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## Enchytraeidae of the Netherlands (Annelida; Oligochaeta)

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This paper is based on enchytraeid material collected in a few localities during investigations into the soil fauna, and consequently bears a preliminary character as to the distribution of enchytraeids in the Netherlands.

Only two species of enchytraeids were known to occur in the Netherlands, viz. *Enchytraeus albidus* Henle, 1837 and *Hemifridericia parva* Nielsen & Christensen, 1959. The former one, a large and conspicuous species, is recorded from various habitats as e.g. detritus along the coast of the former Zuiderzee (now IJsselmeer), in particular the eastern part of it; in garden soil; manured agricultural soil (DE VOS, 1922) and in mud between stones and various objects covered with Algae along the border of ponds and ditches (PRUD'HOMME VAN REYNE, 1944). *Hemifridericia parva* was found in forest soil (NIELSEN & CHRISTENSEN, 1959).

VAN DER DRIFT (1951) made some preliminary studies on the densities of enchytraeids while investigating the soil fauna of a beech forest. Owing to the difficulties in identifying enchytraeids down to species level they were treated as a unit, however.

In 1958, A. A. Sterk (unpublished Itbon Report) investigated the enchytraeids of the Hackfort forest (see below) in order to gain some information on the quantitative composition of the three forest floor types of this forest. Although the enchytraeids were again treated as a unit, samples of his material were identified by Overgaard Nielsen. Generally only live and mature specimens can be identified with certainty and unfortunately the greater part of Sterk's specimens, apart from being preserved, were immature. This collection contained the following species:

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*Mesenchytraeus ? glandulosus* (Levinsen, 1884)  
*Cognettia ? sphagnetorum* (Vejdovskij, 1877)  
*Achaeta* sp. div.  
*Henlea ? ventriculosa* (Udekem, 1854)  
*Henlea dicksoni* (spec. dub., cf. NIELSEN & CHRISTENSEN, 1959)  
*Fridericia ? bulboides* Nielsen & Christensen, 1959  
*Fridericia ? paroniana* Issel, 1904  
*Fridericia ? striata* (Levinsen, 1884)  
*Fridericia bisetosa* (Levinsen, 1884)  
*Enchytraeus buchholzi* Vejdovskij, 1879

The present author has studied the enchytraeids since the summer of 1961. The worms were obtained by using the wet-funnel method as described by O'CONNOR (1962). Samples from the following localities were studied:

Hackfort forest. — A wooded area situated about 6 km southeast of Zutphen, mainly covered with slash oak on a low sandy soil. According to old records, it always carried forest and the soil was never disturbed by man. Three main types of forest floor are present:

Type I — calcareous mull, carrying mainly *Quercus robur* L., *Betula verrucosa* Ehrb., *Alnus glutinosa* (L.), *Populus tremula* L. and an occasional *Corylus avellana* L.

Type II — Acid mull, with a stand of oak, birch and a few aspen.

Type III — Light mor with mainly oak-trees and a few birches.

Middachten. — A poorly developed Querceto-Carpinetum on a river basin clay soil. Water table high, about 30 cm below the surface and in winter sometimes even reaching the surface.

Beuningen. — Standard, bush-tree and spindle-bush tree orchards of apple and pear on a light stream-ridge clay soil.

Hoge Veluwe (De Pollen). — A poor dry sandy soil (inland dunes). The samples were taken at various places, viz.:

- a. in the bare sand,
- b. patches with a scanty vegetation of lichens and mosses (*Cladonia* sp. and *Polytrichum piliferum* Schreb.,
- c. patches covered with grass (*Festuca ovina* L.),
- d. under Scots pine trees.

In all instances the various layers (F<sub>0</sub>, F<sub>1</sub>, etc.) were sampled separately.

Arnhem. — 1. A Scots pine wood and a mixed stand of mainly *Quercus robur* L. and *Quercus rubra* L. with an occasional *Abies* sp. and *Fagus sylvatica* L. with a patchy undergrowth of *Vaccinium myrtillus* L. near the Itbon. Both on a poor sandy soil.

2. Various places in the garden of the Itbon.

Heino (Ov.). — Fields of oats, rye and potatoes on a sandy soil mixed with humus. The samples were taken at depths from 0—20 cm.

Ketelhaven (Oostelijk Flevoland). — Polder land with a clayish soil; in 1957 reclaimed from the IJsselmeer (= former Zuiderzee).

Anjum (NW-Friesland). — Along the coast of the Waddenzee.

Boskoop. — Horticultural soil.

Wijster (Dr.) — Compost heaps.

Hauwert (N-Holland). — Arable land.

Barendrecht. — Soil from a greenhouse, and grassy soil.

Zwijndrecht. — Soil from a greenhouse.

Genus *Mesenchytraeus* Eisen, 1878

1. *Mesenchytraeus glandulosus* (Levinsen, 1884)  
Hackfort I, II & III; Middachten; Arnhem (in litter of *Fagus sylvatica* L.). — Fairly common from late autumn to early spring in the upper layers of the litter.
2. *Mesenchytraeus pelicensis* Issel, 1905  
Hackfort II — In a mouldered branch of an oak-tree. November.
3. *Mesenchytraeus armatus* Levinsen, 1884  
Middachten — In very wet litter. October.
4. *Mesenchytraeus flavus* (Levinsen, 1884)  
Middachten — In very wet litter. October.

Genus *Cognettia* Nielsen & Christensen, 1959

5. *Cognettia sphagnetorum* (Vejdovskij, 1877)  
Hackfort I, II, III — In litter and the upper layer of the soil.  
Hoge Veluwe — In the F<sub>0</sub>, F<sub>1</sub> and humus layer of Scots pine; patches covered with grass, heather, lichens and moss on a sandy soil.  
Arnhem — In litter of mixed deciduous forest mainly *Quercus robur* L. and *Q. rubra* L. with *Vaccinium myrtillus* L. Ithon garden, in litter of birch and in grassy soil.  
A very common and often abundant species. August—January.  
A sample of 100 cm<sup>2</sup>, at a depth of 0—5 cm may contain as many as one thousand specimens.
6. *Cognettia glandulosa* (Michaelsen, 1888)  
Beuningen — In the soil of a mixed standard orchard. July.
7. *Cognettia cognettii* (Issel, 1905)  
Middachten — In very wet soil. October.

Genus *Achaeta* Vejdovskij, 1877

8. *Achaeta vesiculata* Nielsen & Christensen, 1959  
Beuningen — At a depth of 2½—5 cm in the soil of a young bush tree orchard on a former meadow. August.

Arnhem — Itbon garden, in the top layer of the soil (0—2½ cm) underneath a solitary beech tree. September.

9. *Achaeta bohémica* (Vejdovskij, 1879)  
Arnhem — Itbon garden, at a depth of 2½—5 cm in loose sandy soil under some apple trees. October.
10. *Achaeta eiseni* Vejdovskij, 1877  
Arnhem — Itbon garden, in the soil below birch litter. September.
11. *Achaeta affinis* Nielsen & Christensen, 1959  
Hackfort I & II. In the soil, 0—5 cm. July, August

Genus *Enchytronia* Nielsen & Christensen, 1959

12. *Enchytronia annulata* Nielsen & Christensen, 1959  
Heino — In the soil of an oat-field, at a depth of 10—20 cm. June.

Genus *Henlea* Michaelsen, 1889

13. *Henlea perpusilla* Friend, 1911, augm. Cernostvitov, 1937  
Hackfort — In the soil of a meadow bordering type I. July.  
Beuningen — In the soil of an old standard orchard. July.  
Heino — In the soil of an oat-field at depths of 0—10 cm and 10—20 cm. June.
14. *Henlea cf. heleotropha* Stephenson, 1922  
Arnhem — Itbon garden, in birch litter. September.
15. *Henlea nasuta* (Eisen, 1878)  
Hackfort I — In the soil at a depth of 0—1 cm. April.  
Hackfort — In the soil of the meadow bordering type I. July.  
Heino — In the soil of an oat-field at a depth of 10—20 cm. June.  
Arnhem — Itbon garden, in the soil of the "orchard". August.  
Barendrecht — In a greenhouse. June.
16. *Henlea similis* Nielsen & Christensen, 1959  
Heino — In the soil of an oat-field at a depth of 10—20 cm. June.
17. *Henlea ventriculosa* (Udekem, 1854)  
Heino — In the soil of an oat-field at a depth of 10—20 cm. June.

Genus *Buchholzia* Michaelsen, 1887

18. *Buchholzia appendiculata* (Buchholz, 1862)  
Arnhem — Itbon garden, in birch litter and in the soil of the "orchard". July. In February 1963 it was present in an unfrozen layer of the soil (0—5 cm) with a snow cover of 30 cm.
19. *Buchholzia fallax* Michaelsen, 1887  
Arnhem — Itbon garden, in the soil of the "orchard". February, September, October.

Genus *Bryodrilus* Ude, 1892

20. *Bryodrilus ehlersi* Ude, 1892  
Hackfort I — In moss on an oak-tree. October.

Genus *Hemifridericia* Nielsen & Christensen, 1959

21. *Hemifridericia parva* Nielsen & Christensen, 1959  
Forest soil (leg. J. v. d. Drift).

Genus *Friderica* Michaelsen, 1889

22. *Friderica bulbosa* (Rosa, 1887)  
Beuningen — In the soil of an old mixed standard (apple and pear).  
July.
23. *Friderica bulboides* Nielsen & Christensen, 1959  
Hackfort — In the soil of a meadow bordering type I. October.  
Ketelhaven — In the soil. September.  
Barendrecht — In grassy soil, June.  
Heino — In a field of oats at a depth of 2—4 cm. July.
24. *Friderica striata* (Levinsen, 1884)  
Hackfort I & II — In the soil. July, October. In autumn and in early  
winter it also occurs on and between the leaves of the  $F_0$  and  $F_1$  layer,  
however.  
Arnhem — Itbon garden, in the soil of the "orchard". August.
25. *Friderica paroniana* Issel, 1904  
Beuningen — In the soil of an old mixed standard orchard (apple and  
pear). August.  
Heino — In a field of oats at a depth of 2—4 cm. July.
26. *Friderica bisetosa* (Levinsen, 1884)  
Beuningen — In the soil of an old mixed standard orchard (apple and  
pear). July.  
Heino — In the soil of a potato-field at a depth of 0—10 cm; in the soil  
of fields of oats and rye at depths of 0—10 cm and 10—20 cm. June.  
Arnhem — Itbon garden, in the soil of the "orchard". August.  
In Feb. 1963 also in the unfrozen upper layer of the soil (0—5 cm)  
under a snow cover of 30 cm.  
Barendrecht — In grassy soil. June.  
Zwijndrecht — In the soil of arable land. June.
27. *Friderica maculata* Issel, 1904  
Arnhem — Itbon garden, in the soil of the "orchard". June.
28. *Friderica leydigi* (Vejdovskij, 1877)  
Heino — In the soil of an oat-field at depths of 0—10 cm and 10—20  
cm. Also in a field of potatoes. June, September.  
Barendrecht — In a greenhouse. June.

29. *Fridericia connata* Bretscher, 1902  
 Beuningen — In the soil of an orchard of young bush trees on a former meadow. August, October.  
 Arnhem — Itbon garden, in litter of birch and in the soil (0—2½ cm) of the "orchard". September.
30. *Fridericia magna* Friend, 1899  
 Hackfort II — In the topsoil. July. This species known to occur in the British Isles and Ireland has not been recorded previously from Continental Europe (NIELSEN & CHRISTENSEN, 1959, 1963).
31. *Fridericia perrieri* (Vejdovskij, 1877)  
 Hauwert (N-Holland) — In the soil of arable land. April.  
 Barendrecht — In grassy soil. June.
32. *Fridericia aurita* Issel, 1905  
 Beuningen — In the soil of an old standard orchard. March.
33. *Fridericia galba* (Hoffmeister, 1843)  
 Hackfort II — In the soil; also in the meadow bordering type I. July.  
 Middachten — In the soil. October.  
 Beuningen — In the soil of an old standard orchard. July.  
 Arnhem — Itbon garden, in the soil of the "orchard". August.  
 Barendrecht — In grassy soil. June.  
 Zwijndrecht — In grassy soil. June.
34. *Fridericia ratzeli* (Eisen, 1872)  
 Hackfort I — In the soil and in the meadow bordering type I. February, July.  
 Beuningen — In the soil of an old standard orchard. July.  
 Boskoop — In horticultural soil (Plant Protection Service leg.). January.  
 Arnhem — Itbon garden, in the soil of the "orchard". August.
35. *Fridericia gracilis* von Bülow, 1957  
 Heino — In the soil of an oat-field at depths of 0—10 cm and 10—20 cm; in the soil of a field of potatoes at a depth of 0—10 cm. June, September.
36. *Fridericia hegemon* (Vejdovskij, 1877)  
 Barendrecht — In grassy soil. June.

Genus *Enchytraeus* Henle, 1837

37. *Enchytraeus albidus* Henle, 1837  
 Along the coast of the former Zuiderzee (DE Vos, 1922).  
 Anjum (N.W. Friesland) — Very abundant in decaying seaweed (*Fucus* sp.) along the coast of the Waddenzee (J. Pieters leg.). January.
38. *Enchytraeus capitatus* von Bülow, 1957  
 Wijster (Dr.) — In compost. March.

39. *Enchytraeus buchholzi* Vejdovskij, 1879  
Hackfort II — In the soil. October.  
Beuningen — In the soil of a young orchard of bush trees on a former meadow. July.  
Ketelhaven (O-Flevoland) — In the soil. September.  
Heino — In the soil of fields of oats and potatoes at depths of 0—10 cm and 10—20 cm. June.  
Arnhem — Itbon garden, in the soil of the "orchard".  
Barendrecht — In a greenhouse and in grassy soil. June.  
Zwijndrecht — In a greenhouse. June.
40. *Enchytraeus irregularis* Nielsen & Christensen, 1961  
Arnhem — Itbon garden, in litter of hazel. October.
41. *Enchytraeus minutus* Nielsen & Christensen, 1961  
Arnhem — Itbon garden, in the soil of the "orchard". October.

Genus *Lumbricillus* Ørsted, 1844

42. *Lumbricillus rivalis* Levinsen, 1883; augm. Ditlevsen, 1904  
Anjum (NW-Friesland) — In decaying seaweed (*Fucus* sp.) along the coast of the Waddenzee (J. Pieters leg.). January.  
Arnhem — In a wash-basin. May.
43. *Lumbricillus pagenstecheri* (Ratzel, 1869)  
Anjum (NW-Friesland) — In decaying seaweed (*Fucus* sp.) along the coast of the Waddenzee (J. Pieters leg.). June.

Genus *Marionina* Michaelsen, 1889

44. *Marionina communis* Nielsen & Christensen, 1959  
Arnhem — In litter of a solitary *Fagus sylvatica* L. in a mixed stand of mainly *Quercus robur* L. and *Quercus rubra* L. September.
45. *Marionina tubifera* Nielsen & Christensen, 1959  
Arnhem — Itbon garden, in the soil of the "orchard" and in litter of *Corylus avellana* L.. September, November.  
Heino — In the top soil of a field of rye. June.
46. *Marionina clavata* Nielsen & Christensen, 1961  
Arnhem — In litter of Scots pine. October.  
Hoge Veluwe (De Pollen) — In poor sandy soil with lichens (*Cladonia* sp.) and moss (*Polytrichum piliferum* Schreb.), patches of heather, and in the F<sub>0</sub>, F<sub>1</sub> and H-layer under Scots pine. October-January.

DISCUSSION

At present 46 species of Enchytraeidae are known to occur in the Netherlands.

As stated at the beginning of this paper the samples examined by the author were taken in a few localities only. The only littoral sample examined yielded

three species of which two proved to be new to the fauna of the Netherlands.

As the Danish fauna, which was intensively studied by NIELSEN & CHRISTENSEN, contains 84 species, including about 18 littoral ones, the number of Dutch species may be expected to increase as soon as sampling is extended to other parts of the country.

#### SUMMARY

This paper presents a preliminary check list of 46 species of Enchytraeidae hitherto found in the Netherlands.

With the exception of *Enchytraeus albidus* and *Hemifridericia parva*, these species are recorded from the Netherlands for the first time.

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