

Two earthworm taxa (Oligochaeta, Lumbricidae) new to Finland

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Two taxa of the Lumbricidae, *Eisenia andrei*, Bouché 1972 and *Aporrectodea caliginosa tuberculata* (Eisen 1874) have been reported in Finland for the first time. Both have earlier been confused with other closely similar species or subspecies, and were now found to be more common than those taxa. The sites of the finds are listed, the taxonomy and nomenclature discussed.

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Introduction

Considerable confusion exists in the taxonomy of earthworms, partly due to the neglect of biological and ecological evidence in most taxonomical studies, and, to some extent, to misapplication of the nomenclatural rules. In 1986 samples of *Eisenia* spp. and *Aporrectodea* spp. were collected in different parts of Finland in connection with studies dealing with the potential use of earthworms in waste-processing or in improving soil fertility (Haimi & Huhta 1986 and 1987, Huhta et al. 1986, Huhta & Kulmala 1987). This led to the discovery of two taxa previously confused with others known to occur in Finland. The taxa reported here are *Eisenia andrei*, Bouché 1972, and *Aporrectodea caliginosa tuberculata* (Eisen 1874).

Results and discussion

Eisenia andrei

E. andrei was recorded at the following sites:

(Numbers in parentheses indicate the 10×10 km squares of the uniform grid system, (Grid 27°E); see Heikinheimo & Raatikainen 1971.)

1. Jyväskylä, Kortemäki (690:43) 15 May 1986. Alone in compost (initial population from Hämeenlinna, see below).
2. Jyväskylä, Kortemäki (690:43) 19 May 1986. In a litter heap together with *E. fetida*.
3. Jyväskylä, Sulkuranta (690:43) 12 Oct. 1986. In compost with *E. fetida*.
4. Hämeenlinna (676:36) 26 May 1986. Together with *E. fetida*.
5. Hämeenlinna, Kukostensyrjä (676:36) 23 May 1986. No other earthworms present.

Eisenia fetida (sensu lato) is a mixture of earthworm taxa. Avel (1937), and later Omodeo (1952), recognized two forms, one clearly striped and one uniformly coloured. These were named by André (1963) var. *typica* and var. *unicolor*, respectively. André (1963) demonstrated in the laboratory that the two “varieties” can interbreed, but that their hybrid offspring are sterile. Devries (1968) showed that the segmentation of these “varieties” differentiates early in the embryos. In a survey of the French fauna, Bouché (1972) concluded that the two “varieties” are most probably sibling species, but in the absence of sufficient material, adopted the conservative status of subspecies, i.e. *E. fetida fetida* and *E. fetida andrei*.

Since then, more information has accumulated in a series of papers devoted to biochemical polymorphism, based on antibacterial factors (Roch et

al. 1980) or enzyme electrophoresis (Jaenike 1982, Robotti 1983, Qien & Stenersen 1984), and in studies on the polymorphism of *E. andrei* (Roch 1979, Robotti 1982), and comparisons of numerous populations (Robotti 1983, Qien & Stenersen 1984, Omodeo et al. in press). These studies point to the following conclusions: 1) *E. andrei* is a good species, 2) no hybrids are found when *E. fetida* and *E. andrei* occur sympatrically in nature, 3) the genetic distance between populations of *E. andrei* is smaller than that between those of *E. fetida*, which indicates that there is more heterogeneity in the latter species.

Our finds revealed that *E. andrei* is far more common in Finland than *E. fetida*. On the other hand, it was shown that the two species can occur together in the same compost heap. It is not known whether there are differences in the ecological requirements of these species, but some at least can be expected. It was shown by Haukka (1987) that *Eisenia* spp. and the enchytraeid *Enchytraeus albidus* (Henle) occupied different niches in one particular compost (Site 1, see above).

Considerable basic and applied research has been performed on *Eisenia* earthworms. In virtually all cases it has been reported that the species in question was *E. fetida*. Haimi & Huhta (1986 and 1987) studied the use of earthworms in composting organic residues, and regarded the whole population as *E. fetida*, until it was found that it was in fact a mixture of *E. fetida* and *E. andrei*, *E. andrei* being strongly dominant. It is not yet known whether these species differ in their ability to process organic wastes, or whether there are differences in their physiochemical requirements.

Aporrectodea caliginosa tuberculata

A. caliginosa tuberculata was recorded in Finland at the following sites:

1. Jyväskylä (690:42 and 690:43). In many places around the town (gardens, forests, agricultural land) in May and October 1986, in most cases together with *Lumbricus terrestris* and *L. rubellus*.

2. Konnevesi, Research Station of Univ. Jyväskylä (964:46) 24 June 1986. In fresh coniferous forest together with *Aporrectodea rosea*, *L. terrestris* and *Dendrobaena octaedra*.

3. Korttesjärvi, Kukkola (702:30) 28 Sept. 1986. In potato field together with *L. rubellus*.

4. Jokioinen (674:30) 19 Sept. 1986. In agricultural soil together with *A. caliginosa*, *A. rosea* and *L. terrestris*.

5. Hämeenlinna (676:36) 5 Oct. 1986. In a garden, together with *A. rosea* and *L. terrestris*.

Aporrectodea caliginosa tuberculata was described long ago by Eisen (1874), but unfortunately synonymized by Michaelsen (1900) with *A. caliginosa* and then forgotten. On the basis of ecological, chorological and morphological observations, Bouché (1972) described a subspecies, *A. caliginosa alternisetosa*. At the same time, Gates (1972) independently reached the conclusion that *A. tuberculata* (Eisen) is a good species in the "caliginosa complex". Bouché (1976) observed that *A. caliginosa alternisetosa* is identical with *A. tuberculata*, and restored the senior name at the level of subspecies, *A. caliginosa tuberculata*. Zicsi (1982) and Sims & Gerard (1985) were the opinion that the form "tuberculata" does not deserve taxonomic status.

The "caliginosa complex" is still poorly known and the taxonomic status of its varieties is often obscure. The morphology does not give enough characters to recognize and describe taxa that may differ clearly in their ecology. We have provisionally adopted a conservative solution, treating *A. caliginosa tuberculata* as a subspecies. Nevertheless, even the small numbers of sites studied in Finland has revealed a great variability among local strains (or clones ?) of the "caliginosa complex".

Until recently nothing has been known about the "varieties" of *A. caliginosa* in Finland. Now it seems that *A. caliginosa tuberculata* is clearly more common than the nominate taxon, *A. caliginosa* was found at only one locality in south-western Finland (Jokioinen), in agricultural soil.

In France, *A. caliginosa* is predominant in the "caliginosa complex", and there are some rather clear differences in the ecology of the two taxa (Bouché 1972). The mean pH of the soil where *A. caliginosa* was found was 6.3, while that of the soil with *A. caliginosa tuberculata* was 5.9. The mean C/N ratios were 11.7 and 14.0, respectively. Consequently, *A. caliginosa tuberculata* seems to live in poorer and more acid soil, and also in deeper soil layers.

At Finnish latitudes the conditions in the soil are usually rather harsh, for example the pH is often far below 5. Our observations indicate that *A. caliginosa tuberculata*

tuberculata is predominant in the "caliginosa complex" in most kinds of soils in Finland. *A.c. caliginosa* can probably be found only in good mull soils.

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References

- André, F. 1963: Contribution à l'analyse expérimentale de la reproduction des Lombriciens. — Bull. Biol. Fr. Belg. 81:1–101.
- Avel, M. 1937: Titres et travaux scientifiques. Delmas. Bordeaux.
- Bipoli, R., Rodino, E., Giacomazzo, A. & Omodeo, P. (in press): Genetic diversity of Oligochaeta of the genus *Eisenia*. — Proc. Int. Coll. Earthworms, Bologna-Carpi, 1985.
- Bouché, M. B. 1972: Lombriciens de France, écologie et systématique. — Inst. Nat. Rech. Agronom., Paris. I.N.R.A. Publ. 72–2, 672 pp.
- » – 1976: Contribution à la stabilisation de la nomenclature de Lumbricidae, Oligochaeta I. Synonymes et homonymes d'espèces du Bassin Parisien. — Bull. Mus. Nat. Hist. Nat., (Ser. 3, Zool.), 247:81–88.
- Devries, I. 1968: Les premières étapes de la réglementation (formation de la jeune blastule) chez le lombricien *Eisenia foetida*. — Bull. Soc. Zool. France 93:87–97.
- Eisen, G. 1874: Om skandinavians Lumbricider. — Öfversigt Kgl. Vet.-Akad. Förhandl. 1873 no 8:1–16.
- Gates, G. E. 1972: Contributions to north American earthworms (Annelida: Oligochaeta) no 3. Toward a revision of the earthworm family Lumbricidae. IV. The trapezoides species group. — Bull. Tall Timbers Res. Stat. 12:1–146.
- Haimi, J. & Huhta, V. 1986: Capacity of various organic residues to support adequate earthworm biomass for vermicomposting. — Biol. Fertil. Soils 2:23–27.
- » – 1987: Comparison of composts produced from identical wastes by "vermistabilization" and conventional composting. — Pedobiologia 30:137–144.
- Haukka, J. 1987: Growth and survival of *Eisenia fetida* (Sav.) (Oligochaeta: Lumbricidae) in relation to temperature, moisture and presence of *Enchytraeus albidus* (Henle) (Enchytraeidae). — Biol. Fertil. Soils 3:99–102.
- Heikinheimo, O. & Raatikainen, M. 1971: The recording of localities of biological finds in Finland. — Ann. Entomol. Fennici 37:9–12.
- Huhta, V., Haimi, J. & Setälä, H. 1986: Influence of the earthworms *Lumbricus rubellus* and *L. terrestris* on soil processes when feeding on birch litter in raw humus soil: a laboratory experiment. — Trans. XIII Congr. Int. Soc. Soil. Sci. 2:584–585.
- Huhta, V. & Kulmala, S. 1987: Management of earthworm populations in coniferous forest. — In: Striganova, B. R. (ed.), Soil fauna and soil fertility. Proceedings of the 9th International Colloquium on Soil Zoology, 168–172. Moscow.
- Jaenike, J. 1982: "*Eisenia foetida*" is two biological species. — Megadriologica 4:6–8.
- Michaelsen, W. 1900: Oligochaeta. — Tierreich 10:1–575. Berlin.
- Qien, N. & Stenersen, J. 1984: Esterases of earthworms III. Electrophoresis reveals that *Eisenia fetida* (Savigny) is two species. — Comp. Biochem. Physiol. 78C:277–282.
- Omodeo, P. 1952: Cariologia dei Lumbricidae. — Caryologia 4:173–275.
- Robotti, C. A. 1982: Biochemical polymorphism of earthworms 4. Enzymes of *Eisenia fetida andrei* Bouché (Annelida: Oligochaeta). — Monit. Zool. Ital. (N.S.) 16:341–344.
- » – 1983: Genetic distances among European populations of *Eisenia fetida andrei* and *Eisenia fetida fetida*. — Attr. Assoc. Genet. Ital. 29:207–208.
- Roch, Ph. 1979: Protein analysis of earthworm coelomic fluid: 1) Polymorphic system of the natural hemolysin of *Eisenia fetida andrei*. — Developm. Comparat. Immunol. 3:599–608.
- Roch, Ph., Valembouis, P. & Lasseques, M. 1980: Biochemical particularities of the antibacterial factor of two subspecies *Eisenia fetida fetida* and *Eisenia fetida andrei*. — Amer. Soc. Zool. 20:794.
- Sims, R. W. & Gerard, B. M. 1985: Earthworms. Keys and notes for the identification and study of the species. Synopses of the British Fauna No 31. — 171 pp., London.
- Zicsi, A. 1982: Verzeichnis der bis 1971 beschriebenen und revidierten Taxa der Familie Lumbricidae (Oligochaeta). — Acta Zool. Acad. Scient. Hungaricae 28:421–454.

Tiivistelmä

Tutkittaessa lierojen hyväksikäyttömahdollisuuksia orgaanisen jätteen kompostoinnissa ja maan viljavuuden parantajana löydettiin Suomelle uutena tunkiolierolaji *Eisenia andrei*, Bouché 1972 ja peltolieron alalaji *Aporrectodea caliginosa tuberculata* (Eisen 1874). Näytteitä kerättiin paikoin Etelä- ja Keski-Suomesta, tiheään Jyväskylän ympäristöstä. Nyt löydetyt taksonit näyttävät olevan Suomessa selvästi yleisempiä kuin ne, joihin ne on aikaisemmin sekoitettu. Artikkelissa on ilmoitettu ko. taksonien löytöpaikat sekä käsitelty niiden taksonomiaa ja nimitystä.

Symposium — Symposio

De kalla åren på 1980-talet — inverkan på djur och växter

1980-luvun kylmien vuosien vaikutus eläimiin ja kasveihin

Symposium i Ständerhuset, Snellmansgatan 9–11, Helsingfors fredagen den 25 november 1988

Symposio Säätytalossa, Snellmaninkatu 9–11, Helsinki perjantaina 25. marraskuuta 1988

Arrangör Societas pro fauna et flora fennica Järjestäjä

- | | |
|-------------|--|
| 9.00–9.10 | Öppning av symposiet — Symposoin avaus
Sällskapets ordförande Karl-Gustav Widén |
| 9.10–9.40 | Ankarat talvet Suomessa
Juhani Rinne |
| 9.40–10.10 | Alhaisten lämpötilojen paikalliset erot
Kyösti Laaksonen |
| 10.10–10.40 | Trädslag och provenienser efter vintrarna 1984–1987
Max Hagman |
| 10.40–10.55 | Kaffepaus — Kahvitauko |
| 10.55–11.25 | Hur har skärgårdens vattenmiljö reagerat på de kalla vintrarna på 1980-talet?
Erik Bondsdorff |
| 11.25–11.55 | Puutarhavauriot 1980-luvun kylmien talvien jälkeen
Annikki Palmén |
| 11.55–12.25 | 1980-luvun kylmien vuosien vaikutus suursieniin
Esteri Ohenoja |
| 12.25–13.30 | Lunchpaus — Lounastauko |
| 13.30–14.00 | 1980-luvun kylmien vuosien vaikutus riistaeläimiin, varsinkin metsoon
Harto Lindén |
| 14.00–14.30 | Pikkunisäkkäiden kannanvaihtelut 1980-luvulla
Heikki Henttonen |
| 14.30–15.00 | Lintujen selviytyskeinot pakkastalvina
Seppo Sulkava |
| 15.00–15.30 | Ankarien talvien vaikutus Suomen linnustoon
Olavi Hildén |
| 15.30–15.45 | Kaffepaus — Kahvitauko |
| 15.45–16.15 | Om fjällbjörksmätarens frekvensväxlingar (Preliminär rubrik)
Olle Tenow |
| 16.15–16.45 | Hur har de kalla åren inverkat på insekt-, och särskilt fjärlbeständen?
Harry Krogerus |
| 16.45–17.15 | Slutdiskussion — Loppukeskustelu |
| 17.15–17.25 | Symposiet avslutas — Symposio päättyy |
| 18.00– | Supé — Illallinen |