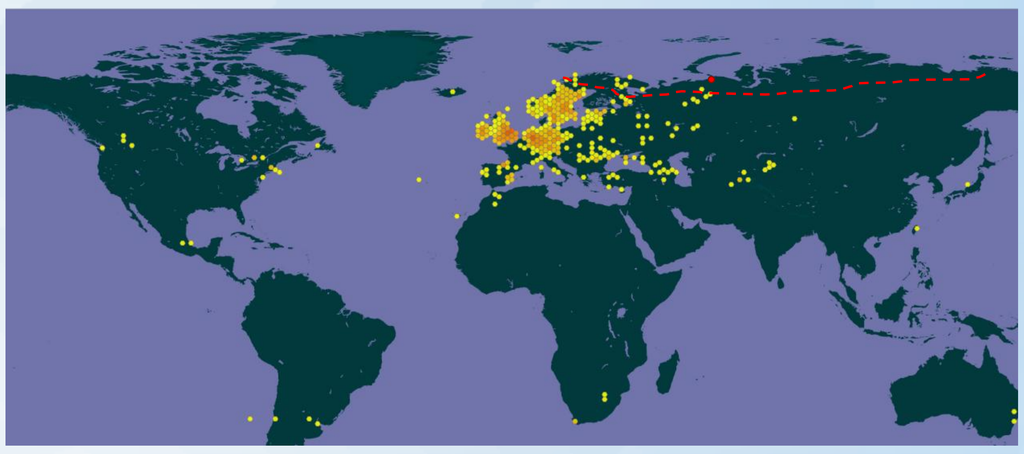
Twenty species of soil invertebrates were collected from the manure enriched soil near hydrogen sulphid springs in Vorkuta, Komi Republic, Russia (67º29′ N, 64º02′ E). Four of them were new records for East European tundra. We hypothesize that the establishment of these species results from increased frequency of introductions and warm, thermal stability in organic enriched soils during the nordic winter. We believe that three of four new records described present could live in disturbed territories in sever conditions and couldn't immediate threat to ecology of tundra.



Two new records of earthworms for East European tundra

Eiseniella tetraedra (Savigny, 1826) northern european species (Tiunov, 2006), widely extended from the Kola Peninsula to the Caucasus, and often meets in high latitudes that indicates efficiency of his adaptive strategy. It is not directly linked with human culture and is not intentionally transported by human activity (Terhivou et al., 2011), but very sensitive to pH.

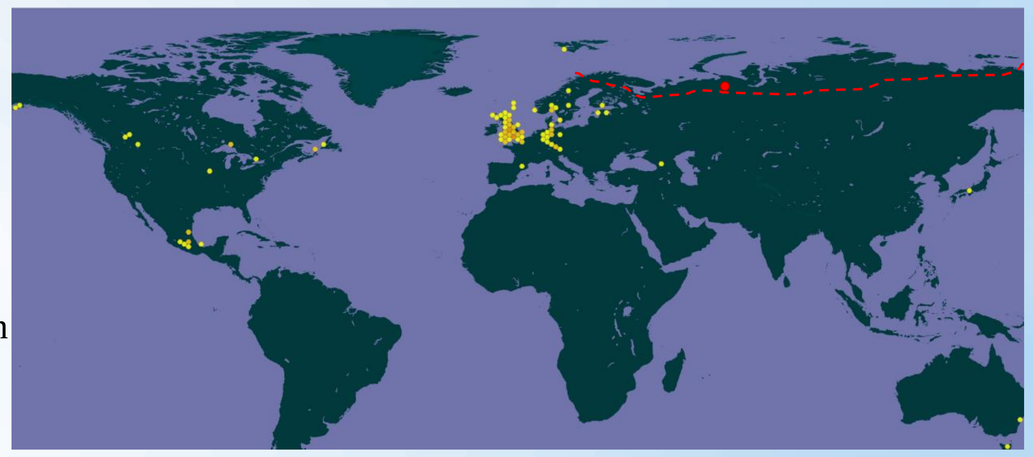
In natural habitats, these worms live in numerous colonies, in technogenic landscapes can be considered as an "edifying" species (Barne, Striganova, 2008). Number varies from single individuals to 160 ind./m^2, and in certain cases to 1000 ind./m^2.
(genbank accession numbers: MH410149)



Distribution map of a species of *Eiseniella tetraedra*

Dendrodrilus rubidus (Eisen, 1874) has alien range in the Northwest Russia and Siberia. It has native range in Denmark, Finland, Island, Norway and Sweden (from Global Invasive Database), where it inhabits boreal forests often at a very low densities. In lowlands and hydromorphic habitats such as flooded meadows and lotic bogs.

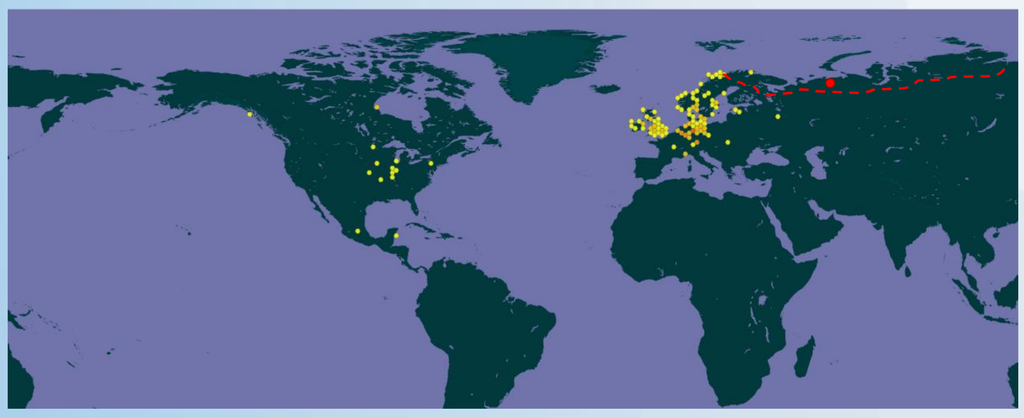
Its range penetrates north from the Russian plain into the White Sea basin. The northern part of the Russian plain that lies between Fennoscandia and the Ural mountains is mainly covered by coniferous boreal forests, which are gradually replaced by tundra biomes north of 65° latitude. Most of this region was covered by Pleistocene ice shields which is thought to have mostly eliminated native earthworm Species (Tiunov et al., 2006). It was registered in Svalbard in cowsheds (Coulson et al., 2013).
(genbank accession numbers: MH410150)



Distribution map of a species of *Dendrodrilus rubidus*

Two new records of Collembola for East European tundra

Distribution map of a species of *Desoria trispinata*



Distribution map of a species of *Folsomia fimetaria*

Desoria trispinata (MacGillivray, 1896) is a highly important species as it occurs worldwide and at high abundances (Roihmeier et al., 2018). It is a probably introduced species, originally described from Ohio, USA (Potapov, 2001; Fjellberg, 2007). MacGillivray (1896) first described it under its synonym Isotoma trispinata based on specimens from Salineville, Ohio (MacGillivray, 1896, page 51). But today it is a cosmopolitan mainly distributed in North America and East Asia and with a few records from Europe (Fjellberg, 2007; Potapov, 2001; Roithmeier et al., 2018). This species probably originated from warmer parts of the world (Fjellberg, 2007, Sharin, 2004), where it can even show high densities appr. 600 thous.ind./m^2 (Dorlong, 1984).

Folsomia fimetaria (Linnaeus, 1758) holarctic species. In the european part of Russia it is very seldom in forests, but characteristic for meadows. Due to its ecological preferences, it may have been artificially introduced (Potapov, 2001). In Iceland and Fennoscandia, it is often found in organic soils along seashores (Fjellberg, 2007) and it may become resident in such habitats in Svalbard (Coulson et al., 2013), but it was not found in ornithogenic soils (Zmudczynska et al., 2015) and zoogenic habitats in Russian Arctic islands (Babenko, 2018). On Kola Peninsula it was found in anthropogenic soils with high content of organic (Babenko, 2012).

CONCLUSIONS

The establishment success of these species may be due to the fact that soils with high content of organic can stay warm throughout the season as a result of continuous fermentation process. Consequently, species preferring warm soils probably do not suffer from chilling injuries (Bale, 1993) during the winter in Vorkuta, despite the fact that their temperature tolerances are adapted to a warmer climate (Ødegaard, Tømmerås, 2000).

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In work photos and distribution maps of species in the website www.gbif.org are used.