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The superfamily Dorylaimoidea (Nematoda) – a review
Family Dorylaimidae

By

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Contents

Abstract. This paper gives a survey on the family Dorylaimidae within the superfamily Dorylaimoidea (Nematoda). Both the family and four of the subfamilies – Amphidorylaiminae, Prodorylaiminae, Dorylaiminae, Laimydorinae – are characterized, while the subfamily Afrodorylaiminae will be discussed elsewhere. Nineteen genera are defined and 224 valid species enumerated and presented in form of keys. Four new genera – *Apodorylaimus* (Amphidorylaiminae), *Protodorylaimus* (Prodorylaiminae), *Crocodorylaimus* and *Halodorylaimus* (Laimydorinae) – are proposed and seven new species – *Apodorylaimus bini, Dorylaimus numidicus, Dorylaimus fodori, Crocodorylaimus aequatorialis, Crocodorylaimus dimorphus, Mesodorylaimus kittenbergeri* and *Calodorylaimus densus* – are described. Several new combinations are introduced.

In a series of papers I should like to give a picture on the present taxonomic status of the families, subfamilies, genera and species of the nematode superfamily Dorylaimoidea DE MAN, 1876. The first paper has treated of the families

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Thorniidae De Coninck, 1965 and Thornenematidae Siddiqi, 1969 and enumerated eleven genera and 59 species. The present article deals with the family Dorylaimidae de Man, 1876 and defines nineteen genera belonging to four subfamilies. The subfamily Afrodorylaiminae Andrássy, 1969 will be discussed separately in a subsequent article. The number of species listed and presented here is 224.

The family Dorylaimidae has been established by de Man (1876) for the one genus *Dorylaimus.* The main steps of its history can be summarized as follows.

Micoletzky (1922) regarded the group as a subfamily (Dorylaiminae) of the family Tylenchidae and ordered five genera into it *(Dorylaimus, Actinolaimus, Trichodorus, Campydora* and *Iotonchus).* Baylis and Daubney (1926) discussed the subfamily Dorylaiminae within the family Anguillulinidae and enumerated twelve genera in it. Thorne (1939) re-established the Dorylaimidae as a family and divided it into five subfamilies: Dorylaiminae, Tylencholaiminae, Actinolaiminae, Nygolaiminae and Longidorinae. He mentioned seven genera in the subfamily Dorylaiminae and fifteen in the other subfamilies. In accepting Thorne's system Chitwood (1950) gave the same division of the family.

Baker (1962) left only two subfamilies (Dorylaiminae and Tylencholaiminae) and listed 23 genera (and two uncertain ones). Goodey (1963) divided the Dorylaimidae into three subfamilies (Dorylaiminae, Actinolaiminae, Tylencholaiminae) and counted 35 genera. Paramonov (1964) added Nygolaiminae to the above three subfamilies, and listed 16 genera within the Dorylaiminae. De Coninck (1965) distinguished two subfamilies only (Dorylaiminae and Thorniinae), and counted 21 genera in the Dorylaiminae. Siddiqi (1969) returned to the old conception of de Man, and regarded the genus *Dorylaimus* as the only representative of the whole family.

In 1969 I outlined a new system of the Dorylaimidae, and proposed four subfamilies: Dorylaiminae *(Dorylaimus, Paradorylaimus, Ischiodorylaimus),* Laimydorinae *(Laimydorus, Idiodorylaimus),* Mesodorylaiminae *(Mesodorylaimus, Calodorylaimus, Drepanodorylaimus)* and Afrodorylaiminae *(Afrodorylaimus).* Not yet knowing this paper, Ferris (1971) published a quite different system: she divided the family into six subfamilies: Dorylaiminae (with 23 genera), Discolaiminae (with 4 genera), Nordiinae (with 3 genera), Cephalodorylaiminae (with 1 genus), Pungentinae (with 5 genera) and Vanderlindiinae (with 1 genus).

In a book (1976) I further developed my previous system (1969). I grouped the genera into four subfamilies as in the above-mentioned paper and added a further genus, *Minidorylaimus.* Eliava (9184) accepted the outline of this system in general but added two subfamilies, Prodorylaiminae (with 2 genera) and Thornenematinae (with 3 genera) to the family.

Besides the above scientists a number of other authors has contributed to the knowledge of the Dorylaimidae. At least one of them should not be left unmentioned; it is Loof, who has given, especially in his papers of 1983 and 1985, many valuable comments to the taxonomic problems of our group, the so-called "long-tailed dorylaims".

Family **DORYLAIMIDAE** DE MAN, 1876

Dorylaimoidea. Small to large nematodes, body varying between 0.8 and 8.5 mm. Cuticle smooth or finely annulated, occasionally provided with longitudinal ridges. Head offset or continuous with neck, labial framework not sclerotized. Spear straight or slightly sinuate, moderately long, aperture generally occupying 1/3 of its length. Guiding ring simple or double. Oesophagus expanded in posterior half or so. Prerectum distinct, occasionally very long. Female genital organ didelphic, both ovaries lying in general on the same side of intestine. Vulva mostly equatorial, with sclerotized lips. Testes two, spicula dorylaimoid with small lateral pieces. A pair of adcloacal papillae and a ventromedial row of numerous supplements present. Tail predominantly with sexual dimorphism: in females attenuated to filiform, in males short and rounded; in some cases long and filiform in both sexes.

The family may be characterized within the superfamily Dorylaimoidea by the simple vestibule, the shape of spear, the always amphidelphic gonads and the tail which is either long in both sexes or shows a sexual dimorphism.

The two dozen genera may be grouped into five subfamilies:

Amphidorylaiminae ANDRÁSSY, 1976
Prodorylaiminae ANDRÁSSY, 1969
Dorylaiminae DE MAN, 1876
Laimydorinae ANDRÁSSY, 1969
Afrodorylaiminae ANDRÁSSY, 1969

Subfamily AMPHIDORYLAIMINAE ANDRÁSSY, 1976

Dorylaimidae. Small to medium-sized animals. Cuticle smooth, without longitudinal ridges. Spear straight, moderately long, guiding ring thin. Spermatozoa fusiform. Spicula simple, not truly dorylaimoid, without central thickening and lateral pieces. Supplements few, spaced. Tail in both sexes similar, filiform.

Two genera (with 4 species):

Amphidorylaimus ANDRÁSSY, 1960
Minidorylaimus ANDRÁSSY, 1972 (syn. n.)
Apodorylaimus gen. n.

Key to genera of Amphidorylaiminae

1 Supplements 5 – 8, arranged in pairs . . . . **Apodorylaimus gen. n.**
– Supplements 1 or 2 . . . . **Amphidorylaimus** ANDRÁSSY

Genus *Amphidorylaimus* ANDRÁSSY, 1960

Syn. *Minidorylaimus* ANDRÁSSY, 1972 (syn. n.)

Dorylaimidae, Amphidorylaiminae. Body 0.8 – 1 mm long, fairly slender. Cuticle smooth or very finely annulated. Lips well separate, angular, head offset. Amphids broad, funnel-shaped. Spear straight, 8 – 11 μm, about as long as labial width; aperture 1/3 of its length. Guiding ring double but narrow, located less than one-head diameter from anterior body end. Oesophagus expanded posterior to its middle. Prerectum in both sexes two or three anal diameters long, in males beginning anterior to the supplements. Vulva longitudinal, far pre-equatorial (in 34–41%). Female gonads amphidelphic. Eggs elongate, 5–6 times as long as wide. Testes two, spermatozoa spindle-shaped. Spicula simple, alaimoid, without central thickening and lateral pieces. Supplements one or two, precloacal space as long as or shorter than spicula. Tail in both sexes similar, filiform, about 20 times as long as anal body diameter.

Type-species: *Dorylaimus infecundus* Cobb in Thorne & Swanger, 1936 = *Amphidorylaimus infecundus* (Cobb in Thorne & Swanger, 1936) Andrássy, 1960.

This genus is unique within the family in having quite simple, not dorylaimoid spicula and a very limited number of copulatory supplements.

The representatives of *Amphidorylaimus* live in the soil around roots and occur in Asia, Africa and South America.

Two species:

A. flagellicauda Monteiro, 1970
A. infecundus (Cobb in Thorne & Swanger, 1936) Andrássy, 1960
    Dorylaimus infecundus Cobb in Thorne & Swanger, 1936
    Minidorylaimus decembris Andrássy, 1972 (syn. n.)

Key to species of Amphidorylaimus

1 One supplement, lying before the spicula. – ♀: L = 0.79–1.0 mm; a = 36–48; b = 4.4–5.3; c = 3.2–4.0; V = 34–40%. ♂: L = 0.87 mm; a = 42; b = 4.4; c = 4; PO: 1. (India, Brazil) .... **flagellicauda** Monteiro

– Two supplements, the posterior one lying level with the spicula. – ♀: L = 0.80–0.95 mm; a = 33–46; b = 4.5–4.8; c = 3.4–4.2; V = 39–41%. ♂: L = 0.74 mm; a = 43; b = 3.9; c = 4.7; PO: 2. (Japan, Congo Republic, Venezuela) .... **infecundus** (Cobb in Thorne & Swanger)

Remarks

Amphidorylaimus infecundus. – I described from the Congo Republic a new genus and species, *Minidorylaimus decembris* Andrássy, 1972. Although the male is not known, I suppose that this genus is identical with *Amphidorylaimus;* their main characters correspond well (body small, lips angular, spear short with comparatively large aperture, vulva longitudinal, without sclerotized lips, eggs unusually large, tail very long). On the basis of the measurements, shape of head, length of spear and tail, I regard *M. decembris* as a junior synonym of *A. infecundus.*

Genus *Apodorylaimus* gen. n.

Dorylaimidae, Amphidorylaiminae. Body 0.8 to 1.7 mm long, fairly slender. Cuticle smooth. Lips not or slightly separate, head offset or continuous with neck. Amphids broad, funnel-shaped. Spear straight, gradually widened to its proximal end, 10–26 μm, as long or almost twice as long as labial diameter; aperture 1/3 of its length. Guiding ring thin, simple, located far back. Oesophagus enlarged gradually. Prerectum short, in females hardly longer than body width, in males beginning in the range of supplements. Vulva pre-equatorial, without sclerotization. Female genital organ amphidelphic. Testes two, spermatozoa spindle-shaped. Spicula semi-dorylaimoid, simple, without inner sclerotization and lateral pieces. Supplements 5 – 8, arranged by twos. Precloacal space longer than spicula. Tail in both sexes filiform, 10 to 22 anal diameters long.

Type-species: *Apodorylaimus bini* sp. n.

The genus is unique within the Dorylaimidae in having supplements arranged by twos. It is similar to *Amphidorylaimus* ANDRÁSSY, 1960 but the prerectum is short, the spicula are somewhat more developed and the supplements more numerous and differently arranged.

Aquatic or semi-aquatic nematodes known from Asia and Africa.

Two species:

A. bini sp. n.

A. congonensis (ANDRÁSSY, 1960) comb. n.
Dorylaimus infecundus apud SCHUURMANS STEKHOVEN & TEUNISSEN, 1938
Amphidorylaimus congonensis ANDRÁSSY, 1960

Key to species of Apodorylaimus

1 Spear 24 – 26 μm, twice as long as labial width; supplements 8 (4 pairs); body to 1.7 mm. – ♀: L = 1.2 – 1.7 mm; a = 37 – 42; b = 3.8 – 4.7; c = 3.1 – 3.9; V = 38 – 43%; c' = 18 – 22. ♂: L = 1.6 mm; a = 45; b = 4.5; c = 3.6; c' = 16; PO: 8. (India) .... **bini** sp. n.

– Spear 10 μm, as long as labial width; supplements 5 (6?, 3 pairs); body hardly 1 mm. – ♀ unknown. ♂: L = 0.8 mm; a = 45; b = 4; c = 4.3; c' = 10; PO: 5. (Zaire) .... **congonensis** (ANDRÁSSY)

Subfamily PRODORYLAIMINAE ANDRÁSSY, 1969

Dorylaimidae. Bigger animals, predominantly well over 1 mm (to 5.5 mm). Cuticle without longitudinal ridges. Spear straight, guiding ring simple, thin. Spermatozoa oval to fusiform. Spicula dorylaimoid. Supplements numerous, contiguous or spaced. Tail in both sexes similar, elongate to filiform.

Three genera (with 19 species):

Prodorylaimium ANDRÁSSY, 1969
Prodorylaimus ANDRÁSSY, 1959
Protodorylaimus gen. n.

Key to genera of Prodorylaiminae

1 Prerectum in both sexes excessively long (15 – 25 anal diameters); body very slender (a to 80) .. **Protodorylaimus** gen. n.

– Prerectum much shorter (in females to 4, in males to 8 anal diameters); body not so slender ...2

2 Supplements spaced and limited in number (6 – 10) .... **Prodorylaimium** ANDRÁSSY

– Supplements contiguous and numerous (13 – 31) .... **Prodorylaimus** ANDRÁSSY

Genus *Prodorylaimus* ANDRÁSSY, 1959

Dorylaimidae, Prodorylaiminae. Body varying in length between 1 and 5 mm, generally slender. Cuticle moderately thick, smooth or very finely annulated. Lips hardly separate, head mostly slightly offset. Amphids broad, funnel-shaped. Spear straight, 1.5–2.5 times as long as labial diameter, 18 to 50 μm. Aperture occupying 1/4 or 1/3 of spear length. Guiding ring thin, located maximum at a distance of one-head diameter from anterior end. Oesophagus widened near its middle. Prerectum in females shorter (1–4 anal diameters) than in males (4–8 anal diameters, beginning nearly level with the anteriormost supplement). Female genital organ amphidelphic. Vulva mostly longitudinal, in 35 to 56% of body length, with sclerotized lips. Testes two, spermatozoa oval to fusiform. Spicula dorylaimoid. Supplements contiguous, 13 to 31 in number; precloacal space longer than spicula. Tail in both sexes similar, elongate to filiform, 2 to 25 times as long as anal body diameter (in males somewhat shorter than in females). Males in general nearly as common as females.

Type-species: *Dorylaimus longicaudatus* in sense of DE MAN, 1876 and subsequent authors = *Prodorylaimus longicaudatoides* ALTHERR, 1968*

Within the subfamily the genus *Prodorylaimus* ANDRÁSSY, 1959 is well characterized by the comparatively short prerectum and the great number of contiguous supplements.

In his 1985 paper LOOF discussed the genus *Prodorylaimus* and published several clear descriptions. He made some taxonomic-nomenclatorial proposals as well, a part of which, however, I cannot agree with. He explained the outlines of the genus too widely. For instance, he transferred a number of *Laimydorus* species, in which males were not known, to *Prodorylaimus*. Why would it be better to see these species here and not there? (At this moment we don't know whether their males are long- or short-tailed). A number of new combinations have been superfluously proposed so. Afterwards, LOOF synonymized the genus *Drepanodorylaimus* JAIRAJPURI, 1966 with *Prodorylaimus*. This proposal is quite wrong. *Drepanodorylaimus* is a distinct genus having good and constant characteristics by which it may be distinguished from *Prodorylaimus* not only at genric but also at subfamily level.**

The representatives of *Prodorylaimus* inhabit wet biotopes. They are distributed in Europe (5 species), Asia (5 species), Africa (5 species), South America (3 species) and Australia (1 species). The most common of them, the type-species, has been recorded from 26 countries or states hitherto.

Thirteen species:

P. brasiliensis (MEYL, 1956) ANDRÁSSY, 1959
    Dorylaimus brasiliensis MEYL, 1956
P. dahli (ALTHERR, 1960) ANDRÁSSY, 1964
    Dorylaimus dahli ALTHERR, 1960
P. dolichurus (LOOS, 1946) SIDDIQI, 1969
    Enchodelus dolichurus LOOS, 1946
P. eliavai THALOLIKHIN, 1977
P. ensis KLEYNHANS, 1970
P. filiarum ANDRÁSSY, 1964
    Prodorylaimus gurvitschi ELIAVA, 1975 (syn. n.)

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* As proposed by LOOF (1980), since the original species, *Dorylaimus longicaudatus* BÜTSCHLI 1874 is a species inquirenda.

** The genus *Drepanodorylaimus* and related forms will be discussed in a separate paper.

P. kukuy Thalolikhin, 1977
P. longicaudatoides Altherr 1968
Dorylaimus longicaudatus apud de Man, 1876, 1880, 1884; Loof, 1961; Andrássy, 1959, 1964, 1969
Prodorylaimus kralli Thalolikhin, 1975 (syn. n.)
P. mas Loof, 1985
Prodorylaimus longicaudatus apud Loof & Coomans, 1970
P. obesus Ahmad & Jairajpuri, 1982
P. paralongicaudatus (Micoletzky, 1925) Andrássy, 1959
Dorylaimus paralongicaudatus Micoletzky, 1925
Dorylaimus filiformis apud Schuurmans Stekhoven & Teunissen, 1938
P. rionensis (Gerlach, 1954) Andrássy, 1959
Dorylaimus rionensis Gerlach, 1954
P. rotundiceps Loof, 1985

Key to species of Prodorylaimus

1 Tail short, in females 2 – 4 anal diameters 2
– Tail longer, in females 7 – 25 anal diameters 5

2 Spear 30 – 50 μm long; body longer than 2 mm 3
– Spear 20 – 25 μm long; body distinctly shorter than 2 mm 4

3 Spear length above 40 μm; supplements 25 or more. – ♀: L = 2.1 – 2.8 mm; a = 17 – 25; b = 3.4 – 4.0; c = 15 – 18; V = 49 – 53%; c' = 3 – 3.5. ♂: L = 2.2 – 2.5 mm; a = 17 – 23; b = = 3.7 – 4.1; c = 15 – 19; PO: 25 – 28. (Soviet Union: Baical Lake) ..... **kukuy** Thalolikhin
– Spear length under 40 μm; supplements 22 or less. – ♀: L = 2.5 – 3.3 mm; a = 37 – 53; b = = 4.5 – 5.9; c = 21 – 27; V = 44 – 47%; c' = 3 – 4. ♂: L = 2.0 – 2.6 mm; a = 51 – 60; b = = 5.3 – 5.6; c = 20 – 30; PO: 17 – 22. (Kenya, South Africa, Brazil) .....**rionensis** (Gerlach)

4 Tail, especially in females, dorsally bent; body relatively plump. – ♀: L = 1.6 – 1.8 mm; a = 26 – 30; b = 4.6 – 5.2; c = 26 – 30; V = 50 – 56%; c' = 2. ♂: L = 1.6 – 1.7 mm; a = 26 – 30; b = 4.7 – 5.2; c = 6.4 – 6.9; PO: 15 – 18. (India) ......**obesus** Ahmad & Jairajpuri
– Tail straight or ventrally bent; body slender. – ♀: L = 1.1 – 1.3 mm; a = 40 – 53; b = 4.2 – 4.8; c = 27 – 31; V = 41 – 48%; c' = 2 – 2.5. ♂: L = 1.0 – 1.2 mm; a = 48 – 52; b = 4.3 – 4.8; c = 25 – 37; PO: 13 – 14. (Brazil) .... **brasiliensis** (Meyl)

5 Spear long, 45 – 50 μm; female tail 6 – 8 times anal diameter. – ♀: L = 2.9 – 4.2 mm; a = 22 – 28; b = 3.5 – 4.2; c = 15 – 16; V = 48 – 55%; c' = 6 – 8. ♂: L = 4.8 – 4.9 mm; a = 31 – 35; b = 4.4 – 4.8; c = 16 – 35; PO: 28 – 30. (Soviet Union: Baical Lake) ... **eliavai** Thalolikhin
– Spear shorter, 18 to 40 μm; female tail at least 10 times anal diameter 6

6 Spear longer than 30 μm 7
– Spear 25 μm or shorter 10

7 Number of supplements 21 – 31. – ♀: L = 2.5 – 3.5 mm; a = 30 – 45; b = 4 – 7; c = 4.4 – 8.0; V = 35 – 45%; c' = 15 – 18. ♂: L = 2.0 – 3.0 mm; a = 30 – 45; b = 4.0 – 5.8; c = 9 – 15; PO: 21 – 31. (Holland, Federal and Democratic Germany, Denmark, Finland, Poland, Switzerland, Austria, Hungary, Czechoslovakia, Yugoslavia, Spain, Italy, Soviet Union [Russia, Lithuania, Latvia, Uzbekistan, Tadzhikistan, Azerbajzhan], Cameroon, Zaire, Uganda, Kenya, Tanzania, Chile, Campbell Islands) .... **longicaudatoides** Altherr
– Number of supplements 14 – 20 8

8 Tip of tail finely rounded; body very slender. – ♀: L = 2.2 – 3.6 mm; a = 43 – 64; b = 4.6 – 6.0; c = 7 – 10; V = 35 – 41%; c' = 12. ♂: L = 2.2 – 3.4 mm; a = 41 – 54; b = 4.4 – 5.4; c = 12 – 18; PO: 15 – 18. (Cameroon) ....**dahli** (Altherr)
– Tip of tail pointed; body less slender 9

9 Supplements 14 – 15. – ♀: L = 2.7 – 2.9 mm; a = 37 – 44; b = 5.3 – 5.8; c = 2.8 – 3.2; V = = 38 – 39%; c' = 20. ♂: L = 2.4 – 2.5 mm; a = 38 – 42; b = 4.9; c = 3.3 – 3.6; PO: 14 – 15. (South Africa) ....**ensis** Kleynhans

– Supplements 15 – 20. – ♀: L = 2.4 – 3.0 mm; a = 30 – 40; b = 4.5 – 6.0; c = 3.1 – 5.0; V = 37 – 43%; c' = 12 – 16. ♂: L = 2.0 – 2.9 mm; a = 35 – 40; b = 4.0 – 5.3; c = 6.2 – 8.0; PO: 15 – 20. (Hungary, Soviet Union [Lithuania], Angola, Zaire, Kenya, Tanzania) .... **paralongicaudatus** (MICOLETZKY)

10 Lip region narrow, rounded, continuous with neck; supplements 13 – 14. – ♀: L = 2.3 – 2.8 mm; a = 48 – 63; b = 5.6 – 6.7; c = 4.5 – 6.5; V = 35 – 42%; c' = 15 – 23. ♂: L = 2.0 – 2.6 mm; a = 51 – 60; b = 5.3 – 5.6; c = 6.3; PO: 13 – 14. (Holland, Switzerland, Hungary) ...... **rotundiceps** LOOF

– Lip region broad, not rounded, more or less offset; supplements 15 – 25 11

11 Tail extremely long, 25 anal diameters, 1/3 of body length; male prerectum originating at level of the anterior supplement. – ♀: L = 2.1 mm; a = 48; b = 5.5; c = 3.1; V = 39; c' = 251. ♂: L = 2.1 mm; a = 48; b = 5.3; c = 3.4; PO: 15 – 18. (Sri Lanka). ......**dolichurus** (LOOS)

– Tail shorter, 10 – 16 anal diameters, 1/6 – 1/8 of body length; male prerectum originating well before the supplements 12

12 Vulva transverse; spear 22 – 26 µm long. – ♀: L = 1.8 – 2.4 mm; a = 42 – 51; b = 5.4 – 5.8; c = 5.8 – 7.7; V = 43 – 48%; c' = 12 – 15. ♂: 2.2 – 2.3 mm; a = 52 – 58; b = 5.5 – 6.0; c = 6.4 – 6.9; PO: 19 – 25. (Holland, Switzerland, Federal Germany, Austria, Italy) ....**mas** LOOF

– Vulva longitudinal; spear 18 – 20 µm long. – ♀: L = 1.6 – 2.2 mm; a = 40 – 52; b = 5.4 – 6.5; c = 5.5 – 7.9; V = 40 – 48%; c' = 10 – 16. ♂: L = 1.6 – 2.3 mm; a = 40 – 55; b = 5.4 – 6.7; c = 6.1 – 8.4; PO: 16 – 21. (Holland, Hungary, Soviet Union [Ukraine]) ..**filiarum** ANDRÁSSY

Remarks

Prodorylaimus filiarum. – No differences can be stated between *P. gurvitschi* ELIAVA, 1975 and *P. filiarum* ANDRÁSSY, 1964: the measurements of body, the length of spear and tail, and also the number of supplements are the same in both species. ELIAVA's species is consequently a junior synonym of *filiarum.*

Prodorylaimus longicaudatoides. – There is no doubt about the identity of *P. kralli* THALOLIKHIN, 1975 and *P. longicaudatoides* ALTHERR, 1968. I could examine one female and two males from the type material, kindly sent by Dr. THALOLIKHIN, and concluded that the Russian author has overlooked the length of the spear. In the original description (1975) as well as in a later paper (1980) he mentioned 75 – 80 µm for the length of spear against my 33 – 35 µm. Besides, also the other characters of *kralli* correspond well to *longicaudatoides.*

Genus *Prodorylaimium* ANDRÁSSY, 1969

Dorylaimidae, Prodorylaiminae. Body 1.1 to 2.5 mm long, moderately slender. Cuticle smooth or very finely striated. Lips slightly separate, offset. Amphids broad, funnel-shaped. Spear straight or slightly sinuate, 14 to 26 µm long, 1.3 – 1.8 times longer than labial diameter; aperture occupying 1/3 of its length. Guiding ring thin, located less than one-head diameter behind anterior body end. Oesophagus widened in or somewhat behind the middle. Prerectum in females short (2 – 3 anal diameters), in males originating level with the anterior supplements. Female gonads amphidelphic, vulva pre-equatorial (in 38 – 45%), with sclerotized lips. Testes two, spermatozoa fusiform. Spicula dorylaimoid. Supplements 6 to 10, spaced; precloacal space shorter or longer than spicula. Tail in both sexes similar, filiform, 5 to 26 times as long as anal body diameter, in males not shorter than in females. Both sexes equally common.

Type-species: *Dorylaimus brigdammensis* DE MAN, 1876 = *Prodorylaimium brigdammense* (DE MAN, 1876) ANDRÁSSY, 1969.

This genus is similar to *Prodorylaimus* ANDRÁSSY, 1959 but its supplements are spaced and less in number.

The *Prodorylaimium* species live in the soil or in limnic habitats, and are known in Europe (2 species) and Asia (3 species). The most common species, *P. brigdammense,* has been recorded from 20 countries or states.

Four species:

P. alpinum Andrássy, 1978
P. brigdammense (de Man, 1876) Andrássy, 1969
Dorylaimus brigdammensis de Man, 1876
Prodorylaimus brigdammensis (de Man, 1876) Goodey, 1963
P. goaense Ahmad & Jairajpuri, 1985
P. stenosoma (de Man, 1876) Andrássy, 1973
Dorylaimus stenosoma de Man, 1876
Dorylaimus brigdammensis apud de Man, 1884 (partim); Loof, 1961

Key to species of Prodorylaimium

1 Supplements 9–10, the posteriormost of them levelling with the spicula. – ♂: L = 1.1–1.3 mm; a = 35–36; b = 4.3–4.6; c = 8.7–10; c' = 5–6; PO: 9–10. ♀ unknown. (Nepal, Korea) .... **alpinum** Andrássy
– Supplements 6–8, the posteriormost of them located before the spicula 2

2 Spear 13–14 μm, hardly longer than labial width. – ♀: L = 1.5–1.7 mm; a = 38–45; b = 4.7–5.7; c = 4.5–6.0; V = 38–45%; c' = 8–10. ♂: L = 1.2–1.5 mm; a = 35–45; b = 3.9–5.0; c = 5.0–6.5; PO: 6–8. (Holland, Federal Germany, Denmark, Poland, Switzerland, Hungary, Rumania, Spain, France, Italy, Soviet Union [Russia, Lithuania, Georgia, Uzbekistan, Azerbajzhan, Tadzhikistan], India, Taiwan, Japan, Sumatra, Suriname) .... **brigdammense** (de Man)
– Spear 20–26 μm, nearly twice as long as labial width 3

3 Tail 18–26 times as long as anal diameter; spear 25–26 μm. – ♀: L = 1.6–2.0 mm; a = 44–55; b = 4.2–4.9; c = 3.1–3.8; V = 41–43%; c' = 18–26. ♂: L = 1.7 mm; a = 39; b = 4.4; c = 3.2; PO: 8. (India) .... **goaense** Ahmad & Jairajpuri
– Tail 8–10 times as long as anal diameter; spear 20 μm. – ♀: L = 1.8–2.5 mm; a = 38–50; b = 5.2–6.3; c = 4.7–6.5; V = 39–42%; c' = 8–10. ♂: L = 1.9–2.5 mm; a = 43–48; b = 5.8–6.7; c = 6–7; PO: 6–7. (Holland) .... **stenosoma** (de Man)

Remarks

Prodorylaimium alpinum. – I found this species recently in Korea, Nampo Vando, near Pyongyan, in soil around grass roots, June 1984, one male and two juveniles. ♂: L = 1.3 mm; a = 36; b = 4.6; c = 10; c' = 5; supplements 9, the last of them at level of the spicula; spear 16 μm long; spicula 38 μm long.

Genus *Protodorylaimus* gen. n.

Dorylaimidae, Prodorylaiminae. Body 2.5 to 4.8 mm long, excessively slender (a = 64 to 81). Cuticle moderately thick, smooth or very finely annulated. Head not offset, lips hardly separate. Amphids funnel-shaped. Spear straight, 10–12 μm, equal with labial diameter. Guiding ring simple, thin, lying closer than one-head diameter to the anterior end. Oesophagus expanded near its middle. Prerectum of both sexes unusually long, 15–25 times as long as anal body width, in males beginning very far before the supplements. Female genital organ amphidelphic, vulva longitudinal and pre-equatorial (in 38–41%). Testes paired. Spicula dorylaimoid. Supplements contiguous, 15 to 22 in number;

precloacal space longer than spicula. Tail in both sexes similar, filiform, 10 – 14 times as long as anal body diameter.

Type-species: *Prodorylaimus dalmassoi* Loof, 1985 = *Protodorylaimus dalmassoi* (Loof, 1985) comb. n.

This genus is similar to *Prodorylaimus* Andrássy, 1959 in general habit but differs from that by the very slender body, the short and weak spear and the extremely long prerectum in both sexes.

As far as known the *Protodorylaimus* species live in the soil and occur in Europe and Asia.

Two species:

P. dalmassoi (Loof, 1985) comb. n.
Prodorylaimus dalmassoi Loof, 1985
P. kazakhstanicus (Sagitov, 1973) comb. n.
Prodorylaimus kazakhstanicus Sagitov, 1973

Key to species of Protodorylaimus

1 Body 4 – 5 mm long; supplements 21 – 22. – ♀: L = 4.0 – 4.8 mm; a = 73 – 81; b = 6.8 – 7.9; c = 9.4 – 14; V = 38 – 41%; c' = 12 – 14. ♂: L = 4.5 – 4.8 mm; a = 65 – 80; b = 7.8 – 8.1; c = 11 – 14; PO: 21 – 22. (France) .... **dalmassoi (Loof)**
– Body 2.5 – 3 mm long; supplements 15. – ♀: L = 2.5 – 2.6 mm; a = 64 – 65; b = 5.2 – 5.8; c = 6.5 – 7.5; V = 38 – 40%; c' = 10 – 14. ♂: L = 2.7 mm; a = 66; b = 5.9; c = 8.6; PO: 15. (Soviet Union: Kazakhstan) .... **kazakhstanicus (Sagitov)**

Remarks

Protodorylaimus dalmassoi. – I could examine a female paratype specimen kindly sent by Dr. Loof. The prerectum was more than 800 μm long, about 25-fold of anal body diameter. Such an enormous length of the prerectum is so unusual within the family Dorylaimidae that this phenomenon alone may be enough to separate *dalmassoi* from the members of *Prodorylaimus* at generic level.

Subfamily DORYLAIMINAE de Man, 1876

Dorylaimidae. Large nematodes, to 8.5 mm. Cuticle provided with conspicuous longitudinal ridges, 28 to 60 in number on mid-body region. Spear strong, straight, guiding ring double, tall. Spermatozoa fusiform, spicula dorylaimoid. Supplements small and numerous, arranged in a continuous row or in two groups. Tail of sexes dissimilar: in females elongate to filiform, in males very short and broadly rounded.

Two genera (with 32 species):

Dorylaimus Dujardin, 1845
Ischiodorylaimus Andrássy, 1969

Key to genera of Dorylaiminae

1 Supplements arranged in two groups connected by some free supplementary papillae .... **Ischiodorylaimus Andrássy**
– Supplements contiguous, arranged in an unbroken row .... **Dorylaimus Dujardin**

Genus *Dorylaimus* DUJARDIN, 1845

Dorylaimidae, Dorylaiminae. Body large, between 2.2 and 7.5 mm. Cuticle generally thick, provided with prominent longitudinal ridges, 28 to 60 in number. Lips hardly – rarely well – separate, labial region more or less offset. Amphids broad, funnel-shaped. Spear straight, strong, 35 to 63 (in one case 24) μm long, 2–3 times as long as cephalic diameter; aperture occupying 1/3 to almost 1/2 spear length. Guiding ring always double, located 1–1.5 head diameters from anterior body end. Oesophagus widened near the middle. Prerectum in females moderately long, in males longer, beginning well before the supplements. Female genital organ amphidelphic, strongly developed. Vulva predominantly pre-equatorial (in 34–51%), with sclerotized lips. Testes double, spermatozoa oval to fusiform. Spicula dorylaimoid, fairly slender and large (to 140 μm). Supplements small, very dense and numerous (22 to 62). Precloacal space mostly twice as long as spicula. Tail of sexes different: in females elongate-conoid to filiform (4–10 anal diameters, only in one species shorter), in males short and broadly rounded. Males almost as common as females.

Type-species: *Dorylaimus stagnalis* DUJARDIN, 1845 (sensu THORNE & SWANGER, 1936 and subsequent authors).

The members of this genus inhabit limnic biotopes, but they may occur also in moist soil and moss. They are distributed all over the world, only Australia and the Antarctica seem to be free of them. According to our present-day knowledge Europe is represented by 8, Asia by 11, Africa by 10, North America by 5 and South America by 2 species. The most common form is *Dorylaimus stagnalis* having been recorded from 49 countries or states.

Twenty-four species:

D. afghanicus ANDRÁSSY, 1960
D. alaeus THORNE, 1939
D. asymphydorus ANDRÁSSY, 1969
D. carinatus THORNE & SWANGER, 1936
D. conicus ANDRÁSSY, 1981
  Dorylaimus conurus ANDRÁSSY, 1978 nec THORNE, 1939
D. crassus DE MAN, 1884
  Dorylaimus stagnalis crassus DE MAN, 1884 (MICOLETZKY,1922)
  Dorylaimus stagnalis fecundus crassus DE MAN, 1884 (MICOLETZKY, 1922)
  Dorylaimus stagnalis fecundus pseudocrassus MICOLETZKY, 1925
  Mesodorylaimus crassus (DE MAN, 1884) GOODEY, 1963

D. fodori sp. n.
D. geraerti BAQRI & JANA, 1986
D. gigas KLEYNHANS, 1970
D. helveticus STEINER, 1919
  Dorylaimus fecundus helveticus STEINER, 1919
D. lineatus ALTHERR & DELAMARE DEBOUTTEVILLE, 1972
D. macroproctus ALTHERR, 1963
D. montanus STEFANSKI, 1923
  Dorylaimus stagnalis montanus STEFANSKI, 1923
  Dorylaimus paradoxus ELIAVA, 1967 (syn. n.)
D. numidicus sp. n.

D. pachys Andrássy, 1970
D. popus Gagarin, 1981
D. siddiqii Ahmad & Jairajpuri, 1982
D. stagnalis Dujardin, 1845
  Dorylaimus stagnalis fecundus multipapillatus Micoletzky, 1922
  Dorylaimus stagnalis bonensis Rahm, 1925
  Enoplus liratus Schneider, 1866
  Dorylaimus liratus (Schneider, 1866) Örley, 1880
  Dorylaimus robustus de Man, 1876
  Dorylaimus striatus Daday, 1894
  Dorylaimus saprophilus Peters, 1930
  Mesodorylaimus saprophilus (Peters, 1930) Goodey, 1963
  Laimydorus saprophilus (Peters, 1930) Siddiqi, 1969
  Dorylaimus innovatus Jana & Baqri, 1982 (syn. n.)
D. stekhoveni Baqri & Coomans, 1973
  Dorylaimus stagnalis apud Schuurmans Stekhoven, 1944
D. stenus Andrássy, 1970
D. stephani Andrássy, 1969
D. tepidus Andrássy, 1959
  Dorylaimus stagnalis filiformis Kreis, 1924 nec Bastian, 1865
D. thornei Andrássy, 1969
D. unicus Andrássy, 1970

Key to species of Dorylaimus

1 Number of longitudinal ridges between 50 and 60 2
– Number of longitudinal ridges less than 45 4

2 Cuticle unusually thick, 14 – 18 μm on mid-body; spear 60 – 63 μm long. – ♀: L = 3.9 – 4.9 mm; a = 26 – 30; b = 4.0 – 4.3; c = 11 – 14; V = 39 – 44%; c' = 5 – 6. ♂: L = 4.4 mm; a = 32; b = 3.7; c = 80; PO: 33. (South Africa) .... **pachys** Andrássy
– Cuticle much thinner, at most 5 μm on mid-body; spear 50 μm or shorter 3

3 Female tail conoid, 4 anal diameters long. – ♀: L = 4.4 mm; a = 33; b = 5.0; c = 31; V = 48%; c' = 4. ♂: L = 4.2 mm; a = 36; b = 5.0; c = 71; PO: 50 – 54. (United States: Montana) .... **alaeus** Thorne
– Female tail attenuated, 6 – 7 anal diameters long. – ♀: L = 4.1 – 5.1 mm; a = 40 – 46; b = 4.2 – 5.0; c = 16 – 18; V = 42 – 45%. ♂ unknown. (South Africa) ...... **stenus** Andrássy

4 Female tail conoid and very short, 2 – 3 anal diameters. – ♀: L = 4.5 – 5.2 mm; a = 44 – 50; b = 4.6 – 4.8; c = 37 – 44; V = 47 – 51%; c' = 2.3 – 3. ♂: L = 3.6 – 4.6 mm; a = 44 – 48; b = 3.8 – 4.2; c = 85 – 94; PO: 26 – 36. (Nepal) .... **conicus** Andrássy
– Female tail attenuated to filiform, at least 5 anal diameters 5

5 Body exceptionally slender (a = 60 or more) 6
– Body not so slender 7

6 The biggest species in the genus, 6.5 – 7.5 mm; spicula 130 μm long. – ♀: L = 6.5 – 7.5 mm; a = 58 – 62; b = 6.1 – 6.9; c = 13 – 16; V = 36 – 40%; c' = 10. ♂: L = 5.2 mm; a = 52; b = 4.4; c = 122; PO: 33. (South Africa) .... **gigas** Kleynhans
– Body about 5 mm; spicula 100 μm long. – ♀: L = 5.0 – 5.6 mm; a = 66 – 76; b = 5.1 – 6.0; c = 17 – 20; V = 36 – 43%; c' = 5 – 6. ♂: L = 4.3 – 4.5 mm; a = 55 – 60; b = 4.2 – 4.6; c = 97 – 108; PO: 35 – 39. (Switzerland, Hungary, Italy, Soviet Union [Moldavia, Uzbekistan], Kenya) .... **tepidus** Andrássy

7 Spear shorter, 35 – 45 μm ... 8
– Spear longer, 50 – 60 μm ... 15

8 Vulval region with 4 – 5 ventral papillae ... 9
– Vulval region without papillae ... 10

9 Head distinctly offset; longitudinal ridges 32. – ♀: L = 2.7 – 2.8 mm; a = 27 – 28; b = 4.8 – 5.0; c = 12 – 13; V = 44 – 45%; c' = 5 – 6. ♂ unknown. (Yugoslavia) ... **thornei** Andrássy

– Head not or hardly offset; longitudinal ridges 38 – 42. – ♀: L = 2.4 – 4.3 mm; a = 28 – 43; b = 3.8 – 5.0. c = 11 – 15; V = 45 – 51%; c' = 5 – 6. ♂: L = 2.6 – 4.0 mm; a = 26 – 42; b = 3.8 – 4.6; c = 56 – 86; PO: 35 – 40. (Canada, United States [Washington, Massachusetts]) **lineatus** Altherr & Delamare Deboutteville

10 Spear thrice as long as head diameter; spicula 50 μm. – ♀: L = 2.2 mm; a = 35 – 38; b = 4.3 – 4.5; c = 14; V = 49%; c' = 5 – 6. ♂: L = 1.6 – 1.9 mm; a = 28 – 35; b = 3.9 – 4.0; c = 53 – 64; PO: 31 – 34. (India) ... **siddiqii** Ahmad & Jairajpuri

– Spear about twice as long as labial diameter; spicula 80 – 90 μm ... 11

11 Body about 2 mm long; supplements 55. – ♀: L = 2.3 mm; a = 39; b = 4.0; c = 8.3: V = 45 %; c' = 8.6. ♂: L = 2.2 mm; a = 28; b = 3.5; c = 50; PO: 55. (United States: Virginia) ... **carinatus** Thorne & Swanger

– Body 3 – 4 mm long; supplements fewer ... 12

12 Supplements 46. – ♀: L = 3.6 – 4.2 mm; a = 37 – 41; b = 4.9 – 5.3; c = 15 – 16; V = 38 – 41%; c' = 5.0 – 5.3. ♂: L = 3.3 mm; a = 39; b = 5.0; c = 76; PO: 46. (India) .. **fodori** sp.n.

– Supplements less in number ... 13

13 Supplements 35 – 38. – ♀: L = 2.8 – 3.5 mm; a = 32 – 39; b = 4.3 – 4.8; c = 12 – 13; V = = 41 – 43%; c' = 6 – 11. ♂: L = 2.5 – 2.9 mm; a = 32 – 33; b = 3.8 – 4.4; c = 68 – 83; PO: 35 – 38. (India) ... **geraerti** Baqri & Jana

– Supplements 22 – 27 ... 14

14 Vulva in 36 – 39%. – ♀: L = 3.1 – 3.2 mm; a = 40 – 47; b = 4.4 – 4.6; c = 13 – 15; V = 36 – 39%; c' = 6 – 7. ♂: L = 2.6 – 2.8 mm; a = 40 – 42; b = 4.0 – 4.3; c = 91 – 96; PO: 22 – 27. (Algeria) ... **numidicus** sp. n.

– Vulva in 44 – 49%. – ♀: L = 3.3 – 4.1 mm; a = 30 – 36; b = 4.3 – 5.6; c = 14 – 17; V = 44 – 49%; c' = 4.5 – 6. ♂: L = 3.5 – 4.0 mm; a = 36 – 43; b = 4.3 – 4.8; c = 72 – 84; PO: 26 – 27. (Soviet Union: Tadzhikistan) ... **popus** Gagarin

15 Cuticle exceedingly thick, 12 – 14 μm on mid-body; spicula 140 μm long. – ♀: L = 4.2 – 4.8 mm; a = 24 – 27; b = 4.7 – 4.9; c = 14; V = 44 – 45%; c' = 5 – 6. ♂: L = 3.6 – 4.2 mm; a = = 25 – 26; b = 40; c = 62 – 70; PO: 44. (Holland, Denmark, Ireland, Sweden, Finland, Austria, Hungary, Spain, Soviet Union [Russia, Uzbekistan], Taiwan, Japan, Chile) ... **crassus** de Man

– Cuticle much thinner, only exceptionally 8 – 10 μm thick; spicula at most 120 μm long ... 16

16 Longitudinal ridges 40 – 44 on mid-body ... 17
– Longitudinal ridges 28 – 36 on mid-body ... 19

17 Lips well separate, angular, head sharply offset. – ♀: L = 3.4 – 3.7 mm; a = 46 – 50; b = 4.9 – 5.2; c = 12 – 13; V = 41 – 42%; c' = 6 – 7. ♂: L = 3.3 – 3.4 mm; a = 43 – 47; b = 4.6 – – 4.7; c = 90 – 94; PO: 39 – 41. (Kenya) ... **stephani** Andrássy

– Lips hardly separate, rounded, head not offset ... 18

18 Supplements 55 – 62; length of spicula around 120 μm. – ♀: L = 4.0 – 6.4 mm; a = 47 – 57; b = 4.3 – 5.4; c = 12 – 21; V = 36 – 40%; c' = 5 – 6. ♂: L = 4.5 – 5.4 mm; a = 49 – 61; b = 4.1 – 5.1; c = 102 – 149; PO: 55 – 62. (Zaire) ... **stekhoveni** Baqri & Coomans

– Supplements 25 – 35; length of spicula around 80 μm. – ♀: L = 3.3 – 4.8; a = 32 – 47; b = = 5.6; c = 12 – 22; V = 40%. ♂: L = 3.2 – 4.1 mm; a = 39; b = 4.3; c = 111; PO: 25 – 35. (Switzerland, Poland, Soviet Union [Russia, Ukraine], Mongolia) ... **montanus** Stefanski

19 Spear three times as long as labial width ... 20
– Spear maximal two-and-a-half times as long as labial width ... 21

20 Longitudinal ridges 28 – 29, unequally spaced (on both sides of body more densely arranged); vulva in 37 – 38%. – ♀: L = 3.5 – 4.2 mm; a = 33 – 40; b = 4.0 – 5.1; c = 14 – 15; V = 37 – – 38%; c' = 6 – 7. ♂: L = 3.9 mm; a = 33; b = 4.5; c = 85; PO: 46. (South Africa) .... **unicus** Andrássy

– Longitudinal ridges 32 – 35, equally spaced; vulva in 46%. – ♀: L = 4.2 mm; a = 28; b = 4.1; c = 24; V = 46%. ♂: L = 3.6 mm; a = 28; b = 4.3; c = 67; PO: 36 – 55. (Switzerland, Poland, Austria, Czechoslovakia, Hungary, Yugoslavia, Spain, Soviet Union [Russia, Uzbekistan], Canada, United States [Montana]) .... **helveticus** Steiner

21 Spear 57 – 60 μm long; on each side of vulva a small papilla present. – ♀: L = 4.4 – 5.1 mm; a = 48; b = 4.8 – 5.0; c = 14 – 17; V = 39 – 41%. ♂ unknown. (Switzerland) .... **macroproctus** Altherr

– Spear shorter, 46 – 53 μm; no papillae by the vulva 22

22 Aperture occupying half the length of spear; spear with a dorsal fissure; supplements 28. – ♀: L = 4.7 – 5.7 mm; a = 41 – 45; b = 5.0 – 5.7; c = 15 – 18; V = 34 – 40%; c' = 5 – 6. ♂: L = = 5.1 mm; a = 44; b = 5.0; c = 55; PO: 28. (Hungary, Italy, Spanish Sahara, South Africa) **asymphydorus** Andrássy

– Aperture occupying one-third of spear length; spear without dorsal fissure; supplements between 36 and 52 23

23 Spear conspicuously thicker than cuticle at the same level; vulva in 37 – 39%; supplements 52. – ♀: L = 3.4 – 4.0 mm; a = 38 – 42; b = 4.3 – 5.1; c = 12 – 15; V = 37 – 39%. ♂: L = 3.6 mm; a = 37; b = 4.1; c = 74; PO: 52. (Hungary, Afghanistan, Nepal, South Africa) .... **afghanicus** Andrássy

– Spear as thick as or thinner than cuticle at the same level; vulva in 42 – 47%; supplements 36 – 45. – ♀: L = 4.3 – 5.2 mm; a = 30 – 38; b = 4.8 – 5.7; c = 14 – 20; V = 42 – 47%; c' = = 5 – 6. ♂: L = 39 – 5.0 mm; a = 30 – 35; b = 4.5 – 5.4; c = 70 – 110; PO: 36 – 45. (Holland, Federal and Democratic Germany, Denmark, Iceland, Greenland, Sweden, Poland, Switzerland, Czechoslovakia, Hungary, Yugoslavia, Portugal, Spain, Italy, Turkey, Soviet Union [Russia, Ukraine, Moldavia, Estland, Lithuania, Georgia, Uzbekistan, Kazakhstan, Kirgizia, Tadzhikistan], Izrael, Iran, India, Mongolia, Japan, Sudan, Cameroon, Mauretania, Upper Volta, Ivory Coast, Ethiopia, Uganda, Kenya, Tanzania, Zaire, Simbabwe, South Africa, Canada, United States [Washington, Utah, Colorado], Suriname, Brazil) .... **stagnalis** Dujardin

Remarks

Dorylaimus montanus. – As I supposed in my paper (1969, p. 197, Footnote), *Dorylaimus paradoxus* Eliava, 1967 is most probably identical with *Dorylaimus montanus* Stefanski, 1923. The only difference between them can be found in the structure of amphids: in *paradoxus* they are provided with some flap-like extensions. As such a phenomenon is quite strange for the family Dorylaimidae, we may suppose that those "flaps" were only secretion-outflows.

Dorylaimus stagnalis. – I add *Dorylaimus innovatus* Jana & Baqri, 1982 as a new synonym to *Dorylaimus stagnalis* Dujardin, 1845. The measurements, habit, length of spear, shape of head, number of supplements etc. all are identical in both species.

Genus *Ischiodorylaimus* Andrássy, 1969

Dorylaimidae, Dorylaiminae. The largest nematodes within the family: 6 to 8.5 mm (only rarely smaller: 4 mm). Cuticle usually very thick (to 20 μm on mid-body), provided with longitudinal ridges, 28 – 56 in number. Lips hardly separate, head slightly offset. Amphids funnel-shaped. Spear straight, strong, 46 to 106 μm long, 2 – 3 times as long as labial diameter; aperature occupying 1/3 to 2/5 of its length. Guiding ring wide, double, located more than one-head diameter from anterior body end. Oesophagus generally expanded before the middle. Prerectum in females 4 – 10 times, in males 15 – 25 times as long as anal body width; in males beginning far before the supplements. Female genital organ amphidelphic, vulva longitudinal, pre-equatorial (in 27 to 44%), with sclerotized lips and some ventral papillae on both sides. Testes two, spermatozoa fusiform. Spicula dorylaimoid, large and slender, 90 to 172 (!) μm. Supplements arranged in two dense groups or fascicles connected by a row of separate supplementary papillae (8 – 13 in number). Precloacal space 1.5 – 2 times as long as spicula. Tail with sexual dimorphism: in females elongate conoid to attenuate, 2.5 – 8 anal diameters long, in males short and broadly rounded. Males in general as common as females.

Type-species: *Dorylaimus gulliver* Andrássy, 1964 = *Ischiodorylaimus gulliver* (Andrássy, 1964) Andrássy, 1969.

Ischiodorylaimus much resembles *Dorylaimus* Dujardin, 1845 but the genital supplements of males are differently arranged. Besides, the body is in general bigger, the spear and prerectum longer, and the longitudinal vulva is accompanied by small papillae.

Limnic nematodes. Of the eight species two occur in Europe, one in Asia and five in Africa.

Eight species:

I. bathypyla Andrássy, 1970
I. cognatus Andrássy, 1983
I. gulliver (Andrássy, 1964) Andrássy, 1969
Dorylaimus gulliver Andrássy, 1964
I. loeffleri (Andrássy, 1964) Andrássy, 1969
Dorylaimus loeffleri Andrássy, 1964
I. novus Baqri & Jana, 1986
I. robustus Zullini, 1974
I. tessares Kleynhans, 1970
I. ugandanus Andrássy & Banage in Andrássy, 1969

Key to species of Ischiodorylaimus

1 Cuticle with 54 – 56 longitudinal ridges; spear 96 – 106 μm long. = ♀: L = 6.0 – 7.6 mm; a = = 39 – 47; b = 3.7 – 4.5; c = 11 – 13; V = 39 – 44%; c' = 7 – 8. ♂: L = 6.7 – 7,6 mm; a = 35 – 39; b = 3.8 – 4.1; c = 100 – 115; PO: 10 – 13 + 10 – 12 + 11 – 13. (Kenya) .... **loeffleri** (Andrássy)

– Cuticle with 28 – 34 longitudinal ridges; spear shorter than 80 μm 2

2 Cuticle very thick, 13 – 19 μm on mid-body, at level of spear as thick as or thicker than the latter 3

– Cuticle thinner, 4 – 12 μm on mid-body, at level of spear conspicuously thinner than the latter. 6

3 Vulva deeply sunk in body contour. – ♀: L = 6.3 – 7.8 mm; a = 46 – 52; b = 5.5 – 7.0; c = 22 – 28; V = 27 – 35%; c' = 5. ♂ unknown. (South Africa) .... **bathypyla** Andrássy

– Vulva not sunk in body contour 4

4 Body slender; copulatory hump before the supplements strongly developed. – ♀: L = 5.8 – 7.4 mm; a = 40 – 46; b = 4.7 – 5.2; c = 16 – 24; V = 37 – 39%; c' = 4 – 5. ♂: L = 4.6 – 6.0 mm; a = 36 – 44; b = 3.6 – 4.6; c = 90 – 110; PO: 6 – 9 + 8 – 12 + 8 – 10. (Uganda) .... **ugandanus** Andrássy & Banage

– Body plump; copulatory hump before the supplements weak 5

5 Supplements 20 + 5 + 14; female tail 3 – 4 anal diameters long. – ♀: L = 4.5 mm; a = 35; b = 4.7; c = 19; V = 42%; c' = 3.6. ♂: L = 4.1 mm; a = 31; b = 4.3; c = 88; PO: 20 + 5 + + 14. (India) .... **novus** Baqri & Jana

– Supplements 9 + 13 + 18; female tail 5 – 6 anal diameters long. – ♀: L = 6.1 – 6.7 mm; a = = 26 – 34; b = 5.1 – 5.8; c = 15 – 19; V = 35 – 39%; c' = 5 – 6. ♂: L = 5.4 mm; a = 28; b = = 5.2; c = 107; PO: 9 + 13 + 18. (Italy) .... **robustus** Zullini

6 Smaller species, about 4 mm; spear shorter than 50 μm. – ♀: L = 4.0 – 4.3 mm; a = 32 – 34; b = 4.7 – 5.2; c = 14 – 16; V = 39 – 41%; c' = 4.5 – 6. ♂: L = 3.4 mm; a = 32; b = 4.3; c = 88; PO: 10 + 11 + 10. (Hungary) .... **cognatus** ANDRÁSSY

– Larger species, over 6 mm; spear 60 μm or longer 7

7 Spear about 60 μm long; cuticle thin, 4 – 5 μm on mid-body. – ♀: L = 6.2 – 6.7 mm; a = 46 – 50; b = 4.9 – 5.1; c = 29 – 34; V = 36 – 37%; c' = 2.6 – 3.8. ♂: L = 5.8 – 6.5 mm; a = 46 – 50; b = 4.7 – 5.0; c = 133 – 149; PO: 7 – 9 + 10 – 12 + 9 – 12. (South Africa) .... **tessares** KLEYNHANS

– Spear over 70 μm; cuticle much thicker, 8 – 12 on mid-body. ♀: L = 7.0 – 8.5 mm; a = 50 – 59; b = 4.6 – 5.2; c = 20 – 23; V = 37 – 41%; c' = 4 – 5. ♂: L = 6.1 – 7.5 mm; a = 50 – 56; b = 4.0 – 4.6; c = 109 – 135; PO: 7 – 10 + 9 – 13 + 8 – 9. (Kenya, South Africa) .... **gulliver** (ANDRÁSSY)

Subfamily LAIMYDORINAE ANDRÁSSY, 1969

Dorylaimidae. Body varying in length from 1 to 7 mm. Cuticle smooth, without longitudinal ridges*. Spear small to strong, straight; guiding ring single or double. Spermatozoa fusiform, spicula dorylaimoid. Supplements varying in number, contiguous or spaced. Tail of sexes dissimilar, in females attenuated to filiform, in males short and conoid-rounded to rounded.

Twelve genera (with 169 species):

Aporcedorus JAIRAJPURI & AHMAD, 1983
Calcaridorylaimus ANDRÁSSY, 1986
Calodorylaimus ANDRÁSSY, 1969
Chrysodorus JIMÉNEZ GUIRADO & CADENAS, 1985
Crocodorylaimus gen. n.
Fuscheila SIDDIQI, 1982
Halodorylaimus gen. n.
Idiodorylaimus ANDRÁSSY, 1969
Laimydorus SIDDIQI, 1969
Mesodorylaimus ANDRÁSSY, 1959
Miodorylaimus ANDRÁSSY, 1986
Paradorylaimus ANDRÁSSY, 1969

Key to genera of Laimydorinae

1 Cuticle distinctly annulated. .... **Idiodorylaimus** ANDRÁSSY

– Cuticle smooth (at most both body ends very finely striated) 2

2 Oral opening dorso-ventral, slit-like; aperture occupying more than half the length of spear .... **Aporcedorus** JAIRAJPURI & AHMAD

– Oral opening pore-like; aperture occupying less than half the length of spear 3

3 Spear unusually thin; body extremely slender (a = 60 to 92) .... **Chrysodorus** JIMÉNEZ GUIRADO & CADENAS

– Spear usual, not very thin; body not so slender 4

4 Mouth cavity (vestibule) with sclerotized rods .... **Fuscheila** SIDDIQI

– Mouth cavity without sclerotized rods 5

5 Amphidial aperture smaller than usual, only 1/6 – 1/8 of corresponding body width; haline forms .... **Halodorylaimus** gen. n.

– Amphidial aperture normal, 1/2 – 1/3 of corresponding body width 6

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* Except *Idiodorylaimus annulatiformis* (see page 20).

6 Male prerectum very long, originating well before the supplements 7
– Male prerectum shorter, originating within the row of supplements (or only a little before that) 10

7 Supplements arranged in two groups with some intermediate elements .... **Calodorylaimus** ANDRÁSSY
– Supplements arranged in an unbroken row 8

8 Supplements spaced; guiding ring single; body small, near 1 mm .. **Miodorylaimus** ANDRÁSSY
– Supplements contiguous; guiding ring double; body mostly longer than 2 mm 9

9 Conspicuous yellowish spots present around the basis of spear; male tail comparatively narrow, conoid-rounded, ventrally bent ....**Crocodorylaimus gen. n.**
– No yellowish spots around the basis of spear; male tail plump, more or less straight .... **Laimydorus** SIDDIQI

10 Spear as long as or longer than two head diameters; guiding ring double .... **Paradorylaimus** ANDRÁSSY
– Spear much shorter than two head diameters; guiding ring single 11

11 Spicula with small spurs near the distal tip ....**Calcaridorylaimus** ANDRÁSSY
– Spicula without spurs near the distal tip ....**Mesodorylaimus** ANDRÁSSY

Genus *Idiodorylaimus* ANDRÁSSY, 1969

Dorylaimidae, Laimydorinae. Large animals, between 2 and 6.7 mm. Cuticle smooth on its surface* but prominently annulated in its inner layer; thick (to 10 μm). Lips hardly separate, labial region continuous with neck or slightly offset. Amphids not too large, funnel-shaped. Spear straight, strong, 29 to 70 μm long, 1.5 – 2 times as long as cephalic diameter; aperature occupying 1/3 or 2/5 of its length. Guiding ring double, tall, located somewhat farther from anterior body end than one head diameter. Oesophagus expanded somewhat before the middle. Prerectum in females 4 – 10 times as long as anal body width, in males longer, beginning far before the supplements. Female genital organ amphidelphic, vulva pre-equatorial (in 40 – 49%), longitudinal, with sclerotized lips. Testes two, spermatozoa fusiform. Spicula dorylaimoid, large and slender, 47 to 150 μm long. Supplements contiguous, 19 to 37 in number. Precloacal space longer than spicula. Tail different in sexes: elongate-conoid to filiform in females (5 – 10 anal diamters), short and bluntly rounded in males. Males approximately as common as females.

Type-species: *Dorylaimus annulatus* DADAY, 1905 = *Idiodorylaimus annulatus* (DADAY, 1905) ANDRÁSSY, 1969.

Idiodorylaimus resembles *Laimydorus* SIDDIQI, 1969 (double guiding ring, very long male prerectum, contiguous supplements, large body) but differs from that in the conspicuous transverse striation of the cuticle – a unique phenomenon within the whole family.

Aquatic nematodes. As far as known, the genus predominantly occurs in the Neogaean region; two species are palaearctic.

Six species:

I. annulatiformis LOOF, 1973
Dorylaimus annulatus apud LOOF, 1964; LOOF & COOMANS, 1970

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* In one species provided with longitudinal ridges.

I. annulatus (Daday, 1905), Andrássy, 1969
    Dorylaimus annulatus Daday, 1905
    Mesodorylaimus annulatus (Daday, 1905) Goodey, 1963
I. homalopapillatus (Kreis, 1932) Andrássy, 1969
    Dorylaimus homalopapillatus Kreis, 1932
    Actinolaimoides homalopapillatus (Kreis, 1932) Andrássy, 1960
I. kreisi Loof, 1973
    Dorylaimus annulatus apud Kreis, 1932
I. novaezealandiae (Cobb, 1904) Andrássy, 1969
    Dorylaimus novaezealandiae Cobb, 1904
    Mesodorylaimus novaezealandiae (Cobb, 1904) Goodey, 1963
I. robustus Gagarin, 1985

Key to species of Idiodorylaimus

1 Cuticle with 35 – 40 longitudinal ridges. – ♀: L = 3.7 mm; a = 44; b = 4.8; c = 13; V = 42 %. ♂: L = 3.3 – 3.8 mm; a = 44 – 51; b = 4.8 – 5.4; c = 109 – 132; PO: 32 – 34. (Venezuela, Suriname) .... **annulatiformis Loof**
– Cuticle without longitudinal ridges 2

2 Large species, between 4.5 and 7 mm; spear robust, much thicker than cuticle at the same level 3
– Smaller species, to 3.3 mm; spear slenderer, about as thick as cuticle at the same level 5

3 Body length about 7 mm; supplements 29. – ♀: L = 6.7 mm; a = 36; b = 5.0; c = 20; V = 45%; c' = 5. ♂: L = 6.4 mm; a = 43; b = 4.5; c = 125; PO: 29. (United States [Washington D. C.], New Zealand) .... **novaezealandiae** (Cobb)
– Body length about 5 mm; supplements over 30 4

4 Spear 70 µm long; male tail blunt. – ♀ unknown. ♂: L = 5.1 mm; a = 30; b = 3.6; c = 90; PO: 37. (Paraguay) .... **annulatus** (Daday)
– Spear 50 µm long; male tail more conoid. – ♀: L = 4.7 – 5.1 mm; a = 26 – 28; b = 4.9 – 5.4; c = 16; V = 40 – 43%; c' = 5 – 6. ♂: L = 4.4 mm; a = 30; b = 4.3; c = 90; PO: 32. (Soviet Union: Russia) .... **robustus Gagarin**

5 Spear 29 – 31 µm long; spicula 47 – 55 µm long. – ♀: L = 2.0 – 2.7 mm; a = 24 – 33; b = 4.3 – 5.1; c = 10 – 13; V = 43 – 49%; c' = 7. ♂: L = 1.9 – 2.3 mm; a = 26 – 27; b = 4.3 – 4.5; c = 74 – 86; PO: ? (Paraguay) .... **homalopapillatus** (Kreis)
– Spear 34 – 40 µm long, spicula 65 – 70 µm long. – ♀: L = 2.8 – 3.3 mm; a = 35 – 41; b = 4.6 – – 5.2; c = 9.6 – 11.5; V = 41 – 45 %; c' = 8 – 10. ♂: L = 2.6 – 2.9 mm; a = 34 – 37; b = 4.6 – 4.7; c = 98 – 105; PO: 19 – 21. (Paraguay) .... **kreisi Loof**

Remarks

Idiodorylaimus annulatiformis. – This species differs from the other representatives of the genus in having conspicuous longitudinal ridges on the cuticle, a phenomenon that occurs in the subfamily Dorylaiminae only. Regarding this character, Loof's species ought be separated at generic level from the other *Idiodorylaimus* species, I accept, however, Loof's proposal (1973) to leave *annulatiformis* in the genus *Idiodorylaimus*. There is no doubt that *annulatiformis* is closely related with the other South American forms of the genus and all they have developed most probably in one and the same evolutionary line.

Idiodorylaimus novaezealandiae. – Loof (1973) questioned whether this species was a true *Idiodorylaimus*, since Cobb (1904) did definitely not mention any annulation of the cuticle. Thorne and Swanger (1936) described under the same name, *novaezealandiae*, a female specimen from the United States which does belong without doubt to *Idiodorylaimus* (the cuticle shows a distinct and loose inner striation). Until Cobb's species will be rediscovered in the type locality, we should consider both the nematode of Cobb and that of Thorne and Swanger to be conspecific.

Genus *Laimydorus* SIDDIQI, 1969

Dorylaimidae, Laimydorinae. Body generally over 2 mm (to 5.6 mm), slender to very slender. Cuticle smooth, moderately thick, occasionally very thick (to 9 – 10 μm). Lips slightly separate, continuous with neck or more or less offset. Amphids large, caliciform. Spear straight, varying in length from 19 to 70 μm, 1.2 – 2 times as long as cephalic diameter; aperature occupying 1/3 of its length or so. Guiding ring double, located in general about one-head diameter from anterior body end. Oesophagus enlarged in or behind its middle. Prerectum well developed, in females 4 – 12 times as long as anal body width, in males always originating before the supplements. Female gonads amphidelphic, vulva predominantly pre-equatorial (in 32 – 53%). Testes two, spermatozoa fusiform. Spicula dorylaimoid. Supplements contiguous, 20 to 47 in number. Female tail attenuated to filiform, 2 – 14 times as long as anal diameter, male tail short and rounded. Males nearly as common as females.

Type-species: *Dorylaimus prolificus* THORNE & SWANGER, 1936 = *Laimydorus prolificus* (THORNE & SWANGER, 1936) SIDDIQI, 1969.

In general appearance *Laimydorus* much resembles *Dorylaimus* DUJARDIN, 1845, the cuticle is, however, devoid of longitudinal ridges. Besides, the number of copulatory supplements is generally lower than that of *Dorylaimus* (20 – 35 versus 22 – 62). *Laimydorus* comes close also to *Mesodorylaimus* ANDRÁSSY, 1959 in some respects (especially the smaller species) but the members of *Laimydorus* are comparatively bigger (2 – 5.6 versus 0.8 – 2.3 mm), they have a longer spear (19 – 70 versus 7 – 25 μm), a double guiding ring (in every case!), a male prerectum originating farther ahead, supplements being always contiguous and female gonads lying in an alternative position with the intestine (each gonad on the other side)*. Nevertheless, *Laimydorus* is badly in need of a revision.

The species of the genus *Laimydorus* live predominantly in aquatic or semiaquatic biotopes. They are distributed almost all over the world: five continents serve as home for them: Europe (7 species), Asia (5 species), Africa (6 species), North America (8 species) and South America (2 species). The most common species is *Laimydorus pseudostagnalis*.

Twenty-three species:

L. afer (ANDRÁSSY, 1964) ANDRÁSSY, 1986
    Eudorylaimus afer ANDRÁSSY, 1964
L. agilis (DE MAN, 1880) SIDDIQI, 1969
    Dorylaimus agilis DE MAN, 1880
    Dorylaimus carteri agilis DE MAN, 1880 (MICOLETZKY, 1922)
    Mesodorylaimus agilis (DE MAN, 1880) GOODEY, 1963
L. aquatilis (SKWARRA, 1921) comb. n.
    Dorylaimus aquatilis SKWARRA, 1921
L. baldus BAQRI & JANA, 1983
L. crassoides (JÄGERSKIÖLD, 1908) SIDDIQI, 1969
    Dorylaimus crassoides JÄGERSKIÖLD, 1908
    Dorylaimus stagnalis crassoides JÄGERSKIÖLD, 1908 (MICOLETZKY, 1922)
    Mesodorylaimus crassoides (JÄGERSKIÖLD, 1908) GOODEY, 1963

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* I don't dare to say that this last character is constant.

- **L. doryuris** (Ditlevsen, 1911) Andrássy, 1986
  - *Dorylaimus doryuris* Ditlevsen, 1911
  - *Eudorylaimus doryuris* (Ditlevsen, 1911) Andrássy, 1959
- **L. elephas** nom. n.
  - *Dorylaimus callosus* apud Thorne & Swanger, 1936
- **L. finalis** Thorne, 1975
  - *Laimydorus crassus* apud Thorne, 1974
  - *Prodorylaimus finalis* (Thorne, 1975) Loof, 1985
  - *Dorylaimus stagnalis* apud Khera, 1970, partim
- **L. gazella** Andrássy, 1970
- **L. halophilus** (Daday, 1897) Andrássy, 1969
  - *Dorylaimus halophilus* Daday, 1897
  - *Tylencholaimus limnophilus* Daday, 1893, nec de Man, 1880
- **L. keilini** (Lee, 1961) Andrássy, 1986
  - *Dorylaimus keilini* Lee, 1961
  - *Mesodorylaimus keilini* (Lee, 1961) Andrássy, 1969
- **L. kherai** Baqri, 1985
  - *Eudorylaimus odhneri* apud Khera, 1970, partim
- **L. luettichaui** (Meyl, 1957) Siddiqi, 1969
  - *Chrysonema luettichaui* Meyl, 1957
- **L. multialaeus** (Khera, 1970) Baqri, 1985
  - *Dorylaimus multialaeus* Khera, 1970
- **L. pinguis** nom. n.
  - *Dorylaimus crassus* apud Thorne & Swanger, 1936
- **L. prolificus** (Thorne & Swanger, 1936) Siddiqi, 1969
  - *Dorylaimus prolificus* Thorne & Swanger, 1936
  - *Mesodorylaimus prolificus* (Thorne & Swanger, 1936) Goodey, 1963
- **L. proximus** (Thorne & Swanger, 1936) Siddiqi, 1969
  - *Dorylaimus proximus* Thorne & Swanger, 1936
  - *Mesodorylaimus proximus* (Thorne & Swanger, 1936) Goodey, 1963
- **L. pseudostagnalis** (Micoletzky, 1927) Siddiqi, 1969
  - *Dorylaimus pseudostagnalis* Micoletzky, 1927
  - *Mesodorylaimus pseudostagnalis* (Micoletzky, 1927) Goodey, 1963
  - *Dorylaimus selangorensis* de Man, 1929
  - *Mesodorylaimus selangorensis* (de Man, 1929) Goodey, 1963
  - *Dorylaimus filiformis papillatus* Imamura, 1931, nec Bastian, 1865
  - *Dorylaimus imamurai* Thorne & Swanger, 1936
  - *Mesodorylaimus imamurai* (Thorne & Swanger, 1936) Goodey, 1963
  - *Dorylaimus exilicaudatus* Altherr, 1953
- **L. reversus** Thorne, 1974
- **L. siddiqii** Baqri & Jana, 1983
- **L. stenopygus** (Andrássy, 1968) Siddiqi, 1969
  - *Dorylaimus stenopygus* Andrássy, 1968
- **L. unipapillatus** (Daday, 1905) Andrássy, 1969
  - *Dorylaimus unipapillatus* Daday, 1905
  - *Mesodorylaimus unipapillatus* (Daday, 1905) Goodey, 1963
  - *Dorylaimus merogaster* Steiner, 1916
  - *Dorylaimus stagnalis merogaster* Steiner, 1916 (Micoletzky, 1922)
  - *Mesodorylaimus merogaster* (Steiner, 1916) Goodey, 1963

L. vixamictus (Andrássy, 1962) Siddiqi, 1969
Dorylaimus vixamictus Andrássy, 1962
Prodorylaimus vixamictus (Andrássy, 1962) Loof, 1985

Key to species of Laimydorus

1 Female tail short and digitate, only 2 – 3 times as long as anal body diameter 2

– Female tail longer, conoid to attenuate, 4 – 14 times as long as anal body diameter 6

2 The posterior digitate half of female tail dorsally curved 3

– The posterior digitate half of female tail straight or ventrally curved 4

3 Body almost 4 mm; female tail shorter than two anal diameters; lips amalgamated. – ♀: L = 3.8 mm; a = 55; b = 5.4; c = 61; V = 43%; c' = 1.7. ♂ unknown. (Kenya) .... **afer** (Andrássy)

– Body about 2 mm; female tail longer than two anal diameters; lips distinct. – ♀: L = 2.1 mm; a = 42; b = 5.0; c = 28; V = 53%; c' = 2.5. ♂: L = 2.2 mm; a = 36; b = 5.2; c = 86; PO: 20. (United States: Dakota) .... **reversus** Thorne

4 Tip of female tail spicate. – ♀: L = 2.2 mm; a = 35; b = 4.3; c = 22; V = 50%; c' = 2. ♂ unknown. (Denmark) .... **doryuris** (Ditlevsen)

– Tip of female tail somewhat swollen, rounded 5

5 Body 4 mm long; cuticle very thick, at level of spear much thicker than that. – ♀: L = 4.0 mm; a = 28; b = 4.9; c = 17; V = 44%; c' = 3. ♂ unknown. (Germany) ... **aquatilis** (Skwarra)

– Body 2.5 – 3 km long; cuticle at level of spear about as thick as that. – ♀: L = 2.5 – 3.0 mm; a = 24; b = 3.6; c = 15; V = 46%; c' = 3. ♂: L = 2.0 – 2.5 mm. (Hungary) .... **halophilus** (Daday)

6 Spear 40 µm or longer 7

– Spear 30 µm or shorter 13

7 Body longer than 4 mm 8

– Body shorter than 4 mm 11

8 Orifice occupying almost half the length of spear 9

– Orifice occupying 1/4 or 1/3 of the length of spear 10

9 Cuticle 12 µm on mid-body, thicker than spear at the same level; lips continuous with neck contour. – ♀: L = 5.6 mm; a = 28; b = 5.6; c = 13.5; V = 49%; c = 6. ♂: unknown. (United States: Utah) .... **elephas** nom. n.

– Cuticle 7 µm thick on mid-body, thinner than spear at the same level; lips distinctly offset. – – ♀ unknown. ♂: L = 4.5 mm; a = 30; b = 3.8; c = 90; PO: 30. (Paraguay) .... **unipapillatus** (Daday)

10 Eggs numerous, to 72 in one female; ovoviviparous; female tail 7 anal diameters long. – ♀: L = 4.4 mm; a = 36; b = 5.9; c = 15; V = 47%; c' = 7. ♂: L = 4.0 mm; a = 37; b = 5.6; c = 100; PO: 24 – 27. (United States: Washington D. C.) .... **prolificus** (Thorne & Swanger)

– Eggs fewer; oviparous; female tail 5 anal diameters long. – ♀: L = 4.9 mm; a = 25; b = 4.7; c = 13.5; V = 46%; c' = 5. ♂ unknown. (United States: Utah) ....**pinguis** nom. n.

11 Cuticle at level of spear much thinner than the latter. – ♀: L = 2.5 – 3.8 mm; a = 40 – 60; b = 4.1 – 5.6; c = 9 – 12; V = 46 – 49%; c' = 8 – 10. ♂: L = 2.5 – 3.8; a = 45 – 52; b = 4.2 – – 4.7; c = 80 – 120; PO: 23 – 35. (Italy, Soviet Union [Russia, Uzbekistan], India, Japan, Ghana, Kenya, Jamaica) .... **pseudostagnalis** (Micoletzky)

– Cuticle at level of spear as thick as or thicker than the latter 12

12 Female tail hooked on terminus. – ♀: L = 2.8 – 3.7 mm; a = 26; b = 4.3; c = 20; V = 45%; c' = 4. ♂: L = 2.9 mm; a = 24; b = 3.6; c = 48; PO: ? (Switzerland) .... **crassoides** (Jägerskiöld)

– Female tail not hooked. – ♀: L = 3.8 – 4.1 mm; a = 33 – 42; b = 5.1 – 5.4; c = 15 – 17; V = 40 – 48%; c' = 5 – 7. ♂: L = 3.1 mm; a = 35; b = 4.4; c = 90; PO: 47. (India, United States [Nebraska]).......................... **finalis** (Thorne)

13 Body extremely slender, a = 67 – 86; female prerectum very long, 10 – 12 anal diameters. – ♀: L = 3.0 – 3.5 mm; a = 67 – 86; b = 6.5 – 8.0; c = 21 – 29; V = 32 – 40%; c' = 6 – 7, ♂: L = 2.7 – 3.2 mm; a = 68 – 82; b = 6.3 – 7.3; c = 140 – 175; PO: 20 – 22. (Tanzania) .... **luettichaui** (Meyl)

– Body not so slender (a less than 50); female prerectum 3 to 8 anal diameters 14

14 Spear distinctly thicker than cuticle at the same level 15

– Spear as thick as or thinner than cuticle at the same level 16

15 Tail longer, c = 5 – 6. – ♀: L = 2.3 – 2.5 mm; a = 32 – 35; b = 5.3 – 5.4; c = 5.4 – 5.5*; V = 42 – 43%. ♂ unknown. (Hungary) .... **vixamictus** (Andrássy);

– Tail shorter, c = 10 – 12. – ♀: L = 2.4 – 2.6 mm; a = 35 – 38; b = 5.3 – 5.9; c = 10 – 12; V = 43 – 47%; c' = 7 – 10. ♂: L = 2.0 – 2.2 mm; a = 37 – 39; b = 4.4 – 4.8; c = 96 – 109. (India) .... **multialaeus** (Khera)

16 Supplements 31 – 33, the posterior one opposite to the proximal ends of spicula. – ♀: L = 2.4 mm; a = 39; b = 5.2; c = 7.7; V = 46%; c' = 12 – 15. ♂: L = 2.5 mm; a = 37; b = 4.5; c = 90; PO: 31 – 33. (United States: Virginia) .... **proximus** (Thorne & Swanger)

– Supplements less than 30, the posterior one located before the spicula 17

17 Female tail 12 – 14 times as long as anal body diameter. – ♀: L = 2.7 – 2.8 mm; a = 40 – 49; b = 4.6 – 5.1; c = 7.8 – 8.2; V = 45 – 48%; c' = 12 – 14. ♂: L = 2.0 – 2.7 mm; a = 34 – 46; b = 4.2 – 4.7; c = 91 – 125; PO: 21 – 26. (India) .... **siddiqii** Baqri & Jana

– Female tail 6 – 10 times as long as anal body diameter 18

18 Spear 18 – 21 μm long. – ♀: L = 1.4 – 2.2 mm; a = 24 – 40; b = 4.0 – 5.2; c = 10 – 11; V = 44 – 45%; c' = 6 – 7. ♂: L = 2.0 mm; a = 41; b = 5.6; c = 83; PO: 23 – 26. (Austria, Sweden, Soviet Union [Russia, Novaja Zemlja, Lithuania, Armenia, Uzbekistan], United States [Utah], Brazil) .... **agilis** (de Man)

– Spear 24 – 29 μm long 19

19 Anal region – both dorsally and ventrally – distinctly constricted. – ♀: L = 1.9 – 2.2 mm; a = 33 – 38; b = 4.0 – 4.3; c = 11 – 12; V = 41 – 43%; c' = 7 – 9. ♂: L = 1.8 – 1.9 mm; a = 29 – 34; b = 4.0 – 4.2; c = 89 – 98; PO: 28 – 29. (Congo Republic) .... **stenopygus** (Andrássy)

– Anal region not constricted 20

20 Spear 28 – 29 μm long; supplements 28. – ♀: L = 2.4 – 2.6 mm; a = 38 – 41; b = 4.7 – 4.9; c = 14 – 15; V = 48 – 49%; c' = 6 – 7. ♂: L = 2.7 mm; a = 40; b = 5.0; c = 102; PO: 28. (South Africa) .... **gazella** Andrássy

– Spear 24 – 25 μm long; supplements 24 21

21 Lips amalgamated, practically continuous with neck. – ♀: L = 2.1 – 2.4 mm; a = 34 – 36; b = 4.8 – 5.1; c = 11 – 12; V = 43 – 48%; c' = 7 – 8. ♂: L = 1.8 mm; a = 35; b = 4.3; c = 77; PO: 24. (India) .... **baldus** Baqri & Jana

– Lips distinct, slightly offset. – ♀: L = 2.2 mm; a = 42; b = 4.0; c = 12; V = 45%; c' = 8 – 10. ♂: L = 2.1 mm; a = 39; b = 3.7; c = 98; PO: 24. (Nigeria) .... **keilini** (Lee)

Remarks

Laimydorus baldus. – This species is probably identical with *Laimydorus keilini* (Lee, 1961).

Laimydorus elephas. – *Dorylaimus callosus* apud Thorne and Swanger (1936) is hardly identical with Skwarra's species, *Dorylaimus callosus* Skwarra, 1921: it is much bigger (5.6 vs. 3.6 mm) and has no longitudinal ridges on the cuticle. I am of Loof's opinion (1985) who thought it improbable that Skwarra might have mistaken the subcuticular muscles for the longitudinal ridges of the very thick cuticle. I propose the name "*elephas*" for the American species since it is very robust and pachyderm.

Laimydorus finalis. – It is quite likely that this species is identical with *Laimydorus crassoides* (Jägerskiöld, 1908).

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* Probably also *L. kherai* (see Remarks).

Laimydorus kherai. – This species is close to *Laimydorus vixamictus* (ANDRÁSSY, 1962). Its identity cannot be stated however with certainty since the tail tip of the single female (holotype) was unfortunately broken (see BAQRI, 1985).

Laimydorus pinguis. – *Dorylaimus crassus* of THORNE and SWANGER (1936) is not conspecific with DE MAN's species, *Dorylaimus crassus* DE MAN, 1884: *1.* it has no longitudinal ridges (*crassus* does in fact have 35–40 ridges according to LOOF (1961); *2.* its cuticle is comparatively thin, about 5 µm (that of *crassus* is 14 µm thick). I propose the new name *Laimydorus pinguis* for the species of THORNE and SWANGER.

Genus *Paradorylaimus* ANDRÁSSY, 1969

Dorylaimidae, Laimydorinae. Body 2–3 mm long, slender. Cuticle relatively thin, smooth, subcuticle often finely striated. Lips more or less separate, cehalic region slightly offset. Amphids funnel-shaped, large. Spear straight, comparatively long, 26 to 46 µm, two labial diameters or longer; orifice occupying about 1/3 of spear length. Guiding ring double, one-head diameter behind anterior body end. Oesophagus widened in or posterior to its middle. Prerectum short, in females 1–3 times as long as anal body width, in males beginning far within the range of supplements. Female gonads amphidelphic, vulva preequatorial (in 36–50%). Testes two, spermatozoa fusiform. Spicula dorylaimoid. Supplements 13–18, contiguous. Tail showing sexual dimorphism: in females long, filiform (6 to 50 anal diameters), male tail short and rounded.

Type-species: *Dorylaimus parafecundus* DE CONINCK, 1935 = *Paradorylaimus parafecundus* (DE CONINCK, 1935) ANDRÁSSY, 1969.

Paradorylaimus is closely related to *Laimydorus* SIDDIQI, 1969 but differs from that in having a comparatively longer spear, a short prerectum in both sexes and less numerous supplements (13–18 versus 20–35). It resembles also *Mesodorylaimus* ANDRÁSSY, 1959 but the body and the spear are longer and the guiding ring is double.

I originally described the genus *Paradorylaimus* as having longitudinal ridges on the cuticle. In the description of *Dorylaimus parafecundus*, the type-species, DE CONINCK (1935) said: "Cuticle avec des stries longitudinales distinctes, probablement 32 en nombre". LOOF and COOMANS re-examined quite recently (1986) the type specimens of *parafecundus* and found that those "stries longitudinales" were not cuticular ridges but only striae of the subcuticular musculature. On the basis of this they transferred *parafecundus* to the genus *Laimydorus*, and concluded that *Paradorylaimus* ANDRÁSSY, 1969 is consequently identical with *Laimydorus* SIDDIQI, 1969.

Nevertheless, I think that it would be better to retain *Paradorylaimus* as a valid genus. The presence or absence of longitudinal ridges does not alter the *status quo* of it, only the definition must be somewhat modified. The ominous species, *parafecundus* as well as some relative forms do differ still in some respects from the *Laimydorus* species: they have a longer spear, a smaller number of supplements and, especially, a much shorter prerectum both in females and in males. By separating these species from the "true" representatives of the genus *Laimydorus*, this genus would remain more homogeneous and would contain species with long prerectum beginning in males always well before the row of supplements.

The species of *Paradorylaimus* inhabit aquatic biotopes and are distributed in Asia and Africa.

Four species:

P. jankowskyi (Thalolikhin, 1977) comb. n.
Mesodorylaimus jankowskyi Thalolikhin, 1977
Laimydorus jankowskyi (Thalolikhin, 1977) Andrássy, 1986
P. parafecundus (De Coninck, 1935) Andrássy, 1969
Dorylaimus parafecundus De Coninck, 1935
Laimydorus parafecundus (De Coninck, 1935) Loof & Coomans, 1986
L. tenuistriatus (Schneider, 1935) comb. n.
Dorylaimus tenuistriatus Schneider, 1935
Laimydorus tenuistriatus (Schneider, 1935) Loof & Coomans, 1986
L. wilhelmschneideri (Andrássy, 1959) Andrássy, 1969
Dorylaimus sp. apud Schneider, 1937
Dorylaimus wilhelmschneideri Andrássy, 1959

Key to species of Paradorylaimus

1 Female tail exceedingly long, about 50 anal diameters. – ♀: L = 2.8 mm; a = 50; b = 5.7; c = 2.3; V = 36%; c' = 50. ♂ unknown. (Sumatra) .... **wilhelmschneideri** (Andrássy)
– Female tail at most 20 anal diameters long 2

2 Spear 26 – 28 μm long, rather thin; female tail 6 – 7 times as long as anal body width. – ♀: L = 2.1 – 2.9 mm; a = 42 – 52; b = 4.2 – 5.3; c = 13 – 18; V = 42 – 50%; c' = 6 – 7. ♂: L = 2.0 – 2.5 mm; a = 38 – 43; b = 3.8 – 4.3; c = 63 – 69; PO: 18. (Soviet Union: Baical Lake) .... **jankowskyi** (Thalolikhin)
– Spear 33 – 46 μm long; female tail 12 – 20 times as long as anal body width 3

3 Spear shorter, 33 – 36 μm; vulva transverse. – ♀: L = 2.5 – 3.1 mm; a = 43 – 55; b = 4.9 – 5.4; c = 4.2 – 4.6; V = 42 – 45%; c' = 17 – 20. ♂: L = 2.0 – 2.6 mm; a = 36 – 47; b = 4.2 – 4.6; c = 61 – 84; PO: 13 – 18. (Ivory Coast) .... **tenuistriatus** (Schneider)
– Spear longer, 41 – 46 μm; vulva longitudinal. – ♀: L = 2.8 – 2.9 mm; a = 36 – 39; b = 4.1 – – 4.4; c = 4.6 – 5.3; V = 43 – 48%; c' = 13 – 14. ♂: L = 2.2 – 2.4 mm; a = 33 – 35; b = 3.3 – – 3.6; e = 60 – 63; PO: 16 – 17. (Zaire). .... **parafecundus** (De Coninck)

Genus *Fuscheila* Siddiqi, 1982

Dorylaimidae, Laimydorinae. Body moderately large, 1.2 to 2.5 mm. Cuticle fairly thick, practically smooth (with very fine striation only). Lips slightly separate, hardly offset. Amphids comparatively small. Atrium of mouth cavity provided with sclerotized pieces. Spear straight, thin-walled, 24 – 30 μm, one-and-a-half times as long as labial width; aperture 1/3 of its length. Guiding ring double, located one-head diameter from anterior body end. Oesophagus expanded near its middle. Prerectum short, only 1 – 1.5 anal body diameters. Female genital organ amphidelphic. Vulva small, transverse, preequatorial. Female tail attenuated, 10 – 24 times as long as anal diameter. Males not known, uteri without spermatozoa.

Type-species: *Fuscheila citrifera* Siddiqi, 1982.

Fuscheila comes close to *Laimydorus* Siddiqi, 1969 and *Paradorylaimus* Andrássy, 1969 but differs from those in having sclerotized rods at the beginning of the mouth cavity. Besides, *Fuscheila* seems to be monosexual.

Soil inhabiting nematodes. Both species have been recorded from South America.

Two species:

F. citrifera SIDDIQI, 1982
F. godmanae SIDDIQI, 1982

Key to species of Fuscheila

1 Head continuous with neck; body longer, 2–2.5 mm. – ♀: L = 2.0–2.5 mm; a = 37–42; b = 4.5–5.2; c = 3.2–4.6; V = 39–43%. ♂ unknown. (Colombia) ..... **godmanae** SIDDIQI
– Head slightly offset; body shorter, 1.2–1.9 mm. – ♀: L = 1.3–1.8 mm; a = 26–35; b = 3.5–4.1; c = 3.9–7.6; V = 44–55%. ♂ unknown. (Colombia) .... **citrifera** SIDDIQI

Genus *Crocodorylaimus* gen. n.

Dorylaimidae, Laimydorinae. Body of medium length, 1.4–3.5 mm, slender to very slender (a = 42 to 75). Cuticle relatively thin, smooth or very finely striated transversally. Lips amalgamated, head practically continuous with adjacent body. Amphids funnel-shaped. Spear straight, moderately long, 15–20 μm, 1.3–2.3 times as long as cephalic diameter; aperture occupying 1/3 of spear length. Guiding ring rather small, about one head diameter behind anterior body end. Four spindle-shaped yellowish bodies present near basis of spear. Oesophagus enlarged near middle or posterior to that. Prerectum of female 3–6 anal diameters long, that of male much longer, originating far before the supplements. Female genital organ amphidelphic. Vulva longitudinal or transverse, pre-equatorial (in 40–52%). Testes two, spermatozoa fusiform. Spicula dorylaimoid, more massive than in general. Supplements contiguous, 12 to 32 in number. Precloacal space mostly longer than spicula. Tail with sexual dimorphism: in females attenuated, 3–10 anal diameters long, in males short, more or less finger-shaped, ventrally bent (concave in its ventral contour) and rounded, on ventral surface with a subterminal blister. Females and males generally equally common.

Type-species: *Dorylaimus flavomaculatus* LINSTOW, 1876 – *Crocodorylaimus flavomaculatus* (LINSTOW, 1876) comb. n.

This genus resembles *Laimydorus* SIDDIQI, 1969 and *Mesodorylaimus* ANDRÁSSY, 1969, it can be, however, definitely separated from them. Its distinguishing characters are the slender body, the four yellowish spots around the basis of spear, the ventrally curved and narrowly rounded male tail and the presence of a blister-like structure on the latter.

Limnic or semi-aquatic nematodes, very active in movement. The genus is distributed in Europe, Asia, Africa, North and South America. The most common species is *Crocodorylaimus flavomaculatus*. (χρόχεος = yellow, saffron-coloured.)

Seven species:

C. aequatorialis sp. n.
C. dadayi (THORNE & SWANGER, 1936) comb. n.
Dorylaimus pusillus apud DADAY, 1905
Dorylaimus dadayi THORNE & SWANGER, 1936
Mesodorylaimus dadayi (THORNE & SWANGER, 1936) GOODEY, 1963
Laimydorus dadayi (THORNE & SWANGER, 1936) ANDRÁSSY, 1969

C. dimorphus sp. n.

C. fecundus (Cobb, 1914) comb. n.
Dorylaimus fecundus Cobb, 1914
Dorylaimus stagnalis fecundus Cobb, 1914 (Micoletzky, 1922)
Mesodorylaimus fecundus (Cobb, 1914) Goodey, 1963
Laimydorus fecundus (Cobb, 1914) Andrássy, 1986

C. flavomaculatus (Linstow, 1876) comb. n.
Dorylaimus flavomaculatus Linstow, 1876
Mesodorylaimus flavomaculatus (Linstow, 1876) Goodey, 1963
Laimydorus flavomaculatus (Linstow, 1876) Siddiqi, 1969
Dorylaimus incae Steiner, 1920
Dorylaimus filiformis incae Steiner, 1920 (Micoletzky, 1922)
Mesodorylaimus incae (Steiner, 1920) Goodey, 1963
Laimydorus incae (Steiner, 1920) Thorne, 1974

C. maior nom. n.
Dorylaimus flavomaculatus apud Thorne & Swanger, 1936

C. paraincae (Thorne, 1974) comb. n.
Laimydorus paraincae Thorne, 1974

Key to species of Crocodorylaimus

1 Larger species, 3 – 3.5 mm 2
– Smaller species, 1.5 – 2.3 mm 3

2 Female tail 3 – 4 anal body widths long; supplements 18 – 25. – ♀: L = 3.4 mm; a = 52; b = 6.3; c = 25; V = 43%; c' = 3 – 4. ♂: L = 3.5 mm; a = 71; b = 5.9; c = 100; PO: 18 – 25. (United States: Washington D. C.) .... **fecundus** (Cobb)
– Female tail 7 – 9 anal body widths long; supplements 21 – 32. – ♀: L = 3.0 mm; a = 56 – 75; b = 6.3 – 6.7; c = 16 – 17; V = 40 – 46%; c' = 7 – 9. ♂: L = 2.6 mm; a = 62; b = 5.6; c = 111; PO: 21 – 32. (Hungary, United States [Utah]) .... **maior** sp. n.

3 Each side of vulva with some small ventral papillae 4
– No ventral papillae near vulva 5

4 Supplements 17 – 22; subterminal blister on male tail large and flat; larger species. – ♀: L = 2.0 – 2.2 mm; a = 41 – 44; b = 4.9 – 5.1; c = 11 – 13; V = 43 – 44%; c' = 7 – 8. ♂: L = 1.9 – – 2.2 mm; a = 40 – 48; b = 4.4 – 4.7; c = 66 – 77; PO: 17 – 22. (Ecuador) .... **aequatorialis** sp. n.
– Supplements 12 – 14; subterminal blister on male tail small and convex; smaller species. – ♀: L = 1.6 – 1.7 mm; a = 42 – 47; b = 5.3 – 5.6; c = 8 – 12; V = 42 – 50%; c' = 8. ♂: L = 1.6 – – 1.8 mm; a = 43 – 46; b = 5.0 – 5.6; c = 50 – 70; PO: 12 – 14. (Soviet Union [Russia], Mauretania, Paraguay) .... **dadayi** (Thorne & Swanger)

5 Spear of both sexes different in length: in females 19 – 20 µm, 2.1 – 2.3 head diameters, in males 13 – 14 µm, 1.5 – 1.6 head diameters; supplements beginning level with anterior end of spicula. – ♀: L = 1.8 – 2.1 mm; a = 52 – 58; b = 5.0 – 5.3; c = 13 – 14; V = 44 – 45%; c' = 7 – 8. ♂: L = 1.4 mm; a = 44 – 48; b = 5.0 – 5.9; c = 57 – 66; PO: 14 – 15. (Vietnam). .... **dimorphus** sp. n.
– Spear of both sexes equal in length; supplements beginning at a distance before spicula 6

6 Vulva longitudinal; supplements slightly spaced. – ♀: L = 2.3 mm; a = 59; b = 5.8; c = 16; V = 49%; c' = 6 – 7. ♂: L = 2.4 mm; a = 59; b = 5.9; c = 75; PO: 14 – 16. (United States: South Dakota) .... **paraincae** Thorne
– Vulva transverse; supplements dense, contiguous. – ♀: L = 1.5 – 2.0 mm; a = 40 – 55; b = 4.0 – 5.5; c = 7 – 13; V = 45 – 52%; c' = 7 – 10. ♂: L = 1.4 – 1.9 mm; a = 44 – 60; b = 5 – 6; c = 70 – 80; PO: 13 – 18. (This species has been recorded from 21 countries or states but we cannot be sure that all the data refer to the true *flavomaculatus*. Occurrence with certainty: Federal Germany, Switzerland, Austria, Hungary, United States [South Dakota]) .... **flavomaculatus** (Linstow)

Remarks

Crocodorylaimus dadayi. – The *Laimydorus* spec. apud BAQRI and COOMANS (1973) is probably conspecific with *C. dadayi* (THORNE & SWANGER, 1936).

Crocodorylaimus fecundus. – Although COBB did not say anything about yellowish spots around the basis of spear, the other characters of this species correspond very well to the criteria of *Crocodorylaimus.*

Crocodorylaimus flavomaculatus. – We can take it for certain that in the literature more than one species have been mixed under the name "*flavomaculatus*". Thus, the *flavomaculatus* described by THORNE and SWANGER (1936) obviously does not belong to LINSTOW's species. The measurements given by LINSTOW are as follows: L = 2.0 mm; a = 46; c = 9; the "true" *flavomaculatus* is to be found among the shorter species of the genus. The following data certainly refer to this species: HOFMÄNNER and MENZEL (1915), MICOLETZKY (1922, 1925), THORNE (1974). Besides, the species *Dorylaimus incae* STEINER, 1920 is conspecific with LINSTOW's *flavomaculatus.*

Crocodorylaimus maior. – As mentioned above, the *Dorylaimus flavomaculatus* apud THORNE and SWANGER, 1936 is not identical with the species of LINSTOW. Its body is longer (3 versus 1.5 – 2 mm), the tail is shorter (c = 17 versus 7 – 13) and the number of supplements is higher (21 – 32 versus 13 – 18). I propose the name *Crocodorylaimus maior* nom. n. for the species of the American authors. – I have found this species in Hungary with the following data: ♀: L = 3.03 mm; a = 75; b = 6.7; c = 16; V = 46%; c' = 9; spear 17 μm long, 1.4 times as long as cephalic diameter; head 12 μm wide; cuticle 1.8 – 2 μm thick; oesophagus expanded in 58%; tail 192 μm long; rectum 2 times, prerectum 5 times as long as anal body width; yellowish bodies 18 μm long. Locality: Sirok in Hungary, Nyirjes Lake, moist soil with grass roots, August 1984.

Genus *Mesodorylaimus* ANDRÁSSY, 1959

Dorylaimidae, Laimydorinae. Body small to moderately long, 0.8 to 2.3 mm. Cuticle smooth or very finely annulated. Lips rounded or angular, head continuous with adjacent body or more or less offset. Amphids large, funnel-shaped. Spear straight, varying in length between 7 and 25 μm; orifice occupying mostly 1/3 of the spear length. Guiding ring single, thin. Oesophagus widened in its middle or posterior to that. Prerectum varying in length, in males beginning before or, mostly, within the range of supplements. Posterior end of intestine often with a long, tongue-like structure. Female genital organ amphidelphic, each gonad lying on the same side of intestine. Vulva transverse or longitudinal, with sclerotized lips. Testes two, spermatozoa fusiform or sausage-shaped. Spicula dorylaimoid, 26 to 72 μm long. Supplements 4 to 26 in number, contiguous or spaced. Tail with sexual dimorphism: in females more or less elongate, conoid or in anterior part convex-conoid, in posterior part slender, digitiform, straight or dorsally curved, varying in length between 1 to 20 anal body diameters; in males short and rounded. Females in general more common than males.

Type-species: *Dorylaimus mesonyctius* KREIS, 1930 (in sense of THORNE & SWANGER, 1936) = *Mesodorylaimus mesonyctius* (KREIS, 1930) ANDRÁSSY, 1959.

The genus resembles *Laimydorus* SIDDIQI, 1969 but its species are shorter, the spear is smaller, the guiding ring simple, and the supplements are fewer and, partly, spaced. As far as the number of species, *Mesodorylaimus* is by far the richest genus within the family Dorylaimidae, yet it is fairly homogeneous.

Although I published in a recent paper (ANDRÁSSY, 1986) a new concept of the genus *Mesodorylaimus,* I want to propose here some alterations to that, even if only little ones. The reason of these modifications is that in the present study the genus is not surveyed alone, as a taxonomic unit, but in respect to its relationship, i. e. together with the other members of the family Dorylaimidae.

The representatives of *Mesodorylaimus* predominantly live in terrestrial habitats, i.e. in the soil, but a good part of the species may occur in aquatic or semi-aquatic biotopes, too. They are distributed all over the world, including the Antarctic. They are especially common in Africa (29 species), Europe (29 species), North (27 species) and South America (26 species).

A hundred-and-three species:

M. aberrans LOOF, 1969
M. adalberti ANDRÁSSY, 1963
M. aduncus ANDRÁSSY, 1986
M. aegypticus (ANDRÁSSY, 1958) ANDRÁSSY, 1959
  Dorylaimus aegypticus ANDRÁSSY, 1958
M. aequatorialis ANDRÁSSY, 1986
M. aestuarii (TIMM, 1952) ANDRÁSSY, 1959
  Dorylaimus aestuarii TIMM, 1952
M. alpestris (THORNE, 1939) ANDRÁSSY, 1959
  Dorylaimus alpestris THORNE, 1939
  Mesodorylaimus vaalensis HEYNS & KRUGER, 1983
M. americanus ANDRÁSSY, 1986
  Mesodorylaimus recurvus THORNE, 1974, nec ANDRÁSSY, 1964
M. angustus ANDRÁSSY, 1964
M. arcuatus ANDRÁSSY, 1986
M. bainsi BASSON & HEYNS, 1974
M. bastiani (BÜTSCHLI, 1873) ANDRÁSSY, 1959
  Dorylaimus bastiani BÜTSCHLI, 1873
  Dorylaimus macrourus LINSTOW, 1876
  Dorylaimus langii COBB, 1888
  Dorylaimus javanicus ZIMMERMANN, 1898
M. bastianoides (MEYL, 1961) ANDRÁSSY, 1967
  Dorylaimus bastiani longicaudatus DADAY, 1894, nec BÜTSCHLI, 1874
  Dorylaimus bastianoides MEYL, 1961
M. biroi (DADAY, 1899) ANDRÁSSY 1959
  Dorylaimus biroi DADAY, 1899
  Dorylaimus biroi zeylandicus LOOS, 1945
M. brassicus SONI & NAMA, 1981
M. brevidens THORNE, 1974
M. brevispicatus (SCHUURMANS STEKHOVEN, 1951) ANDRÁSSY, 1986
  Dorylaimus brevispicatus SCHUURMANS STEKHOVEN, 1951
  Eudorylaimus brevispicatus (SCHUURMANS STEKHOVEN, 1951) ANDRÁSSY, 1959
M. cardiacus THORNE, 1974
M. chekiangensis (WU & HOEPPLI, 1929) ANDRÁSSY, 1986
  Dorylaimus filiformis chekiangensis WU & HOEPPLI, 1929
M. clavicaudatus (THORNE & SWANGER, 1936) ANDRÁSSY, 1959
  Dorylaimus clavicaudatus THORNE & SWANGER, 1936
M. cognatus ANDRÁSSY, 1986
M. conurus (THORNE, 1939) GOODEY, 1963
  Dorylaimus conurus THORNE, 1939
  Laimydorus conurus (THORNE, 1939) SIDDIQI, 1969
  Mesodorylaimus sabaudiensis JUGET, 1969

- **M. cryptosperma** Loof, 1969
  - *Dorylaimus agilis* apud Thorne & Swanger, 1936
  - *Laimydorus cryptosperma* (Loof, 1969) Loof, 1985
- **M. delicatus** Lordello, 1965
- **M. derni** Loof, 1969
- **M. deuberti** (Andrássy, 1958) Goodey, 1963
  - *Dorylaimus deuberti* Andrássy, 1958
- **M. dolomiticus** Vinciguerra, 1982
- **M. dreyeri** (Van der Linde, 1938) Goodey, 1963
  - *Dorylaimus dreyeri* Van der Linde, 1938
- **M. effilatus** (Schuurmans Stekhoven & Teunissen, 1938) Andrássy, 1959
  - *Dorylaimus effilatus* Schuurmans Stekhoven & Teunissen, 1938
  - *Laimydorus effilatus* (Schuurmans Stekhoven & Teunissen, 1938) Andrássy, 1969
- **M. erdelyii** Andrássy, 1965
- **M. exilis** (Cobb, 1893) Andrássy, 1959
  - *Dorylaimus exilis* Cobb, 1893
  - *Dorylaimus filiformis exilis* Cobb, 1893 (Micoletzky, 1922)
- **M. flagellatus** (Williams, 1959) Andrássy, 1960
  - *Dorylaimus flagellatus* Williams, 1959
- **M. ghanae** Andrássy, 1965
- **M. globiceps** Loof, 1964
- **M. graciosus** Andrássy, 1986
- **M. guarani** Andrássy, 1968
- **M. hofmaenneri** (Menzel in Hofmänner & Menzel, 1914) Goodey, 1963
  - *Dorylaimus hofmaenneri* Menzel in Hofmänner & Menzel, 1914
  - *Dorylaimus filiformis hofmaenneri* Menzel in Hofmänner & Menzel, 1914 (Micoletzky, 1922)
  - *Laimydorus hofmaenneri* (Menzel in Hofmänner & Menzel, 1914) Andrássy, 1969
- **M. imperator** Loof, 1975
- **M. importunus** Basson & Heyns, 1974
- **M. intermedius** Dassonville & Heyns, 1984
- **M. intervallis** (Thorne & Swanger, 1936) Andrássy, 1959
  - *Dorylaimus intervallis* Thorne & Swanger, 1936
- **M. japonicus** (Cobb in Thorne & Swanger, 1936) Andrássy, 1987
  - *Dorylaimus japonicus* Cobb in Thorne & Swanger, 1936
  - *Oxydirus japonicus* (Cobb in Thorne & Swanger, 1936) Andrássy, 1960
  - *Dorylaimus arvensis* Cobb in Thorne & Swanger, 1936
  - *Mesodorylaimus arvensis* (Cobb in Thorne & Swanger, 1936) Andrássy, 1959
  - *Mesodorylaimus musae* Geraert, 1962
- **M. johanni** Basson & Heyns, 1974
- **M. kamandeanus** Baqri & Coomans, 1973
  - *Dorylaimus filiformis* apud Schuurmans Stekhoven, 1944
- **M. kittenbergeri** sp. n.
- **M. kowyni** Basson & Heyns, 1974
- **M. lissus** Thorne, 1974

- **M. litoralis** Loof, 1969
    - *Mesodorylaimus prerectus* Thorne, 1974
- **M. lopadusae** Vinciguerra & La Fauci, 1978
- **M. lourdesae** (Lordello, 1955) Andrássy, 1959
    - *Dorylaimus lourdesae* Lordello, 1955
- **M. luci** Brzeski & Szczygiel, 1961
- **M. macrophallus** Thorne, 1974
- **M. macrospiculum** Zullini, 1987
- **M. margaritifer** Andrássy, 1986
- **M. margaritus** Basson & Heyns, 1974
- **M. meridianus** Andrássy, 1963
- **M. mesonyctius** (Kreis, 1930) Andrássy, 1959
    - *Dorylaimus mesonyctius* Kreis, 1930
    - *Dorylaimus subulatus* Cobb in Thorne & Swanger, 1936
    - *Mesodorylaimus subulatus* (Cobb in Thorne & Swanger, 1936) Andrássy, 1959
    - *Aporcelaimus subulatus* (Cobb in Thorne & Swanger, 1936) Brzeski, 1962
- **M. mexicanus** Zullini, 1973
- **M. meyli** (Andrássy, 1958) Andrássy, 1959
    - *Dorylaimus meyli* Andrássy, 1958
    - *Drepanodorylaimus meyli* (Andrássy, 1958) Andrássy, 1986
- **M. nigritulus** (Schneider, 1937) Andrássy, 1959
    - *Dorylaimus nigritulus* Schneider, 1937
- **M. nudus** (Thorne, 1939) Andrássy, 1959
    - *Dorylaimus nudus* Thorne, 1939
- **M. obscurus** Thorne, 1974
- **M. orientalis** Andrássy, 1970
- **M. paetzoldi** Altherr, 1965
- **M. parabastiani** (Paetzold, 1958) comb. n.
    - *Dorylaimus parabastiani* Paetzold, 1958
    - *Laimydorus parabastiani* (Paetzold, 1958) Siddiqi, 1969
- **M. paraguayensis** (Kreis, 1932) Andrássy, 1959
    - *Dorylaimus paraguayensis* Kreis, 1932
- **M. paralitoralis** Basson & Heyns, 1974
- **M. parasubtilis** (Meyl, 1957) Andrássy, 1959
    - *Dorylaimus parasubtilis* Meyl, 1957
- **M. parasubulatus** (Meyl, 1954) Andrássy, 1959
    - *Dorylaimus parasubulatus* Meyl, 1954
- **M. paulbuchneri** (Meyl, 1956) Andrássy, 1959
    - *Dorylaimus paulbuchneri* Meyl, 1956
- **M. pendschikenticus** (Tulaganov, 1949) Andrássy, 1959
    - *Dorylaimus pendschikenticus* Tulaganov, 1949
- **M. pizai** Lordello, 1965
- **M. plicatus** Andrássy, 1986
- **M. potus** Heyns, 1963
- **M. procerus** Andrássy, 1986
- **M. pseudobastiani** Loof, 1969
    - *Dorylaimus bastiani* apud Thorne & Swanger, 1936
- **M. pseudosubtilis** Basson & Heyns, 1974

M. puellae Andrássy, 1963
M. pulcher Andrássy, 1986
M. pusillus (Cobb, 1893) Andrássy, 1959
Dorylaimus pusillus Cobb, 1893
M. recurvus Andrássy, 1964
M. rhenanus Altherr, 1965
M. rotundolabiatus Basson & Heyns, 1974
M. sanctus Basson & Heyns, 1974
M. similibastiani Zell, 1986
M. simplex Thorne, 1974
M. spengelii (de Man, 1912) Andrássy, 1959
Dorylaimus spengelii de Man, 1912
M. subtiliformis (Andrássy, 1959) Andrássy, 1959
Dorylaimus subtiliformis Andrássy, 1959
M. subtilis (Thorne & Swanger, 1936) Andrássy, 1959
Dorylaimus subtilis Thorne & Swanger, 1936
Dorylaimus krishnaraoi Moorthy, 1938
Mesodorylaimus krishnaraoi (Moorthy, 1938) Goodey, 1963
M. subtiloides (Paetzold, 1958) Andrássy, 1959
Dorylaimus subtiloides Paetzold, 1958
M. sveltus (Meyl, 1957) Andrássy, 1959
Dorylaimus sveltus Meyl, 1957
M. sylphus (Thorne, 1939) Goodey, 1963
Dorylaimus sylphus Thorne, 1939
Laimydorus sylphus (Thorne, 1939) Siddiqi, 1969
M. szechenyii Andrássy, 1961
M. szunyoghyi Andrássy, 1968
M. tenellus (Thorne & Swanger, 1936) Andrássy, 1959
Dorylaimus tenellus Thorne & Swanger, 1936
M. thermae (Cobb in Hoeppli, 1926) Goodey, 1963
Dorylaimus thermae Cobb in Hoeppli, 1926
M. tholocercus Andrássy, 1968
M. thorneiswangerae Andrássy, 1968
Dorylaimus biroi apud Thorne & Swanger, 1936
M. transkeiensis Basson & Heyns, 1974
M. trapaefructus Andrássy, 1986
M. usitatus Basson & Heyns, 1974
M. vulneratus Andrássy, 1986
M. vulvapapillatus Bagaturia & Eliava, 1966

Key to species of Mesodorylaimus

1 Female tail 14 – 20 times as long as anal body diameter 2
– Famele tail at most 12 times as long as anal body diameter 7

2 Body 1 mm long; core in tail articulate in its basis. – ♀: L = 1.0 mm; a = 35 – 38; b = 4.4 – – 4.7; c = 3.9; V = 43 – 46%; c' = 18 – 20, ♂ unknown. (Mauritius) .. **flagellatus** (Williams)
– Body 1.4 – 1.9 mm long; core in tail not articulate 3

3 Lips angular, well offset. – ♀: L = 1.5 – 1.8 mm; a = 35 – 43; b = 4.6 – 5.5; c = 4 – 5; V = 41 – 45%; c' = 14 – 20. ♂: L = 1.0 – 1.3 mm; a = 27 – 39; b = 2.9 – 6.6; c = 57 – 83; PO: 11 – 14. (South Africa) .... **bainsi** Basson & Heyns
– Lips rounded, not offset 4

4 Female tail one-sixth of body length. – ♀: L = 1.7 mm; a = 42; b = 5.2; c = 5.9; V = 43%; c' = 14. ♂ unknown. (United States: New York) .... **dreyeri** (Van der Linde)
– Female tail one-fourth of body length or longer 5

5 Supplements 7, spaced. – ♀: L = 1.45 mm; a = 41; b = 4.9; c = 4.1; V = 44%; c' = 20. ♂: L = 1.0 – 1.1 mm; a = 32 – 35; b = 3.6 – 3.7; c = 50 – 52; PO: 7. (Ecuador) .... **graciosus** Andrássy
– Supplements 17 or more, contiguous 6

6 Body 1.5 mm; supplements 17. – ♀: L = 1.5 mm; a = 44; b = 5.1; c = 3.5; V = 44%; c' = 21. ♂: L = 1.1 mm; a = 34; b = 4.0; c = 68; PO: 17. (Ecuador) .... **pulcher** Andrássy
– Body 1.7 – 1.8 mm; supplements 24 – 28. – ♀: L = 1.7 – 1.8 mm; a = 36 – 42; b = 4.9 – 5.5; c = 4.6 – 5.6; V = 41%; c' = 14. ♂: L = 1.3 mm; a = 33; b = 4.1; c = 50; PO: 24 – 28. (United States: Virginia, Utah, South Dakota) .... **sylphus** (Thorne)

7 Tip of female tail distinctly swollen 8
– Tip of female tail not swollen 11

8 Tail 5 – 6 anal diameters long 9
– Tail 3 – 4 anal diameters long 10

9 Body 1.9 – 2.3 mm long; lips angular, offset. – ♀: L = 1.9 – 2.3 mm; a = 34 – 37; b = 4.7 – 5.1; c = 10 – 14; V = 44 – 49%; c' = 6, ♂: L = 1.9 – 2.2 mm; a = 33 – 39; b = 4.3 – 5.0; c = 63 – 87; PO: 16 – 23. (Holland, Democratic Germany, Soviet Union [Russia, Moldavia, Uzbekistan]) .... **parabastiani** (Paetzold)
– Body 1.3 – 1.4 mm long; lips rounded, not offset. – ♀: L = 1.3 – 1.4 mm; a = 36 – 39; b = 3.7 – 4.6; c = 12 – 13; V = 49 – 51; c' = 5 – 6. ♂ unknown. (Denmark, Sweden, Soviet Union [Russia, Kirghizia], Egypt, Kerguelen Islands) .... **aegypticus** (Andrássy)

10 Labial region offset; supplements 13, spaced. – ♀: L = 1.2 – 1.3 mm; a = 33 – 39; b = 4.4 – 4.8; c = 15 – 17; V = 50%; c' = 4. ♂: L = 1.0 – 1.2 mm; a = 32 – 39; b = 4.1 – 4.3; c = 47 – 51; PO: 13. (Brazil) .... **paulbuchneri** (Meyl)
– Labial region not offset; supplements 17, contiguous. – ♀:1.2 mm; a = 31; b = 4.7; c = 12.5; V = 49%; c' = 3. ♂: L = 1.2 mm; a = 35; b = 5.0; c = 59; PO: 17. (Poland, Spain) .... **clavicaudatus** (Thorne & Swanger)

11 Posterior half of female tail dorsally bent 12
– Posterior half of female tail straight or slighly bent ventrally 35

12 Tail 4 – 10 anal diameters long 13
– Tail shorter than 4 anal diameters 22

13 Posterior end of intestine with a long tongue-like structure; sclerotized vulval lips angular. – – ♀: L = 1.5 – 1.9 mm; a = 38 – 46; b = 3.9 – 4.3; c = 14 – 18; V = 52 – 55%; c' = 5 – 6. ♂ unknown. (Peru) .... **trapaefructus** Andrássy
– Posterior end of intestine without such a structure 14

14 Supplements 7 – 11, spaced 15
– Supplements 9 – 16, contiguous 17

15 Supplements 11. – ♀: L = 1.3 – 1.6 mm; a = 26 – 35; b = 4.2 – 4.8; c = 8 – 10; V = 48 – 49%; c' = 5 – 8. ♂: L = 1.3 mm; a = 27; b = 3.8; c = 83; PO: 11. (Federal Germany, Czechoslovakia, Bulgaria, Soviet Union [Russia, Tadzhikistan]) .... **meyli** (Anrássy)
– Supplements 7 – 8 16

16 Vulva pre-equatorial; female tail as long as 6 – 7 anal diameters. – ♀: L = 1.5 mm; a = 34; b = 4.8; c = 10; V = 44%; c' = 6 – 7. ♂: L = 1.3 mm; a = 36; b = 4.0; c = 51; PO: 7 – 8. (United States: South Dakota) .... **obscurus** Thorne
– Vulva post-equatorial; female tail as long as 4 – 5 anal diameters. – ♀: L = 1.5 – 1.8 mm; a = 38 – 40; b = 4.7 – 4.9; c = 14 – 18; V = 53 – 55%; c' = 4 – 5. ♂: L = 1.4 mm; a = 36 – 40; b = 4.2 – 4.8; c = 63 – 66; PO: 8. (Ghana) .... **ghanae** Andrássy

17 Spear 16 – 17 µm long, robust, almost as thick as 1/3 labial diameter. – ♀: L = 1.5 – 2.0 mm; a = 35 – 38; b = 4.5 – 5.4; c = 14 – 17; V = 44 – 46%; c' = 4 – 6. ♂: L = 1.7 mm; a = 34; b = 5.0; c = 56; PO: 15. (Tanzania) .... **szechenyii** Andrássy
– Spear 7 – 13 µm long, never so robust 18

18 Cuticle perceptibly thickened on neck region 19
– Cuticle not thickened on neck region 20

19 Head continuous with neck contour. – ♀: L = 1.1 – 1.6 mm; a = 28 – 40; b = 5.1 – 7.6; c = 8 – 16; V = 39 – 43%; c' = 10 – 11. ♂: L = 1.3 – 1.4 mm; a = 36 – 38; b = 5.2 – 7.5; c = 48 – 83; PO: 11 – 15. (South Africa) .... **sanctus** Basson & Heyns
– Head slightly offset. – ♀: L = 1.1 – 1.2 mm; a = 24 – 31; b = 4.5 – 5.4; c = 8 – 10; V = 43 – 46%; c' = 6 – 7. ♂: L = 0.9 – 1.1 mm; a = 22 – 27; b = 4.1 – 4.9; c = 36 – 55; PO: 11 – 14. (South Africa) .... **kowyni** Basson & Heyns

20 Head distinctly offset; spear 7 – 9 μm long. – ♀: L = 1.0 – 1.2 mm; a = 27 – 47; b = 3.9 – 4.9; c = 8 – 12; V = 37 – 47%; c' = 6 – 7. ♂: L = 0.9 – 1.1 mm; a = 24 – 29; b = 3.8 – 4.4; c = 51 – 61; PO: 9 – 10. (South Africa) .... **transkeiensis** Basson & Heyns
– Head not or hardly offset; spear 11 – 13 μm long 21

21 Supplements 11; female tail 110 – 153 μm (6 – 9 anal diameters) long. – ♀: L = 1.4 – 1.7 mm; a = 29 – 40; b = 5.3 – 6.5; c = 9 – 13; V = 39 – 44%; c' = 6 – 9. L = 1.4 mm; a = 29; b = 5.4; c = 62; PO: 11. (South Africa) .... **johanni** Basson & Heyns
– Supplements 13; female tail 90 – 128 μm (4 – 6 anal diameters) long. – ♀: L = 1.5 – 1.7 mm; a = 35 – 47; b = 5.5 – 6.8; c = 13 – 16; V = 43%; c' = 4 – 6. ♂: L = 1.4 – 1.6 mm; a = 36 – 44; b = 5.2 – 6.2; c = 59 – 66; PO: 13. (South Africa) .... **importunus** Basson & Heyns

22 Female tail unusually shaped: short, conoid and bluntly rounded on its tip. – ♀: L = 1.3 mm; a = 33; b = 4.3; c = 40; V = 49%; c' = 1.5. ♂: L = 1.4 – 1.5 mm; a = 36; b = 4.2 – 4.6; c = 61 – 62; PO: 10 – 19. (Hungary) .... **deuberti** (Andrássy)
– Female tail not so unusually shaped, never bluntly rounded 23

23 Female tail cupola-shaped, abruptly narrowing to a thin appendix; posterior end of intestine with a long tongue-like structure 24
– Female tail not so, at least its ventral contour continuous, not abruptly narrowing 26

24 Prerectum unusually short, shorter than rectum; intestinal "tongue" 45 – 48 μm long. – ♀: L = 1.4 – 1.5 mm; a = 22 – 25; b = 3.9 – 4.3; c = 18 – 25; V = 52 – 54%; c' = 2. ♂ unknown. (Cuba, Paraguay) .... **tholocercus** Andrássy
– Prerectum twice as long as rectum; intestinal "tongue" 10 – 20 μm long 25

25 Spear robust, 23 – 24 μm long; lips rounded and amalgamated. – ♀: L = 1.3 – 1.4 mm; a = 24 – 25; b = 3.8 – 3.9; c = 20 – 30; V = 54 – 58%; c' = 1.2 – 1.3. ♂ unknown. (Mexico) ...... **mexicanus** Zullini
– Spear slender, 15 μm long; lips angular and separate. – ♀: L = 1.2 mm; a = 31; b = 4.5; c = 25; V = 52%; c' = 2 – 2.5. ♂ unknown. (Brazil) .... **thorneiswangerae** Andrássy

26 Female tail shorter than two anal diameters, its anterior rounded part longer than the posterior tapering one 27
– Female tail two anal diameters or longer, its anterior rounded part as long as, or shorter than the posterior tapering one 31

27 Vulva longitudinal, open (sclerotized lips spaced) 28
– Vulva transverse, closed (sclerotized lips not spaced) 30

28 Body 1.8 – 2 mm, spear 22 – 24 μm long. – ♀: L = 1.8 – 2.0 mm; a = 33 – 40; b = 4.3 – 4.5; c = 38 – 48; V = 53 – 55%; c' = 1.3 – 1.4. ♂: L = 1.8 – 2.0 mm; a = 34 – 38; b = 4.2 – 4.7; c = 73 – 85; PO: 10 – 11. (Australia) .... **procerus** Andrássy
– Body 1.2 – 1.4 mm, spear 14 – 16 μm long 29

29 Female tail as long as anal body diameter, its tip strongly bent; cuticle 3 – 3.5 μm thick on mid-body. – ♀: L = 1.4 mm; a = 24 – 28; b = 4.3 – 4.5; c = 39 – 46; V = 50 – 52%; c' = 1. ♂: L = 1.2 mm; a = 29; b = 4.0; c = 5; PO: 19. (Hungary) .... **aduncus** Andrássy
– Female tail distinctly longer than anal body diameter, its tip slightly bent; cuticle 2 – 2.5 μm thick on mid-body. – ♀: L = 1.2 – 1.3 mm; a = 29 – 31; b = 4.0 – 4.6; c = 31 – 33; V = 53 – 55%; c' = 1.3 – 1.6. ♂ unknown. (Hungary). .... **recurvus** Andrássy

30 Lips angular; spear as thick as cuticle at the same level; supplements 13 – 14. – ♀: L = 1.2 mm; a = 24 – 25; b = 3.8 – 3.9; c = 28 – 31; V = 52 – 53%; c' = 1.4 – 1.8. ♂: L = 1.1 – 1.2 mm; a = 27 – 30; b = 3.6 – 3.8; c = 46 – 49; PO: 13 – 14. (Ecuador) .. **vulneratus** Andrássy
– Lips rounded; spear thinner than cuticle at the same level; supplements 17 – 18. – ♀: L = 1.2 – 1.4 mm; a = 26 – 31; b = 4.1 – 4.3; c = 29 – 39; V = 52 – 54%; c' = 1.4 – 1.5; ♂: L = 1.1 – 1.2 mm; a = 26 – 28; b = 4.1 – 4.6; c = 58 – 69; PO: 17 – 18. (Ecuador) .... **cognatus** Andrássy

31 Spear long, 20 – 25 μm 32
– Spear shorter, 9 – 15 μm 33

32 Spear twice as thick as cuticle at the same level; female tail strongly bent dorsally. – ♀: L = 1.6 – 1.7 mm; a = 32 – 34; b = 4.1 – 4.2; c = 25 – 32; V = 51 – 52%; c' = 1.9 – 2.3. ♂: L = 1.4 – 1.6 mm; a = 25 – 32; b = 3.9 – 4.1; c = 58 – 63; PO: 15 – 20. (Bolivia) .... **arcuatus** Andrássy
– Spear as thick as cuticle at the same level; female tail slightly bent dorsally. – ♀: L = 1.2 – 1.4 mm; a = 26 – 31; b = 3.7 – 4.3; c = 20 – 24; V = 49 – 50%; c' = 2 – 2.3. ♂: L = 1.5 mm; a = 33; b = 4.5; c = 62; PO: 16. (Ecuador) .... **aequatorialis** Andrássy

33 Head well offset. – ♀: L = 1.4 – 1.7 mm; a = 30 – 39; b = 4.8 – 6.1; c = 20 – 31; V = 41 – 46%. ♂: L = 1.3 – 1.7 mm; a = 31 – 39; b = 5.1 – 6.2; c = 48 – 60; PO: 12 – 16. (South Africa) .... **margaritus** Basson & Heyns
– Head not offset 34

34 Body about 2 mm long, slender. – ♀: L = 1.8 – 2.1 mm; a = 40; b = 4.8; c = 32 – 46; V = 53 %; c' = 2.5. ♂ unknown. (United States: North Dakota) .... **americanus** Andrássy
– Body 1 – 1.5 mm long, less slender. – ♀: L = 1.0 – 1.5 mm; a = 21 – 34; b = 4.1 – 5.5; c = 12 – 22; V = 47 – 52%; c' = 2 – 4. ♂: L = 1.3 – 1.5 mm; a = 30 – 35; b = 4.6 – 5.3; c = 48 – 61; PO: 12 – 15. (South Africa) .... **rotundolabiatus** Basson & Heyns

35 Vulval region – both sides of vulva – with prominent papillae or cuticular folds 36
– Vulval region without papillae or folds 44

36 Labial region offset 37
– Labial region practically continuous with neck 40

37 Female tail about 3 anal diameters long 38
– Female tail 6 – 8 anal diameters long 39

38 Female tail unusually short, 1.3 – 1.5 anal diameters; supplements 11. – ♀: L = 1.1 – 1.3 mm; a = 28 – 35; b = 3.5 – 5.5; c = 31 – 44; V = 49 – 54%; c' = 1.3 – 1.5. ♂: L = 1.5 mm; a = 40; b = 4.8; c = 80; PO: 11. (Kenya.) .... **kittenbergeri** sp. n.
– Female tail about 2.5 anal diameters long; supplements 16. – ♀: L = 1.4 mm; a = 31; b = 4.4; c = 17; V = 53%; c' = 2.7. ♂: L = 1.3 mm; a = 34; b = 3.6; c = 43; PO: 16. (Soviet Union: Georgia.) .... **vulvapapillatus** Bagaturia & Eliava

39 Oesophagus widened in 2/3 of its length; tip of female tail pointed; supplements 16 – 19. – ♀: L = 1.0 – 1.4 mm; a = 29 – 35; b = 4.4 – 5.8; c = 7.5 – 9.4; V = 42 – 46%; c' = 7 – 8. ♂: L = 1.0 – 1.4 mm; a = 28 – 33; b = 4.1 – 5.5; c = 44 – 58; PO: 16 – 19. (Venezuela.) .... **globiceps** Loof
– Oesophagus widened not so far back; tip of female tail rounded; supplements 9 – 13. – ♀: L = 1.4 – 1.6 mm; a = 25 – 40; b = 4.8 – 5.2: c = 7.7 – 10; = 48 – 50%; c' = 6 – 8. ♂: L = 1.1 – 1.5 mm; a = 23 – 37; b = 3.8 – 5.1; c = 43 – 56; PO: 9 – 13. (Italy.) .... **lopadusae** Vinciguerra & La Fauci

40 Vulva with one papilla on each side 41
– Vulval region with cuticular folds 42

41 Spicula 50 – 60 μm long, supplements 18 – 20; female tail 4 – 6 anal diameters long. – ♀: L = 1.3 – 1.8 mm; a = 33 – 38; b = 5.5 – 6.8; c = 11 – 16; V = 40 – 45%; c' = 3.9 – 5.6. ♂: L = 1.2 – 1.6 mm; a = 34 – 45; b = 5.3 – 6.2; c = 67 – 78; PO: 18 – 20. (Ethiopia.) .... **macrospiculum** Zullini
– Spicula about 40 μm long, supplements 13; female tail 9 – 10 anal diameters long. – ♀: L = 1.0 – 1.1 mm; a = 30 – 34; b = 5.3 – 5.8; c = 6.4 – 7.3; V = 44 – 45%; c' = 9 – 10. ♂: L = 0.9 mm; a = 29; b = 5.0; c = 50; PO: 13. (Vietnam.) .... **orientalis** Andrássy

42 Cuticular folds deep; spear 17 – 19 μm long. – ♀: L = 1.6 – 1.9 mm; a = 38 – 45; b = 4.2 – 4.7; c = 15 – 19; V = 49 – 53%; c' = 5.2 – 6.5. ♂: L = 1.4 – 1.5 mm; a = 35 – 37; b = 4.0 – 4.5; c = 74 – 90; PO: 7 – 10. (Ecuador.) .... **plicatus** Andrássy
– Cuticular folds not so deep, rather superficial; spear 12 – 14 μm long 43

43 Female tail 3 – 5 anal diameters long; cuticle densely wrinkled on vulval region. – ♀: L = 1.2 – 1.5 mm; a = 26 – 30; b = 3.9 – 4.8; c = 13 – 18; V = 50 – 55%; c' = 3.6 – 4.6. ♂: L = 1.1 – 1.5 mm; a = 29; b = 3.8 – 4.5; c = 55 – 68; PO: 11 – 13. (Antarctic.) ... **imperator** Loof

– Female tail 6 – 7 anal diameters long; cuticle with some innervations on vulval region. – ♀: L = 1.6 mm; a = 39; b = 6.3; c = 12; V = 50%; c' = 6 – 7. ♂: L = 1.3 mm; a = 40; b = 5.6; c = 50; PO: 11. (Egypt, United States [Nebraska].) ... **intervallis** (Thorne & Swanger)

44 Female tail of *mesonyctius*-type: first convex-conoid then suddenly narrowing both on ventral and dorsal side and passing into a thinner subdigitate part; this latter once to twice as long as the anterior rounded part ... 45

– Female tail not so: either long, more or less uniformly attenuated, or narrowing on the dorsal side only, or the posterior subdigitate part more than twice as long as the anterior rounded one ... 60

45 Lips offset by deep constriction ... 46

– Lips not or only sightly offset ... 48

46 Female tail longer (c = 12). – ♀: L = 1.2 mm; a = 22; b = 4.9; c = 12; V = 49%; c' = 4. ♂ unknown. (Soviet Union: Uzbekistan.) ... **pendschikenticus** (Tulaganov)

– Female tail shorter (c = 18 – 22) ... 47

47 Supplements 8, spaced; tip of female tail rounded. – ♀: L = 0.9 mm; a = 28; b = 4.1; c = 18; V = 52%; c' = 2.5. ♂: L = 0.9 – 1.2 mm; a = 29 – 33; b = 4.1 – 4.7; c = 50 – 61; PO: 8. (Federal Germany, Czechoslovakia, Soviet Union [Far East], Mongolia.) ... **parasubulatus** (Meyl)

– Supplements 17 – 20, contiguous; tip of female tail pointed. – ♀: L = 1.1 – 1.2 mm; a = 26 – – 34; b = 3.7 – 5.1; c = 18 – 22; V = 47 – 51%; c' = 2.4 – 3.6. ♂: L = 1.0 – 1.3 mm; a = 25 – 38; b = 4.1 – 5.2; c = 46 – 61; PO: 17 – 20. (South Africa.) ... **paralitoralis** Basson & Heyns

48 Posterior end of intestine possessing a tongue-like process; vulva longitudinal. – ♀: L = 1.5 mm; a = 32; b = 5.0; c = 16; V = 49%; c' = 3 – 4. ♂ unknown. (United States: South Dakota.) ... **simplex** Thorne

– Posterior end of intestine without such a process; vulva transverse ... 49

49 Posterior tapering part of female tail as long as, or shorter than the anterior rounded part ... 50

– Posterior tapering part of female tail distinctly longer than the anterior rounded part ... 52

50 Lips completely amalgamated; body about 1 mm long. – ♀: L = 1.1 mm; a = 21 – 26; b = 4.6 – 5.3; c = 17 – 18; V = 49%; c' = 2 – 2.5. ♂: L = 1.0 – 1.1 mm; a = 27; b = 4.9 – 5.9; c = 44 – 47; PO: 11 – 12. (Brazil.) ... **pizai** Lordello

– Lips more or less separate; body 1.5 mm long or longer ... 51

51 Female tail as long as three anal diameters; body 2 mm long. – ♀: L = 2.1 mm; a = 49; b = 5.1; c = 29; V = 52%; c' = 3. ♂ unknown. (Zaire.) ... **effilatus** (Schuurmans Stekhoven & Teunissen)

– Female tail as long as two anal diameters; body 1.5 mm long. – ♀: L = 1.5 mm; a = 33; b = 4.4; c = 27; V = 55%; c' = 2. ♂ unknown. (Federal Germany.) ... **rhenanus** Altherr

52 Tip of female tail conoid and pointed (very narrowly rounded) ... 53

– Tip of female tail cylindrical, rounded ... 54

53 Supplements 9 – 13, spaced. – ♀: L = 1.5 – 1.7 mm; a = 38 – 48; b = 4.5 – 5.0; c = 12 – 22; V = 52 – 60%; c' = 3 – 4. ♂: L = 1.5 – 1.7 mm; a = 41 – 53; b = 4.5 – 4.9; c = 65 – 80; PO: 9 – 13. (Holland, Federal and Democratic Germany, Sweden, Poland, Austria, Czechoslovakia, Hungary, Yugoslavia, Spain, France, Italy, Soviet Union [Russia, Belorussia, Ukraine, Estonia, Latvia, Lithuania, Georgia, Armenia, Uzbekistan, Tadzhikistan], Sumatra, Java, Canary Islands, Morocco, Cameroon, Annobon, Mauritius, Tanzania, Zambia, Zaire, South Africa, United States, Mexico, Australia. It is questionable whether all these data refer to the "true" *bastiani.*) **bastiani** (Bütschli)

– Supplements 18 – 24, contiguous. – ♀: L = 1.4 – 2.1 mm; a = 34 – 41; b = 4.3 – 5.3; c = 14 – 28; V = 52 – 59%; c' = 2 – 3. ♂: L = 1.4 – 1.5 mm; a = 39 – 40; b = 5.1 – 5.2; c = 62 – 68; PO: 18 – 24. (Soviet Union [Russia], United States [Utah].) ... **pseudobastiani** Loof

54 Spear 18 – 20 μm long ... 55

– Spear shorter, 10 to 16 μm long ... 56

55 Body about 2 mm long; vagina heavily swollen. – ♀: L = 1.9 mm; a = 36; b = 4.3; c = 17; V = 55%; c' = 4. ♂ unknown. (Federal Germany.) ... **paetzoldi** Altherr

– Body 1.2 – 1.7 mm; vagina not so swollen. – ♀: L = 1.2 – 1.7 mm; a = 27 – 34; b = 3.7 – 5.5; c = 7 – 25; V = 47 – 53%; c' = 4 – 5 (– 8). ♂: L = 1.3 – 1.5 mm; a = 30 – 35; b = 3.9 – 4.4; c = 52 – 58; PO: 10 – 15. (Holland, Switzerland, Yugoslavia.) .... **aberrans** Loof

56 Posterior tapering part of female tail comparatively shorter, about 1.5 times as long as the anterior rounded part* 57
– Posterior tapering part of female tail longer, about 2 times as long as the anterior rounded part 58

57 Body longer (1.5 mm) and very slender (a = 50 – 70). – ♀: L = 1.5 mm; a = 50 – 70; b = 4.5; c = 30; V = ?; c' = 3. ♂ unknown. (Soviet Union [Russia], India, Mauritius, Brazil, New Guinea.) .... **biroi** (Daday)
– Body shorter (0.8 – 1.2 mm) and much stouter (a = 23 – 33). – ♀: L = 0.8 – 1.2 mm; a = 23 – 33; b = 3.8 – 4.7; c = 15 – 20; V = 50 – 56%; c' = 3-5. ♂: L = 0.9 – 1.1 mm; a = 24 – 33; b = 3.8 – 4.9; c = 45 – 70; PO: 9 – 12. (Poland, Czechoslovakia, Hungary, Italy, Soviet Union [Russia], China, India, South Africa, Jamaica, Venezuela.). .... **mesonyctius** (Kreis)

58 Vulva longitudinal; cardia about as long as body width. – ♀: L = 1.4 mm; a = 34; b = 4.3; c = 13 – 15; V = 52%; c' = 3.5. ♂: L = 1.3 mm; a = 35; b = 4.1; c = 65; PO: 8 – 10. (United States: Montana, Nebraska, North- and South Dakota.) .... **cardiacus** Thorne
– Vulva transverse; cardia shorter 59

59 Spicula unusually massive; body 1.6 mm long. – ♀: L = 1.6 mm; a = 37; b = 4.5; c = 15 – 28; V = 54%; c' = 4. ♂: L = 1.6 mm; a = 37; b = 4.6; c = 80; PO: 7. (United States: Nebraska.) .... **macrophallus** Thorne
– Spicula normal; body 1.0 – 1.4 mm long. – ♀: L = 1.0 – 1.4 mm; a = 28 – 41; b = 3.8 – 5.0; c = 9 – 16; V = 47 – 53%; c' = 4 – 9. ♂: L = 0.9 – 1.3 mm; a = 28 – 39; b = 4.0 – 4.7; c = 45 – 47; PO: 5 – 9. (South Africa.) .... **usitatus** Basson & Heyns

60 Female tail shorter, 2 to 5 anal diameters 61
– Female tail longer, 6 to 12 anal diameters 68

61 Tail 2 – 2.5 times anal diameter 62
– Tail 3 – 5 times anal diameter 64

62 Labial region completely continuous with neck contour. – ♀: L = 1.2 – 1.6 mm; a = 30 – 36; b = 4.3 – 5.2; c = 20 – 35; V = 50 – 53%; c' = 2. ♂: L = 1.2 – 1.4 mm; a = 31 – 38; b = 4.5 – 4.8; c = 59 – 83; PO: 7 – 9. (India) .... **brassicus** Soni & Nama
– Labial region well offset 63

63 Tail ventrally curved; body about 1 mm long. – ♀: L = 1.1 mm; a = 33; b = 3.3; c = 20; V = 50%; c' = ? ♂: L = 1.1 mm; a = 40; b = 4.1; c = 71; PO: 4. (Holland.) ....
spengelii (de Man)
– Tail straight; body about 2 mm long. – ♀: L = 1.9 mm; a = 44; b = 4.5; c = 30; V = 53%; c' = 2 – 2.5. ♂ unknown. (Zaire.) .... **brevispicatus** (Schuurmans Stekhoven)

64 Body shorter, 0.8 – 1.1 mm 65
– Body longer, 1.3 – 1.7 mm 67

65 Intestine blackish coloured. – ♀: L = 0.9 mm; a = 26 – 33; b = 3.3 – 3.7; c = 12 – 14; V = 51 – 59%; c' = 3.5 – 4.5. ♂ unknown. (Sumatra.) .... **nigritulus** (Schneider)
– Intestine lightly coloured 66

66 Supplements 8, well spaced. – ♀: L = 0.8 – 1.0 mm; a = 28 – 35; b = 3.7 – 5.1; c = 6 – 8; V = 43 – 47%; c' = 5 – 6. ♂: L = 0.7 – 0.8 mm; a = 24; b = 5; c = 40 – 50; PO: 8. (Hungary, Brazil, Venezuela.) .... **parasubtilis** (Meyl)
– Supplements 11, contiguous. – ♀: L = 1.1 mm; a = 27 – 28; b = 3.9 – 4.1; c = 12 – 18; V = 55 – 59%; c' = 3 – 4. ♂: L = 1.0 – 1.1 mm; a = 27 – 28; b = 3.9 – 4.7; c = 47 – 54; PO: 11. (Argentina.) .... **adalberti** (Andrássy)

67 Tail ventrally bent; spear about 1.5 times as long as labial width. – ♀: L = 1.4 mm; a = 20; b = 5.2; c = 15; V = 41%; c' = 3.5 – 4. ♂: L = 1.8 mm; a = 26; b = 4.7; c = 63; PO: ? (China.) .... **chekiangensis** (Wu & Hoeppli)

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* The quite recently described species, *Mesodorylaimus similibastiani* Zell, 1986, probably belongs to this group.

– Tail straight; spear about as long as labial width. – ♀: L = 1.3 – 1.6 mm; a = 30 – 43; b = 4.8 – 6.1; c = 13 – 21; V = 49 – 50%; c' = 3 – 5. ♂: L = 1.4 – 1.6 mm; a = 30 – 37; b = 5.0 – 5.6; c = 56 – 75; PO: 15 – 18. (Holland, Spain, United States [South Dakota].) .... **litoralis** Loof

68 Marine species. – ♀: L = 1.7 mm; a = 31; b = 5; c = 16; V = 45%. ♂ unknown. (United States: Maryland.) .... **aestuarii** (Timm)
– Continental species 69

69 Larger species, 1.8 – 2.3 mm, body generally very slender 70
– Smaller species, less than 1.8 mm, body not so slender 74

70 Dorsal side of body, opposite to the vulva, perceptibly impressed; male tail constricted in the middle. – ♀: L = 2.0 – 2.2 mm; a = 47 – 57; b = 4.6 – 5.1; c = 11 – 15; V = 47 – 52%; c' = 7 – 10. ♂: L = 1.7 – 2.5 mm; a = 46 – 58; b = 3.9 – 5.1; c = 66 – 93; PO: 8 – 10. (Kenya.) ... **angustus** Andrássy
– Dorsal side of body not impressed; male tail not constricted in the middle 71

71 Head offset by constriction 72
– Head not offset 73

72 Supplements 21 – 26. – ♀: L = 1.9 – 2.3 mm; a = 25 – 40; b = 4.0 – 5.2; c = 10 – 12; V = 45 – 48%; c' = 6 – 7. ♂: L = 1.8 – 2.1 mm; a = 32 – 41; b = 4.0 – 5.6; c = 64 – 84; PO: 21 – 26. (United States: Utah.) .... **cryptosperma** Loof
– Supplements 16. – ♀: L = 1.8 mm; a = 41; b = 3.7; c = 12; V = 55%; c' = 6. ♂: L = 1.6 – 2.0 mm; a = 37; b = 5; c = 66; PO: 16. (Fiji, Ivory Coast, Suriname.) ...... **exilis** (Cobb)

73 Supplements 6; male tail conoid, with narrowly rounded tip. – ♀: L = 1.8 – 2.0 mm; a = 32 – 34; b = 4.8 – 5.8; c = 4.6 – 5.9; V = 39 – 41%; c' = 7 – 12. ♂: L = 1.3 mm; a = 31; b = 5.1; c = 62; PO: 6. (Poland.) .... **luci** Brzeski & Szczygiel
– Supplements 12 – 14; male tail not conoid, with blunt tip. – ♀: L = 1.8 mm; a = 45; b = 4.5; c = 6.7; V = 44%; c' = 10 – 11. ♂: L = 1.6 mm; a = 47; b = 4.5; c = 67; PO: 12 – 14. (Italy, United States [Virginia].). .... **nudus** (Thorne)

74 Body 1 mm or smaller 75
– Body over 1 mm 83

75 Labial region offset by deep constriction 76
– Labial region offset by slight depression or continuous with neck 77

76 Orifice occupying 1/2 of spear length. – ♀: L = 1.0 mm; a = 33 – 34; b = 4.9; c = 5.0 – 5.4; V = 43 – 47%; c' = 10. ♂ unknown. (Brazil.) .... **delicatus** Lordello
– Orifice occupying 1/3 of spear length. – ♀ (juv.): a = 30 – 33; b = 3.8 – 4.0; c = 5.8 – 6.6; c' = 8 – 10. ♂: L = 0.9 mm; a = 30 – 32; b = 4.0 – 4.1; c = 40 – 43; PO: 10 – 12. (Tanzania.) **szunyoghyi** Andrássy

77 Spear almost twice as long as labial width. – ♀: L = 0.9 mm; a = 33; b = 4.3; c = 5.6; V = 44%; c' = 10 – 11. ♂ unknown. (Soviet Union [Georgia], Jamaica, Australia.) .... **pusillus** (Cobb in Thorne & Swanger)
– Spear as long as labial width or only slightly longer 78

78 Supplements 5 – 8, spaced 79
– Supplements 15 – 17, contiguous 81

79 Supplements 7 – 8 (mostly 8). – ♀: L = 1.0 – 1.1 mm; a = 31 – 36; b = 4.1 – 4.8; c = 7.6 – 9.5; V = 47 – 51%; c' = 7. ♂: L = 0.8 – 1.0 mm; a = 29 – 34; b = 3.7 – 4.7; c = 43 – 59; PO: 7 – 8. (Democratic Germany.) .... **subtiloides** (Paetzold)
– Supplements 5 or 6 80

80 Supplements 5; spicula 26 – 28 μm long. – ♀: L = 0.9 mm; a = 27 – 32; b = 4.1 – 4.3; c = 6 – 7; V = 46 – 49%; c' = 9 – 11. ♂: L = 0.8 mm; a = 30; b = 3.7; c = 48; PO: 5. (Paraguay.) **guarani** Andrássy
– Supplements 6; spicula 35 μm long. – ♀: L = 0.8 mm; a = 28; b = 4.1; c = 6.7; V = 46%; c' = 7 – 8. (Soviet Union [Far East], Japan, Angola, Zaire, South Africa, United States [Virginia].) .... **japonicus** (Cobb in Thorne & Swanger)

81 Spear massive, nearly as wide as 1/3 labial diameter. – ♀: L = 1.0 – 1.1 mm; a = 30 – 32; b = 4.8 – 5.6; c = 8.9 – 9.3; V = 46 – 47%; c' = 7. ♂: L = 1.0 mm; a = 29; b = 4.8; c = 43; PO: 17. (Ghana.) .... **erdelyii** Andrássy
– Spear thin, as wide as 1/6 – 1/8 labial diameter 82

82 Female tail 11 – 12 times anal diameter (c = 4 – 5). – ♂: L = 1.1 mm; a = 27; b = 5.4; c = 4.6; V = 39%; c' = 11 – 12. ♂: L = 0.9 mm; a = 22; b = 4.5; c = 41; PO: 16. (Argentina.) **puellae** Andrássy
– Female tail 6 times anal diameter (c = 9 – 11). – ♀: L = 0.8 – 1.0 mm; a = 26 – 32; b = 4.3 – 5.5; c = 8.8 – 10.6; V = 39 – 58%; c' = 6. ♂: L = 0.7 – 0.9 mm; a = 26 – 29; b = 4.3 – 5.2; c = 43 – 53; PO: 15 – 16. (Paraguay, Brazil.) .... **paraguayensis** (Kreis)

83 Spear 25 μm long. – ♀: L = 1.4 – 1.5 mm; a = 25 – 30; b = 3.8 – 4.3; c = 5.4 – 5.6; V = 46 – – 48; c' = 10. ♂ unknown. (Brazil.) .... **lourdesae** (Lordello)
– Spear length between 9 and 20 μm 84

84 Cuticle over entire length of body finely annulated; female tail ventrally arcuate. – ♀: L = 1.5 mm; a = 41 – 44; b = 4.5; c = 6.0; V = 40 – 41%; c' = 11 – 12. ♂ unknown. (Hungary.) **margaritifer** Andrássy
– Cuticle at most on both ends of body annulated; female tail predominantly straight 85

85 Supplements spaced, 6 to 15 in number 86
– Supplements contiguous, 11 to 21 in number 91

86 Supplements 6 – 9. – ♀: L = 1.4 – 1.5 mm; a = 37 – 38; b = 4.9 – 5.0; c = 8.3 – 8.5; V = 44 – 50%; c' = 8. ♂: L = 1.3 mm; a = 32 – 36; b = 4.6 – 4.7; c = 62 – 67; PO: 6 – 9. (Holland, Federal and Democratic Germany, Yugoslavia, Israel, India, United States [Utah, South Dakota], Brazil.) .... **subtilis** (Thorne & Swanger)
– Supplements 10 – 15 87

87 Posterior part of intestine with a long tongue-like process. – ♀: L = 1.5 – 1.6 mm; a = 28 – 36; b = 4.8 – 5.4; c = 5.2 – 5.7; V = 43 – 44%; c' = 9 – 10. ♂: L = 1.0 – 1.3 mm; a = 22 – 35; b = 3.1 – 4.2; c = 38 – 48; PO: 10 – 13. (Italy.) .... **dolomiticus** Vinciguerra
– Posterior part of intestine without such a process. 88

88 Supplements 10 89
– Supplements 13 – 15 90

89 Spear conspicuously thicker than cuticle at the same level; male tail narrowly rounded. – ♀: L = 1.3 mm; a = 33; b = 4.6; c = 11; V = 52%; c' = 5.8 – 7.5. ♂: L = 1.2 mm; a = 32; b = 3.8; c = 63; PO: 10. (Czechoslovakia, Rumania.) .... **subtiliformis** (Andrássy)
– Spear as thick as cuticle at the same level; male tail broadly rounded. – ♀: L = 0.9 – 1.5 mm; a = 24 – 37; b = 4.4 – 5.0; c = 5 – 7; V = 46 – 50%; c' = 7 – 12. ♂: L = 1.0 mm; a = 30; b = 4.0; c = 65; PO: 10. (South Africa.) .... **pseudosubtilis** Basson & Heyns

90 Body very slender (a = 50 – 55); spear 20 – 21 μm long. – ♀: L = 1.5 mm; a = 50 – 55; b = 4.5 – 4.8; c = 9 – 12; V = 50 – 60%; c' = 8 – 9. ♂: L = 1.3 – 1.5 mm; a = 50 – 60; b = 4.0 – – 4.5; c = 65 – 75; PO: 13 – 15. (Brazil.) .... **sveltus** (Meyl)
– Body not so slender (a = 36 – 45); spear 11 – 13 μm long. – ♀: L = 1.0 – 1.6 mm; a = 36 – 45; b = 4.7 – 6.3; c = 9 – 14; V = 42 – 49%; c' = 6.5 – 7.8. ♂: L = 1.3 mm; a = 40; b = 5.3; c = 78; PO: 14. (South Africa.) .... **intermedius** (Dassonville & Heyns)

91 Lips well offset 92
– Lips not or hardly offset 94

92 Spear massive, twice as thick as cuticle at the same level; supplements 14 – 16. – ♀: L = 1.3 – – 1.6 mm; a = 27 – 42; b = 5.0 – 6.2; c = 6 – 8; V = 40 – 47%; c' = 9 – 12. ♂: L = 1.1 – 1.4 mm; a = 24 – 38; b = 4.8 – 5.2; c = 49 – 66; PO: 14 – 16. (Soviet Union [Russia], South Africa.) .... **potus** Heyns
– Spear slender, about as thick as cuticle at the same level; supplements 18 – 21 93

93 Spear twice as long as labial width. – ♀: L = 1.6 mm; a = 32; b = 5.9; c = 6.0; V = 42%; c' = 10 – 11. ♂: L = 1.6 mm; a = 34; b = 4.1; c = 45; PO: 20. (United States: South Dakota.) .... **lissus** Thorne
– Spear only slightly longer than labial width. – ♀: L = 1.4 – 1.8 mm; a = 24 – 31; b = 4.5 – 5.0; c = 9.4 – 13; V = 47%. ♂: L = 1.3 – 1.7 mm; a = 26 – 37; b = 4 – 5; c = 50 – 65; PO: 18 – 21 (Federal Germany, Hungary.) .... **bastianoides** (Meyl)

94 Spear 18 – 20 µm, nearly twofold labial diameter. – ♀: L = 1.6 mm; a = 35; b = 4.3; c = 9.0; V = 48%; c' = 9. ♂: L = 1.6 mm; a = 32; b = 4.3; c = 125; PO: 21. (Switzerland, Tanganyika Lake, United States [Washington D. C.].) .... **conurus** (Thorne)
– Spear 9 to 15 µm, as long as, or slightly longer than labial diameter 95

95 Vulva equatorial or a little post-equatorial in position 96
– Vulva pre-equatorial in position. (Closely allied species, difficult to separate) 97

96 Female tail shorter, 5 – 6 anal diameters; spear as long as labial width. – ♀: L = 1.3 mm; a = 30; b = 4.1; c = 11; V = 51%; c' = 6. ♂: L = 1.3 mm; a = 36; b = 4.0; c = 62; PO: 14 – 17. (South Africa, United States [Utah].) .... **alpestris** (Thorne)
– Female tail longer, 9 – 10 anal diameters; spear distinctly longer than labial width. – ♀: L = 1.5 mm; a = 41; b = 4.7; c = 8.3; V = 51%; c' = 9 – 10. ♂: L = 1.2 mm; a = 37; b = 4.5; c = 59; PO: 15 – 16. (Spain, United States [Virginia].) ..... **tenellus** (Thorne & Swanger)

97 Spear 9 – 10 µm, hardly as long as cephalic diameter 98
– Spear 11 – 15 µm, longer than cephalic diameter 100

98 Female tail uniformly conoid over its entire length. – ♀: L = 1.1 – 1.6 mm; a = 33 – 37; b = 5.3 – 6.0; c = 10 – 12; V = 43 – 45%; c' = 5 – 8. ♂: L = 1.1 – 1.6 mm; a = 36; b = 1.1 – 1.6 mm; a = 36; b = 4.8; c = 90; PO: 18 – 20. (United States: Wyoming, Utah.) ....
thermae (Cobb in Hoeppli)
– Female tail first convex-conoid then subcylindrical 99

99 Tip of female tail sharply pointed; body 1.5 – 1.7 mm long. – ♀: L = 1.5 – 1.7 mm; a = 32 – 35; b = 6.1 – 6.8; c = 9 – 10; V = 43 – 44%; c' = 7.5 – 8. ♂: L = 1.2 – 1.5 mm; a = 31 – 33; b = 5.1 – 6.1; c = 67 – 76; PO: 15 – 20. (Mexico, Argentina.) ....
meridianus Andrássy
– Tip of female tail finely rounded; body 1.3 mm long. – ♀: L = 1.3 mm; a = 35; b = 6; c = 9.5; V = 45%; c' = 7. ♂: L = 1.2 mm; a = 38; b = 5.2; c = 55; PO: 16. (United States: South Dakota.) .... **brevidens** Thorne

100 Lips separate, head slightly offset. – ♀: L = 1.4 – 1.8 mm; a = 34 – 41; b = 4.5 – 5.2; c = 7.5 – 8.6; V = 46 – 49%; c' = 8 – 10. ♂: L = 1.0 – 1.4 mm; a = 29 – 42; b = 3.7 – 4.6; c = 45 – 65; PO: 11 – 20. (Holland, Federal Germany, Soviet Union [Russia], India.) ....
derni Loof
– Lips completely amalgamated, head continuous with neck 101

101 Supplements 12 – 16. – ♀: L = 1.2 – 1.6 mm; a = 30 – 39; b = 4.0 – 5.5; c = 5 – 10; V = 43%; c' = 12. ♂: L = 1.4 mm; a = 30 – 35; b = 4.0; c = 45 – 57; PO: 12 – 16. (Federal Germany, Switzerland, Austria, Hungary, Yugoslavia, Spain, Soviet Union [Latvia], Sumatra, Java, United States [California, Virginia].) ....
hofmaenneri (Menzel in Hoffmänner & Menzel)
– Supplements 18 – 21. – ♀: L = 1.0 – 1.3 mm; a = 32 – 37; b = 4.4 – 5.1; c = 9 – 11; V = 43 – 48%; c' = 6 – 7. ♂: L = 1.1 – 1.2 mm; a = 32 – 41; b = 4.2 – 5.1; c = 53 – 70; PO: 18 – 21. (Zaire.) .... **kamandeanus** Baqri & Coomans

Genus *Miodorylaimus* Andrássy, 1986

Dorylaimidae, Laimydorinae. Body small and slender, 0.9 – 1.2 mm. Cuticle very thin and smooth. Labial region not or hardly offset, lips angular. Amphids large, caliciform. Spear straight, rather short, 11 – 12 µm; aperture occupying one-third of spear length. Guiding ring single, thin. Oesophagus enlarged posterior to its middle. Prerectum long, especially in males. Posterior end of intestine with a long tongue-like process. Female genital organ amphidelphic. Vulva transverse, in 43 – 52% of body length, vulval lips not sclerotized. Spicula dorylaimoid, weakly sclerotized. Testes two. Spermatozoa elongate. Supplements far spaced, very few in number (4). Tail of females long and filiform, 7 to 15 anal body diameters, that of males short and rounded, ventrally bent.

Type-species: *Miodorylaimus decens* ANDRÁSSY, 1986.

This genus comes close to *Mesodorylaimus* ANDRÁSSY, 1959 but the cuticle is very thin, the vulval lips not sclerotized, the male prerectum very long, the spicula are short and the supplements restricted.

Both species of *Miodorylaimus* inhabit terrestrial biotopes and occur in South America.

Two species:

M. decens ANDRÁSSY, 1986
M. iucundus ANDRÁSSY, 1986

Key to species of Miodorylaimus

1 Body very slender (a = 50); female tail 7 – 8 anal diameters long. – ♀: L = 1.2 mm; a = 50; b = 4.5; c = 10; V = 52%; c' = 7.5. ♂: L = 1.1 mm; a = 46 – 49; b = 4.2 – 5.0; c = 44 – 50; PO: 4. (Peru.) .... **decens** ANDRÁSSY

– Body less slender (a = 33); female tail 15 anal diameters long. – ♀: L = 0.9 mm; a = 33; b = 4.5; c = 4; V = 43%; c' = 15. ♂ unknown. (Peru.) .... **iucundus** ANDRÁSSY

Genus *Calcaridorylaimus* ANDRÁSSY, 1986

Dorylaimidae, Laimydorinae. Body of medium length, 1.2 to 1.7 mm, slender. Cuticle thin and smooth. Lips rounded or somewhat angular, not or slightly offset. Amphids caliciform. Spear short and straight, 11 – 20 µm, with aperture occupying 1/3 of its length. Guiding ring thin and simple. Oesophagus expanded posterior to its middle. Prerectum comparatively short, in males beginning within the range of supplements. An intestinal tongue maybe present. Female gonads amphidelphic, vulva transverse or longitudinal, with strongly sclerotized inner lips. Testes two. Spermatozoa fusiform. Spicula somewhat differing from the usual dorylaimoid type: elongate, about twice as long as tail, with a small but distinct spur before the distal tip. Supplements 7 – 13, spaced. Tails different in sexes: in females elongate, 3 to 11 anal diameters, in males shorter than anal diameter and rounded. Posterior end of male body generally twisted. Males in general as common as females.

Type-species: *Calcaridorylaimus calcarifer* ANDRÁSSY, 1986.

This genus comes closest to *Mesodorylaimus* ANDRÁSSY, 1959, the differences between them are to be found in the males: the posterior end of body is strongly twisted, the spicula are larger and other-shaped, showing a spur each near the tip, and the supplements are very small. In fixed specimens the spicula are in almost every case thrusted out.

The species of the genus *Calcaridorylaimus* are limited to the southern hemisphere: two species occur in Africa and one each in South America, Australia and the Antarctic.

Five species:

C. calcarifer ANDRÁSSY, 1986
C. promissus ANDRÁSSY, 1986

C. ruwenzorii (De Coninck, 1935) Andrássy, 1986
Dorylaimus ruwenzorii De Coninck, 1935
Mesodorylaimus ruwenzorii (De Coninck, 1935) Andrássy, 1959
C. signatus (Loof, 1975) Andrássy, 1986
Mesodorylaimus signatus Loof, 1975
C. simillimus Andrássy, 1986

Key to species of Calcaridorylaimus

1 Spear 16 – 20 μm, body 1.3 – 1.7 mm long 2
– Spear 11 – 14 μm, body 1.2 – 1.4 mm long 3

2 Supplements 12; female tail 3 – 4 anal diameters long. – ♀: L = 1.3 – 1.7 mm; a = 25 – 33; b = 3.9 – 4.6; c = 12 – 18; V = 49 – 56%; c' = 2.9 – 4.2. ♂: L = 1.7 mm; a = 29; b = 4; c = 61; PO: 12. (Antarctic.) .... **signatus** (Loof)
– Supplements 7 – 8; female tail 7 anal diameters long. – ♀: L = 1.6 mm; a = 32; b = 4.3; c = 10; V = 47%; c' = 7. ♂: L = 1.3 – 1.5 mm; a = 35 – 40; b = 3.5 – 4.3; c = 44 – 74; PO: 7 – 8. (Zaire.) .... **ruwenzorii** (De Coninck)

3 Vulva longitudinal; supplements 8 – 9. – ♀: L = 1.2 – 1.3 mm; a = 30 – 32; b = 4.2 – 4.4; c = 8 – 10; V = 49 – 52%; c' = 6 – 8. ♂: L = 0.9 – 1.1 mm; a = 26 – 28; b = 3.3 – 3.4; c = 45 – 46; PO: 8 – 9. (Congo Republic.) .... **calcarifer** Andrássy
– Vulva transverse; supplements 10 – 13 4

4 Posteriormost supplement(s) located level with spicula; spear 11 μm long. – ♀: L = 1.3 mm; a = 43; b = 4.4; c = 7.4; V = 50%; c' = 11. ♂: L = 1.1 mm; a = 33; b = 3.8; c = 0.7; PO: 11. (Bolivia.) .... **simillimus** Andrássy
– Posteriormost supplement located before the spicula; spear 11 μm long. – ♀: L = 1.3 – 1.4 mm; a = 36 – 38; b = 4.3 – 4.5; c = 7.7 – 8.4; V = 45 – 47%; c' = 8.4 – 9. ♂: L = 1.0 – 1.1 mm; a = 28 – 30; b = 3.5 – 3.8; c = 47 – 57; PO: 10 – 13. (Australia.) .....**promissus** Andrássy

Genus *Calodorylaimus* Andrássy, 1969

Dorylaimidae, Laimydorinae. Body large, between 1.5 and 5.4 mm. Cuticle smooth, moderately thick. Labial region continuous with neck or offset, lips rounded or angular. Amphids caliciform. Spear and guiding ring located farther back in mouth cavithy than usual in the family. Spear relatively long and slender, between 19 and 53 μm; aperture occupying 1/3 or more its length. Guiding ring thin, located one-and-a-half or two head diameters from anterior body end. Oesophagus widened in or behind its middle. Female gonads amphidelphic, well developed. Vulva transverse or longitudinal, mostly pre-equatorial (in 36 – 51%). Testes two, spermatozoa fusiform. Spicula long and slim, generally twice as long as tail. Supplements 16 to 31, arranged in three groups: two contiguous rows and between them 1 – 8 separate elements. Tails of both sexes different, in females long and filiform, 5 to 27 anal diameters, in males short and rounded. Males known in every species.

Type-species: *Calodorylaimus octo* Andrássy, 1969.

The genus differs from *Mesodorylaimus* and related forms by the position of spear and guiding ring, the long spicula, the male prerectum beginning far before the supplements, and the characteristic arrangement of the supplements.

The representatives of *Calodorylaimus* live in limnic habitats; three species have been described from paddy fields. They are distributed in Asia (6 species) and Africa (3 species).

Nine species:

C. andrassyi Baqri & Jana, 1983
C. chassanicus (Alekseev & Naumova, 1977) comb. n.
  Dorylaimus chassanicus Alekseev & Naumova, 1977
C. densus sp. n.
C. gravidus Andrássy, 1986
C. indicus Ahmad & Jairajpuri, 1982
  Calodorylaimus simplex Baqri & Jana, 1983
C. insignis (Gagarin, 1981) comb. n.
  Drepanodorylaimus insignis Gagarin, 1981
  Laimydorus insignis (Gagarin, 1981) Loof, 1985
C. mongolicus nom. n.
  Dorylaimus montanus apud Thalolikhin, 1985
C. octo Andrássy, 1969
C. parhomalopapillatus (Schuurmans Stekhoven, 1944) comb. n.
  Dorylaimus parhomalopapillatus Schuurmans Stekhoven, 1944
  Laimydorus parhomalopapillatus (Schuurmans Stekhoven, 1944) Baqri & Coomans, 1973

Key to species of Calodorylaimus

1 Body small, 1.5 – 1.8 mm; spear 19 – 22 µm long 2
– Body longer, 2.1 – 5.4 mm; spear 23 – 53 µm long 3

2 Body strongly tapering to its anterior end; female gonads unusually long (anterior branch reaching to the oesophagus); female tail as long as 9 – 10 anal diameters. – ♀: L = 1.6 mm; a = 27 – 29; b = 5.0 – 5.3; c = 9 – 11; V = 44 – 47%; c' = 9 – 10. ♂: L = 1.3 mm; a = 28; b = 4.8; c = 80; PO: 18 (9 + 2 + 7). (Ethiopia.) .... **gravidus** Andrássy
– Body hardly tapering to its anterior end; female gonads much shorter; female tail as long as 5 – 6 anal diameters. – ♀: L = 1.5 – 1.8 mm; a = 30 – 32; b = 4.5 – 5.0; c = 13 – 16; V = 44 – 47%; c' = 5 – 6. ♂: L = 1.4 – 1.5 mm; a = 29 – 38; b = 39 – 4.1; c = 78 – 91; PO: 21 – 22 (9 + 3 – 4 + 9). (Soviet Union: Tadzhikistan.) .... **insignis** (Gagarin)

3 Supplements 31, also the middle ones hardly separate. – ♀: L = 2.8 – 3.0 mm; a = 44 – 49 mm; b = 4.7 – 5.4; c = 12 – 14; V = 45 – 51%; c' = 6.5 – 8. ♂: L = 2.2 mm; a = 35; b = 3.9; c = 116; PO: 31. (India.) .... **densus** sp. n.
– Supplements 16 – 29, the middle ones well separate 4

4 Body very large, 5.4 (♀) mm. – ♀: L = 5.4 mm; a = 50; b = 4.7; c = 13; V = 40%; c' = 5. ♂: L = 3.6 – 4.5 mm; a = 41 – 48; b = 3.8 – 4.5; c = 83 – 120; PO: 25 – 29. (Zaire.) .... **parhomalopapillatus** (Schuurmans Stekhoven)
– Body smaller, to 3.9 mm 5

5 Lip region practically continuous with neck 6
– Lip region distinctly offset by a constriction 7

6 Spear 23 – 27 µm long; spicula shorter than 50 µm. – ♀: L = 2.1 – 2.7 mm; a = 35 – 51; b = 4.3 – 5.4; c = 5 – 7; V = 43 – 47%; c' = 14 – 20. ♂: L = 1.7 – 2.0 mm; a = 29 – 49; b = 3.9 – 4.6; c = 98 – 118; PO: 20 – 22 (9 – 10 + 1 – 2 + 9 – 10). (India.) .... **indicus** Ahmad & Jairajpuri
– Spear 39 – 42 µm long; spicula longer than 70 µm. – ♀ unknown. ♂: L = 2.1 – 2.9 mm; a = 26 – 50; b = 3.9 – 4.1; c = 74 – 76; PO: 24 – 25 (12 + 2 – 3 + 10). (Soviet Union: Far East.) .... **chassanicus** (Alekseev & Naumova)

7 Female tail short, 5 – 6 anal diameters. – ♀: L = 3.6 – 3.9 mm; a = 37 – 49; b = 5.0 – 5.7; c = 16 – 19; V = 42 – 43%; c' = 5 – 6. ♂: L = 3.3 – 3.6 mm; a = 31 – 36; b = 4.4 – 5.1; c = 70 – 110; PO: 23 – 27 (with 7 – 8 intermediate supplements). (Mongolia.) .. **mongolicus** nom. n.
– Female tail long, 12 – 27 anal diameters 8

8 Vulva in 36 – 37% of body length; female tail 20 – 27 times as long as anal body width. – ♀ L = 3.0 – 3.6 mm; a = 40 – 45; b = 6.0 – 6.6; c = 5.0 – 5.5; V = 36 – 37%; c' = 20 – 27: ♂: L = 2.2 – 2.6 mm; a = 30 – 36; b = 5.0 – 5.6; c = 100 – 130; PO: 17 – 20 (9 – 10 + 2 + 1 – 9). (Ivory Coast.) .... **octo** Andrássy

– Vulva in 44 – 45% of body length; female tail 12 – 15 times as long as anal body width. – ♀: L = 2.9 – 3.5 mm; a = 60 – 64; b = 5.6 – 6.1; c = 8 – 11; V = 44 – 45%; c' = 12 – 15. ♂: L = 2.6 – 3.1 mm; a = 58 – 61; b = 4.8 – 5.6; c = 131 – 260; PO: 16 – 18. (India.) .... **andrassyi** Baqri & Jana

Genus *Halodorylaimus* gen. n.

Dorylaimidae, Laimydorinae. Body 1.6 – 2 mm long, moderately slender. Cuticle smooth. Lips slightly separate, somewhat offset. Amphids funnel- or barrel-shaped with unusually narrow aperature measuring only 1/6 – 1/8 of corresponding width of body. Spear straight, 16 – 20 μm, 1.1 – 1.5 times as long as cephalic diameter; aperture occupying one-fourth of spear length. Guiding ring double, lying less than one head diameter from anterior body end. Oesophagus enlarged in posterior half. Prerectum in females 4 to 10 anal diameters long, in males beginning somewhat before the supplements. Vulva longitudinal, mostly pre-equatorial. Female gonads amphidelphic. Testes two. Spicula rather thick, dorylaimoid. Supplements closely approximated, 13 to 21. Female tail attenuated to filiform, 7 – 8 anal diameters long, male tail short and rounded. Both females and males occur together.

Type-species: *Dorylaimus marinus* Dujardin, 1845 = *Halodorylaimus marinus* (Dujardin, 1845) comb. n.

Halodorylaimus may be distinguished from the other genera of the Laimydorinae in having a very small amphid aperture and a short orifice in the spear.

Marine or halophilic animals occurring in Europe and North America.

Two species:

H. marinus (Dujardin, 1845) comb. n.
  Dorylaimus marinus Dujardin, 1845
  Mesodorylaimus marinus (Dujardin, 1845) Andrássy, 1959
  Laimydorus marinus (Dujardin, 1845) Siddiqi, 1969
H. micramphis (Chesunov, 1985) comb. n.
  Laimydorus micramphis Chesunov, 1985

Key to species of Halodorylaimus

1 Supplements 21; amphids barrel-shaped; vulva far pre-equatorial. – ♀: L = 2.0 mm; a = 28; b = 5.2; c = 8.6; V = 39%; c' = 7. ♂: L = 1.8 mm; a = 27; b = 4.7; c = 62; PO: 21. (On the shores of France and the United States [Massachusetts].) .... **marinus** (Dujardin)

– Supplements 13 – 15; amphids funnel-shaped; vulva almost equatorial. – ♀: L = 1.8 – 2.0 mm; a = 34 – 43; b = 5.3 – 6.5; c = 14 – 23; V = 42 – 52%; c' = 7 – 8. ♂: L = 1.6 – 1.8 mm; a = 33 – 42; b = 4.4 – 5.6; c = 65 – 69; PO: 13 – 15. (Soviet Union: Caspian Sea.) .... **micramphis** (Chesunov)

Genus *Chrysodorus* Jiménez-Guirado & Cadenas, 1985

Dorylaimidae, Laimydorinae. Body 2.2 – 4.3 mm long, extremely slender (a = 60 – 92). Cuticle thin, smooth. Head truncate, continuous with neck or offset. Amphids funnel-shaped. Spear weak and unusually slender, somewhat longer than labial width, 20 to 43 μm; aperture occupying 1/3 to 1/6 of its length. Guiding ring double but small, located less than one-head diameter behind anterior body end. Oesophagus enlarged in or behind its middle. Female prerectum 6 – 10 times as long as anal body diameter, male prerectum originating well before the supplements. Vulva slightly pre-equatorial (in 40 – 50%), longitudinal. Female genital organ amphidelphic, long. Testes two. Spermatozoa fusiform. Spicula dorylaimoid, not too slender. Supplements closely packed or contiguous, 7 to 16 in number. Tail in females attenuate, 5 to 20 anal diameters long, in males short and rounded.

Type-species: *Chrysodorus longicaudatus* Jiménez-Guirado & Cadenas, 1985.

Chrysodorus may be distinguished from the other genera of the family in having an unusually thin spear, a truncate head and an excessively slender body.

Limnic or terrestrial animals, occurring in Europe, Asia and South America.

Five species:

C. attenuatus (de Man, 1880) comb. n.
Dorylaimus attenuatus de Man, 1880
Mesodorylaimus attenuatus (de Man, 1880) Andrássy, 1959
C. dhanachandi (Jairajpuri & Ahmad, 1983) Jiménez-Guirado & Cadenas, 1985
Laimydorus dhanachandi Jairajpuri & Ahmad, 1983
C. filiformis (Bastian, 1865) comb. n.
Dorylaimus filiformis Bastian, 1865
Dorylaimus stagnalis filiformis Bastian, 1865 (Kreis, 1924)
Mesodorylaimus filiformis (Bastian, 1865) Goodey, 1963
Laimydorus filiformis (Bastian, 1865) Siddiqi, 1969
Paradorylaimus filiformis (Bastian, 1865) Andrássy, 1969
C. longicaudatus Jiménez-Guirado & Cadenas, 1985
C. lordelloi (Meyl, 1957) Jiménez-Guirado & Cadenas, 1985
Dorylaimus lordelloi Meyl, 1957
Mesodorylaimus lordelloi (Meyl, 1957) Andrássy, 1959
Paradorylaimus lordelloi (Meyl, 1957) Andrássy, 1987

Key to species of Chrysodorus

1 Tail very long, about 20 anal diameters. – ♀: L = 4.3 mm; a = 82; b = 6.1; c = 8.1; V = 40%; c' = 20. ♂: L = 3.6 – 3.7 mm; a = 64 – 65; b = 5.3; c = 188 – 203; PO: 15 – 16. (Spain.) **longicaudatus** Jiménez-Guirado & Cadenas
– Tail shorter, at most 10 anal diameters 2

2 Spear about 40 μm long. – ♀: L = 2.5 mm; a = 59; b = 6.0; c = 13; V = 50%; c' = 6 – 7. ♂ unknown. (England; the other data are uncertain.) .... **filiformis** (Bastian)
– Spear 20 – 25 μm long 3

3 Lip region broad, wider than adjacent body; tail about as long as 10 anal diameters. – ♀: L = 2.2 mm; a = 65; b = 5; c = 14; V = 50%; c' = 10. ♂ unknown. (Holland, Federal Germany, Denmark, Sweden, Poland, Spain, Soviet Union [Russia], Mongolia.) .. **attenuatus** (de Man)
– Lip region not wider than adjacent body; tail as long as 5 – 7 anal diameters 4

4 Supplements 15–16; oesophagus enlarged in the middle. – ♀: L = 3.0 mm; a = 65–74; b = 5.2–6.0; c = 17–20; V = 46–48%; c' = 6–7. ♂: L = 2.7–2.8 mm; a = 78–82; b = 5 1– –5.4; c = 188–195; PO: 15–16. (India.) .... **dhanachandi** (Jairajpuri & Ahmad)

– Supplements 7–9; oesophagus enlarged posterior to the middle. – ♀: L = 2.9–3.2 mm; a = 71–92; b = 5.3–6.2; c = 26–31; V = 46–47%; c' = 5. ♂: L = 2.5–2.7 mm; a =) 80–94; b = 5.0–5.4; c = 92–109; PO: 7–9. (Brazil.) .... **lordelloi** (Meyl

Remarks

Chrysodorus filiformis. – I tentatively propose Bastian's *Dorylaimus filiformis* to be ordered into the genus *Chrysodorus.* The short description (females only) and the figures strongly suggest that this species is congeneric with the other members of *Chrysodorus.* Bastian says: „Body very long and slender, tapering only slightly anteriorly ... Head truncate..." Whether the spear is thinner than usual in the family it cannot be stated with certainty on the basis of the small figure (Plate X, Fig. 48). The species described by de Man (1880 and 1884) under the name *Dorylaimus filiformis* is probably not conspecific with that of Bastian; de Man described and illustrated the labial region as being distinctly offset and conspicuously wider than adjacent body.

Mesodorylaimus argentinus Altherr, 1963. – This species resembles the representatives of *Chrysodorus* in having a thin spear, its body is however not too slender (a = 36–48) and the prerectum is short. Incertae sedis.

Genus *Aporcedorus* Jairajpuri & Ahmad, 1983

Dorylaimidae, Laimydorinae. Body 3–3.5 mm long, very slender. Cuticle smooth, subcuticle finely striated. Head offset, lips distinct. Amphids caliciform. Spear 18–20 μm long, somewhat longer than cephalic diameter; orifice 60% of spear length. Oral opening slit-like, dorso-ventral. Guiding ring single, thin, located less than one head diameter from anterior body end. Oesophagus expanded near its middle. Prerectum long, 5–7 anal diameters. Female gonads amphidelphic, vulva transverse, pre-equatorial. Female tail very long, uniformly attenuated to the fine tip. Males not known.

Type-species: *Aporcedorus filicaudatus* Jairajpuri & Ahmad, 1983.

In its general habit and appearance *Aporcedorus* fits well into the subfamily Laimydorinae but it differs in two characters from the other genera: *1.* the oral opening is a dorso-ventral slit (not pore-like), *2.* the orifice is longer than half the length of spear. Owing to these characters, Jairajpuri and Ahmad regarded their genus as a representative of the family Aporcelaimidae; in my opinion this long-tailed form does come closer to the family Dorylaimidae than Aporcelaimidae.

The single species has been reported from soil and from Asia.

One species:

A. filicaudatus Jairajpuri & Ahmad, 1983

– ♀: L = 3.0–3.4 mm; a = 57–67; b = 5.5–6.0; c = 4.1–5.3; V = 40–44%; c' = 20–27. ♂ unknown. (India.) .... **filicaudatus** Jairajpuri & Ahmad

Subfamily AFRODORYLAIMINAE Andrássy, 1969

The fifth subfamily of the Dorylaimidae, the Afrodorylaiminae, will be discussed elsewhere in a separate paper.

Species inquirendae seu incertae

The following species have either been insufficiently described or by one sex only. Although they may be ordered into the family Dorylaimidae, they cannot be identified with certainty.

Dorylaimus acris THORNE, 1939
    Mesodorylaimus acris (THORNE, 1939) GOODEY, 1963
    Laimydorus acris (THORNE, 1939) ANDRÁSSY, 1969
    Prodorylaimus acris (THORNE, 1939) LOOF, 1985
Dorylaimus africanus DADAY, 1908
    Mesodorylaimus africanus (DADAY, 1908) ANDRÁSSY, 1959
Dorylaimus angusticephalus STEINER, 1914
    Eudorylaimus angusticephalus (STEINER, 1914) ANDRÁSSY, 1959
    Laimydorus angusticephalus (STEINER, 1914) ANDRÁSSY, 1986
Dorylaimus atratus LINSTOW, 1901
Dorylaimus callosus SKWARRA, 1921
    Mesodorylaimus callosus (SKWARRA, 1921) GOODEY, 1963
    Laimydorus callosus (SKWARRA, 1921) ANDRÁSSY, 1969
Dorylaimus cashmerensis ALTHERR & DELAMARE DEBOUTTEVILLE, 1972
Dorylaimus exilicaudatus ALTHERR, 1953
Dorylaimus fastigatus THORNE & SWANGER, 1936
    Mesodorylaimus fastigatus (THORNE & SWANGER, 1936) ANDRÁSSY, 1959
    Drepanodorylaimus fastigatus (THORNE & SWANGER, 1936) ANDRÁSSY, 1986
Dorylaimus festivus PAESLER, 1941
    Mesodorylaimus festivus (PAESLER, 1941) ANDRÁSSY, 1959
Dorylaimus gaussi STEINER, 1916
    Mesodorylaimus gaussi (STEINER, 1916) GOODEY, 1963
    Laimydorus gaussi (STEINER, 1916) ANDRÁSSY, 1986
Dorylaimus libycus PIERANTONI, 1915
Dorylaimus longicaudatus BÜTSCHLI, 1874
    Prodorylaimus longicaudatus (BÜTSCHLI, 1874) ANDRÁSSY, 1959
Dorylaimus maximodorus SCHUURMANS STEKHOVEN & TEUNISSEN, 1938
    Ischiodorylaimus maximodorus (SCHUURMANS STEKHOVEN & TEUNISSEN, 1938) BAQRI & COOMANS, 1973
Dorylaimus nyongi ALTHERR, 1960
    Prodorylaimus nyongi (ALTHERR, 1960) LOOF, 1985
Dorylaimus pachydermis DADAY, 1908
Dorylaimus pachysoma LINSTOW, 1876
Dorylaimus paraagilis ALTHERR, 1953
    Mesodorylaimus paraagilis (ALTHERR, 1953) ANDRÁSSY, 1959
    Prodorylaimus paraagilis (ALTHERR, 1953) ANDRÁSSY, 1986
Dorylaimus polyblastus BASTIAN, 1865
    Mesodorylaimus polyblastus (BASTIAN, 1865) GOODEY, 1963
Dorylaimus serpentinus THORNE & SWANGER, 1936
    Mesodorylaimus serpentinus (THORNE & SWANGER, 1936) GOODEY, 1963
    Laimydorus serpentinus (THORNE & SWANGER, 1936) SIDDIQI, 1969
    Prodorylaimus serpentinus (THORNE & SWANGER, 1936) LOOF, 1985
Dorylaimus sulcatus COBB in COBB, 1915

Dorylaimus tenuicaudatus BASTIAN, 1865
Mesodorylaimus tenuicaudatus (BASTIAN, 1865) GOODEY, 1963
Laimydorus tenuicaudatus (BASTIAN, 1865) SIDDIQI, 1969
Dorylaimus tenuissimus STEFANSKI, 1925
Dorylaimus tenuistriatus SCHNEIDER, 1935
Dorylaimus zograffi DE MAN, 1885
Eudorylaimus aquaticus ELIAVA, 1968
Paradorylaimus aquaticus (ELIAVA, 1968) ANDRÁSSY, 1986
Laimydorus longissimicaudatus ALTHERR, 1977
Prodorylaimus longissimicaudatus (ALTHERR, 1977) LOOF, 1985
Laimydorus thornei ANDRÁSSY, 1969
Dorylaimus filicaudatus apud THORNE & SWANGER, 1936
Prodorylaimus thornei (ANDRÁSSY, 1969) LOOF, 1985
Mesodorylaimus argentinus ALTHERR, 1963
Drepanodorylaimus argentinus (ALTHERR, 1963) ANDRÁSSY, 1986
Prodorylaimus uliginosus Loof, 1985
Urolabes palustris Carter, 1859
Dorylaimus palustris (CARTER, 1859) BASTIAN, 1865

Descriptions of new species

Hereunder seven new species of the family Dorylaimidae are described; one of them belongs to the subfamily Amphidorylaiminae, two belong to the subfamily Dorylaiminae and four to the subfamily Laimydorinae. They have been collected in Asia (4 species), Africa (2 species) and South America (1 species).

Apodorylaimus bini sp. n.

(Fig. 1 A – F)

♀: L = 1.24 – 1.74 mm; a = 37 – 42; b = 3.8 – 4.7; c = 3.1 – 3.9; V = 38 – 43%; c' = 18 – 22.

♂: L = 1.58 mm; a = 45; b = 4.5; c = 3.6; c' = 16.

Body more transparent than usual, 38 – 41 μm wide. Cuticle 1.8 – 2 μm thick on mid-body, smooth, only anterior end very finely annulated. Head not offset, 11 – 12 μm wide, lips hardly separate. Amphids as wide as 2/3 corresponding diameter of body, funnel-shaped. Body at posterior end of oesophagus 3 – 3.2 times as wide as head.

Spear 24 – 26 μm, 2 – 2.2 times as long as labial diameter, about 7% of entire length of oesophagus; its walls not parallel but somewhat widening posteriorly (spear 2.3 – 2.6 μm thick in its first third and 3.5 – 3.8 μm thick just before the posterior end). Aperture occupying one-third of spear length. Guiding ring simple, thin, at a distance of 15 – 17 μm (1.3 – 1.4 head diameters) from anterior body end. Oesophagus 326 – 367 μm long, gradually widening in 54 – 56% of its length. Prerectum 1.3 – 1.7, rectum 1.4 – 1.9 times as long as anal body width. Intestinal tongue present, just before the prerectum about 25 μm long.

Female gonads amphidelphic. Vulval opening round, vulval lips not sclerotized. Vagina longer than 1/3 corresponding diemeter of body. Each gonad 4 – 4.5 times as long as body width. One egg: 102 × 31 μm.

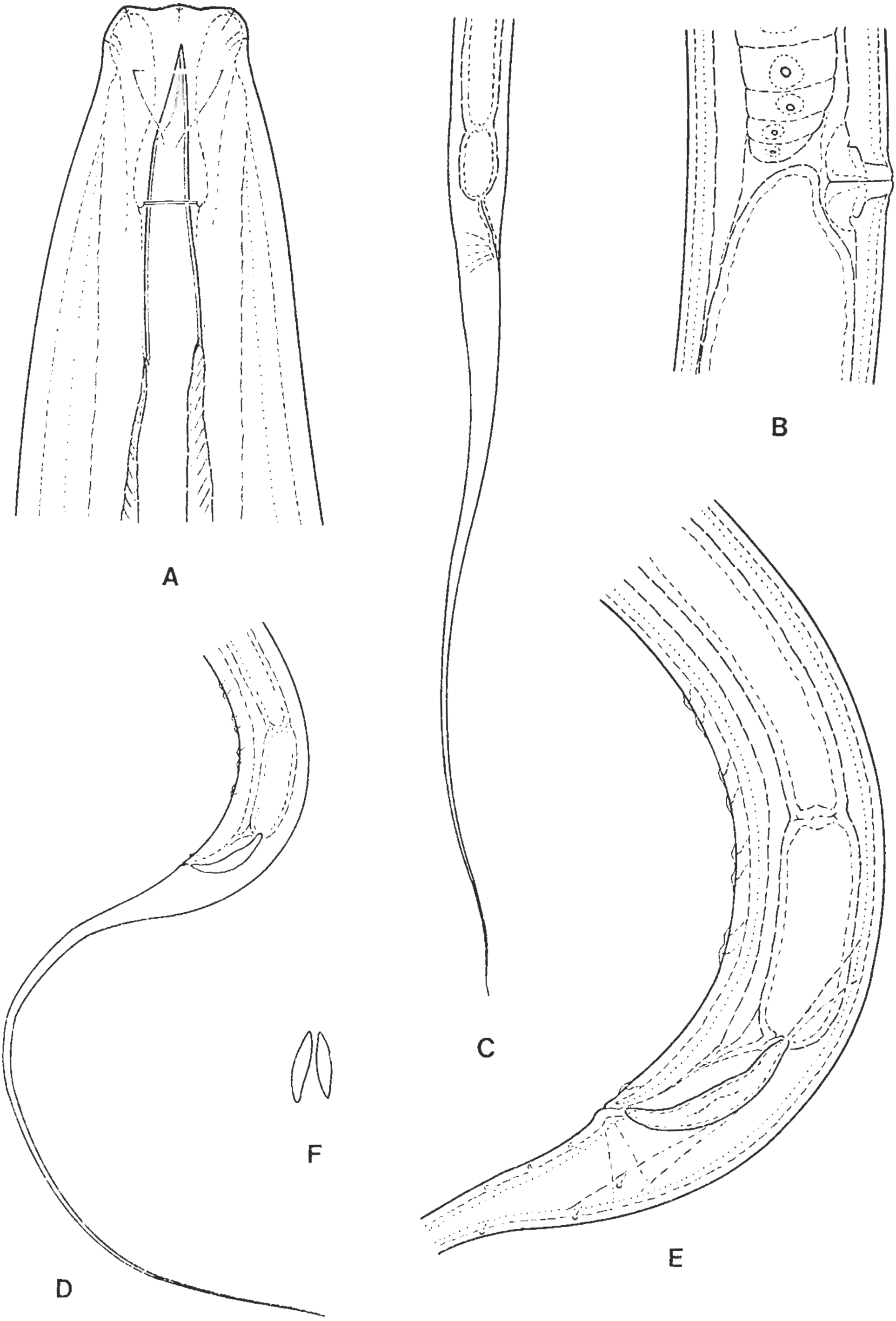

Fig. 1. *Apodorylaimus bini* gen. n., sp. n. A: anterior end (1800×); B: vulval region (760×); C: posterior end of female (240×); D: posterior end of male (240×); E: cloacal region of male (560×); F: spermatozoa (1800×)

Distance between vulva and anus 0.9 – 1.2 times as long as tail. The latter 380 – 490 μm, 18 – 22 times anal body diameters, or 25 – 32% of body length, respectively; filiform with sharply pointed terminus.

Testes two. Spermatozoa fusiform, 5 – 5.5 μm long, 1/8 as long as corresponding diameter of body. Spicula 44 μm long, rather simple, semi-dorylaimoid. Supplements 8, arranged two by two, standing in a row of 53 μm. Tail 438 μm, 16 anal diameters long, 28% of body length, with six pairs of papillae.

Holotype: ♂ on slide No. 11640. Paratypes: 4 ♀ and 2 juveniles. All in the collection of the author.

Type-locality: India, Bangalore, Lal Bagh Botany Garden, marshy soil, February 1986, leg. A. Fodor.

Apodorylaimus bini sp. n. may be distinguished from *A. congonensis* (Andrássy, 1960) comb. n. as follows: body longer (1.2 – 1.7 vs. 0.8 mm), spear much longer (24 – 26 vs. 10 μm), tail longer as well and more sharply pointed (18 – 22 vs. 10 anal diameters), supplements more numerous (8 vs. 5 or 6?) and lying before the spicula.

Dorylaimus numidicus sp. n.

(Fig. 2 A – E)

♀: L = 3.12 – 3.25 mm; a = 40 – 47; b = 4.4 – 4.6; c = 13 – 15; V = 36 – 39%; c' = 6 – 7.

♂: L = 2.63 – 2.80 mm; a = 40 – 42; b = 4.0 – 4.3; c = 91 – 96.

Body 68 – 80 (♀) or 63 – 68 (♂) μm wide. Cuticle 3.5 – 4.5 μm thick on midbody, much thinner than spear at the same level, provided with 32 – 34 longitudinal ridges. Head hardly offset, 18 – 20 μm wide, lips rounded, slightly separate. Body at proximal end of oesophagus 3.7 – 4 times as wide as head. Amphids funnel-shaped, half as wide as corresponding diameter of body.

Spear 43 – 45 μm long and 6 – 6,5 μm thick, 2.2 – 2.3 times as long as labial width, about 6% of oesophagus length. Aperture occupying more than one-third of spear length. Guiding ring double, located at a distance of 24 – 25 μm from anterior end of body. Oesophagus 690 – 720 μm long, in 49 – 50% enlarged. Distance between oesophaus and vulva always shorter than oesophagus. Prerectum 6 – 7, rectum 1.5 – 1.8 anal diameters long.

Female gonads amphidelphic, each lying on the right side of the intestine, and 6 – 8 times as long as body width. Vulva longitudinal, with sclerotized lips, vagina 36 – 43 μm long. Distance vulva-anus 6.7 – 8.3 times as long as tail. Tail 220 – 247 μm, 6 – 7 anal diameters long or 7 – 8% of body length, respectively; conoid with pointed terminus.

Testes two. Spermatozoa spindle-shaped, 8 – 10 μm long, 1/7 – 1/8 as long as corresponding width of body. Spicula 82 – 90 μm, slender. Supplements 22 – 27, contiguous. Prerectum very long, originating 3 – 5 body widths before the row of supplements. Tail 27 – 30 μm long with small papillae.

Holotype: ♀ on slide No. 8298. Paratypes: 2 ♀, 5 ♂ and 2 juveniles. In the collection of the author.

Type-locality: Algeria, in the vicinity of Medea, periphyton from plants in a rivulet, 1973.

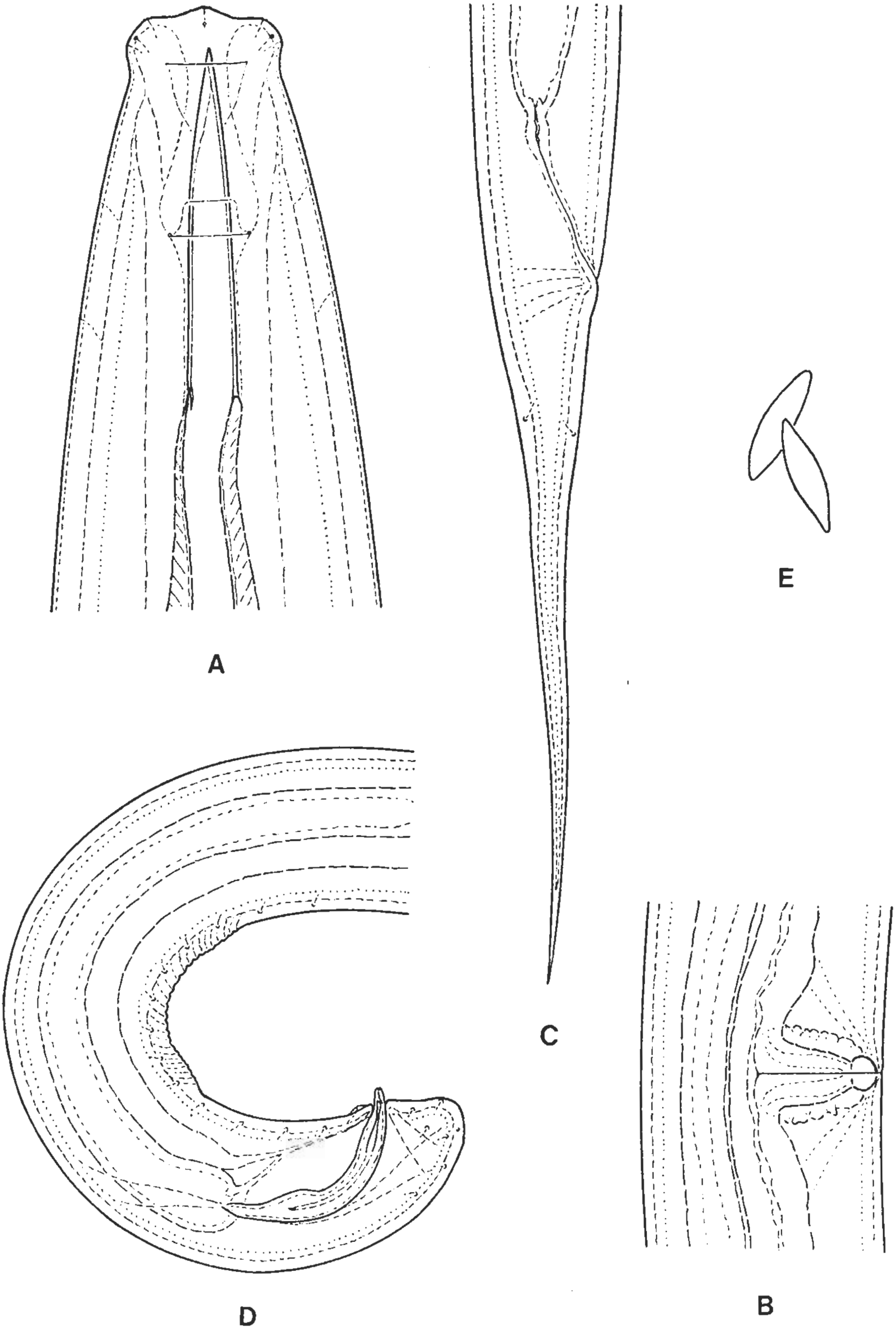

Fig. 2. *Dorylaimus numidicus* sp. n. A: anterior end (1100×); B: vulval region (480×); C: female tail (390×); D: posterior end of male (390×); E: spermatozoa (1800×)

Dorylaimus numidicus sp. n. resembles *D. afghanicus* ANDRÁSSY, 1960 and *D. popus* GAGARIN, 1981; it differs *a)* from *afghanicus:* the number of supplements is much fewer (22 – 27 vs. 52); *b)* from *popus:* the vulva is located farther ahead (36 – 39 vs. 44 – 49%), the distance between the posterior end of oesophagus and vulva is shorter (0.6 – 0.8 vs. 1.2 – 1.3 oesophageal length), the body smaller (♀: 3.1 – 3.2 vs. 3.3 – 4.1, ♂: 2.6 – 2.8 vs. 3.5 – 4.0 mm).

Dorylaimus fodori sp. n.

(Fig. 3 A – E)

♀: L = 3.6 – 4.2 mm; a = 37 – 41; b = 4.9 – 5.3; c = 15 – 16; V = 38 – 41%; c' = 5 – 5.3.
♂: L = 3.34 mm; a = 39; b = 5.0; c = 76.

Body 87 – 104 μm wide in the middle. Cuticle 4.5 – 5 μm thick on mid-body, at level of spear somewhat thinner than that. Longitudinal ridges 32 – 34 on mid-body, and 8 – 11 μm from each other. Head 17 – 20 μm wide, hardly offset, lips amalgamated. Body at proximal end of oesophagus 5 – 5.5 times as wide as head. Amphids caliciform, half as wide as corresponding width of body.

Spear 40 – 42 μm long and 5 μm thick, 2 – 2.4 times as long as labial width, or 5 – 6% of oesophageal length, respectively. Aperture occupying somewhat more than one-third length of spear. Guiding ring double, at a distance of 26 – 27 μm (1.3 – 1.4 head diameters) from anterior end. Oesophagus 658 – 794 μm long, in 50 – 52% expanded. Distance between posterior end of oesophagus and vulva somewhat longer than oesophagus. Prerectum 5.5 – 7.5 times as long as anal body width.

Female genital organ amphidelphic, each gonad 6 – 7.5 times as long as body width. Vulva longitudinal, vulval lips slightly sclerotized; vagina occupying half the width of body. Distance vulva-anus 8 – 8.5 times as long as tail. Tail 230 – 274 μm, 5 – 5.3 times anal body diameter or 6 – 6.5% of entire length of body, respectively. Tip of tail pointed or finely rounded.

Testes two. Spermatozoa oval, 5 μm long, 1/16 – 1/17 as long as corresponding diameter of body. Spicula 88 μm, twice as long as tail, slender. Supplements 46, very small and dense, arranged in a row of 135 μm. Prerectum beginning 3.3 body diameters before the row of supplements. Tail 44 μm long, with 12 pairs of small papillae. Copulatory hump absent.

Holotype: ♀ on slide No. 11630. Paratypes: 3 ♀ and 1 ♂. In the collection of the author.

Type-locality: India, Bangalore, paddy field, April 1986, leg. A. FODOR.

Among the species provided with 32 – 34 cuticular ridges, *Dorylaimus fodori* sp. n. comes closest to *D. afghanicus* ANDRÁSSY, 1960; it differs from that in having a shorter and thinner spear (40 – 42 vs. 46 – 50 μm; 5 vs. 7 – 8 μm), a lower guiding ring and less numerous supplements (46 vs. 52). It is similar in some respects also to *D. numidicus* sp. n. but its cuticle is thicker at level of spear, the spermatozoa are shorter and less elongate (5 vs. 8 μm; 1/16 – 1/17 vs. 1/7 – 1/8 body diameter) and the supplements more numerous (46 vs. 22 – 27).

I dedicate this species to the collector, my friend, Dr. ANDRÁS FODOR (Szeged).

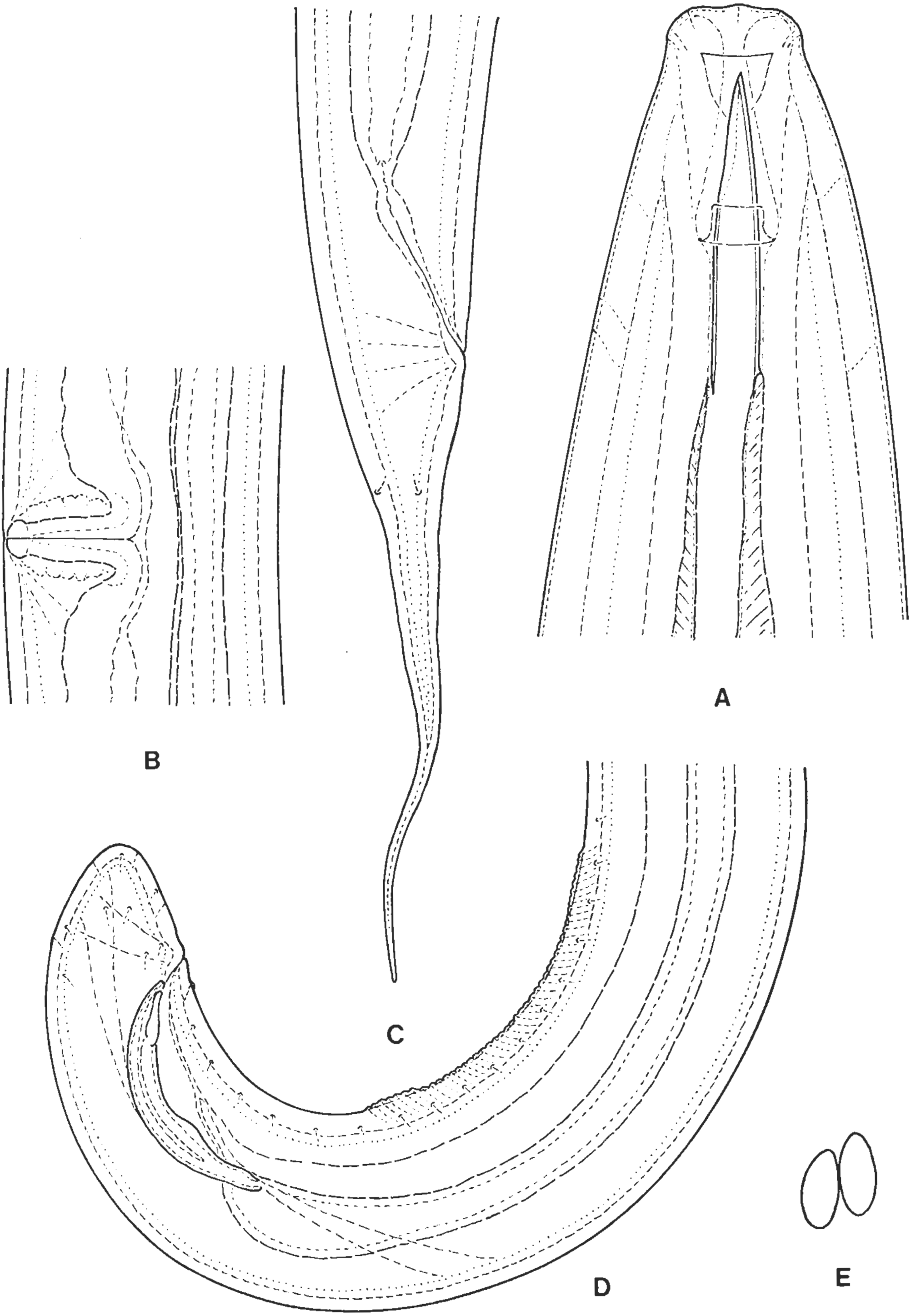

Fig. 3. *Dorylaimus fodori* sp. n. A: anterior end (1100×); B: vulval region (390×); C: female tail (390×); D: posterior end of male (390×); E: spermatozoa (1800×)

Crocodorylaimus aequatorialis sp. n.

(Fig. 4 A – E)

♀: L = 2.03 – 2.18 mm; a = 41 – 44; b = 4.9 – 5.1; c = 10.9 – 12.6; V = 43 – 44%; c' = 7 – 8.

♂: L = 1.88 – 2.16 mm; a = 40 – 48; b = 4.4 – 4.7; c = 66 – 77.

Body slender, 44 – 49 μm wide. Cuticle very thin, 1 – 1.2 μm on mid-body, at level of spear somewhat thinner than that. Head 12 – 12.5 μm wide, not offset, lips slightly angular, amalgamated. Body at proximal end of oesophagus 3.2 – 3.3 times as wide as head. Amphids larger than half the width of corresponding body.

Spear rather weak, 17 – 19 (♀) or 17 – 18 (♂) μm, 1.3 – 1.5 times as long as labial diameter, or about 4% of entire length of oesophagus, respectively. Orifice occupying one-third length of spear. Guiding ring thin. Yellow spots around the basis of spear comparatively weakly expressed, light in colour. Oesophagus 400 – 460 μm long, shorter than distance between posterior oesophageal end and vulva, in 55 – 60% widened. Cardia short, conoid. Prerectum 4.5 – 5, rectum 1.5 – 1.8 anal diameters long. Intestinal tongue absent.

Female gonads amphidelphic, each 6 – 7.5 times as long as body width. Vulva longitudinal, with sclerotized lips. Vagina 26 – 28 μm long. Distance vulva-anus 5 – 6 times as long as tail. This latter 167 – 186 μm, 7 – 8 anal diameters long, 8 – 9% of body length, elongate-conoid, with very finely rounded tip. On both sides of vulva, 30 – 40 μm from that, 1 – 3 small papillae are present.

Testes two. Spermatozoa large, fusiform, 15 – 17 μm, one-third corresponding diameter long. Spicula 54 – 58 μm long. A weak copulatory hump present. Supplements 17 – 22 (in one male 17, in five males 18, in seven males 19, in three males 20, and in one male 22); predominantly contiguous, arranged in a row of 72 – 80 μm. Tail short, 28 – 32 μm, ventrally bent, short, digitiform, with 6 – 7 pairs of papillae, of which the ventral-subterminal one is large and flat (blister-like). Between the anteriormost supplement and anus 7 – 8 pairs of small subventral papillae present.

Holotype: ♂ on slide No. 11940. Paratypes: 9 ♀, 8 ♂ and 14 juveniles. Further specimens from an other locality: 2 ♀, 9 ♂, 10 juveniles. In the collection of the author.

Type-locality: Ecuador, Antisana, 4200 m, submerged plants from a creek, October 1985, leg. I. LOKSA and A. ZICSI. Other locality: Ecuador, Limpiopungo, submerged plants from a rivulet; date and collectors are the same as above.

This new species comes closest to *Crocodorylaimus dadayi* (THORNE & SWANGER, 1936) comb. n. DADAY described his species under the name *Dorylaimus pusillus* DADAY, 1905 – nec *D. pusillus* COBB, 1893 – from Paraguay. The type specimens still exist in fairly good condition in the old collection of DADAY, so that I could compare them with my new species. *Crocodorylaimus aequatorialis* sp. n. is somewhat longer (2.0 – 2.2 : 1.6 – 1.7 mm), its spear also longer (17 – 19 : 15 – 16 μm) and its head wider (12 : 9 – 10 μm). The main differences can be found, however, in the males: in *aequatorialis* the spermatozoa are larger (15 – 17 μm, one-third body width: 10 – 12 μm, one-fourth body width), the spicula longer (54 – 58 : 35 – 38 μm), the supplements more numerous (17 – 22 : 12 – 14) and the subterminal blister on the tail is in *aequatorialis* large and flat, in *dadayi* (Fig. 4 F) small and convex (a constant character!).

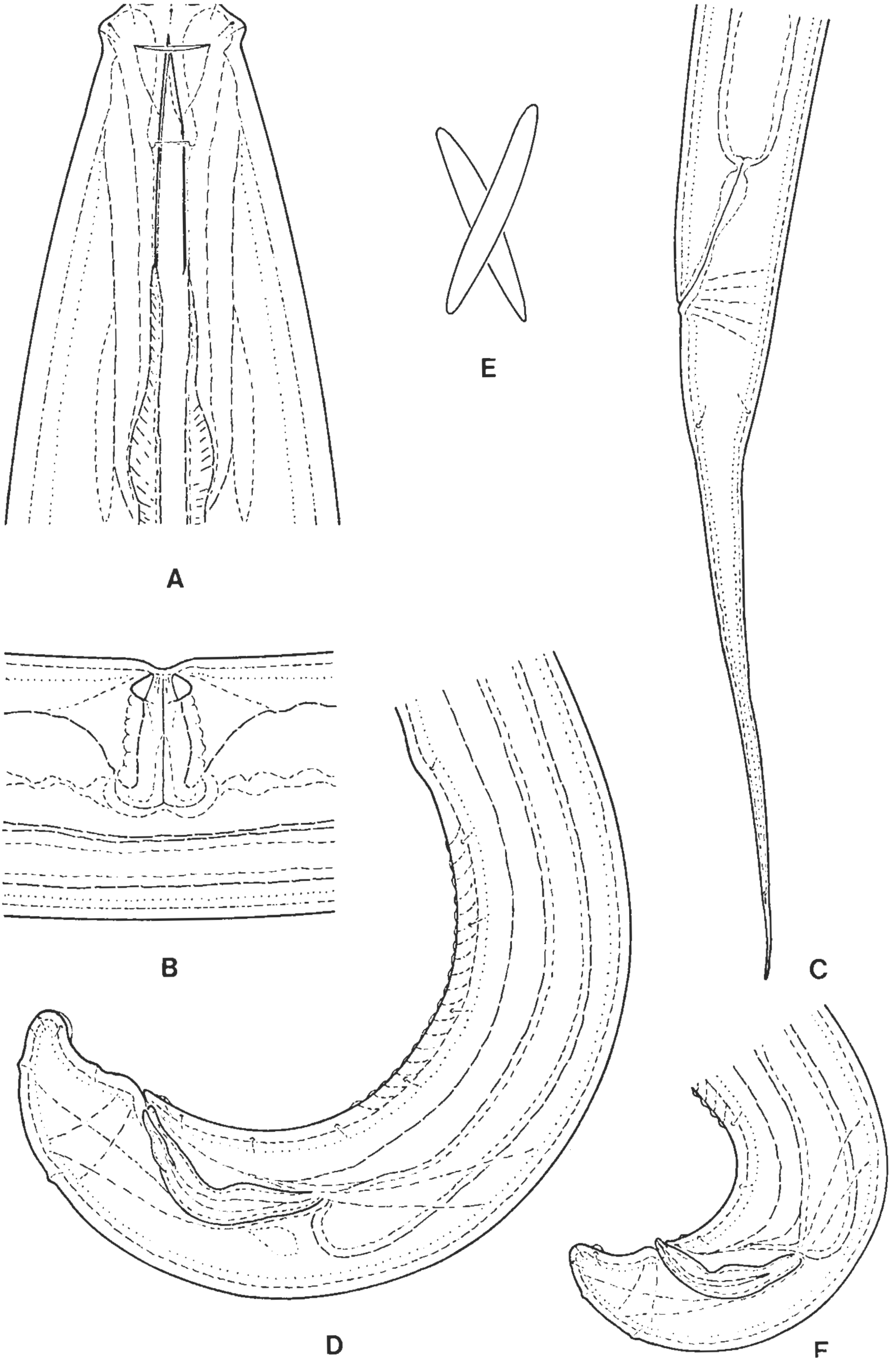

Fig. 4. *Crocodorylaimus aeqatorialis* sp. n. A: anterior end (1800×); B: vulval region (760×); C: female tail (560×); D: posterior end of male (560×); E: spermatozoa (1800×). – F: *Crocodorylaimus dadayi* (Thorne&Swanger, 1936) comb. n., posterior end of male (holotype from Daday's collection)

Crocodorylaimus dimorphus sp. n.

(Fig. 5 A – G)

♀: L = 1.76 – 2.06 mm; a = 52 – 58; b = 5.0 – 5.3; c = 13 – 14; V = 44 – 45%; c' = 7 – 8.

♂: L = 1.37 – 1.45 mm; a = 44 – 48; b = 5.0 – 5.9; c = 57 – 66.

Body slender, 33 – 38 (♀) or 30 – 33 (♂) μm wide. Cuticle smooth and thin (♀: 1.2 – 1.4, ♂: 1.5 – 1.6 μm). Head continuous with adjacent body, 8 – 9 μm wide, lips amalgamated. Body at posterior end of oesophagus 3 – 3.3 times as wide as head. Amphids caliciform, occupying half width of corresponding body.

Spear of different lengths in both sexes: in females 19 – 20 μm, 2.1 – 2.3 head diameters, in males 13 – 14 μm, 1.5 – 1.6 head diameters. Orifice occupying one-third length of spear. Guiding ring thin. Yellowish spots spindle-shaped, 16 – 21 μm long. Oesophagus 350 – 384 μm (♀) or 246 – 274 μm (♂) long, in 57 – 60% widened. Prerectum 3.5 – 4.5, rectum 1.5 – 1.9 times as long as anal body diameter. Intestinal tongue before the prerectum present.

Female gonads amphidelphic, each 4 – 6 times as long as body width. Vulva transverse, vulval lips not sclerotized. Vagina 16 – 18 μm long. Distance vulva-anus 6.3 – 7 times as long as tail. Tail elongate-conoid, 134 – 152 μm, 7 – 8 anal diameters long. Tip of tail pointed.

Testes two. Spermatozoa elongate-fusiform, 11 – 12 μm long, one-third of body width. Spicula 40 – 43 μm long, fairly plump. Supplements 14 – 15, continguous, flat, arranged in a row measuring 70 – 74 μm. Prerectum long, originating two body widths before the supplements. Tail 22 – 25 μm, as long as anal body width, short-digitiform, ventrally bent, with 6 – 7 pairs of papillae. Subterminal blister distinct.

Holotype: ♂ on slide No. 11664. Paratypes: 7 ♀, 2 ♂, 6 juveniles. In the collection of the author.

Type-locality: Vietnam, Uminh, wet forest soil, December 1983.

Crocodorylaimus dimorphus sp. n. may be distinguished from the smaller species of the genus, *C. dadayi* (Thorne & Swanger, 1936), *C. flavomaculatus* (Linstow, 1876) and *C. paraincae* (Thorne, 1974), in showing a sexual dimorphism in the length of spear and in having supplements just beginning at the proximal end of the spicula.

Mesodorylaimus kittenbergeri sp. n.

(Fig. 6 A – F)

♀: L = 1.10 – 1.35 mm; a = 28 – 35; b = 3.5 – 5.5; c = 31 – 44; V = 49 – 54%; c' = 1.3 – 1.5.

♂: L = 1.54 mm; a = 40; b = 4.8: c = 80.

Body 38 – 41 μm wide. Cuticle thin, 1.5 – 1.8 μm on mid-body, at leve with spear thinner than the latter; smooth. Labial region offset, 12 – 13 μm wide, lips separate, papillae protruding. Body at proximal end of oesophagus 3 – 3.4 times as wide as head. Amphids caliciform, half as wide as corresponding body.

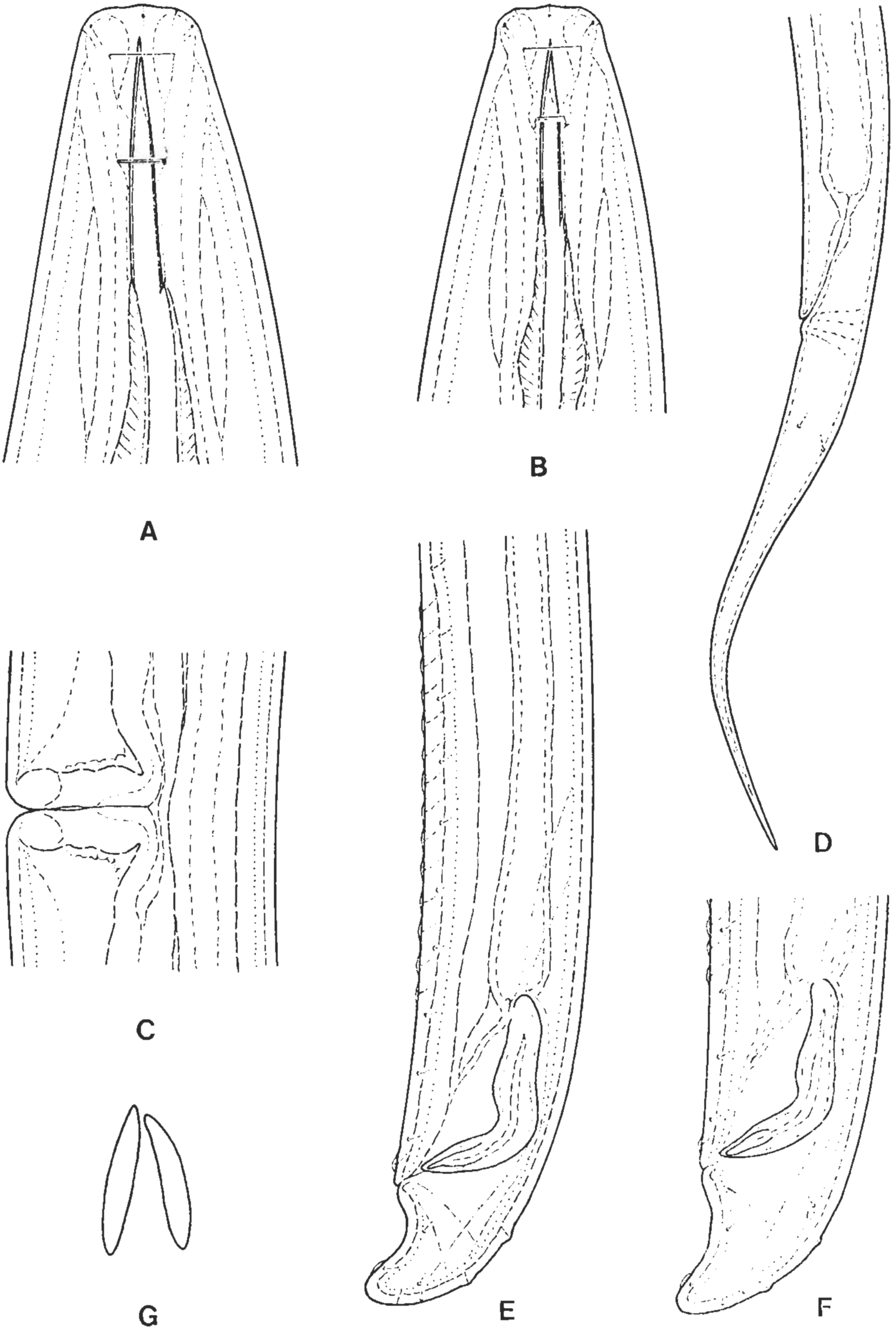

Fig. 5. *Crocodorylaimus dimorphus* sp. n. A: anterior end of female (1800×); B: anterior end of male (1800×); C: vulval region (1100×); D: posterior end of female (480×); E – F: posterior ends of two male specimens (760×); G: spermatozoa (1800×)

Spear short, 14 – 15 μm, 1.1 – 1.3 labial diameters, 4 – 5% of entire length of oesophagus. Orifice occupying one-third of spear length. Guiding ring simple. Oesophagus 270 – 310 μm long, in 58 – 60% enlarged. Prerectum short, 1.5 – 2 times, rectum 1.4 – 1.5 times as long as anal body width. Intestinal tongue lacking.

Female gonads amphidelphic, each branch 5.5 – 7 times as long as body diameter. Vulva transverse, vagina 21 – 23 μm long. Distance between vulva and anus 13 – 21 times as long as tail. The latter very short, 29 – 36 μm, only 1.3 – 1.5 times as long as anal diameter, or 2 – 2.5% of body length, respectively; first dome-shaped then continuing in a short, slightly ventrally curved finger-like portion with rounded tip. Number of caudal papillae two pairs. On each side of vulva a papilliform cuticular fold present.

Testes two. Spermatozoa sausage-shaped, 9 μm long, one-fourth of corresponding body diameter. Spicula plump, 42 μm long, lateral guiding pieces 12 μm long. Supplements 11, closely approximated, located well before the spicula. Prerectum originating level with the anteriormost supplement. Tail 22 μm long with 8 pairs of small papillae. Number of preanal papillae (between the first supplement and the anus) 10 pairs.

Holotype: ♀ on slide No. 11670. Paratypes: 8 ♀, 1 ♂. In the collection of the author.

Type-locality: Kenya, Ukunda, Diani Persian Mosque, mosses and lichens from a baobab tree, September 1985, leg. S. MAHUNKA.

This new species may be distinguished from all known species of the genus by its short and characteristic female tail. Although we know some species which are characterized by a very short tail (shorter than two anal body diameters), viz. *M. aduncus* ANDRÁSSY, 1987, *M. arcuatus* ANDRÁSSY, 1987, *M. cognatus* ANDRÁSSY, 1987, *M. deuberti* (ANDRÁSSY, 1958), *M. mexicanus* ZULLINI, 1973, *M. procerus* ANDRÁSSY, 1987, *M. recurvus* ANDRÁSSY, 1964, *M. tholocercus* ANDRÁSSY, 1968, *M. thorneiswangerae* ANDRÁSSY, 1968 and *M. vulneratus* ANDRÁSSY, 1987, but they all differ from *M. kittenbergeri* sp. n. by the dorsally curved digitate process of their tail.

This species is dedicated to honour of KÁLMÁN KITTENBERGER (1881 – 1958) in appreciation of his imperishable merits in exploring the fauna of East Africa.

Calodorylaimus densus sp. n.

(Fig. 7 A – E)

♀: L = 2.82 – 3.03 mm; a = 44 – 49; b = 4.7 – 5.4; c = 11.8 – 14.5; V = 45 – 51%; c' = 6.5 – 8.2.

♂: L = 2.18 mm; a = 35; b = 3.9; c = 116.

Body 57 – 68 μm wide. Cuticle smooth, in mid-body 3 – 4 μm thick, at level of spear much thinner than the latter. Head slightly offset, 15 – 17 μm wide, lips angular. Body at posterior end of oesophagus 3.8 – 4.2 times as wide as head. Amphids funnel-shaped, about half as wide as body at the same level.

Spear 30 – 31 (♀) or 29 (♂) μm, 1.9 – 2.1 times as long as labial diameter, straight, its tip located at a distance of 8 – 9 μm from anterior body end. Orifice occupying one-third of spear length. Guiding ring thin but double, always more

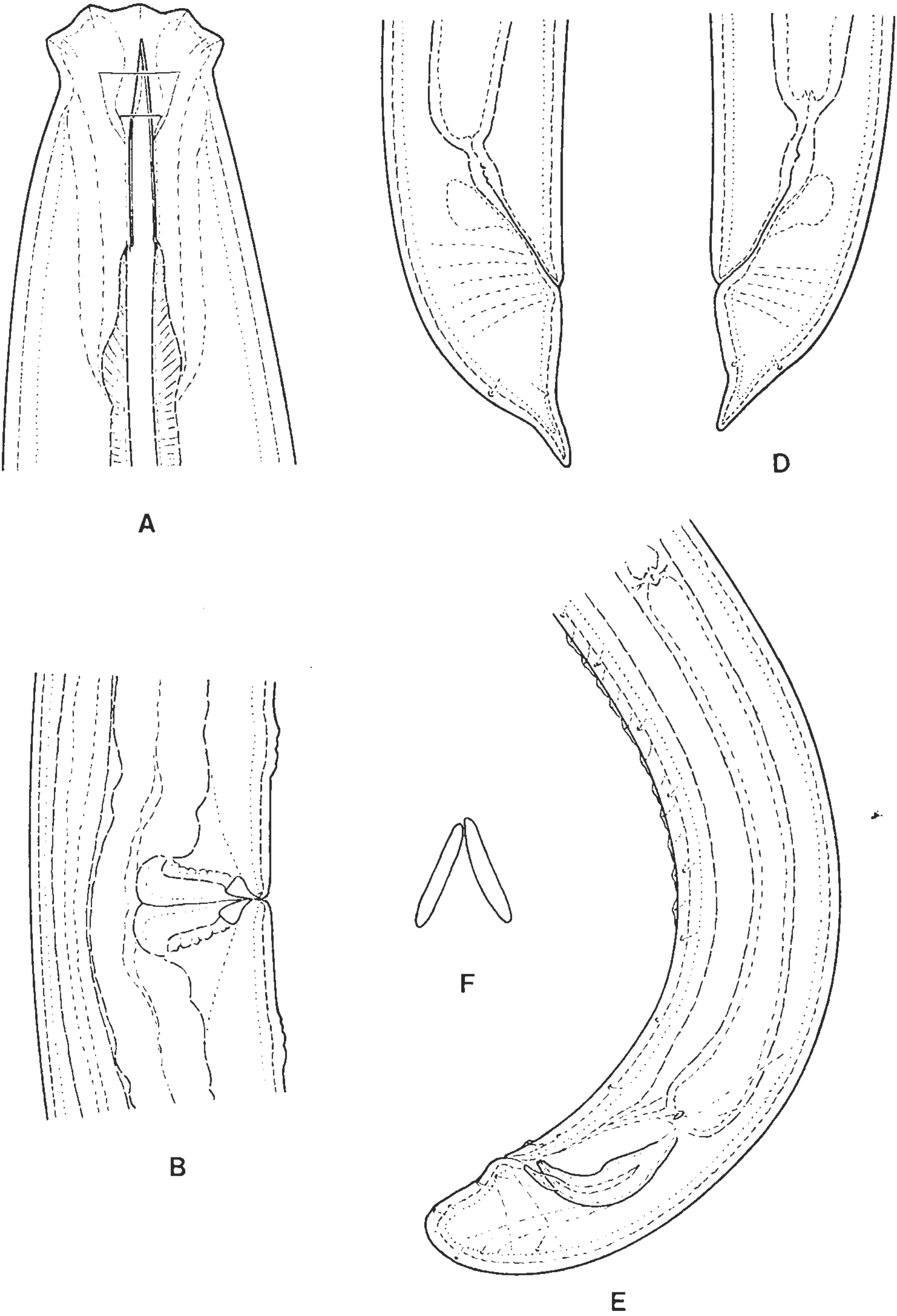

Fig. 6. *Mesodorylaimus kittenbergeri* sp. n. A: anterior end (1800×); B: vulval region (760×); C–D: tails of two females (760×); E: posterior end of male (560×); F: spermatozoa (1800×)

than one head diameter from anterior end. Oesophagus 545 – 615 μm long, gradually expanded in 49 – 52% of its length. Cardia conoid. Distance between posterior end of oesophagus and vulva 1.4 – 1.6 times longer than oesophagus. Prerectum 6 – 6.5, rectum 1.3 – 1.5 times as long as anal body diameter. Intestinal tongue lacking.

Female gonads amphidelphic, long, each branch 8 – 9 times as long as body width. Vulva transverse, with slightly sclerotized lips. Uteri with 2 to 7 eggs at the same time; eggs 77 – 98 × 30 – 33 μm, 1.3 – 1.6 times as long as body width.

Distance vulva-anus 5.5 – 6.2 times as long as tail. Tail 194 – 246 μm, 6.5 – 8.2 anal diameters long, or 7 – 8% of body length; straight with finely rounded tip. Two pairs of caudal papillae present.

Testes two. Spermatozoa elongate-fusiform, 10 – 12 μm long, about 1/5 of corresponding body width. Spicula 55 μm long. Supplements 31, flat, arranged in a row mesauring 125 μm; the marginal ones contiguous, the middle ones closely approximated, almost contiguous. Precloacal space 98 μm long. Prerectum very long, originating more than two body diameters before the supplements. Tail 19 μm long, broadly rounded, with 10 pairs of small papillae.

Holotype: ♂ on slide No. 11630. Paratypi: 10 ♀. In the collection of the author.

Type-locality: India, Bangalore, periphyton from a cistern, February 1986, leg. A. FODOR.

Calodorylaimus densus sp. n. may be easily distinguished from the other known species of the genus by the greater number (31 vs. 16 – 27) and arrangement of supplements (also the middle ones close to each other).

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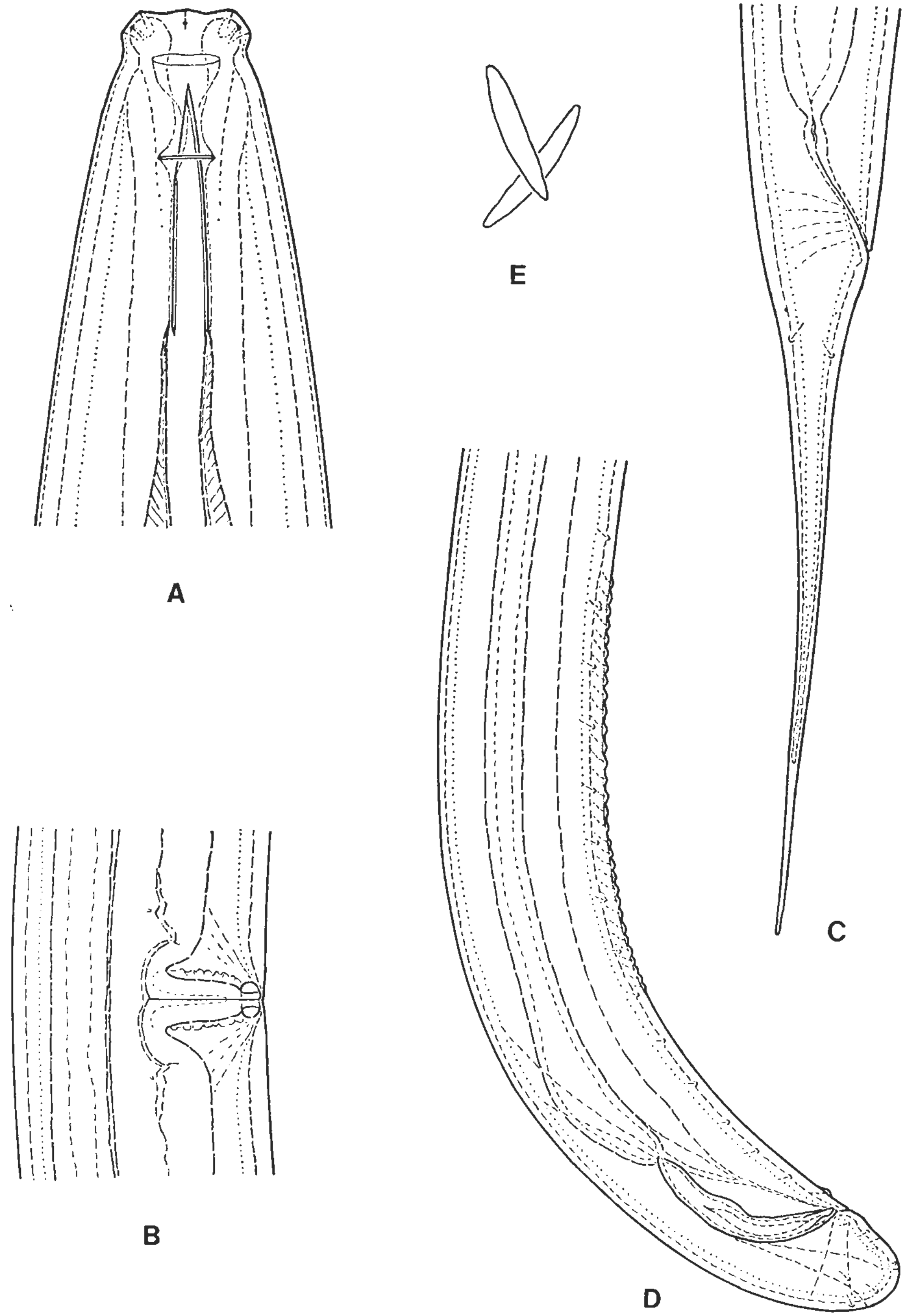

Fig. 7. *Calodorylaimus densus* sp. n. A: anterior end (1100×); B: vulval region (560×); C: female tail (480×); D: posterior end of male (1100×); E: spermatozoa (1800×)

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Opusc. Zool. Budapest, XXIII, 1988

The zoogenic food composition of Utricularia vulgaris in the Lake Fertő

By

S. Andrikovics*, L. Forró** and E. Zsunics***

Abstract. The zoophagous activity of the plant *Utricularia vulgaris* is presented in the Lake Fertő. In 1000 traps examined 19 animal species of 9 major taxonomic groups were found. The frequency of the groups was as follows: Copepoda 〉 Ostracoda 〉 Cladocera 〉 Chironomidae. Beside faunistic results, it has been evidenced that *a)* the most important prey animals belonged to the mesofauna (mainly to Copepoda and Ostracoda), and *b)* the traps never contained specimens of Protozoa and Rotatoria. The zoophagous activity of the plant can be considered as important since two-third of their traps contained animals or fragments of those.

The areas covered by aquatic plants in the shallow lakes are frequently compared to forests, i.e. the aquatic plants correspond to the trees and the crowd of the animals represent the terrestrial fauna elements at various levels.

The place and function of the carnivorous plants – among them *Utricularia vulgaris* – have not been clarified so far. Considering these, we have designed to reveale the zoogenic foods of *Utricularia vulgaris* so as to assigne this plant into the trophic system of the litoral region. This topic is also actualized by the fact that 90% of the Hungarian section of the Lake Fertő, the important shallow lake of our country, is composed of Scirpo-Phragmitetum utricularietosum (Csapody, 1975) with mass occurrence of various *Utricularia* stands. Despite of these, no detailed taxonomic studies have been carried out on the *Utricularia* species. It seems probably, therefore, the occurrences of other *Utricularia* species than *Utricularia vulgaris.*

The place and function of the carnivorous plants to play in the matter and energy flow of the litoral region hasn't been clarified. Their prey animals are probably composed of those mesofauna elements which are best-fitting to the size of the trap.

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The objectives of this study were to reveale the major zoogenic foods of *Utricularia vulgaris*, to identify the most frequent organisms occurring in the traps so as to assigne this plant species into the trophic system, using samples taken from the *Utricularia vulgaris* vegetation of the lake.

Sites, dates of sampling and methods

The *Utricularia vulgaris* samples examined were taken from the Hungarian section of the Lake Fertő in three areas: two isolated ponds, Herlakni and Hidegség, and one smaller isolated pond (Kis-Herlakni). In all three areas the reed belts contained considerable *Utricularia vulgaris* stands at the margins. This plant contituted even a continuous zone in the Kis-Herlakni pond, but the open water in the Nagy Herlakni pond was free of hair-weed.

The sampling periods for the three areas corresponded to the peak vegetation season of the year 1980.

Table 1. Sites and dates of sampling and the numbers of the traps opened

Sampling site	Datum	No. of traps examined
Herlakni pond	13. 08.	300
Hidegség pond	24. 09.	400
Kis-Herlakni pond	24. 09.	300

The samples (indicated in Table 1), were fixed immediately in 4% formalin and opened with a thin insect needle soldered to a glass tube under a stereo-microscope using a magnification of 100×. The animals found in the traps were placed into vials labelled individually according to the taxonomic group. Special attention was also paid to the fact that the traps opened would represent small, intermediate and large sized ones in ca. identical numbers.

Results and discussion

Of the three areas a total of 1000 traps were opened for food analysis (Tables 2 and 3).

Table 2. Representation of the traps contents

Item	Occurrence (No.)
Animal	of 115 traps: 173
Animal fragments (unid.)	13
Detritus	560
Empty	312

In the entire sample, the most frequent were the Copepoda (94 specimens.) On 7 accasions two or three specimens did occur in a single trap.

Meso- and macrofauna taxa found in the traps:

- Nematoídea
  - Nematoda (fragments)
- Gastropoda
  - *Physa fontinalis* (fragments)
- Crustacea
  - Cladocera
    - *Bosmina longirostris* (O. F. MÜLLER, 1785)
    - *Alona rectangula* (SARS, 1862)
    - *Pleuroxus aduncus* (JURINE, 1820)
    - *Chydorus sphaericus* (O. F. MÜLLER, 1785)
    - *Simocephalus exspinosus* (KOCH, 1841)
  - Copepoda
    - *Arctodiaptomus spinosus* (DADAY, 1890)
    - *Eucyclops serrulatus* (FISCHER, 1851)
    - *Acanthocyclops robustus* (SARS, 1863)
    - *Megacyclops viridis* (JURINE, 1820)
    - *Diacyclops bicuspidatus* (CLAUS, 1857)
    - *Mesocyclops leuckarti* (CLAUS, 1857)
  - Ostracoda
    - *Cyclocypris ovum* (JURINE, 1820)
    - *Cypria ophthalmica* (FISCHER, 1853)
  - Ephemeroptera
    - *Cloeon dipterum* (LINNÉ, 1761)
  - Diptera
    - Chironomidae (from subfamily Orthocladiinae)
  - Acaridea
    - Hydracarína
    - *Arrenurus* sp. juv.
    - Oribatidae
    - *Hydrazetes lacustris* (MICH., 1882)

The digested chitin fragments, the various granules and plant fragments are indicated by the term „detritus''. Of 1000 traps opened 312 contained neither digestion fragments nor identifible animals, thus, they were empty.

Unfortunately, we have no information on the digestive speed of the traps and on the exact ratio of the Protozoa of softer body and smaller size, and that of the Rotifera in the food contents of the traps.

According to the analysis by GARDINI (in: HEGI, 1929), of 2084 *Utricularia neglecta* traps the following animal groups were identified: 1196 small crabs, 469 Rotatoria, 327 Protozoa, 66 Nematoda, 13 Isopoda, 10 insect larvae, and 3 Hydracarina specimens. Comparing the list of the 19 species described here with that of GARDINI it can be seen that our sample contianed also the same major groups expect two, Protozon and Rotatoria. It can probably due to the fact that the numbers of the free-living Protozoa and Rotatoria were well below the general level in the water surrounding the *Ultricularia vulgaris* traps.

No animals neither animal fragments were found in 31,2% of the 1000 *Utricularia vulgaris* samples taken in the three areas. The item in 56% of the traps was detritus. Among these, some contained few detritus – occasionally animals as well – but full traps were also frequent. These traps were probably unoperating and they were changed by the more recent ones.

These intermediate and large-sized traps were localized at the deeper, floating part of the plant, much lower from the water surface, close to the bottom.

At this level the aquatic animals floating in the water or living at the bottom can easily be trapped by the plant. We found 115 traps which contained animals, too.

It is worthy to compare the animals found in the 9 major taxonomic groups to the species lists reported earlier for the Lake Fertő. The comparison is rendered more difficult, among the plant stands is small and they are relatively old.

During examinations, one Nematoda species was found in the traps of the plant. *Alona rectangula* was previosuly identified from *Chara*, *Cyclocypris ovum* and *Cypria opthalmica* from *Drepanocladus*, whereas *Arctodiaptomus spinosus* and *Mesocyclops leuckarti* were found in reeds without submerge vegetation (PONYI and DÉVAI, 1977).

The major part of Cladocera occurred in the traps was the typical species-group characteristic of the weedy waters. Thus, their occurrence can be considered natural.

Table 3. Comparison of the crustacean prey to food resource

Food recource (species occurring on *Utricularia vulgaris*)	Prey crustaceans
Chydorus sphaericus	*Chydorus sphaericus*
Acanthocyclops viridis	*Acanthocyclops robustus*
Pleuroxus aduncus	*Pleuroxus aduncus*
Ceriodaphnia reticulata	*Alona rectangula*
Daphnia curvirostris	*Arctodiaptomus spinosus*
Simocephalus exspinosus	*Simocephalus exspinosus*
Scapholeberis kingi	*Megacyclops viridis*
Ceriodaphnia laticaudata	*Diayclops bicuspidatus*
Eucyclops serrulatus	*Eucyclops serrulatus*
Scapholeberis aurita	*Mesocyclops leuckarti*
Diaphanosoma brachyurum	*Cyclocypris ovum*
Bosmina longirostris	*Bosmina longirostris*
Cypris pubera	*Cypria ophthalmica*
Notodromas monacha	

It is also interesting that the Ostracoda occurring in relatively high numbers (44 specimens) are composed of only two species. Among the individuals of the six various species occurred 94 Copepoda specimens. Occurrence of *Arctodiaptomus spinosus*, the predominant crustacean species of the open water of the Lake Fertő, is also noteworthy.

The occurrence of crustacean species in the traps of *Utricularia vulgaris* (Table 3.) can probably be related to the fact that its area has extended with the parallel reduction of the aquatic vegetation. *Acanthocyclops robustus* is getting more frequent in the Austrian open waters, as well. Its increased occurrence can be explained with the reduction of the weed at the end of the seventies.

The traps contained generally detritus-eating crustaceans. The very mobile predatory crustaceans occurred in small numbers in the traps of the plant. Altogether two species, *Acanthocyclops robustus* and *Mesocyclops leuckarti* are predators. Thus, the predominant foods for the plant are composed of the detritus cha in.

The sharp between-area differences in the food spectra are also interesting Whilst specimens of two species were found in the Herlakni and Hidegség ponds each, specimens of 12 species did occur in the Kis-Herlakni pond. These data refer only to the crustaceans, but the results are similar when analysing the proportions of the species belonging into the other major taxonomic groups. Thus, it can be stated that the most organisms occurred in the Kis-Herlakni pond, consequently the fauna of this isolated small pond was the richest in species. The Amphipoda species, known also in the Hungarian section of the lake, did also occur in this pond (ANDRIKOVICS, FORRÓ and METZ, 1982).

The only Ephemeroptera species *(Cloeon dipterum)* found is frequent in the weed-stands of the Lake Fertő. The relatively low contribution of Ephemeroptera to the food spectra of the traps can probably be explained by size-problems.

According to previous reports (ANDRIKOVICS, 1973, 1979), 53,6% of the *Utricularis vulgaris* stand contained Chironomida larvae. Supposed, this high occurrence might have resulted from the high proportion (7.5%) of the relatively large-sized animals in the trap contents. The 13 Chironomidae larvae belong into the subfamily Orthocladiinae and into the herbivorous and detritus eating groups. We have failed to identify the larvae according to species due to their progressive digestion stage.

In the plant stand, among Hydracarina occurring in 6,4% altogether, one specimen was found in the *Utricularia* traps. This animal was identified to be a young *Arrenurus* sp. The Oribatidae belonging into the genus *Hydrazetes* represented itself with altogether one specimen. The animal was identified by DR. PÉTER BALOGH.

Considering the animals found in the traps and the literary data, the following statements can be concluded. The most frequent organisms belong to the crustaceans (89,5%). Of these the Copepoda are predominant (54,3%). The animals are collected by the catching-traps according to size. In case of the intermediate traps the Crustacea, Gastropoda and Nematoda occur. The various Arthropoda species (Chironomida, Ephemeroptera, Hydracarina, Oribatida) occur in the intermediate and mainly in the large-sized traps. The majority of the species found are sediment-eating, the number of predators is relatively small. Altogether one-third part of the traps examined (31,2%) contained neither animals, nor fragments. It can therefore be stated that the zoophag activity of the plant is considerable, but at least non-negligible.

The plant compensates mainly its nitrogen deficiency by digestion of meso- and macrofauna elements. Contrary to our expections, Protozoa and Rotatoria are negligible items in the foods of *Utricularia vulgaris.*

Comparing our results on the fauna-phagous activity of *Utricularia vulgaris* with the feeding studies of the Lake Fertő (ANDRIKOVICS and KERTÉSZ, 1978 – 79) we can state that the food items of this plant has been enlarged by new elements, particularly by small crustaceans, via the detritus food-chain. On the other hand, the plant is also a component of the trophic chain originating from the detritus-Chironomidae level.

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Opusc. Zool. Budapest, XXIII, 1988

Diversity and cluster analysis of the invertebrate macrofauna in the Lake Fertő

By

S. ANDRIKOVICS*, J. PADISÁK** and M. RAJCZI**

Abstract. This paper presents some qualitative and quantitative characteristics of the macrofauna living in different stands of the Lake Fertő. The results of diversity and cluster analysis support the earlier observations and provide statements which cannot be directly extrapolated from the primary zoological data.

Quantitative characteristics of the zoocenoses living in submerz and helophyton vegetations (species composition, relative frequency) and the major ecological factors regulating the occurrences of the macrofauna populations (pH, conductivity, dissolved O_2) have continuously been studied (ANDRIKOVICS, 1973, 1978, 1979 a).

The quantitative relationships of the invertebrate macrofauna occurring in the various aquatic plants have also been examined into consideration (ANDRIKOVICS, 1973, 1980–81).

The most important results of several reports including also the primary data of this paper can be summarized as follows:

A zoological heterogenity of low degree can be developed in the open water and its surroundings due to the frequency of wind-effects (ANDRIKOVICS, 1980–81b). The topography of the weed-zones revealed differences in the fauna groups among the open waters and larger isolates as well as the small ponds surrounded by the reed-belts (ANDRIKOVICS, 1973).

Considering quantitative aspects, the invertebrate macrofauna of the reedbelts bordering the water is poor, whilst that of the weed vegetation is somewhat richer in species (ANDRIKOVICS, 1980–81 a, b). Of the submerz macrovegetations the *Potamogeton pectinatus* fields provide habitats for the zoocenoses of highest number. The community of the *Najas marina* sites examined was conspicously poor from quantitative respects (ANDRIKOVICS, 1979a, b, 1980–81a). Beyond

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these structural-coenological, ecological results two alternatives can be suggested for a further development.

On one hand, initiation of detailed ecofaunistic analyses of the most important aquatic insect groups should be an approach with detailed taxonomical studies of the imagos. On the other hand, the weed repression having taken place since the mid-seventies (ANDRIKOVICS 1979a, 1980–81b; SCHIEMER, 1978) has urged comparing the three major habitats in respects of the helophyton stands of the weed-zones and the macrofauna groups of the sediments, using the more exact diversity and cluster analysis. To utilize more exactly the biological information involved in the primary zoological data, the following objectives were outlined:

– To reveale the differences between the reed-belts (Sc. phragmitetum) and the bulrush stands (Sc. phragmitetum typhetosum angustifolii) in respect of the macrofauna groups.

– To establish the factors of general importance regulating the spatial and timely occurrences of the macrofauna groups living in the submerz and emerz vegetations.

– To determine the spatial heterogenity of the macrofauna groups in identical type vegetations.

– To relate the species and abundance differences of the macrofauna with the determinative ecological factors.

Sites, dates and methods

In weed-zones the samples were taken from May to October during 1971 and 1972 in 11 typical habitats of the Lake Fertő.

Of the submerz stands, quantitative samples were taken during 1975 and 1976 in the surroudings of the Rákos inlet and the Herlakni pond. In reed and bulrush stands as well as in open water sludge, quantitative samples were taken during 1975 and 1976. The samplings were carried out at monthly intervals in all three areas (Fig. 1).

We applied initially the so-called quasi-quantitative sampling method included cutting ca. identical masses of plant over the water-net (No. 25) in the various weed-stand. The principle of the tools suitable for quantitative samplings is a taking fixed water volume and after closing the tools the entire material is taken out.

These methods frequently cannot provide serial samplings in the reed-belts and in the dense bulrush stands due to the low capacity of the cutting tools. As a better alternative, the "frame" sampling can be used.

After submerging the billet, with a basic area of 50×50 cm, covered generally with a 120 cm high nylon net depending upon the water deepness, a diver cuts down the plant stalks with a strong grass-cutting scissors.

The sediment samples were taken with a 50×50×25 cm metal billet, opened at the botton and supplied with a sharp flange. The billet was pressed into the sediment directly over the surface then, closing the bottom of the sampling billet with a metal cover the material was carefully taken out of the water.

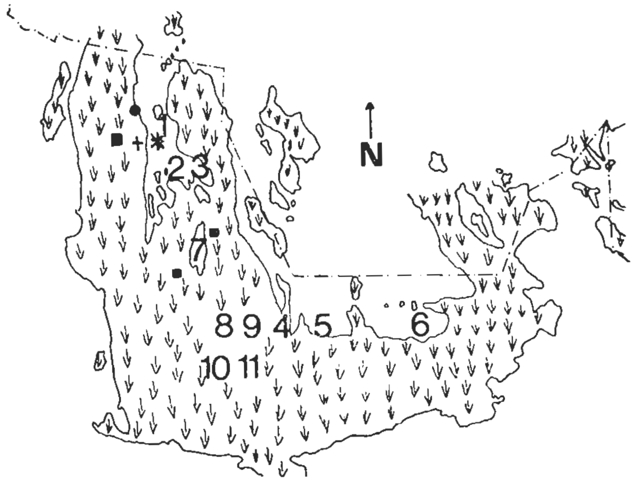

Fig. 1. Sketch of the sampling sites. 1, 4, 6, 7, 8, 10 = *Potamogeton pectinatus;* 2, 3, 5 = *Myriophyllum spicatum;* 9 = *Myriophyllum verticillatum;* 11 = *Utricularia vulgaris* and *Najas marina.* ● open water sediment samples, ■ quantitative zoological samples from the reed stands, + quantitative zoological samples from the bulrush stands, ✱ quantitative zoological samples from the sedge stands

In each month four parallel samples were taken then, the entire sample was analysed. The samples containing also plant fragments were stored in 4% formalin until analysis. In the study areas the frequency distribution of the macrofauna species arranged by size were as follows: 8 Hirudinoidea, 10 Gastropoda, 14 Hydracarina, 1 Isopoda, 5 Ephemeroptera, 9 Odonata (larvae), 13 Trichoptera (larvae), 2 Lepidoptera (larvae), 7 Coleoptera and 7 Heteroptera. The Diptera (Chironomidae + other) were not analysed in details due to the well-known taxonomic problems.

Some aspects of data evaluation

The data obtained from the quasi-quantitative samplings are only informative of the stocking differences of the various habitats, using an arbitary scoring system: few-1, intermediate-2, many-3, mass-4. The data of the quantitative samplings enable us to compute some major structural elements of zoocenology, i.e. the mean number of individuals/m^2 and the dominance relationships in the various vegetations. The results are referred to 1 m^2 water surface so as to ensure a direct comparison with the data for the submerge fauna. The diversity of the macrofauna cenoses was assessed with the Shannon-formule (Shannon, 1948). Of the various similarity indices the Sokal-Mitchener index, the Hummon-index (Hummon, 1974) and the WPGMA fusion algorythm (Sheat and Sokal, 1973) were applied. The data were computerized with the aid of a SZTAKI CDC – 3300 type computer.

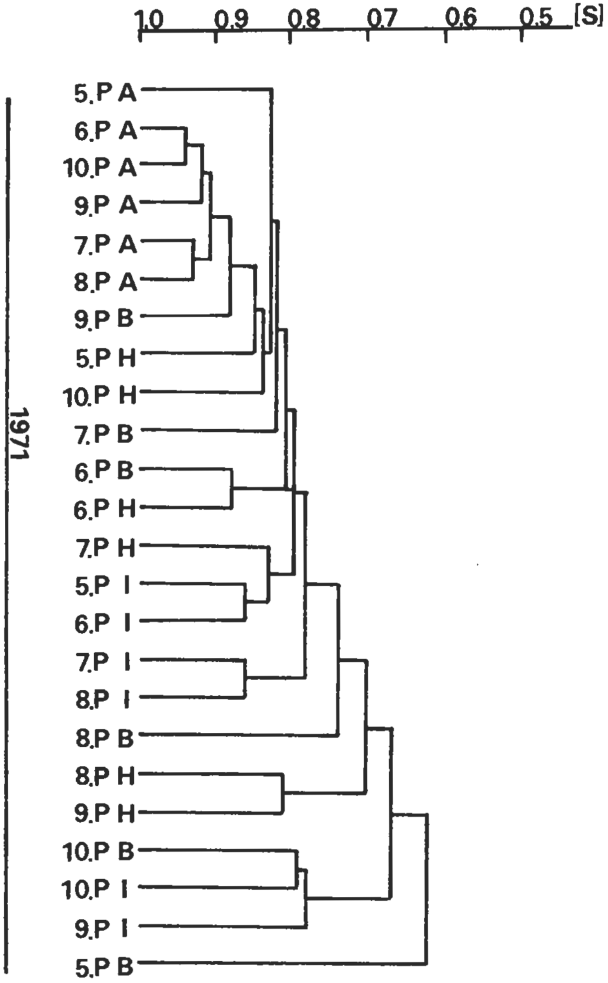

Fig. 2. Dendrogram for the macrofauna cenoses sampled in the open water of the Herlakni pond and in the *Potamogeton pectinatus* stands, on the basis of cluster analysis (Sokal—Mitchener index). PA = *Potamogeton pectinatus* stands in the open water; PB = *Potamogeton pectinatus* stands before the reed walls in the open water; PH = *Potamogeton* stands in the Herlakni pond; PI = *Potamogeton* stands in the isolated ponds; S = similarity

Results and discussion

Taxonomic assessment of the zoological data and a considerable part of the ecological consequences are not discussed here since these have already been reported elsewhere (see Introduction). This paper is focused on the results of the diversity and cluster analysis.

Contrary to the weed-stands of the open waters, the *Potamogeton pectinatus* zones of the isolated small ponds are inhabited by a zoocenoses of greater species

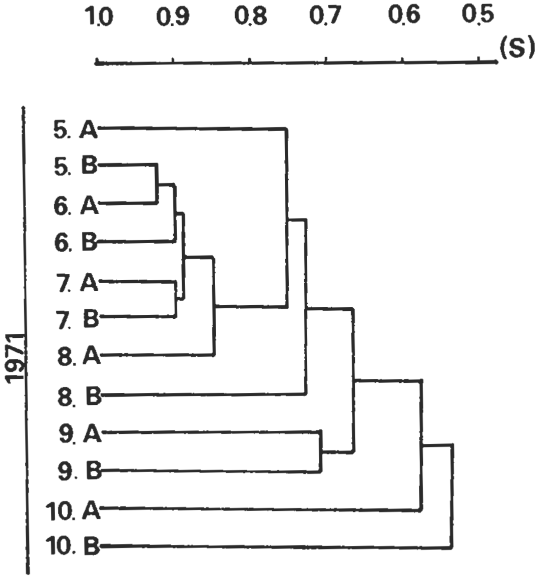

Fig. 3. Dendrogram for the macrofauna groups in the open water and the reed-bordered *Potamogeton pectinatus* stands, on the basis of the cluster analysis (Sokal-Mitchener index). A = *Potamogeton* stands in the open water; B = *Potamogeton* stands before the reed-walls in the open lake; S = similarity

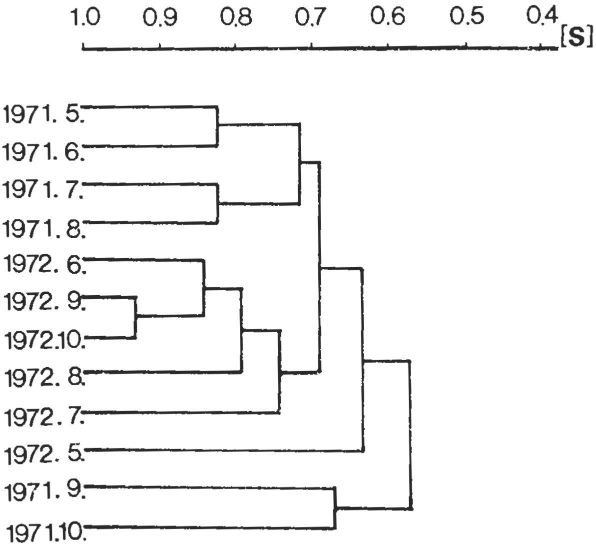

Fig. 4. Dendrogram for the macrofauna cenoses living in the *Potamogeton pectinatus* stands of the isolated small ponds, on the basis of the cluster analysis (Sokal-Mitchener index). S = similarity

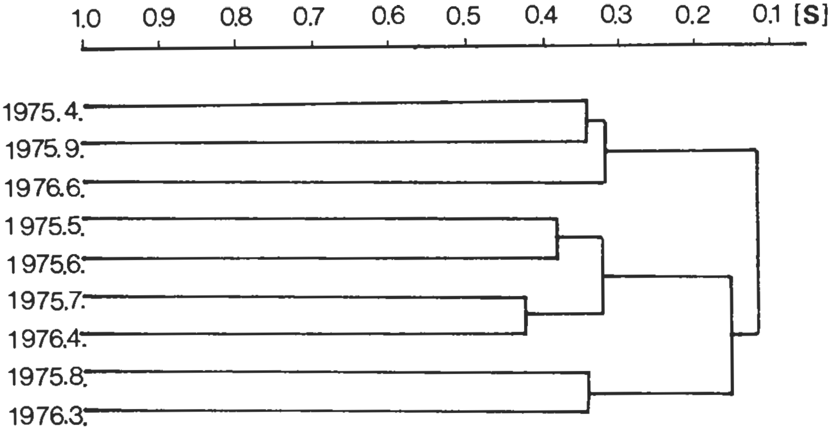

Fig. 5. Dendrogram for the macrofauna cenoses living in the Fertőrákos inlet-water reeds, on the basis of the cluster amalysis (Hummon index). S = similarity

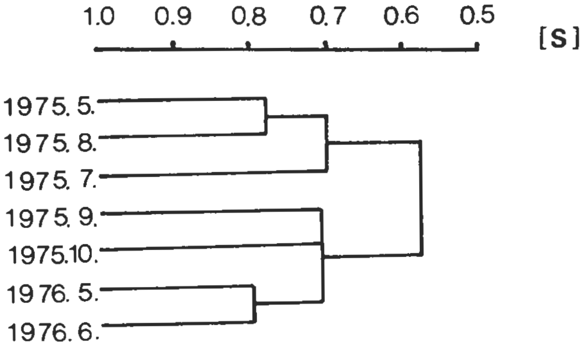

Fig. 6. Dendrogram for the macrofauna cenoses living in *Typha angustifolia* stands of the Fertőrákos inlet on the basis of the cluster analysis (Sokal-Mitchener index). S = similarity

number (ANDRIKOVICS, 1973). The macrofauna living in the *Potamogeton pectinatus* sites of the very differing areas of the pond doesn't form similarity centrums concentrating according to area (Fig. 2). The values for the similarity indices are high but with low ranges of variability (R: 0.35, 0.93 – 0.58). The macrofauna in the *Potamogeton pectinatus* stands is maily represented by the great mass of the Chironomidae (ANDRIKOVICS, 1973, 1979a, b, 1980 – 81a) resulting in numerically low diversity (Talbe 2).

The 1971/72 data for the macrofauna living in the *Potamogeton pectinatus* stands of the Herlakni pond formed a common summer-autumn group. No between-year differences were noted in this area (Fig. 3). However, the macrofauna living in the *Potamogeton pectinatus* stands of the small ponds revealed between-year differences among the similarity groups (Fig. 4).

The macrofauna groups of the within-water reeds showed very little similarities during the various stages of the year. The values for the similarity indices are low (Fig. 5). The within-water reeds contained zoocenoses rich in species but with relatively low number of individuals.

Table 1. Diversity (H") and evenness (I") of the macrofauna living in the reeds, bulrush and the mud of Fertőrákos inlet

Sample	Number of species	Diversity (H")	Evenness (I")
1975.04. reed	12	2,11	0,59
05. reed	17	3,03	0,74
06. reed	19	2,44	0,57
07. reed	13	2,06	0,56
08. reed	14	1,70	0,45
09. reed	7	1,43	0,51
1976.03. reed	14	2,94	0,77
04. reed	12	1,86	0,52
05. reed	10	1,05	0,32
1975.05. bulrush	8	0,75	0,25
06. bulrush	18	2,43	0,58
07. bulrush	14	2,29	0,60
08. bulrush	11	1,52	0,44
09. bulrush	11	1,37	0,39
10. bulrush	10	1,59	0,48
1976.05. bulrush	7	0,44	0,16
06. bulrush	9	1,11	0,35
1975.06. mud	2	0,87	0,87
07. mud	3	0,64	0,40
08. mud	3	0,87	0,55
09. mud	2	0,32	0,32

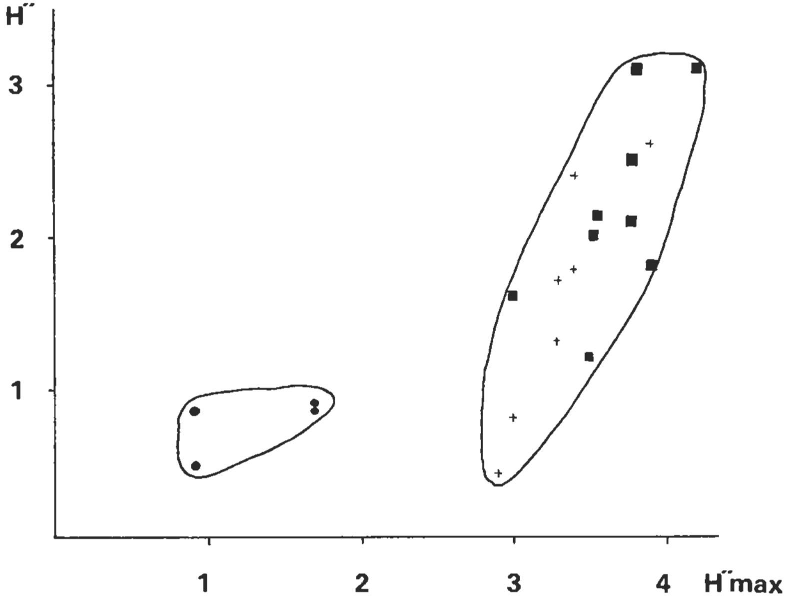

Fig. 7. Related diversity and diversity maximum values for the macrofauna groups living in the reed and bulrush stands of the Fertőrákos inlet, 1975 – 1976. ■ = reed, + = bulrush, ● = mud

The macrofauna groups living in *Typha angustifolia* stands appeared more homogeneous during the various seasons of the year, compared to those of the reed-belts, and didn't follow a seasonal trend (Fig. 6).

Based on diversity, the reed and bulrush stands are not separated from one another and as cluster analysis revealed their macrofauna are not distinguished (Table 1 and Fig. 7).

Among the submerz vegetations of the isolated small ponds, only *Najas marina* stands' macrofauna constitutes a close similarity group (Fig. 8). Above *Najas marina* stands frequently occur extensive *Utricularia vulgaris* stands.

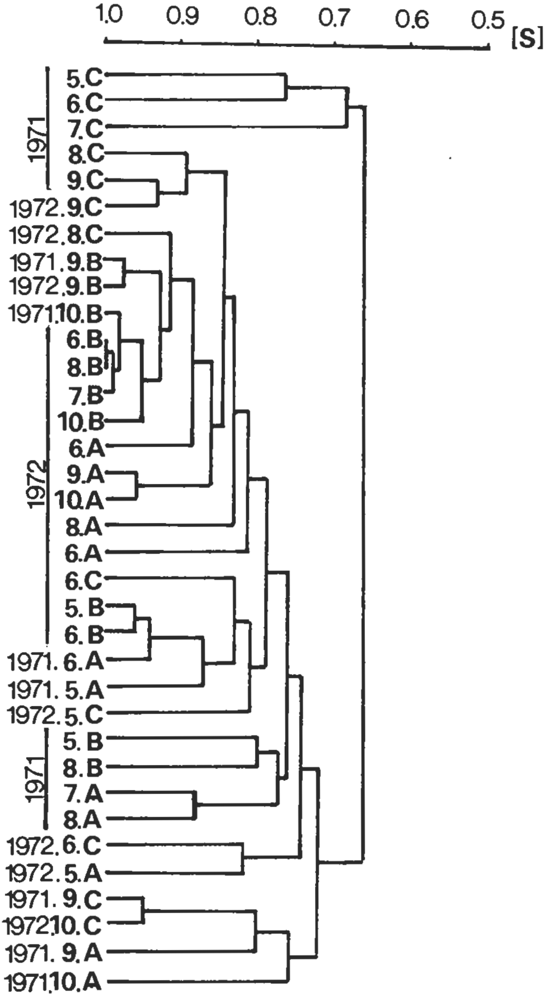

Fig. 8. Dendrogram for the macrofauna cenoses living in the *Potamogeton pectinatus*, *Najas marina* and *Utricularia vulgaris* stands of the isolated small ponds, on the basis of the cluster analysis (Sokal-Mitchener index). A = *Potamogeton pectinatus;* B = *Najas marina ;* C = *Utricularia vulgaris;* S = similarity

Table 2. Diversity (H") and evenness (I") of the macrofauna living in the Potamogeton pectinatus and Najas marina stands of the Herlakni pond

Sample	Number of species	Diversity (H")	Evenness (I")
1975.06. *Potamogeton*	9	0,32	0,10
07. *Potamogeton*	10	0,60	0,18
08. *Potamogeton*	16	0,78	0,20
09. *Potamogeton*	19	1,23	0,29
10. *Potamogeton*	11	0,41	0,12
1975.07. *Najas*	5	0,82	0,35
08. *Najas*	12	2,82	0,79
09. *Najas*	10	1,90	0,57

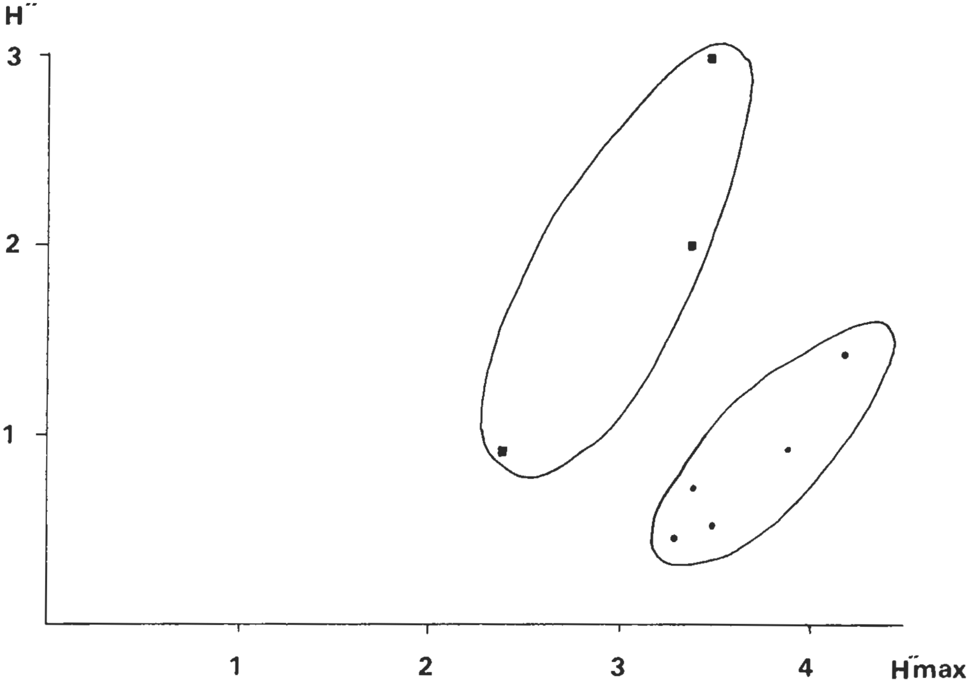

Fig. 9. Related H" and H_{max} values for the macrofauna living in the *Potamogeton pectinatus* and *Najas marina* stand of the Herlakni pond, 1975–1976. ○ = *Potamogeton pectinatus;* ☐ = *Najas marina*

Despite of the close spatial distance, the *Najas* and the *Utricularia* macrofauna don't form a similarity group, i.e. mixed habitats such as are not suitable for the formation of district zoocenoses.

Similarly, the macrofauna of the *Potamogeton pectinatus* stands forms also no similarity group.

In the Herlakni pond, the H" – H" max values for the macrofauna of the *Potamogeton pectinatus* and *Najas marina* sides establish disjunct groups (Fig. 9).

Based on diversity and cluster analysis the following statements can be concluded:

The within-water reeds carry out varied animal groups but with low number of individuals (H'' arithmetic mean: 2.06, H'' max: 3.02, H'' min: 1.04; see Table 1).

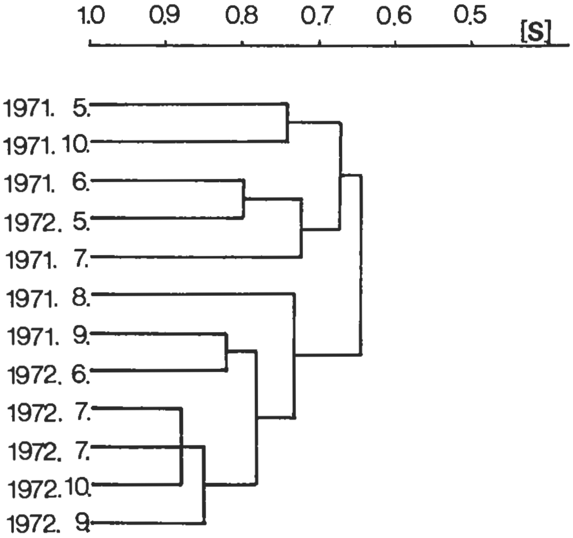

Fig. 10. Dendrogram for the macrofauna cenoses living in the *Potamogeton pectinatus* stands of the Herlakni pond, on the basis of the cluster analysis (Sokal-Mitchener index). S = similarity

The presence of zoocenoses of great species number and diversity suggests the importance of the reed margin as a refuge area promoting the inhabitance of the open water habitats during spring time. This suggestion is also consistent with the peak diversity values.

Based on the results, the bulrush stands showed low seasonal differences, probably due to the greater food supply of the habitat.

The macrofauna of the plant stands examined showed usually summer similarity groups in close connection with the spring and autumn months. These latters are the periods of formation and desintegration of the macrofauna groups.

In case of the most frequent plant stand, *Potamogeton pectinatus*, no spatial heterogenity was noted in the macrofauna. This fact emphasizes clearly the importance of the substrate against the various water-chemistry conditions.

The repression of the weed-stands was commenced at the beginning of the seventies. The impact of this on the structure of the macrofauna cenoses resulted in the distinction of the macrofauna of the small isolated ponds according to year as early as in 1971 and 1972, whilst the phenomenon was not noted in the same period in the Herlakni pond and the open water weed stands, either (Fig. 10).

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How to avoid unprofitable debate on systematics among taxonomists

By

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Abstract. The authors express their opinion that the main source of unprofitable debate on systematical problems among taxonomists is the inadequate distinction between taxonomy and systematics. After defining "taxonomy", "systematics" and biological "classification" of systematics (vs. taxonomical "arrangements"), some types of the fruitless debate are mentioned. It is argued that the simplest possible taxonomical arrangements (where the genus is simply the lowest named taxonomic category, the names of taxa are character categories etc.) may be the most suitable for devising useful arrangements for users. Though the urgent tasks of zootaxonomy may force us to work in this way, several concurrent arrangements of an animal group should not necessarily be a cause for debate.

The authors of this paper are very different kinds of men. There is an age-difference of about one-and-half generations between them and the senior author specializes in mites, the junior in dipterans. They share, however, a common concern over the present crisis of their field of speciality, zootaxonomy. Currently various members of the not too populous company of zootaxonomists, working with inadequate funds and in scattered locations, engage themselves in futile debates on systematics which are irrelevant to their own problems and are a waste of time, thinking and paper. We think that if these problems have brought the attention of an acarologist and a dipterist to the same questions, they are of a nature general enough which should be the concern of every taxonomist. We are aware of other even more important aspects of the current crisis of zootaxonomy. We wish to pay more attention in forthcoming papers to the problems of modernizing nomenclature, to funding and strategic goals of taxonomic research, and the acceptance of taxonomic identification as intellectual achievement.

The crux of the problem defined in the title of this paper lies in the fact that zoosystematics and zootaxonomy are two fundamentally different fields of science and the lack of distinction has been the cause for many misinterpretations. The junior author recently published a brief overview of the concepts

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of taxonomy, systematics and phylogenetic classification (Papp, 1986). According to him, taxonomy is concerned with the study of the manifestation at the individual (population) level of the diversity of living organisms. The level of study is not necessarily idiobiological, rather it focuses attention on problems at the infraindividual level or at the borderline between idiobiological and supraindividual levels. This implies that studies are carried out in some manner on single (animal) specimens although they are always closely related to the infra- and supraindividual levels. The duties of a taxonomist are to collect and analyse primary and basic information on morphological, bionomic and perhaps biochemical characters. Taxonomy deals with the end products of phylogeny, i.e. with the populations and individuals representing species which are the result of biological evolution. Thus, although taxonomy is not a phylogenetic branch of science, it cannot do without a sound basis of evolutionary perspective. Papp (1986) emphasized the general "information-producing" role of taxonomy with which it serves all other branches of biological sciences, and summarized this point briefly, if not precisely enough, as follows: "considering the results of taxonomy, it is but a general auxiliary field of science". With the above-said in mind, taxonomy is concerned with phenological studies.

Systematics studies the causes and modes of the process during which the diversity of life developed, explores the relationships between the various forms (species, monophyletic groups, etc.) which are components of the diversity (canalized manifestations of living matter) brought about by evolution. Systematics draws from the results of taxonomy, evolutionary biology, population genetics, palaeontology and various branches of infraindividual and synbiological levels of study. Systematics is an evolutionary, historical science, yet at the same time its task is to classify organisms in a phylogenetic system. We accept Simpson's concept that systematics is the science of biological sciences, which, however, is only valid if taxonomy is considered an independent branch of science. Systematics is a causal field of science, and is not only concerned with the phenomena discovered by taxonomy.

In close relationship with the above is that classification necessarily has a different meaning in zoology than in formal logic. We propose that classification be considered that branch and family of methods of systematics which divides the phylogenetic tree and phylogenetic relationships, i.e. the reconstruction of evolution, into taxa. This concept concurs with that of Charig (1982) and others. Let us call the various solutions to the necessarily arising need to group organisms in taxonomy, as arrangements. Let us specify that when studying the morphology of recent species, even if with the most modern methods of data capture and analysis, the result can only be phenological (phenogram, phenetics, etc.). We not only accept the omnipotent concept of evolution but respect it so much that we avoid its usage as a slogan. If we bear in mind that the end products of taxonomical arrangements, irrespective whether carried out by classification or by ordination, are never independent of the choice of methods, the points of view and the subjective quality of the person making the arrangement, we should be cautioned to be modest and pragmatic. The end products of these arrangements are not assessed in light of some kind of predetermined consensus, or rigid a priori aspects, but rather whether they fulfil the given practical goals. Hence taxonomy is a "pre-systematics" branch of science. If someone publishes his taxonomic results as some kind of replacement for systematics, he might easily become ridiculous: this is not contradicted if a subsequent systemetic analysis of a taxonomical arrangement shows that it is in good agreement with the phylogenetic classification of the group in question. However, in order to have the various arrangements and their authors to peacefully coexist, the rules of naming animals must be updated (see below).

Arguments and counter-arguments

We wish to emphasize that it is not the arguments in general that we are against, but we definitely object to futile arguments which do not even carry the possibility for agreement in them.

The argument on systematic problems among taxonomists can be traced to three differenct sources:

1. One kind of source can be the advice of a wise man as regards the objectives and taxonomical methods of a systematist. Such advice usually does not take into consideration the exploited state of our field of science and there is little hope that an outsider can extend realistic advices without being an active participant.

2. Excellent opportunities arise for provoking prolonged debates if a taxonomist propagates semi-digested systematic principles and embarks upon a crusade to carry his point to the end.

3. A few young graduates with brilliant ideas consider taxonomy as a hunting ground where aged, ignorant, to the new imperceptive taxonomist rabbits may be hunted. We do not mean to say that no advice in welcome from someone who has spent less time at the microscope than the addressee of the advice, but we find that advices are not readily taken from someone who has never looked through a microscope or who has just started doing so. If, in addition the propositions of our young colleagues are aggressive, arrogant and cynical, even those taxonomists will be confronted who otherwise would have been willing to take heed of the advice and consider their arguments.

We find an increasing number of polemic papers in the recent taxonomic literature. This may be a consequence of the fermenting debates currently pregnant in systematics. Those are not only the debates among the leaders of the outstanding evolutionary systematics schools (from which we expect the renewal of systematics), but also the debates over the "systems" devised by playful categorizing. Taxonomists working with other groups had for decades found cause for ridicule in the fact that any ornithologist worthy of his penny created one or two "systems". The increasing number of acarid and dipteran systems are also cause for concern (after HENDEL, HENNIG, STEYSKAL, ROHDENDORF, OLDROYD, ANDERSSON, GRIFFITHS, ACZÉL and others have erected a "system", some of them even more than one). The increasing number of taxa used is simply shocking: a single dipteran species may be included in the following higher taxa: order, suborder, superphalanx, prephalanx, phalanx, subphalanx, superfamily, prefamily, family-group, family, subfamily, tribe, subtribe, genus, subgenus. We have no intention of questioning the validity of monophyletic groups (e.g. Oppiidae, Sphaeroceridae, Aves, etc.) (see SIMPSON, 1953, 1959, etc.; RENSCH, 1960; SCHAEFER, 1976). We are concerned, however, about the fact that a considerable portion of the time and energy of systematists is devoted to debates over "systems" and categories. The phenomenon that a systematist running out of argument will fall on his foe with the heat and hate of a religious warrior, may very well be observed in taxonomical debates. We think that such a consequence of the close cooperation between the two fields of science is not necessary.*

As a consequence of the above-mentioned we consider that debates on several, perhaps many concurrent arrangements of an animal group are not cause for a necessary debate. However, since the primary objective of taxonomy is to acquire better knowledge of the species, this aspect should be borne in mind when devising arrangements.

For us a species' name is that wonderful key which opens a whole mine of knowledge for mankind, in possession of which we can collate information so far gathered by science with the name. The biological distinctness of the majority of the species is so evident that even with the primitive tools of museum taxonomy (microscope, literature and some brain) 99 – 99.9% of the species can be identified. Since only a fraction of the distinctness of the various biological species is manifested by phenological characters which can be analysed by us, we should not claim any responsibility for the "remaining" unidentified part. Biochemical, genetic etc. methods may very well reveal many differential characters. The so-called "uncertain" cases are but dichotomies, stages in the continuous process of speciation. A species name is a code which becomes functional by setting up a reference set of morphological, bionomical (perhaps biochemical, etc.) characters, in possession of which the species coded by that specific name may be distinguished from its nearest relative. Ever since LINNAEUS it has been customary to use hierachical categories to locate a given species: each taxon is defined by that set of characters held in common which at the same time distinguishes the taxon from the others. Hence the names of the taxa are character categories, and the higher in the hierarchical scale the taxon the fewer the characters held in common. We consider this archaic rather primitive method as the most suitable for devising useful arrangements, because this way any taxon name may automatically be included in identification keys.

We wish to re-emphasize that the above does not mean that we do not consider other arrangements useful and outstanding intellectual achievements. That we consider this method as the one to be used is due not to our modesty but to the following:

1. There are very few zoologists studying the fauna of the world and there are many "white patches" and insufficiently known groups of animals;

2. The fauna of the world is diminishing at a rapid pace, especially in the Tropics where the native vegetation is being devastated.

3. Medicine, agriculture and environmental protection increasingly demand that quick identification be carried out on species posing problems for those

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* We will dispense with the contrary mistake, i.e. several taxonomists, saying that they are zoosystematists, peddle with systematic problems which they are not familiar with. Often enough these attempts result in mediocre papers on "systematics", in lengthy discussions operating with the vocabulary of evolutionary systematics but in reality saying nothing more than more or less typological statements. These mental miscarriages often question the taxonomic abilities of their author.

fields. In other words, the taxonomist of these days is not engaged in descriptions of hitherto unknown species simply because his abilities do not render him suitable for anything else, nor without the wise advices of systematists we would fall back to the slump of 18th century science. On the contrary we should realize that there is nothing more urgent than to carry out the work that has been left undone by the scientists of the 18th to the 20th centuries! We are very well aware of the anachronistic nature of our daily work. Our methods have been modernized which only means that progress is made at a faster pace. The responsibility is, however, ours and cannot be shared with anyone else. There is no doubt that the efficacy of the control of flies pestering free-grazing cattle, and hence milk production, is higher when measures are planned in light of fly taxonomical (bionomical, autecological) data. At the same time it is evident that milk production is not affected by the usage or omission of the superphalanx category. "The test of the pudding is eating" – that of taxonomy is whether its results are used by anyone, and in what way.

The essence of taxonomic work is to revise the taxonomy of various groups. There are three possible ways to do this.

1. The senior author of this paper (Balogh, 1983) and Woas (1981) collected all descriptions and illustrations of his study group previously published and selected a set of characters found in all or almost all descriptions, and on the basis of these defined the categories. In this method the concept of the "weakest link" is used, but the chain will be complete as all or almost all links will be joined. There is one undebatable merit of this procedure: extensive completeness.

2. The other way is to prepare original descriptions and figures of all hitherto described taxa and to erect new categories based on the characters obtained in this way. In this case, and in only this case is the taxonomist in a position to reject previously defined concepts of arrangements and taxa. Besides Raven, 1983; etc., one of the best examples for this kind of procedure is the revision most of of the taxa of the dipteran subfamily Limosininae of Sphaeroceridae by Roháček (1982–83). In this case the concept of the "strong link" is used but the chain will be complete as all or almost all possible are included. It is only by using this procedure that we may reject an arrangement obtained by *1.*

3. Seniczak (1975) and Woas (1986) used a third kind of procedure. Based on their own studies they prepared new modern descriptions of some species and classified most of the descriptions in the literature as useless. In this case the concept of "few strong links" is used: the taxonomist forces himself to reject everything done by his predecessors. The accrueing chaos is even worse than that caused by using procedure 1.

Acceptance of this principle contradicts the driving forces behind the development of taxonomy. In our opinion the strategy of this branch of science necessitates that guerilla warfare methods are not to be used. The trouble with these publications lies not in the lengthy introductions in which the authors describe in what way they are guerillas. There is a place for even the 73rd theory of the extinction of Mesozoic reptiles and it is possible to find a forum for publishing papers of these guerilla antics as well. The trouble is that the authors, irrespective whether they are aware of it or not, subject their way of thinking to a single hypothetical point of view and fail to scrutinize their argument from other points of view.

There may be pragmatic circumstances besides the above which may have influence on the principles of arrangements. Perhaps the most important one is the current regulation of nomenclature which strictly stipulates that binomial nomenclature be used. This fact forces the taxonomist to use the generic category. If this is so, for us the genus is simply the lowest-named taxonomic category. A taxonomist engaged in the study of a group is not at liberty to use the genus or the subgenus as the lowest category, or perhaps the species group, as the history and the traditions of the taxonomy of the group are compelling. The problem is not simply that the "systems" devised by worthy predecessors have become "objects" published in papers and handbooks. For instance in the family Tachinidae there are traditionally many genera of a few species and in the Tipulidae there are a few genera each with numerous species. The genus *Drosophila* is of gigantic size simply because elevating the various subgenera to generic level would result in *Drosophila melanogaster* being no longer a *Drosophila* species, and no one is willing to propose such a splitting.

We substantiate our reasoning for using suprageneric taxa in light of the above with argument borrowed from taxonomy: we have no way of completely and accurately measuring the genetic differences between the species. The taxa of the various levels of the hierarchical arrangement are not all of the same age, they are not equivalent since the tempo of evolution is not the same in various groups and the life-span of the stem-species cannot be used as criteria. There are acarid species known from the Devonian (ca. 400 m.yrs B.P.) included in recent familial taxa (SHEARS, 1984) whereas the stem-species of birds are a few 10 million years old. (The problems of this issue are best and in most details discussed by W. HENNIG; we are not alone in not accepting his propositions).

A prerequisite for a true classification of a group is to know the phylogenetic lineages, ontogeny, etc. of the group in question. However, for instance the phylogeny of the oppiid mites is completely unknown and the ontogeny of only a fraction of the known species has been studied. For many large groups of dipterans only single incomplete pieces of information are available. Since neither of us has found pleasure in the brain-training game of erecting categories, we cannot boast with any "phylogenetic systems".

It is not from birth, and not by chance that we have become suspicious of the so-called "phylogenetic" methods of analysis. The palaeontological data are nothing but blur still-pictures of the phylogeny of living matter, so we believe palaeontological studies should not be considered phylogenetic inquiries at the same time, only evidence is provided for the evolutionary process. There is no reason to consider analyses of incompletely known morphological characters as phylogenetic work. The dichotomies of the past are "deliveries" where neither the mother nor the child can be distinguished: the evolution of living matter continues in both equivalent branches of the dichotomy. This is the point which questions the validity of purely cladistic analysis: the lineage conserving the ancestral single selected character may change in respect of other characters at a faster rate than the other lineage, in which a character different from the ancestral one has evolved. New "plesiomorphic" characters may take the place of apomorphic characters: equivalent configurations of setae, leg modifications and wing venations among dipterans are certainly determined by the same gene complex in various Acalyptratae families. It is more likely that these genes have become even less manifested rather than independently evolving in various groups. If this used to be the case in the past, we may fool ourselves by analysing the "Schwestergruppe". The isolated palaeontological finds provide no clues: we do not know whether the fossil in question was the spark-off of a lineage or it represents an "apomorphic" lineage leading to extinction, and whether there are any hidden characters in that species. The argument concerning "monophyletic or paraphyletic" evolution is futile in lack of complete or more or less so palaeontological series.

Let us briefly mention the two major fields of taxonomical "debates".

There are several proposals to modify the currently used rules of nomenclature. Papp (1983), simply considering practical, purely taxonomical arguments, proposed that the rules pertaining to descriptions of species and those regulating the validity of species names be made more stringent in order to increase the chance of stability in face of priority. Griffiths (1976, etc.) approached the problem from an entirely different point of view and proposed among others that the rules pertaining to the categories and their nomenclature be relaxed (e.g. the regulations specifying the suffixes of various categories should be abolished). Griffiths proved that a classification (in the above sense, i.e. part of systematics) encompassing extinct and extant species poses unresolvable problems for traditional Linnaean nomenclature. It is not for the sake of provoking discussion that we quote from him: "The Linnaean order of categories is a branch of Aristotelian essentialism". "There is no logical necessity to classify monophyletic groups (taxa), i.e. to place them in families or categories". Since the "ancestral species" (stem-species) are not part of the hierarchy only the terminal (i.e. recent) species are, "the traditional form of Linnaean hierarchy must be modified in order to reflect the phylogenetic relationship among the species . . .". By introducing the concept that taxa are non-categorized hierarchies (Griffiths, 1976 : 168 : "the unclassified hierarchy of taxa"), the problems of both systematic classification and taxonomic arrangement can be resolved. The most important outcome of this solution would be that many future arguments would never take place, e.g. the many worthy and smart colleagues engaged in analysing recent species by ordination methods would not be forced to painfully squeeze their results into classification categories. Until such time as these changes take place, we recommend to our colleagues who produce taxonomical arrangements lacking phylogenetic evidence (using Papp's [1986] unrespectful expression, nothing-better-to-do systematists), that they turn to supraspecific categories only when absolutely necessary.

A typical field of futile and paper-wasting debates is to argue over the writings of long deceased ancestors.* Undoubtedly it is very time-consuming and laborious to loan, study and redescribe all type specimens prevously not known or poorly known by us, we personally known how difficult it is, yet this is the only possible solution. If a type series becomes lost or destroyed, neotypes must be designated and described, or using a new specific name a decent description must be produced. It is not our duty to analyse the personal abilities of our predecessors. Their activities have come to an end upon their death and their papers, books and type specimens are all objectively of the same value to us.

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* In order not to offend anyone or provoke further debates among the authors widely known in our fields of speciality, let us just mention O. Duda (1935, 1938, etc.) who spared neither paper nor his readers' patience in speculating on what he thought his predecessors had thought in their publications.

We are confident that taxonomists should aim at acquiring better knowledge of all aspects of the various animal species (populations). Attempts should be made to provide better facilities for carrying out besides morphological studies genetic, physiological, biochemical and so-called autecological analyses. Therefore we think at the present stage of zootaxonomy it would most appropriate to discuss how to increase the standard of species descriptions, how to expand the forms and methods of the reference basis. In certain fields, e.g. in dipterology there is still redundancy in the communication of information: there are no guidelines for brief, to-the-point and at least partly coded descriptions. Acarologists have from the beginning almost obligatorily figured their new species, thus condensing a vast amount of information into small space, and elaborated a code system for the location and names of the various setae. A rationalization on information provision will become necessary for many animal groups because of the above mentioned problems and difficulties in publishing.

The other problem is also methodological. DE SOLLA PRICE (1967) long ago noted as an outsider that in a few "specially archival field, e.g. "zoo- and plant taxonomy", the proportion of citations of recent publications may be as low as 15%. Unlike other branches of sciences, in zoology there is no such thing as a frontline of research being about 40 publications in depth and all the second-line papers precipitating in reviews or even textbooks. It is hardly questionable that a frontline of results achieved with regular (not guerilla) tactics should also be established in taxonomy. To meet this end reviews, catalogues, monographs and official species lists of complete groups of animals need to be published. There is a need afford the same rank to revisions and monographs (proposed by HOWDEN, EVANS and WILSON (1968) and others) such as the one enjoyed by the "Systema Naturae", which means that there is also a need to change the rules of nomenclature. Today a taxonomist working on a larger group is flooded by a mass of information of thousands of publications.

The latter two issues are such that truly require a consensus of taxonomists in general. We would welcome taxonomists focusing future discussions on such problems.

In lieu of summary we wish to extend the following advice on how to avoid unprofitable debate on systematics among zootaxonomists. The wording of these advice has been affected by our fear that we may appear arrogant and conceited.

1. Respect biosystematics! Consider it what it is: the branch of biological sciences working on and synthesizing the greatest amount of factual knowledge. Do not belittle yourself but your attitude be controlled by a fear that successfully working in this field is the privilege of outstanding geniuses such as E. MAYR or G. G. SIMPSON.

2. Admit that there is no place in zoosystematics for rushing ahead: it is part of the essence of this science that significant progress may only be made if all or at least the majority of the species of the group in question are known to an "average" extent.

3. If you aspire for a Nobel price, it is time for you to quickly look for another profession. What this branch of science needs is diligent artisans and not brilliant brain-storming geniuses. The meticulous care for details and the many years spent looking through your microscope will earn you the respect for your taxonomical work.

4. It is impossible and quite unnecessary to convince Brontosauruses that their time is up: wait till they become extinct and their views will perish with them. Till then it should make you happy that the real data of the animal species collected by you should withstand the ravages of time.

5. If there is a contemporary taxonomist whose views you do not agree with, first send him or her your reprints, then through correspondence or personal discussion try to convince him or her of your opinion. If your partner should prove as unbending as Soós and Papp (1984) were in their ideas on how to edit the palaearctic dipteran catalogues, compose your answer in a strictly objective scientific publication.

6. There might have been some slow-minded, one-eyed and even alcoholic persons among the founding doyens of zootaxonomy, but they are the partners for debates only for idiots and occultists. You do not necessarily have to respect your predecessors, but always consider their works with patience, in light of the standards of the era long past.

7. Save your wit for entertaining your guests at your coctail party! Clever remarks, mocking (arrogance, aggressiveness) will not get you closer to your goal, as the most important criterion of a given scientific achievement is its present and future usefulness.

8. If you cannot respect your contemporary partner's opinion, be considerate and generous! Take pains not to show that what he is saying is nonsense.

9. Try as much as possible to avoid debates! Punish your colleagues producing „new systems" by ignoring their papers. Instead of debates focus your attention on describing your new species with meticulous care, employing methods in accordance with the technical standards of our age and try to meet the demands of the practical users of your work as much as possible.

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A survey of the Amerioppia species (Acari, Oribatei)

By

P. BALOGH*

Abstract. A short diagnosis of the genus *Amerioppia* HAMMER, 1961 is given. Identification keys to eight artificial species groups and 41 known species are added.

The genus *Amerioppia* was established by HAMMER (1961). Generic diagnosis:

Five pairs of genital setae. Nine or ten pairs of notogastral setae: setae c_2 (= *ta*) present or absent. Prodorsum without costula. Notogaster without crista. Sensillus fusiform or lanceolate. Interlamellar setae absent. Exostigmatal setae strong, ciliate. Rostral setae originating on the upper side of the rostrum. Three (or two) pairs of interbothridial sigilla present. Lyrifissurae *iad* in adanal position: near to anal plates. Genital plates smaller than anal plates, slightly narrowing forwards.

Type-species: *Amerioppia rudentigera* HAMMER, 1961.

I have found 41 species in the literature that may be placed in the genus *Amerioppia*. The great majority of the species seems to be well established, still at places the differences are hard to describe and merely quantitative. My opinion is that in the descriptions and drawings of the Oribatida species published in the last 30 years a huge mass of information is hidden that should be brought to light. In case a drawing is made by the help of the Abbé apparatus and good care was taken in tracing, the author fixes such information that will only be used in the future when separating the species. The description in oribatidology is far more important than in any other group of animals. The types, especially those of old authors, have been preserved on permanent slides. With the passing time some are squashed and only fragments are recognizable. In such cases that original description harbours a great deal of information more than the squashed specimen. One of the aims of my contribution is to present an identification key which was constructed on these bases. Although some of the data (e.g. the length of setae, the distance of insertion points) might seem to be uncertain, practice shows that this kind of a key much facilitates identification.

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My other aim is to throw light on some interesting trends of distribution of the *Ameroppia* species. Although the continents are not equally explored from the point of view of oribatid mites, we have such a quantity of information that allows to ascertain, at least, the principal trends of distribution. The picture concerning the 41 *Ameroppia* species is quite surprising. The majority of the species lives in the higher altitudes of the Neotropical and the Ethiopian Regions, as well as in the southernmost parts of the southern continents. There are 31 such species, a total of 75%. The remaining 10 species (25%) are found in the Holarctic and the Oriental Regions, 2 and 5 species, respectively, and in the Pacific region, where 3 species are found. The former 31 species live on the parts of Gondwana while the rest in Laurasia. Out of the 10 species, five live, as do the 31 species, in the Southern Hemisphere. Consequently, we may establish on the basis of the 41 known *Ameroppia* species, that the majority lives in the higher mountains of the Southern Hemisphere; especially in the tropical moss forests and montane forests, where the diversity of the species is the highest. It is quite likely that these were the places where speciation took place at the highest rate in the historical geological epochs.

Identification keys to the species groups

1 (2) Sensillus bilaterally ciliate 1
barrancensis group

2 (1) Sensillus without cilia (exceptionally with very small and short spines or granula).
3 (6) Notogastral setae long: as long as or longer than the distance of $la-lm$.
4 (5) Sensillus long: as long as or longer than the distance of bothridia . . 3
decemsetosa group

5 (4) Sensillus medium long or short: shorter than the distance of bothridia 2
longicoma group

6 (3) Notogastral setae medium long or short: shorter than the distance of $la-lm$.
7 (12) Notogastral setae short: shorter than the half distance of bothridia.
8 (9) Sensillus long: as long as or longer than the distance of bothridia . . 4
longiclava group

9 (8) Sensillus medium long or short: shorter than the distance of bothridia.
10 (11) Sensillus short: with short stalk and globular head 5
espeletiarum group

11 (10) Sensillus medium long: with longer stalk and gradually dilated head 6
chilensis group

12 (7) Notogastral setae medium long: longer than the half distance of $la-lm$ (but shorter than the distance of $la-lm$).
13 (14) Sensillus long: as long as or longer than the distance of bothridia . 7
lanceolata group

14 (13) Sensillus medium long or short: shorter than the distance of bothridia 8
rudentigera group

1. barrancensis group

1 (2) Rostral setae originating far from each other, almost parallel. Interlamellar region punctulate. Sensillus setiform, with very slightly dilated distal half. L : 293 µm; W : 153 µm. – USA ....
minuta (Ewing, 1917)

2 (1) Rostral setae originating near each other, geniculate.
3 (4) Lamellar lines slightly converging. Apical half of sensillus well dilated. L : 300 µm; W : 172 µm-. – Peru, Mexico ....
barrancensis (Hammer, 1961)

4 (3) Lamellar lines parallel. Distal half of sensillus very slightly dilated.
5 (6) Short median line between the light spots in the interlamellar area present. Setae p_1 only a little shorter than r_1. L : 260 µm; W : 184 µm. – Java ....
javensis Hammer, 1980

6 (5) Median line between the light spots in the interlamellar area absent. Setae p_1 more than twice shorter than r_1. L : 256 – 279 µm; W : 145 – 152 µm. – Paraguay ....
paraguayensis (Balogh & Mahunka, 1981)

2. longicoma group

1 (2) Lamellar setae long: as long as the distance of *le-ro*. Setae c_2 absent. Setae *lp* twice longer than r_1. Larger species, L : 520 µm; W : 280 µm. – Bolivia, 4900 – 5400 m ....
longicoma Hammer, 1958

2 (1) Lamellar setae short: distance of *le-ro* more than twice longer than lamellar setae. Setae c_2 present. Setae *lp* as long as or only a little longer than r_1. Smaller species, L : 291 – 307 µm; W : 160 – 168 µm. – Tanzania ....
extrusa Mahunka, 1983

3. decemsetosa group

1 (4) Setae h_2 thrice or more longer than h_1.
2 (3) Setae $p_1 - p_3$ short, not longer than h_1. The five long notogastral setae *(la, lm, lp,* h_2 and h_3*)* rigid. L : 246 µm; W : 139 µm. – Columbia, 2700 m. ....
sturmi P. Balogh, 1984

3 (2) Setae $p_1 - p_3$ longer than h_1. The five long notogastral setae with flagellate end. L : 291 – 295 µm; W : 162 – 170 µm. – Fiji Islands ....
aelleni Mahunka, 1982

4 (1) Setae h_2 either as long as or, at most, twice longer than h_1.
5 (6) Setae h_1 as long as h_2. Lamellar line present. L : 281 – 310 µm; W : 150 – 160 µm. – Ethiopia ....
polygonata Mahunka, 1982

6 (5) Setae h_1 shorter than h_2. Lamellar line absent.

7 (8) Setae c_2 absent. Alveoli of rostral setae almost touching. The light spots in the interlamellar area of different sizes: the first and second pairs smaller, the third ones larger. Only the distal third of sensillus slightly dilated. L : 265 µm. – Sahara ....
flagellata Hammer, 1975

8 (7) Setae c_2 present. Alveoli of rostral setae well separated. The light spots in the interlameller area almost of the same size. The distal half of sensillus very slightly dilated. L : 370 µm; W : 199 µm. – Samoa ....
decemsetosa Hammer, 1973

4. longiclava group

1 (4) Setae c_2 absent. Setae p_1 longer than p_2 and p_3. Two very similar species.

2 (3) The end of sensillus with a long and gradually attenuated tip. Vertical separating lines between the light spots of interlamellar area absent. L : 300 – 320 µm; W : 180 µm. – Patagonia, New Zealand ....
longiclava Hammer, 1962

3 (2) The end of sensillus with short, abruptly attenuated tip. Two vertical separating lines between the light spots of interlamellar area present. L : 245 µm; W : 149 µm. – Fiji ....
vicina Hammer, 1971

4 (1) Setae c_2 very short but present. Setae p_1 to p_3 of the same length. Two very similar species.

5 (6) Rostral setae geniculate. L : 250 µm; W : 139 µm. – Java ....
ventrosquamosa Hammer, 1980

6 (5) Rostral setae only slightly curved. L : 320 – 360 µm; W : 180 – 208 µm. – Peru ....
chavinensis Hammer, 1961

5. espeletiarum group

1 (2) Notogaster outside of setae c_2 each with an oblique longitudinal line, resembling a crista. L : 360 µm. – El Salvador ....
salvadorensis (Woas, 1986)

2 (1) Notogaster outside of setae c_2 without an oblique longitudinal line. Two extremely similar species.

3 (4) Prodorsal and notogastral setae smooth. L : 328 – 414 µm; W : 189 – 230 µm. – Columbia, 3700 m, *Espeletia* ....
espeletiae P. Balogh, 1984

4 (3) Prodorsal and notogastral setae finely ciliate. L : 340 µm; W : 180 µm – Germany (Schwarzwald) ....
badensis (Woas, 1986)

6. chilensis group

1 (4) Setae h_2 relatively near to each other: distance of h_2-h_2 less than twice longer than distance of h_1-h_1 and always much shorter than that of $lm-lm$.

2 (3) Setae c_2 present. Alveoli of rostral setae almost touching. Lamellar line present. L : 285 – 299 μm; W : 152 – 166 μm. – Columbia, 4000 m ....
cocuyana P. BALOGH, 1984

3 (2) Setae c_2 absent. Alveoli of rostral setae well separated. Lamellar line absent. L : 330 μm; W : 190 μm. – Bolivia, 4000 m ....
notata (HAMMER, 1958)

4 (1) Setae h_2 far from each other: distance of h_2-h_2 at least thrice longer as distance of h_1-h_1 and always longer than that of $lm-lm$.

5 (6) Sensillus lanceolate: the lanceolated distal part as long as the stalk. L : 300 μm; W : 150 μm. – Peru, 3750 m ....
paripilis HAMMER, 1961

6 (5) Sensillus with a fusiform head: the dilated distal part shorter than the stalk.

7 (8) Sensillus finely granulate. The three pairs of light spots in the interlamellar area connected with united circular field. Setae p_1 to p_3 medium long, curved ventrally. L : 292 – 310 μm; W : 158 – 176 μm. – Tanzania
foveolata MAHUNKA, 1984

8 (7) Sensillus smooth. The three pairs of light spots in the interlamellar area well separated. Setae p_1 to p_3 short. L : 320 μm; W : 180 μm. – Chile, Puerto Montt ....
chilensis HAMMER, 1962

7. lanceolata group

1 (4) Setae c_2 absent.

2 (3) Sensillus much longer than the distance of bothridia. Six long notogastral setae *(la, lm, lp,* h_1, h_2 and h_3*)* of the same length. L : 350 μm; W : 170 μm. – Argentina ....
lanceolata (HAMMER, 1958)

3 (2) Sensillus as long as the distance of bothridia. Two pairs of notogastral setae *(la* and *lm)* long, the remaining ones much shorter. L : 350 μm; W : 210 μm. – Bolivia, 3180 m ....
rotunda (HAMMER, 1985)

4 (1) Setae c_2 present.

5 (6) Sensillus much longer than the distance of bothridia, with a pointed, long tip and with very short, scattered cilia. Setae h_2 twice longer than h_1 and as long as p_1. L : 366 – 405 μm; W : 230 – 247 μm. – Rhodesia
ankae MAHUNKA, 1974

6 (5) Sensillus only a little longer than the distance of bothridia, without long and pointed tip. Setae h_2 as long as h_1 and much longer than p_1.

7 (3) Setae p_1 to p_3 extremely short, hardly visible. Sensillus with gradually dilated and apically rounded tip. L : 287 – 353 μm; W : 172 – 197 μm. – West Africa ....
deficiens (Balogh, 1959)

8 (7) Setae p_1 to p_3 not very short. Sensillus only slightly lanceolate.

9 (10) Surface of prodorsum finely punctate; the anterior part finely striped. The whole surface is finely punctate. along the borders finely striped. L : 360 μm; W : 296 μm. – Peru, 3000 m. ....
pectigera Hammer, 1961

10 (9) Surface of prodorsum and notogaster smooth. L : 366 – 379 μm; W : 223 μm. – East Africa ....
meruensis Balogh, 1961

8. rudentigera group

1 (2) Seven pairs of notogastral setae *(la, lm, lp,* h_1, h_2, h_3 and p_1*)* long, with a dilated and fusiform tip. Setae c_2 present, small, p_2 and p_3 a little longer. Sensillus short, with a dilated head. L : 410 – 424 μm; W : 236 – 250 μm. – Antilles: St. Lucia ....
extrema Mahunka, 1984

2 (1) Notogastral setae setiform, normal, without dilated tip.

3 (8) Setae c_2 absent.

4 (5) Setae h_1 shorter than h_2. L : 340 μm; W : 196 μm. – New Zealand, Fiji ....
woolleyi Hammer, 1968

5 (4) Setae h_1 as long as h_2.

6 (7) Prodorsum smooth. Smaller species. L : 450 μm; W : 220 μm. – Bolivia, Peru, 4600 m. ....
trichosa (Hammer, 1958)

7 (6) Prodorsum distinctly punctate. Larger species. L : 560 – 570 μm; W : 340 – 350 μm. – Peru ....
trichosoides Hammer, 1961

8 (3) Setae c_2 present.

9 (10) Rostral setae geniculate. There is an auriculate outgrowth on the medial side of bothridia. Sensillus very finely ciliate. L : 26P – 285 μm; W : 150 – 170 μm. – Hong-Kong ....
interrogata Mahunka, 1976

10 (9) Rostral setae not geniculate. Bothridia without auriculate outgrowth.

11 (12) Minute species, 260 μm long. Setae p_1 about twice longer than p_2. L: 260 μm; W : 150 μm. – Peru ....
minima HAMMER, 1961

12 (11) Larger species, 320–770 μm long. Setae p_1 to p_2 of the same length.

13 (14) Giant, chestnut brown species, 770 μm. Notogastral setae rough and equally thick throughout. Prodorsum punctate. L : 770 μm; W : 477 μm. Peru, 3550 m. ....
rudentigera HAMMER, 1961

14 (13) Smaller and lighter species: 320–520 μm.

15 (16) Three pairs of notogastral setae: *la*, *lm* and *lp* longer than setae *h*. L : 450 μm; W : 248 μm. – Peru, 3300 m. ....
hexapilis HAMMER, 1961

16 (15) Five or six pairs of the notogastral setae of the same length.

17 (18) Setae h_1 shorter than h_2, thus only five pairs of notogastral setae of the same length. L : 420 μm; W : 226 μm. – Pakistan, 3000 m. ....
asiatica HAMMER, 1977

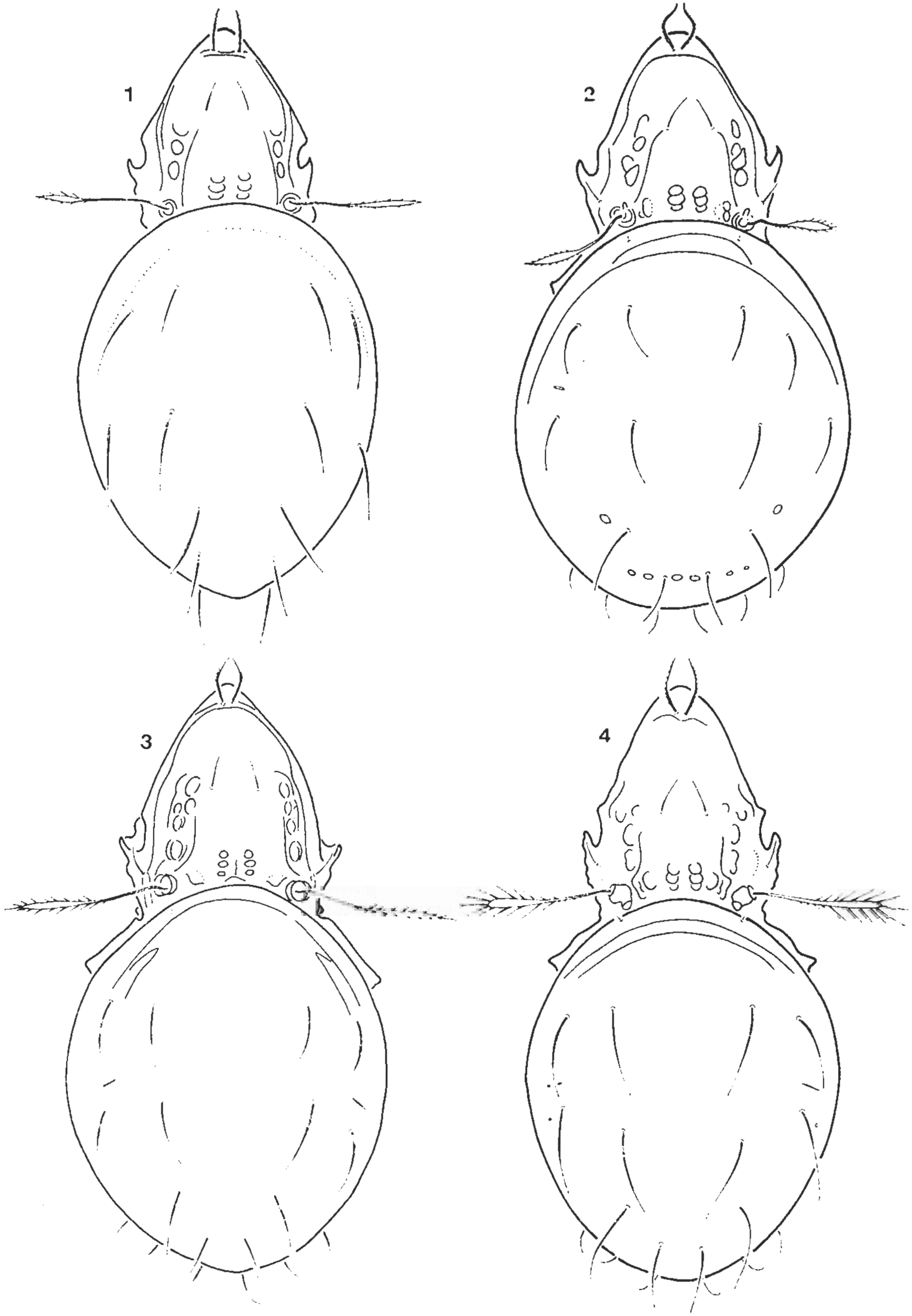
18 (17) Setae h_1 as long as setae h_2, thus six pairs of notogastral setae of the same length.

19 (20) Sensillus short, with short stalk and a broad, fusiform pointed head. L : 357–385 μm. W : 197–217 μm. – Columbia, 4640 m. ....
senecionis P. BALOGH, 1984

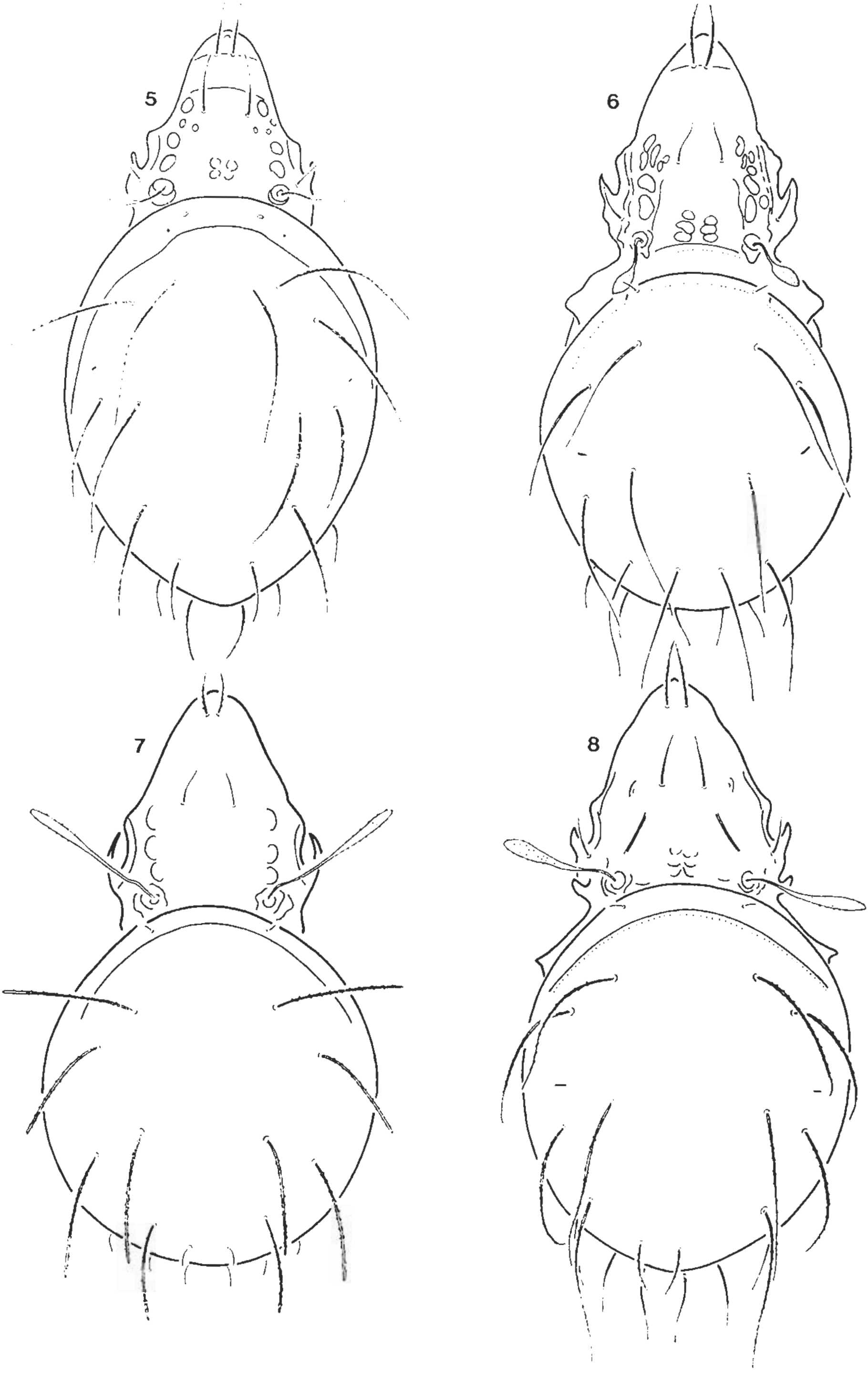
20 (19) Sensillus longer, with a medium long stalk and gradually dilated fusiform head.

21 (22) Rostral setae near to each other: alveoli almost touching. Lamellar setae far behind: distance of *le-ro* much longer than lamellar setae. L : 320–352 μm; W : 184–212 μm. – South Africa ....
africana KOK, 1967

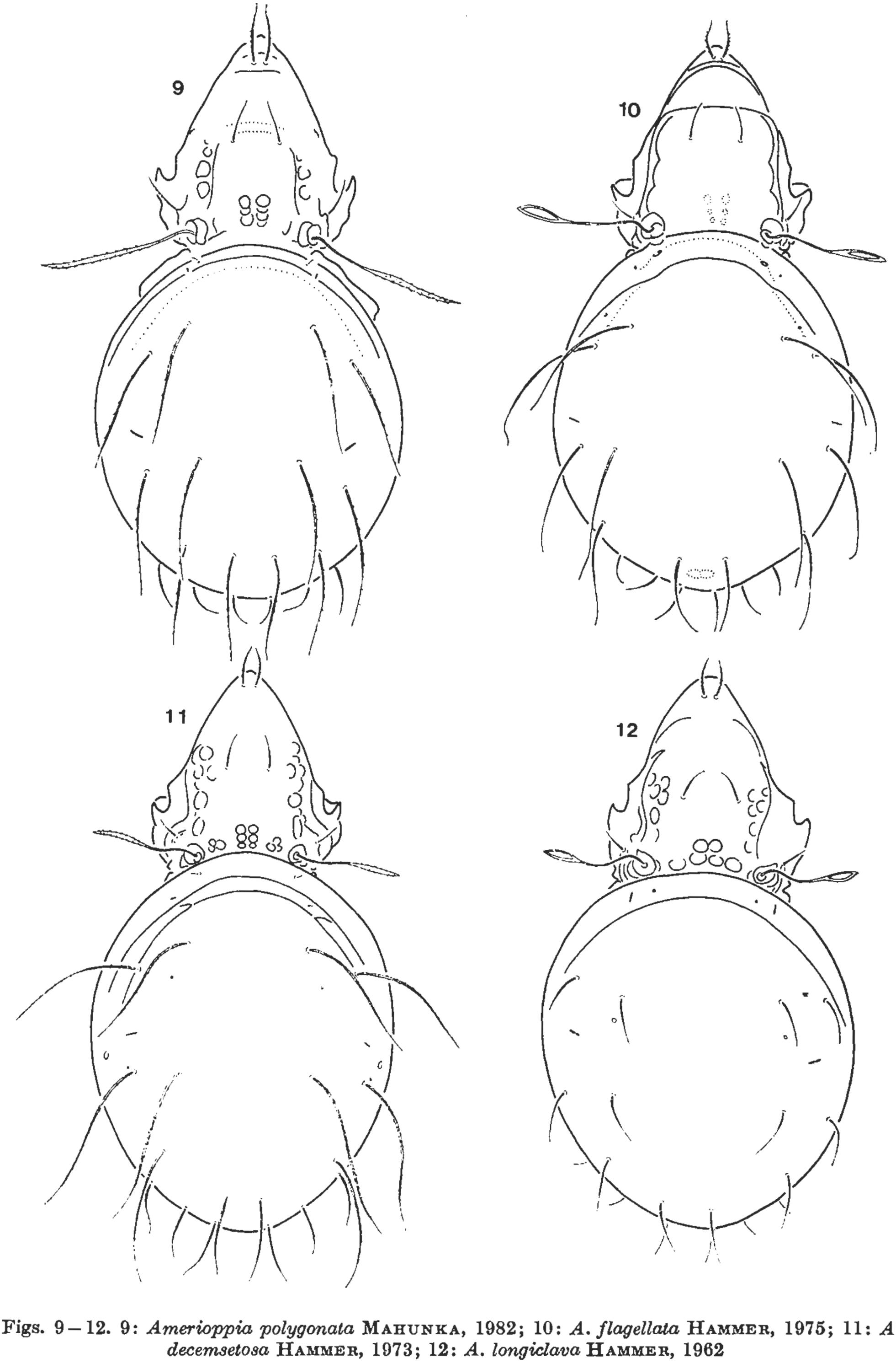
22 (21) Rostral setae well separated. Lamellar setae ahead: distrance of *le-ro* as long as lamellar setae. L : 520 μm; W : 323 μm. – Chile ....
similis COVARRUBIAS, 1967



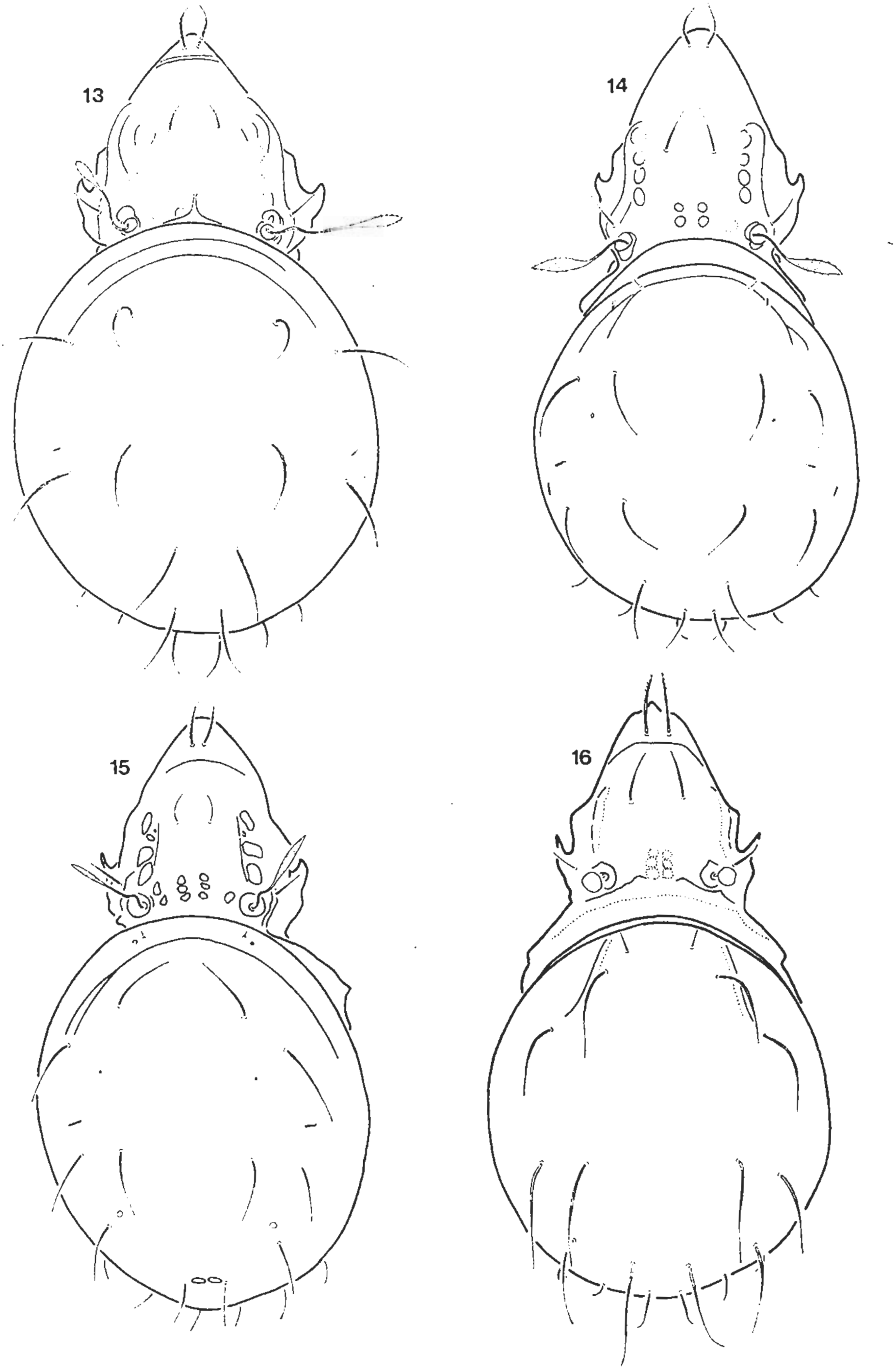
Figs. 1 – 4. 1: *Amerioppia minuta* (Ewing, 1917); 2: *A. barrancensis* (Hammer, 1961); 3: *A. javensis* Hammer, 1980; 4: *A. paraguayensis* (Balogh & Mahunka, 1981)



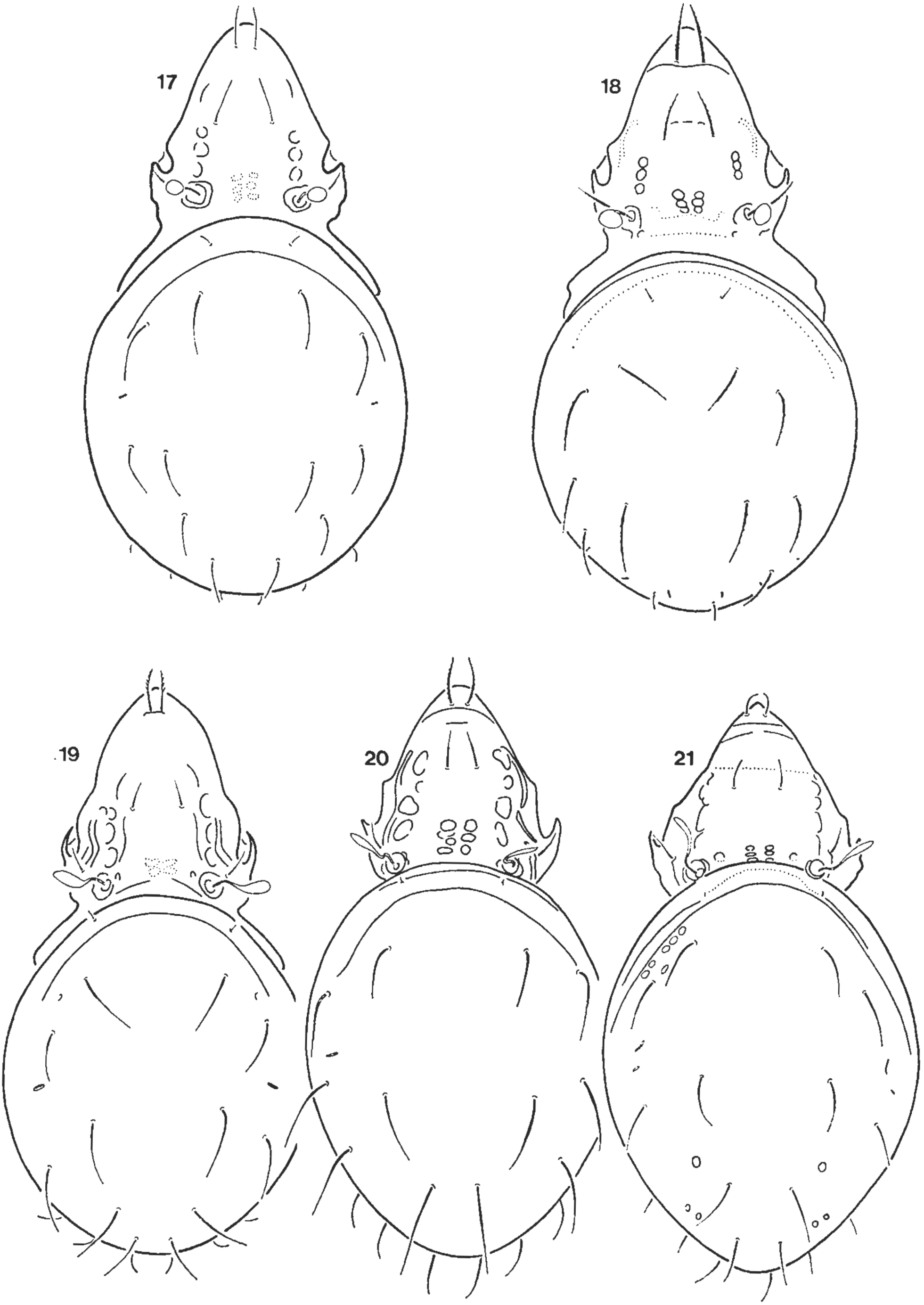
Figs. 5–8. 5: *Amerioppia longicoma* (Hammer, 1958); 6: *A. extrusa* Mahunka, 1983; 7: *A. sturmi* P. Balogh, 1984; 8: *A. aelleni* Mahunka, 1982



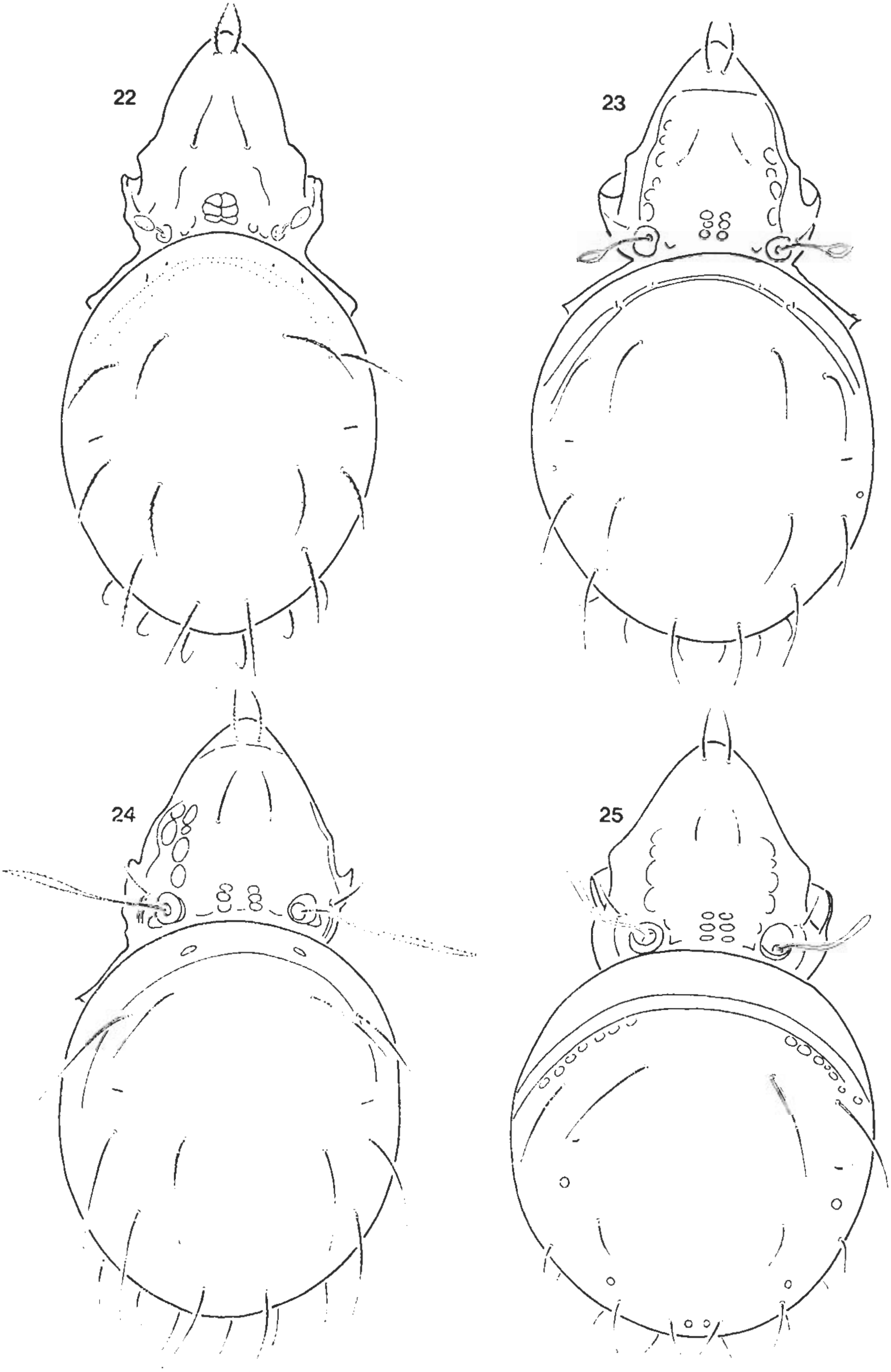
Figs. 9 – 12. 9: *Amerioppia polygonata* Mahunka, 1982; 10: *A. flagellata* Hammer, 1975; 11: *A. decemsetosa* Hammer, 1973; 12: *A. longiclava* Hammer, 1962



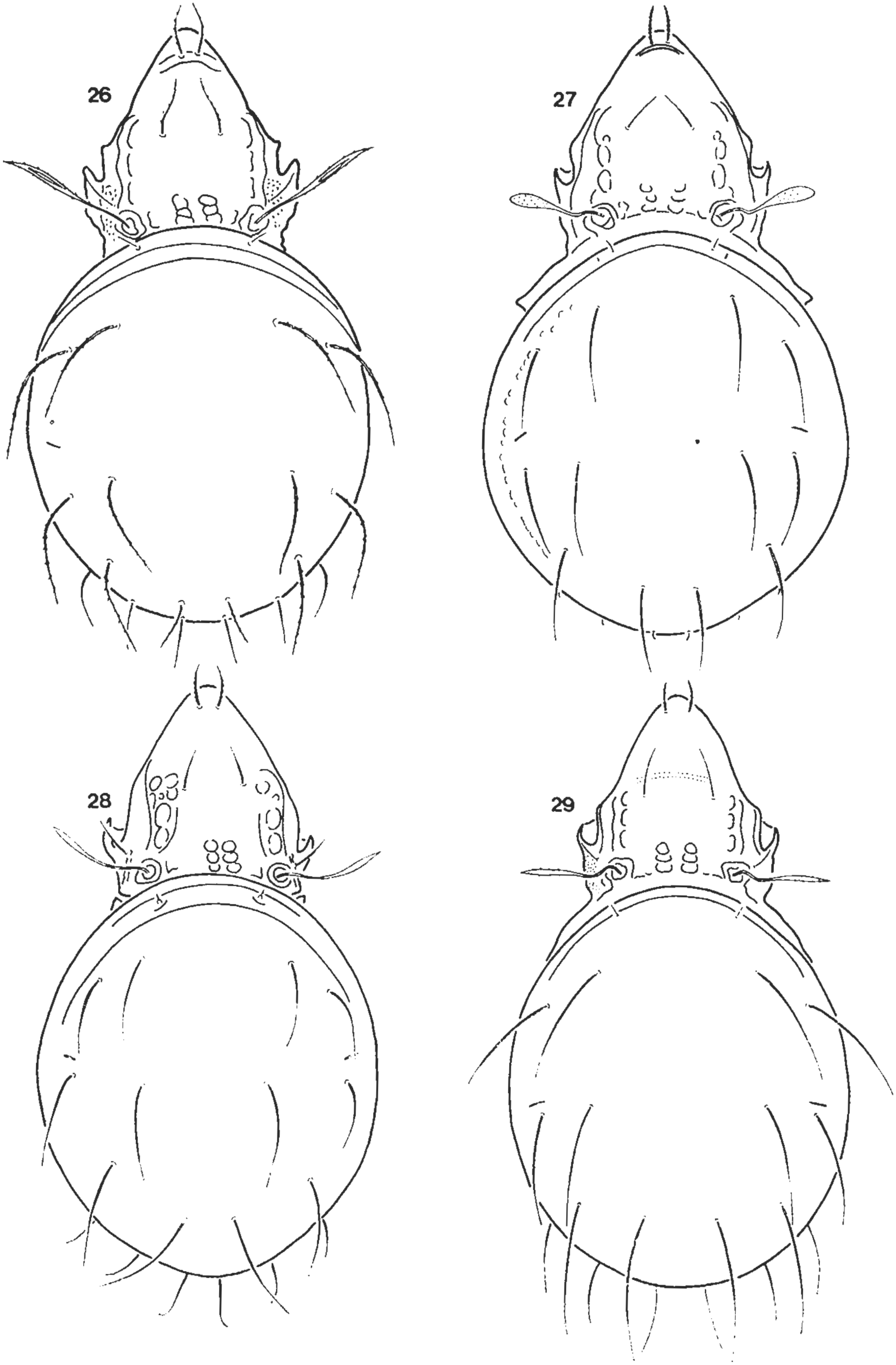
Figs. 13 – 16. 13: *Amerioppia vicina* Hammer, 1971; 14: *A. ventrosquamosa* Hammer, 1980; 15: *A. chaviensis* Hammer, 1961; 16: *A. salvadorensis* (Woas, 1986)



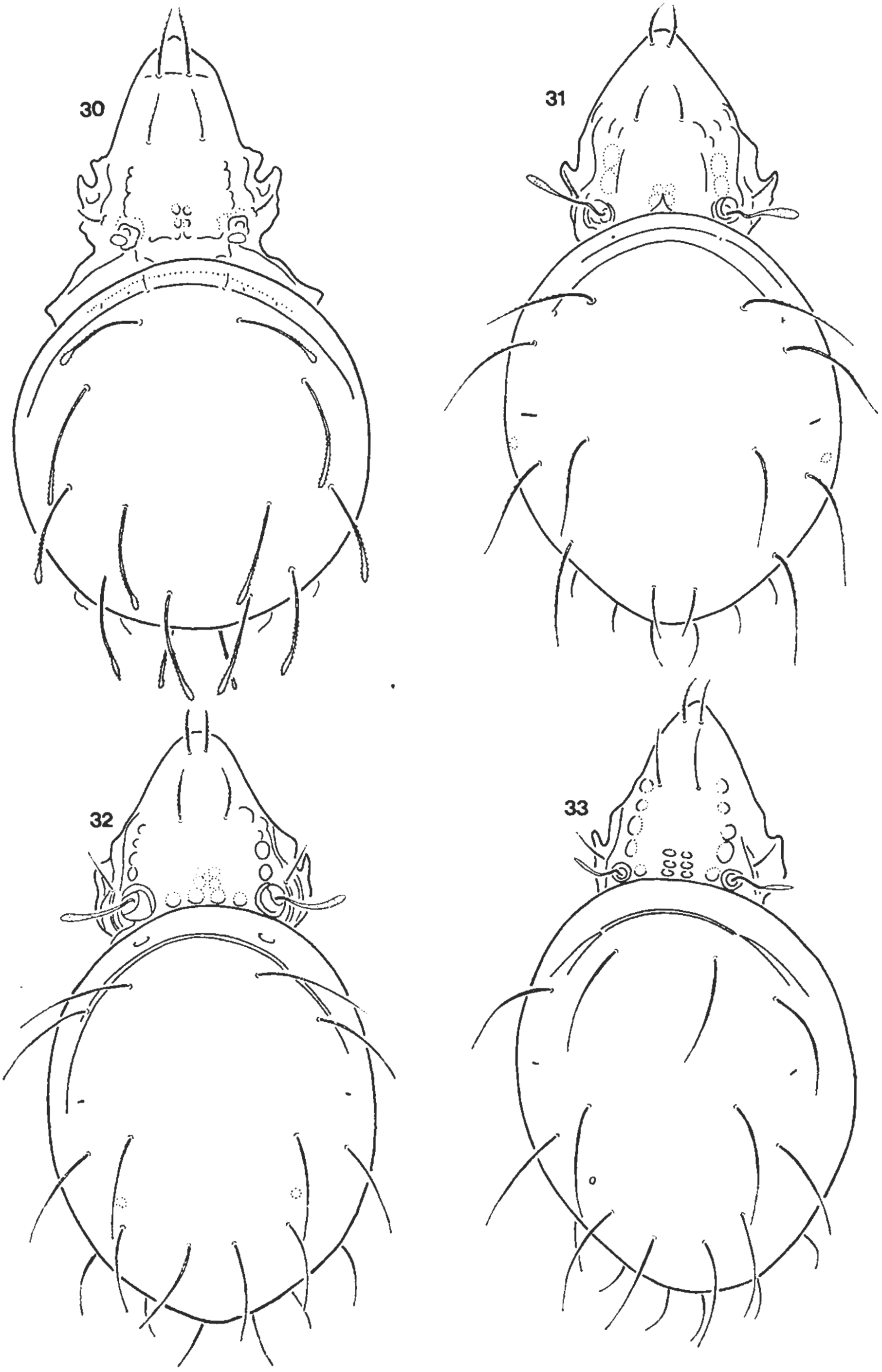
Figs. 17 – 21. 17: *Amerioppia espeletiae* P. Balogh, 1984; 18: *A. badensis* (Woas, 1986); 19: *A. cocuyana* P. Balogh, 1984; 20: *A. notata* (Hammer, 1958); 21: *A. paripilis* Hammer, 1961



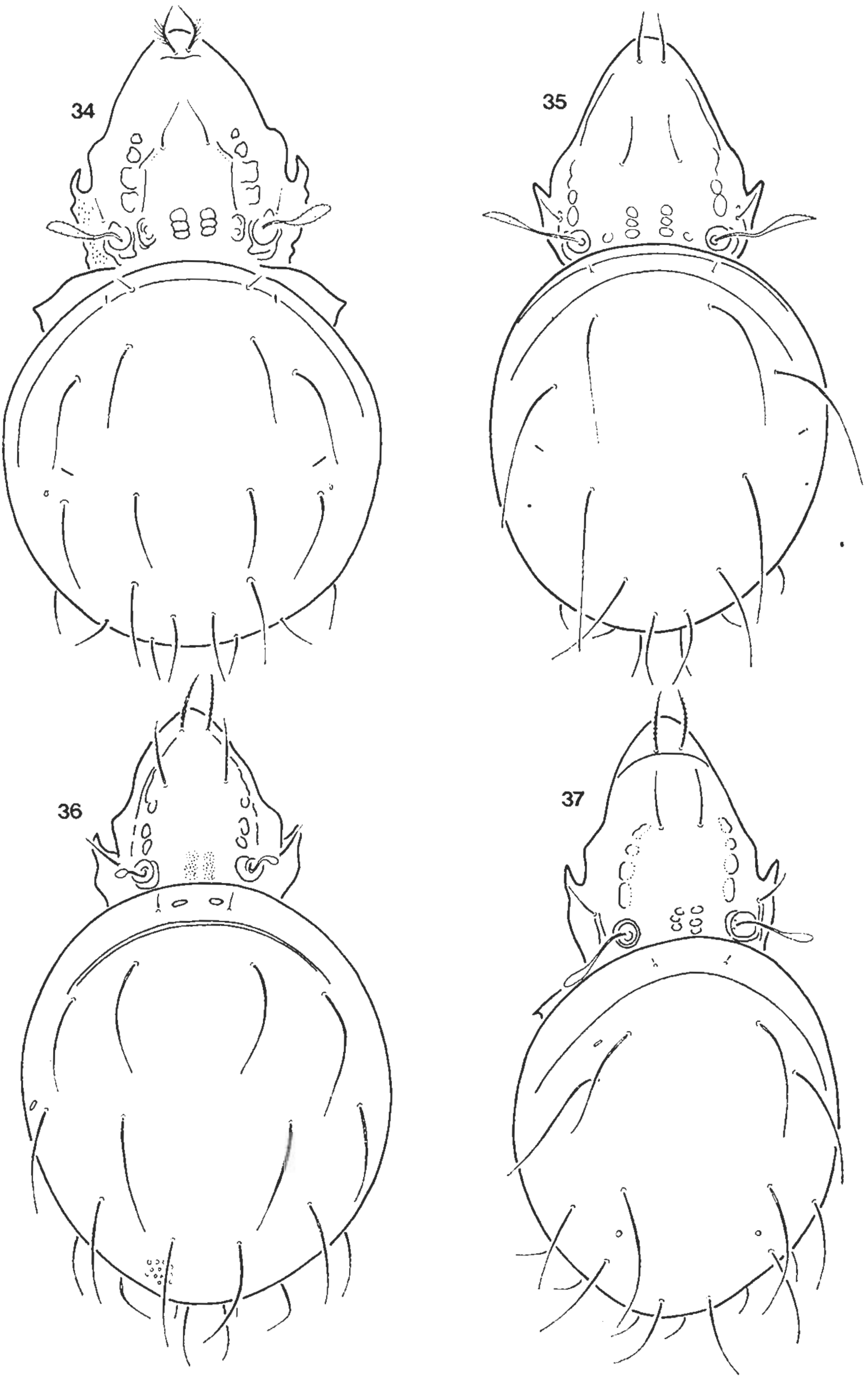
Figs. 22–25. 22: *Amerioppia foveolata* Mahunka, 1984; 23: *A. chilensis* Hammer, 1962; 24: *A. lanceolata* (Hammer, 1958); 25: *A. rotunda* (Hammer, 1958)



Figs. 26 – 29. 26: *Amerioppia ankae* Mahunka, 1974; 27: *A. deficiens* (Balogh, 1959); 28: *A. pectigera* Hammer, 1961; 29: *A. meruensis* Balogh, 1961



Figs. 30 – 33. 30: *Amerioppia extrema* Mahunka, 1984; 31: *A. woolleyi* Hammer, 1968; 32: *A. trichosa* (Hammer, 1958); 33: *A. trichosoides* Hammer, 1961



Figs. 34 – 37. 34: *Amerioppia interrogata* Mahunka, 1976; 35: *A. minima* Hammer, 1961; 36: *A. rudentigera* Hammer, 1961; 37: *A. hexapilis* Hammer, 1961

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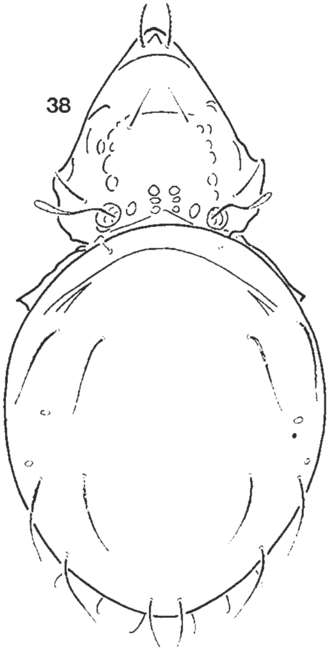

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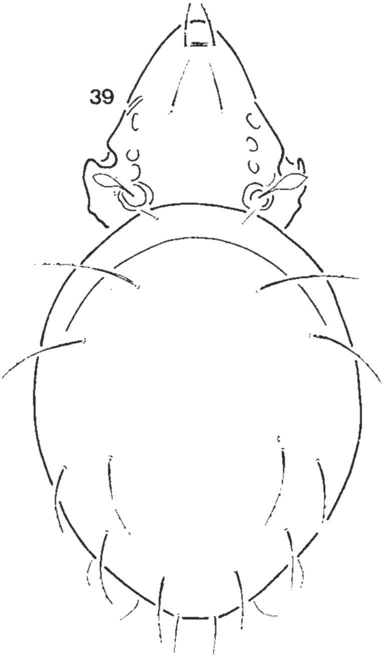

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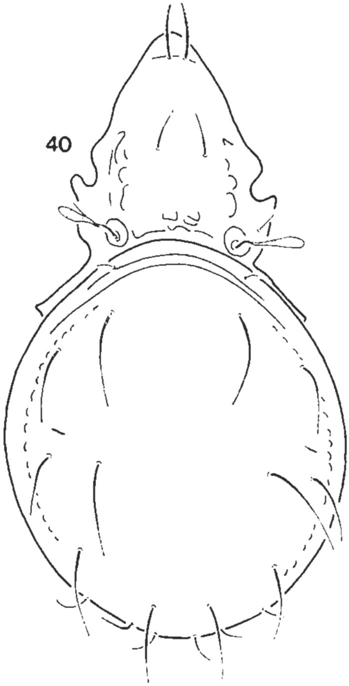

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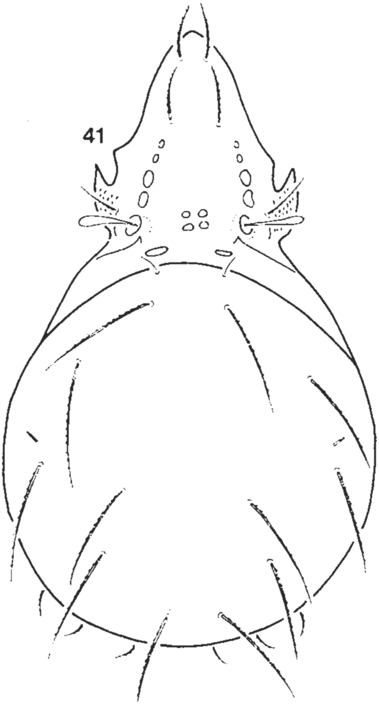

Figs. 38 – 41. 38: *Amerioppia asiatica* HAMMER, 1977; 39: *A. senecionis* P. BALOGH, 1984; 40: *A. africana* KOK, 1967; 41: *A. similis* COVARRUBIAS, 1967

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Opusc. Zool. Budapest, XXIII, 1988

Some oribatid mites (Acari) from the Falkland Islands

By

P. BALOGH*

Abstract. This paper gives the first report on the oribatid fauna of the Falkland Islands. Of the seven species having been observed three are described as new to science: *Phyllhermannia falklandica, Solenoppia pernettyae* and *Solenoppia usheri* spp. n. Some zoogeographical comments are added.

Through the courtesy of Dr. M. B. USHER (Department of Biology, University of York, U.K.) some vials with oribatid mites were received. This material – though it contains a low number of specimens of seven species only – is of great importance, since no oribatid species of the Falkland Islands had formerly been known. The following species were found in this material:

Camisia segnis (HERMANN, 1804): Falkland Islands, Port Stanley, 51°40' S, 58°50' W, 30 m above sea level, N facing slope, *Pernettya pumila* litter: 5 ex., peat: 7 ex. Coll. Joint Services Expedition, 10–24 December, 1984.

Trimalaconothrus novus (SELLNICK, 1921): Falkland Islands, Port Stanley, 51°40' S, 58°50' W, 30 m above sea level, N facing slope, *Pernettya pumila* litter: 1 ex. Coll. Joint Services Expedition, 10–24 December, 1984.

Nodocepheus dentatus HAMMER, 1958: Falkland Islands, Port Stanley, 51°40', S, 58°50' W, 30 m above sea level, N facing slope, peat, 0–3 cm: 1 ex. Coll. Joint Services Expedition, 1984.

Granizetes curvatus HAMMER, 1961: Falkland Islands, Port Stanley, 51°40' S, 58°50' W, 30 m above sea level, N facing slope, *Pernettya pumila* litter: 1 ex. Coll. Joint Services Expedition, 1984.

Phyllhermannia falklandica sp. n. (Figs. 1–4)

Length 623 μm; width 340 μm.

Prodorsum: Sensillus short with short stalk and short, abruptly dilated, spindle-shaped head. Interlamellar setae very small, lanceolate, pointed. Lamellar and rostral setae near each other, setiform, smooth, rigid. Prodorsum without sculpture.

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Notogaster: Surface of notogaster densely granulate, 16 pairs of short, pointed, lanceolate notogastral setae present.

Ventral side: Epimeral setal formula: 3 – 1 – 4 – 5. 6 + 3 pairs of genital setae present. The six setae of medial row very fine, setiform, the three of the second longitudinal row much longer, lanceolate. Two pairs of aggenital, 2 pairs of anal, 3 pairs of adanal setae present.

Remarks: This is the first *Phyllhermannia* species with short, spindle-shaped sensillus-head, 3 – 1 – 4 – 5 epimeral setal formula and densely granulate notogaster.

Material examined: Falkland Islands, Port Stanley, 51°40' S, 58°50' W, 30 m above sea level, N facing slope, *Pernettya pumila* litter, leg.: DR. STUART MARTIN. Holotype: 1 ex., paratype: 1 damaged ex. Coll. Joint Services Expedition, 10 – 24 December, 1984.

Solenoppia pernettyae sp. n. (Figs. 5 – 6)

Length 156 μm; width 103 μm.

Prodorsum: Sensillus short with short stalk and globular head. Interlamellar setae short and thin. Lamellar costulae distinct only distally; apically curved and connected with an obscure, medially disappearing translamellar costula. Inside the curved part of costulae there is a small knob on each side bearing inwardly directed lamellar setae. Rostral setae marginal, far from each other.

Notogaster elliptoid, forward and backward narrowing; dorsosejugal suture arched. Nine pairs of fine, smooth notogastreal setae. Setae $c_2 (= ta)$ only with their alveoli represented.

Ventral side: Apodemata IV very slightly curved, almost straight and parallel with apodemata sejugal. *A 1* ventral setae very short and fine. Four pairs of genital setae: two pairs far behind, two pairs far before. The distance between the 2nd and 3rd genital setae more than twice as long as the distance between 1st and 2 nd. Lyrifissurae *iad* far from the anal plates.

Material examined: Falkland Islands, Port Stanley, 51°40' S, 58°50' W. 30 m above sea level, N facing slope, *Pernettya pumila* litter. Holotype: 1 ex, Coll. Joint Services Expedition, 10 – 24 December, 1984.

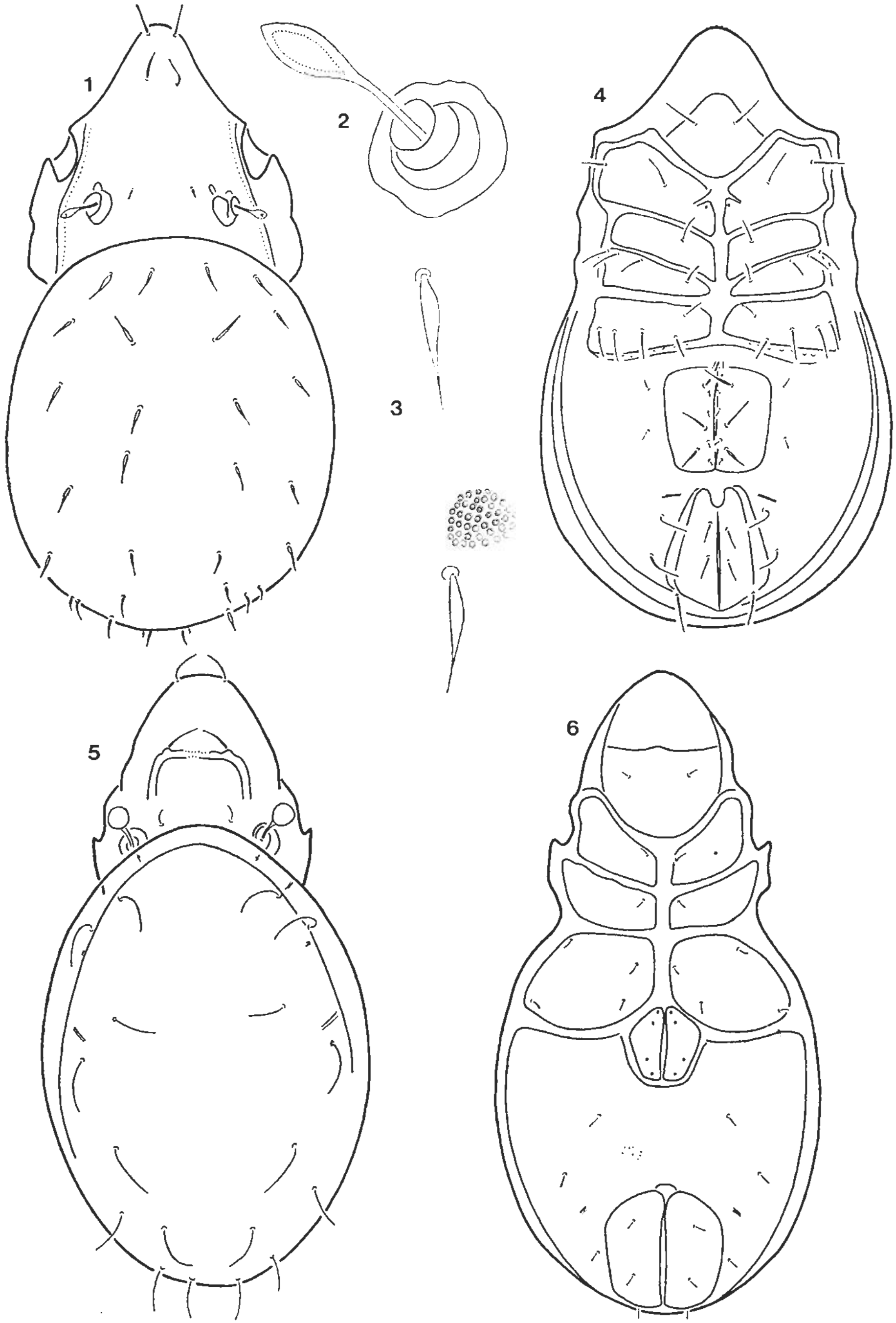
Solenoppia usheri sp. n. (Figs. 7 – 9)

Length 299 μm; width 152 μm.

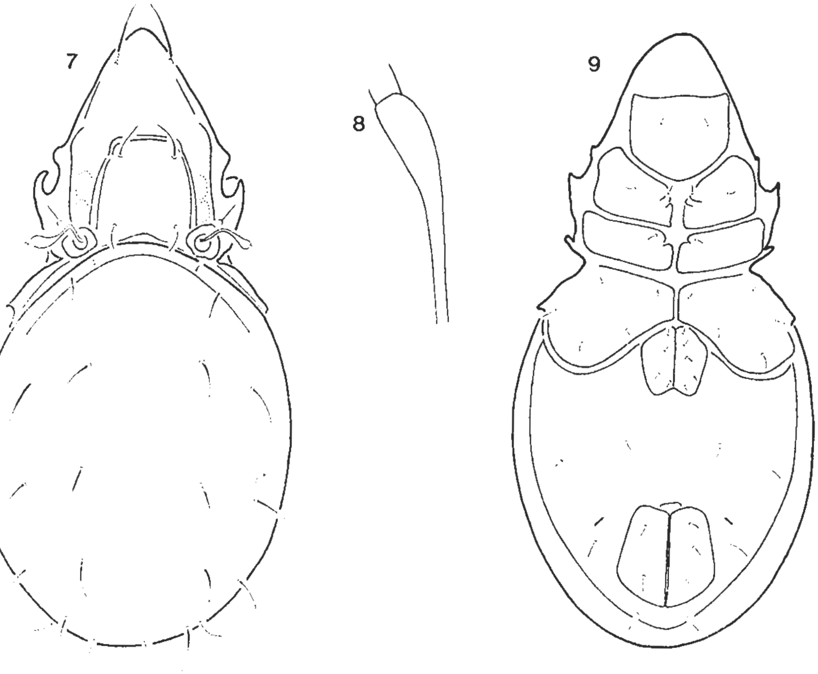
Prodorsum: Sensillus medium long, directed outward and backward, distal third gradually thickened, with obtuse end bearing two fine ciliae. Interlamellar and lamellar setae short, fine. Rostral setae about twice as long as lamellar setae, situated on the lateral part of rostral region. Lamellar costulae well developed but disappearing in the region of lamellar setae. Translamellar costula placed before the lamellar setae. The connection between translamellar and lamellar costulae disappearing. Exostigmatal setae easily observed, smooth.

Notogaster oval, with ten pairs of notogastral setae. The setae $c_2 = ta$ extremely small, hardly visible. The remaining nine pairs short, fine and smooth.

Ventral side: All ventral setae very short. Four pairs of genital setae. (On the right side there are five pairs of genital and three pairs of anal setae!) Lyrifissurae *iad* far from the anal plates.



Figs. 1–4: *Phyllhermannia falklandica* sp. n. – Figs. 5–6: *Solenoppia pernettyae* sp. n.



Figs. 7 – 9: *Solenoppia usheri* sp. n.

Material examined: Falkland Islands, Port Stanley, 51°40'S, 58°50'W, 30 m above sea level, N facing slope, peat, 0 – 3 cm. Holotype: 1 ex. Coll. Joint Services Expedition, 10 – 24 December, 1984.

Two species in the list above, namely *Camisia segnis* (HERMANN, 1804) and *Trimalaconothrus novus* (SELLNICK, 1921) have been found in the Holarctic Region, in the South American Andes and in New Zealand. This interesting type of distribution has been mentioned in connection with *Mucronothrus rostratus* TRÄGARDH, 1931 in one of our recent papers (J. BALOGH and P. BALOGH, 1986). The distribution of these species covers the distribution of the *Nothofagus* species in the Southern Hemisphere.

We can quote two other species, *Nodocepheus dentatus* HAMMER, 1958 and *Granizetes curvatus* HAMMER, 1961, by way of appropriate examples for those Transatlantic relationships, which were mentioned in detail by HAMMER (1968) and HAMMER and WALLWORK (1979). Among this two species, *Nodocepheus dentatus* has hitherto been found in the South American Andes and in New Zealand, while this *Granizetes* species in South America onlly.

Phyllhermannia falklandica sp. n. bears no relation to any of the known species of *Phyllhermannia*. It seems possible that besides the four species in New Zealand and the three species hitherto known from Juan Fernandez Island and Chile, several new species are to be discovered.

One of the two species of Oppiidae found in the Falkland Islands, *Solenoppia pernettyae* sp. n. is one of the smallest oppids with its body length of 156 μm. The other one, *Solenoppia usheri* sp. n. is one of the medium-sized species by 299 μm body length. Both species belong to that artifical species-group, which possesse four pairs of genital setae und their lyrifissurs are *iad* in apoanal position, i.es far from the anal plate. It seems very interesting that – leaving some obviously convergent cases (i.e. some genera of the *Oppiella* group) out of consideration – a majority of the species with 4 genital setae occurs in the southern part of the Southern Hemisphere. Four species were found in the southernmost part of South America, 4 species in the southernmost part of Africa, 12 species in New Zealand, 2 species in the Subantarctic Region and 2 species in Hawaii. Northwards the number of species with 4 genital setae decreases steeply. One can observe a similar trend in the number of genital setae of the *Protoribates* group. Two European or rather Holarctic genera, *Protoribates* and *Rajskibates* have 4 genital setae, while the species of the genera with 3 or 3 pairs of genital setae (*Tuxenia*, *Totobates*, *Subulobates*, *Maculobates* etc.) inhabit the southern parts of South America, New Zealand, the subantartic islands, Australia and Oceania. In the family Ceratozetidae, the genus *Cryptobothria* (with 3 genital setae) substitutes the genus *Punctoribates* on Macquarie Island (the latter one is similar but it has 6 pairs of genital setae). It is very unlikely that all these are not mere coincidences. It is most desirable to pay more attention to the research of the oribatid fauna of the areas in question (South Argentina, South Chile, Falkland Islands, southernmost South Africa and temperate Australia).

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Hydrobiologische Zustandsänderung während eines Jahrzehntes in einem Mittelgebirgsbach in Ungarn

Von

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Abstract. Faunistical and ecological studies in a creek were repeated after ten years in order to reveal potential changes induced in the meantime. The same analytical and sampling methods on the same study sites were used as earlier. According to the results of chemical investigations, pH values slightly increased, whereas increases in the concentrations of HCO_2 and NO_3 were more substantial. The values of oxygene demand in summer were also higher than earlier. The zoological assesment indicated the disappearance of several species. The number of Trichoptera taxa e.g. decreased from 20 to 6 in ten years, and their abundance values became also lower. These undesirable changes are caused by a recreation area developed along the creek by intensive tourism during the past decade.

Im Rahmen der Erforschung der heimischen Bäche sind uns verhältnismässig wenige solche Untersuchungen bekannt, die die Ergebnisse von serienweise vorgenommenem Messungen, Sammlungen zusammenfassen würden. Noch weniger wurde über solche Serienuntersuchungen publiziert.

Vorliegende Abhandlung berichtet über die Untersuchung des ständig wasserführenden Morgó-Baches, eines der Bäche des Börzsönygebirges. Die Auswahl des Untersuchungsobjekts erfolgte aufgrund zweierlei Bedenken. Das Tal des Morgó-Baches bildet fast seit einem halben Jahrhundert eine der Hauptlinien des Tourismus im Börzsöny, deren Belastung infolge der Förderung der Region zum Erholungsgebeit und des stets lebhafteren durchgehenden Touristenverkehrs (den Autotorismus mit inbegriffen) in den letzten 10–12 Jahren beträchtlich zugenommen hat. Eine frühere Untersuchungsserie (Csuták, 1973) bot noch aus einem weniger gestörten Zeitraum gute Möglichkeit zum Vergleich, zur Registrierung der Zustandsänderungen.

Unsere Zielsetzung war den oben Gesagten entsprechend von den wasserchemischen Änderungen, die im Wasser des rund 10 km langen Baches von der Quelle bis zur Mündung vor sich gehen, ein klares Bild zu verschaffen, die sich in der Zusammensetzung der wirbellosen Fauna zeigenden Unterschiede den im Bach trennbaren, abweichenden Biotoptypen nach zu bestimmen, schliesslich die jetzige Lage mit den Vermessungsdaten des vor 10 Jahren festgestellten Zustandes zu vergleichen.

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Untersuchungsgebiet, Untersuchungsstellen

Das Tal des Morgó-Baches zieht sich im südöstlichen Teil des aus eruptivem Gestein bestehenden Börzsönygebirges (Maximalhöhe 939 m ü.d.M.) in Nord-Süd-Richtung von Királyrét bis Kismaros entlang (Abb. 1).

Seine Quellentäler schneiden tief in die Gebirgszüge des Nagy Inóc, Nagy Hideghegy, Csóványos und Hosszúbérc ein, sodann vereinigen sie sich im Királyréti-Becken. Die einzelnen Quellentäler (das Tal des Nagy Vasfazék-Baches am Gebirguszug Nagy Inóc, das sich vom Nagy Hideghegy herabziehende Bagoly-Bükki-Tal, das sich in den südlichen Hang des Csóványos einschneidende Szénpatak-Tal und schliesslich das Tal des Boros-Baches) haben anfangs einen Oberlaufcharackter, sodann verlieren sie an Gefälle etwas vor dem nördlichen Rand des Királyréti-Beckens und lagern ihr Geröll ab.

Bei Királyrét beginnt der 2 km lange, schmale Abschnitt von ziemlich geradem Ablauf der sich vereinten Täler, der dann in das Szokolyai-Becken führt (LÁNG, 1955). Dem Szokolyai-Becken folgt von neuem ein engerer Talabschnitt, der bei Verőcemaros in des Donautal mündet.

Der Bach fliesst in seinem oberen Lauf, also von der Quelle bis zum Rand des Királyréti-Beckens auf einem Andesitgestein. Das Királyréti-Becken ist hingegen zum grössten Teil mit einem Leitha-Kalkstein bedeckt.

Der Bach führt in ausgiebiger Durchflussmenge ständig Wasser. Der Wasserstand ist im Laufe des Jahres in ziemlich grossem Grade Änderungen ausgesetzt. Im Sommer nimmt die Wassermenge ab, im Herbst und im Winter ist der Wasserstand verhältnismässig höher. Der Bach hat im Mai den höchsten Wasserstand.

Die Länge des Baches beträgt von Királyrét 10,5 km. Die Grösse seines Einzugsgebietes ist 78,8 km^2. Die Durchflussmenge des Baches beträgt im Jahresdurchscnitt 210 l/sec.

M 1 Untersuchungsstelle. – Der Bach Nagy Vasfazék (Nebengewässer des Morgó-Baches), oberhalb vom Királyrét, 1000 m vor seiner Mündung in den Morgó-Bach. – Ein lockeres, etwa 1 m breites, steinigkieseliges Bett begleitet von Bäumen, im Sommer im allgemeinen mit wenig Wasser oder ausgetrocknet.

M 2 Untersuchungsstelle. – Unterhalb vom Királyrét, etwa 100 m vor dem Zusammenfluss der Nebenbäche, wo sich der Nagy Vasfazék-Bach, der periodische Bagoly-Bükkivölgyi-Bach, der Szénpatak-Bach und der Királyréti-See vereinigen. – Mit schnellem, stellenweise überfallendem Wasser auf offenem Gelände, mit 2–3 m Bettbreite und grösseren Steinen. Das Wasser ist von den Abwässern der Erholungsheime bzw. Wohnhäuser verunreinigt.

M 3 Untersuchungsstelle. – Zwischen der Remise der Schmalspurbahn und Szokolya. – Galerienartiger Waldstreifen am Ufer, etwa 3 m breiter, beschatteter Bettabschnitt mit kleineren Steinen, vielmehr von schnellem Lauf, auf den Steinen mit sichtbarem Algenüberwuchs.

M 4 Untersuchungsstelle. – Unterhalb von Szokolya, ein von Weidenbäumen flankiertes, beschattetes, etwa 3 m breites, steiniges Bachbett mit schnellfliessendem Wasser. Zum Teil unterspültes, wurzeliges Ufer, mit schotterigen Abschnitten. Aufgelockert bebaute Wochenendsiedlung.

M 5 Untersuchungsstelle. – Verőcemaros, 200 m vor der Endstation der Schmalspurbahn, der Mündung zu. Offenes Gelände, am Uferrand mit Büschen, mittelgrossen Steinen.

Dem Bach zieht sich fast in seiner ganzen Länge eine aufgelockert angelegte Wochenendsiedlung entlang, berührt die Gemeinde Szokolya, zwischen den Untersuchungsstellen M 2 und M 3 befinden sich eine Remise der Schmalspurbahn und eine Holzverladerampe. Die Verkehrsstrasse im Bachtal zwischen Szokolya und Verőcemaros ist in der Erholungszeit besonders verkehrsreich.

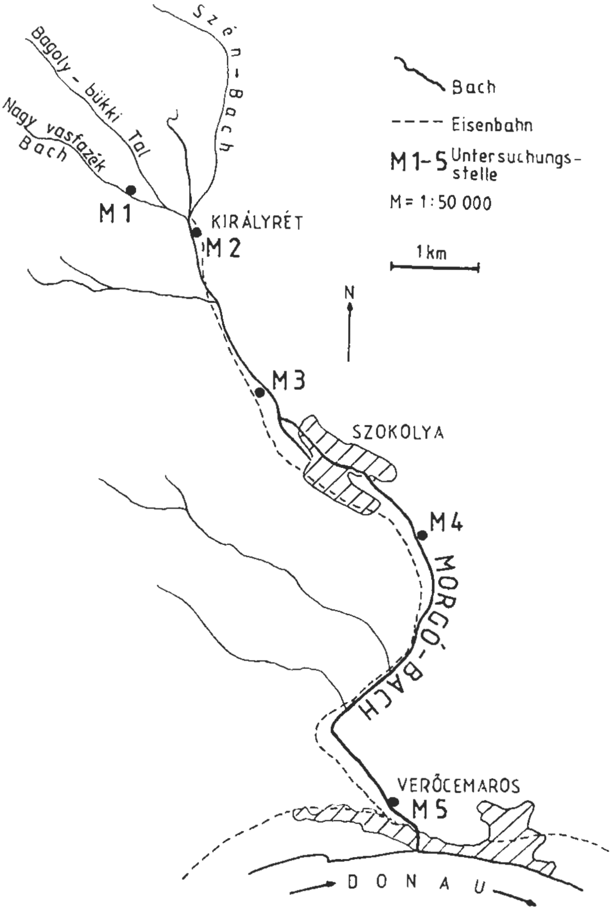

Abb. 1. Lageplan des Untersuchungsgebietes

Methoden

Felduntersuchungen. – Um die ökologischen Verhältnisse feststellen zu können, wurde ein jedesmal der allgemeine Zustand der Probeentnahmestellen untersucht (Vegetation, eventuelle Flussbettänderungen) sowie die Temperatur der Luft und des Wassers gemessen. Wasserproben wurden geschöpft zur Feststellung der elektrischen Leitfähigkeit, der pH-, Nitrit-, Nitrat-, Ammonia-, Hydrogenkarbonatwerte ferner wurden Proben genommen um den gelösten O_2-Gehalt feststellen zu können. Weitere Proben dienten zur Messung des Schwebestoffgehaltes. In sämtlichen Biotoptypen wurde das Einsammeln der Meso-bzw. Makrofauna durchgefürt. Im Interesse der Gewinnung von quasi quantitativen Ergebnissen wurde ein quadratischer (20×20 cm grosser) Eisenrahmen abgesteckt, aus diesem das mit Wasser gemischte Sediment ausgeschöpft, sodann durch ein Netz durchgewaschen. In den Abschnitten von stärkerer Strömung montierten wir an den Rahmen auch ein für diesen Zweck konstruiertes Netz. An sämtlichen Untersuchungsstellen wurden ein jedesmal zwei parallele Proben entnommen.

Die entnommenen wasserchemischen und biologischen Proben (diese letzteren in lebendem Zustand) lieferten wir von der Probeentnahme gerechnet binnen 2 Stunden ins Laboratorium, wo die Analyse bzw. die Sortierung und Konservierung des Materials in 4%igem Formalin unmittelbar durchgeführt wurde.

Laboratoriumuntersuchungen. – Zu den wasserchemischen Analysen kam es in der Ungarischen Donauforschungsstation der UAW (Göd).

Anlässlich der Bearbeitung des zoologischen Materials leistete Dr. S. Andrikovics mit der Bestimmung der Larven von Ephemeroptera, Plecoptera, Odonata und Trichoptera eine grosse Hilfe. Im Falle einiger, als repräsentativ betrachtbarer Proben unternahmen wir auch eine ausführliche quantitative Analyse.

Die chemischen Daten dienen vor allem zur Charakterisierung der Umweltsverhältnisse. Die Daten haben wir auch mit den Ergebnissen der Jahre 1971/72 (E. Csuták, 1973) verglichen, unter besonderer Rücksicht dessen, dass es zu den Analysen im selben Laboratorium gekommen ist, ferner dass die intensive Entwicklung der aus Wochenendhäusern bestehenden Siedlungen dieses Gebietes auf den Zeitraum zwischen den beiden Untersuchungen fällt.

Anlässlich der Auswertung der hydrozoologischen Daten versuchten wir den ökologischen Wert der einzelnen Arten (eventuell der höheren systematischen Kategorien) in Betracht zu ziehen, mit besonderer Hinsicht auf die Einwirkung der Bindung zum Biotop und der anthropogenen Eingriffe (Verunreinigung). Die von uns nachgewiesenen Vorkommen wurden mit den entsprechenden Daten der Jahre 1971/72 (E. Csuták, 1975) verglichen.

An den einzelnen Probeentnahmestellen und zu entsprechenden Zeitpunkten untersuchten wir aufgrund des im ganzen Jahr eingeholten Materials mit „Cluster"-Analyse die Ähnlichkeit der Grundfauna. Als Resemblance zur Analyse wandten wir den aus den binären Daten errechneten euklidischen Abstand, als gruppenbildendes Verfahren die Ward-Methode (sum of square agglomeration) an.

Ergebnisse

Die Probeentnahmen erfolgten vom April bis Dezember 1983 insgesamt viermal an den fünf Untersuchungsstellen.

Die Wassertemperatur des Morgó-Baches wächst im April, Juli und Oktober (Abb. 2–3, 5) der Mündung zu in geringem Masse, ziemlich gleichmässig an. Charakteristisch zu sein scheint zwischen den Untersuchungsstellen M 2 und M 3 im Juli und im Oktober die Abnahme der Temperatur, was ausser den – im

Vergleich zu dem Wasser – grösseren Lufttemperaturdaten auch mit der, den Bach begleitenden, geschlossenen Vegetation und den mikroklimatischen Verhältnissen des Bachbettes erklärt werden kann. Charakteristisch ist ferner auf dem offenen Gelände zwischen M 3 und M 4 der verhältnismässig stärkere Anstieg der Wassertemperatur. Die Wassertemperatur von 0 °C in der vollen Länge ist im Dezember eine Folge der Lufttemperatur unter dem Gefrierpunkt (Abb. 6).

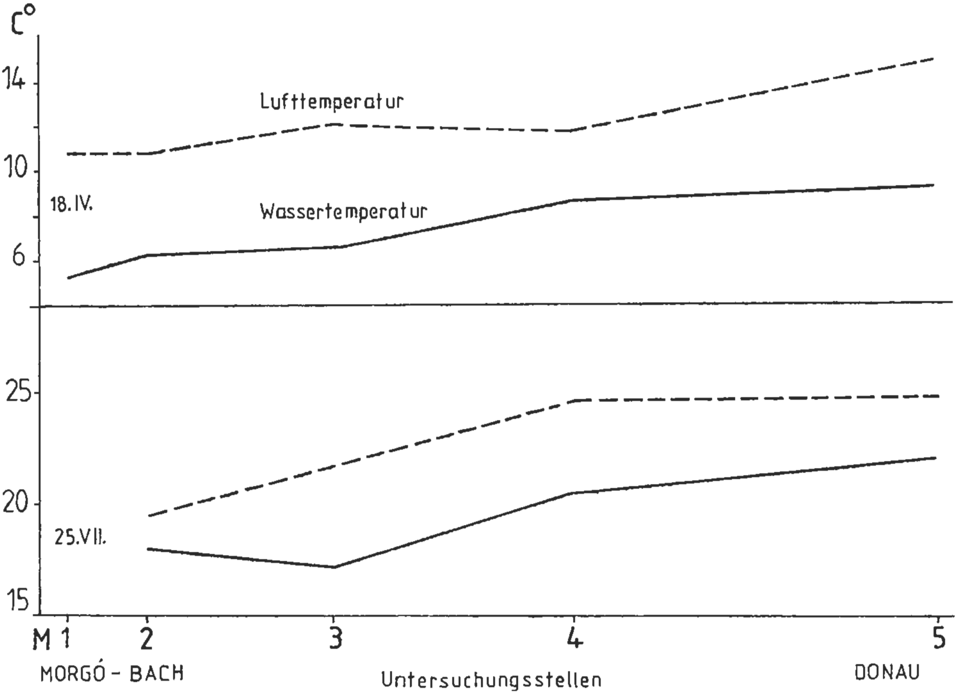

Abb. 2 – 3. Wassertemperaturablauf im IV. und VII. 1983

Chemie

Die chemischen Parameter wurden anlässlich der Untersuchungen und innerhalb dieser den Untersuchungsstellen nach geordnet in einer Tabelle zusammengefasst (Tab. 1.) Die Numerierung der Untersuchungsstellen vergrössert sich der Strömungsrichtung des Wassers nach. Die sich räumlich und zeitlich zeigenden Änderungstendenzen werden weiter unten ausgewertet.

Der pH-Wert war an der Stelle M 1 in allen drei Fällen fast gleich. Die Werte wuchsen der Donau zu ein jedesmal mit 0,6 – 1,5 an.

Die Alkalität, Karbonathärte und HCO_3-Werte nahmen von der Stelle M 1 bis M 5 in allen Fällen mit einer Menge von 120 – 260 mg/l auffallend zu. Die Schwankung des HCO_3-Wertes war an der Stelle M 1 zwischen 57 – 103, an der Stelle M 5 zwischen 176 – 360 mg/l.

Tab. 1. Wasserchemische Daten

Daten Untersuchungsstelle	pH	Älkalität g Äquival.	Karbonathärte DH°	HCO_3	gelöster O_2	O_2 – Sättigung %	Leitfähigkeit $\mu S \cdot cm^{-1}$	Schwebstoff	CSB_{sMn}	NH_4^{++}	NO_2^-	NO_3^-	Wasser- temperatur	Luft- temperatur
				$g \cdot m^{-3}$				$g \cdot m^{-3}$					C°	C°
IV.18.														
M1	7,86	0,94	2,6	57,4	12,1	95	196	5,5	3,1	0,0	0,02	3,7	3,7	10,8
M2	8,08	1,3	3,6	79,3	12,1	98	220	16,0	4,3	0,0	0,03	4,2	6,2	10,8
M3	8,33	1,5	4,2	91,5	13,3	108	255	3,5	3,2	0,0	0,02	3,2	6,5	12,0
M4	8,93	2,3	6,4	140,3	14,0	120	345	3,7	3,4	0,0	0,03	4,8	8,5	11,8
M5	9,03	2,9	8,1	176,9	14,9	130	400	3,3	3,3	0,0	0,024	4,2	9,2	14,8
VII.25.														
M1	–	–	–	–		trocken		–	–	–	–	–	–	–
M2	8,06	3,0	10,4	225,7	4,0	43	371	–	12,9	1,5	0,84	2,8	18,0	19,4
M3	8,40	4,4	12,3	268,4	6,7	70	442	–	13,8	0,38	0,05	2,8	17,1	21,6
M4	8,48	5,6	15,7	341,7	6,1	68	627	–	13,1	0,38	0,15	3,7	20,4	24,5
M5	8,62	5,9	16,5	359,9	8,0	92	592	–	10,2	0,27	0,005	2,3	22,0	24,8
X.25.														
M1	7,57	1,7	4,8	103,7	7,5	60	220	7,2	4,3	0,17	0,0	4,8	6,0	6,3
M2	8,45	3,0	8,4	183,0	10,9	88	318	24,4	7,2	0,66	0,13	7,2	6,0	10,0
M3	8,46	4,2	11,8	256,2	11,2	89	412	4,4	3,9	0,17	0,0	5,8	5,5	9,5
M4	8,88	5,0	14,0	305,1	10,4	87	541	7,6	3,7	0,17	0,0	7,2	7,5	11,5
M5	9,08	5,9	16,5	360,0	12,8	105	584	3,2	3,5	0,28	0,0	6,7	7,0	11,0
XII.12.														
M1	7,68	1,7	4,8	103,7	–	–	221	3,6	2,6	0,0	0,0	2,5	0,0	– 4,5
M2	8,18	2,4	6,7	146,4	–	–	304	7,6	3,5	0,35	0,05	3,5	0,0	– 3,0
M3	8,40	3,7	10,4	225,7	11,1	76	407	2,0	2,7	0,35	0,0	5,0	0,0	– 2,0
M4	8,63	5,0	14,0	305,1	13,5	92	581	4,0	3,1	0,25	0,05	7,5	0,0	– 1,5
M5	8,80	5,9	16,5	359,9	13,9	95	653	4,0	2,4	0,0	0,05	6,5	0,0	– 1,0

Die Menge des gelösten O_2 und die Sauerstoffsättigungswerte waren im April gross, an den Stellen M 3 – M 4 – M 5 zuweilen übersättigt. Die Sättigungswerte der Stellen M 1 – M 2 – M 3 – M 4 lagen im Juli und im Oktober zwischen 43 und 89 (an der Stelle M 5 fand ich beachtlich grössere Werte vor). Die Sättigungswerte im Dezember waren höher als die von April und Oktober: sie fielen zwischen 76 – 95. Die Werte des Sauerstoffgehaltes und der Sättigung erwiesen sich in der Strömungsrichtung ein jedesmal als von steigender Tendenz.

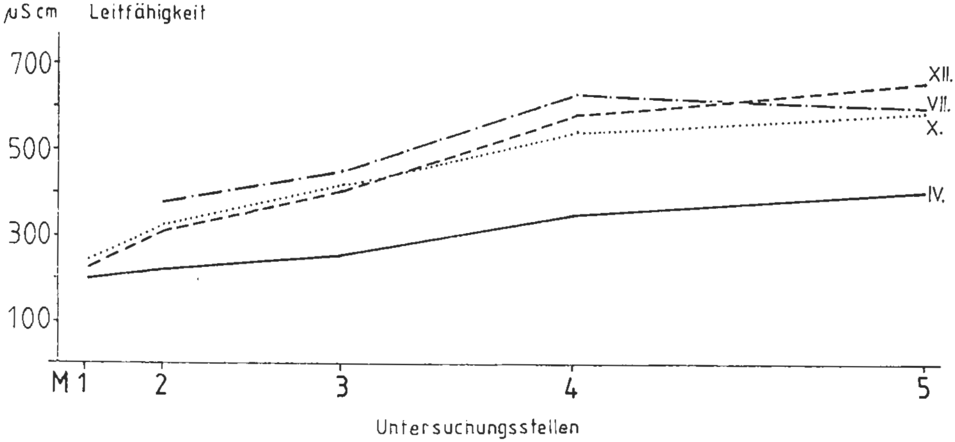

Abb. 4. Elektrische Leitfähigkeitswerte

Die Sauerstoffverbrauchswerte sind im allgemeinen gleichförmig niedrig, bloss die Juli-Werte übertreffen an sämtlichen Untersuchungsstellen in beträchtlichen Masse den Durchschnitt der übrigen. Dies ist eindeutig eine Folge des Erholungssaisons und im allgemeinen der gesteigerteren Inanspruchnahme des Gebietes.

Die Werte der elektrischen Leitfähigkeit nehmen in der Strömungsrichtung stets mehr oder weniger kräftig zu. An der Stelle M 1 sind die Werte sehr beständig. An den weiteren Stellen war den Anstieg von abweichendem Masse. Zwischen M 3 und M 4 zu jeder Zeit hoch (Abb. 4).

Der Schwebestoffgehalt war im allgemeinen gering, nur an der Stelle M 2 konnten zweimal bedeutend grössere Mengen gemessen werden.

Die Mn-Werte des CSB_5 waren im allgemeinen niedrig, nur anlässlich der Probeentnahme im Juli hoch.

Die Werte der Nitrit-, Nitrat- und Ammonium-Mengen sind im allgemeinen gering, in der Strömungsrichtung war das Anwachsen des Nitratgehaltes am grössten.

Zoologie

Die sich auf die einzelnen Arten beziehenden quantitativen Daten wurden während der Zeit der Probeentnahmen, jedoch unabhängig von den Untersuchungsstellen, ferner nach den Untersuchungstellen zusammengezogen und unabhängig vom Zeitpunkt des Einsammelns zusammengestellt (Tab. 2).

Tab. 2. Quantitative Ergebnisse (Exemplar/400 cm^2/ Zeitpunkt: 1983)

Art	18. IV.	25. VII.	24. X.	12. XII.	M 1	M 2	M 3	M 4	M 5
Rhynchelmis limosella	1	2	0	7	8	0	0	0	2
Limnodrilus hoffmeisteri	21	44	23	33	7	75	10	14	15
Potamothrix hammoniensis	35	54	9	10	0	67	7	15	19
Haemopis sanguisuga	12	70	61	27	0	31	13	33	93
Acroloxus lacustris	2	0	0	0	2	0	0	0	0
Limnaea peregra	2	3	12	25	0	12	3	0	27
Ancylus fluviatilis	26	13	67	160	0	192	49	5	20
Hippeutis complanatus	0	0	1	0	0	0	1	0	0
Gyraulus albus	0	15	3	17	0	0	0	1	34
Sphaerium corneum	0	1	0	0	0	1	0	0	0
Pisidium casertanum	0	0	1	0	0	0	1	0	0
Gammarus tatrensis	2	20	4	26	10	11	30	3	0
Gammarus roeseli	0	0	1	0	0	0	1	0	0
Gammarus pulex	0	9	0	0	0	0	8	1	0
Rhitrogena semicolorata	4	0	0	0	1	4	1	0	0
Caenis macrura	38	24	135	58	0	0	124	101	30
Baetis sp.	12	3	0	53	0	0	10	6	52
Ephemera danica	1	1	8	1	0	0	6	5	0
Ecdyonurus sp.	0	1	0	2	0	0	1	1	1
Heptagenia sp.	0	3	0	0	0	0	3	0	0
Caenis horaria	0	20	0	0	0	0	0	20	0
Coenagrion sp.	0	0	0	1	0	0	0	0	1
Nemurella picteti	1	0	0	11	11	1	0	0	0
Capnia bifrons	1	1	1	70	70	0	8	1	0
Protonemura aestiva	2	0	0	0	2	0	0	0	0
Isoperla grammatica	1	0	0	0	1	0	0	0	0
Nemoura cambrica	1	0	0	11	0	0	11	1	0
Sialis fuliginosa	2	2	6	3	0	0	12	1	0
Dryopodidae sp.	0	5	8	8	1	8	7	3	2
Stenophylax permistus	4	1	0	15	16	3	1	0	0
Polycentropus flavomaculatus	2	4	51	16	2	0	55	25	0
Limnephilus sp.	2	0	0	0	0	2	0	0	0
Hydropsyche pellucidula	9	49	0	0	0	16	42	0	0
Goera sp.	0	2	0	0	0	2	0	0	0
Hydropsyche angustipennis	134	348	88	957	0	0	29	453	1045
Oecetis ochracea	0	1	202	28	0	0	227	3	1
Glossosoma sp.	47	23	0	0	0	0	0	48	22
Rhyacophila sp. (báb)	115	0	0	3	115	2	1	0	0
Rhyacophila sp. (tegez)	24	0	0	0	0	0	0	0	24
Orthocladiinae sp.	1	2	0	42	36	0	9	0	0
Rheotanytarsus sp.	78	144	7	270	30	147	13	20	289
Heleniella thienemanni	5	0	0	0	5	0	0	0	0
Thienemannimyia lentiginosa	1	0	0	0	1	0	0	0	0
Cricotopus albiforceps	240	174	20	167	0	69	66	68	398
Cricotopus tibialis	78	0	8	5	0	0	0	0	91
Eukiefferiella longicalcar	409	99	25	64	0	9	20	167	402
Prodiamesa olivacea	6	44	18	45	0	45	24	37	7
Procladius choreus	5	33	4	10	0	18	11	2	21
Chironomus sp.	0	13	0	0	0	13	0	0	0
Pentapedilum ceciliae	0	51	0	0	0	41	10	0	0
Polypedilum breviantennatum	0	5	0	6	0	4	7	0	0
Phytotendipes barbipes	0	0	0	13	0	13	0	0	0

Art	18. IV.	25. VII.	24. X.	12. XII.	M 1	M 2	M 3	M 4	M 5
Limnophyes pusillus	8	0	0	0	0	0	8	0	0
Polypedilum nubeculosum ..	2	28	0	0	0	0	2	0	28
Tabanidae	15	40	41	251	6	6	57	214	82
Simuliidae	0	0	0	161	1	0	0	106	54
Ceratopogonidae	1	0	0	0	1	0	0	0	0

Von den Vertretern der aus dem Morgó-Bach festgestellten 56 Arten (Taxa) erwiesen sich 11 – 12 Arten als häufig oder als in grosser Anzahl vorkommend, die übrigen waren untergeordneter Bedeutung. Wollen wir die nach dem Zeitpunkt der Untersuchungen geordneten quantitativen Daten (Tab. 2) auswerten, so lässt sich folgendes feststellen. Die Holohydrobionten (sensu Berczik, 1973) also die Oligochaeta, Hirudinoidea, Gastropoda und Amphipoda weichen in ihrer Zahl in der vier Jahreszeiten nicht mit eindeutigen Merkmalen voneinander ab. Für die Abweichungen der Individuenzahl der Hemihydrobionten (Ephemeroptera, Plecoptera, Neuroptera, Trichoptera, Diptera) sind in den einzelnen Jahreszeiten grosse Unterschiede charakteristisch: das völlige Fehlen der Vertreter dieser Arten und bedeutende Individuenzahlen können sich in den einanderfolgenden Jahreszeiten abwechseln.

Gemäss der nach Untersuchungsstellen erfassten quantitativen Daten (Tab. 2) zeigt die Untersuchungsstelle M 3 die meisten, M 1 die weingsten Arten auf. Beachtenswert ist die sich auf einige Untersuchungsstellen beziehende, hervorspringende Individuenzahl von einzelnen Arten, wie z. B.:

Rhyacophila sp.
(Untersuchungsstelle M 1)
Limnodrilus hoffmeisteri
Potamothrix hammoniensis
Ancylus fluviatilis
(Untersuchungsstelle M 2)
Rheotanytarsus sp.
(Untersuchungsstellen M 2 und M 5)
Oecetis ochracea
(Untersuchungsstelle M 3)
Caenis macrura
(Untersuchungsstellen M 3 und M 4)
Tabanidae
Simuliidae
(Untersuchungsstelle M 4)
Hydropsyche angustipennis
Eukiefferiella longicalcar
(Untersuchungsstellen M 4 und M 5)
Haemopis sanguisuga
Cricotopus albiforceps
(Untersuchungsstelle M 5)

Tab. 3. Die hervorgekommenen Trichoptera-Arten in den Jahren 1972 und 1983

	1972 (Csuták)	1983 Pham
Stenophylax permistus M.L.	+ + + +	+ +
Micropterna sequax M.L.	+ + + +	–
Stenphylax nigricornis P.	+ + + +	–
Hydropsyche pellucidula C.	+ + + +	+ + +
Chaetopteryx villosa	+ + + +	–
Rhyacophila fascinata	+ + + +	–
Hydropsyche instabilis C.	+ + +	–
Polycentropus flavomaculatus P.	+ + +	+ + +
Sericostoma personatum S.	+ + +	–
Stenophylax rotundipennis	+ + +	–
Oligopectrum maculatum F.	+ + +	–
Silo pallipes F.	+ + +	–
Grammotaulius nigropunctatus R.	+ +	–
Glossosoma vernale P.	+ +	+ +*
Rhyacophila nubila Z.	+ +	+ +*
Metanoea flavipennis P.	+ +	–
Hydropsyche angustipennis C.	+	+ + + +
Mystophora intermedia M.L.	+	–
Rhyacophila obliterata S.	+	–
Halesus nepos M.L.	+	–

* = nur bis auf das Genus bestimmt!
\+ + + + = Arten mit grosser Individuenzahl,
\+ + + = seltenere Arten,
\+ + = seltene Arten,
\+ = durch ein Exemplar vertretene Arten.

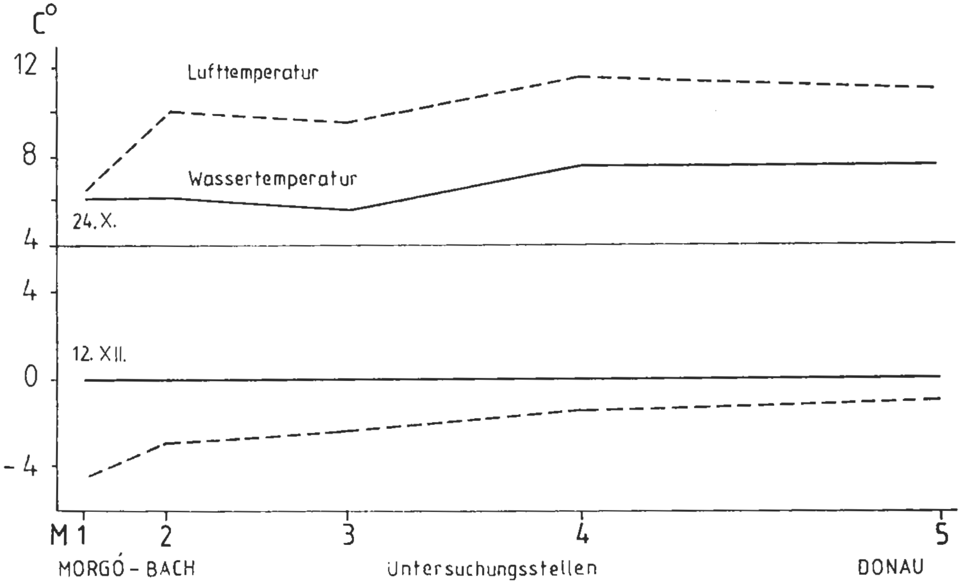

Abb. 5 – 6. Wassertemperatur ablauf im X. und XII. 1983

Sehr charakteristisch ist die Tatsache, dass einzelne Arten an gewissen Untersuchungsstellen durchgehends überhaupt nicht oder nur in ein-zwei Exemplaren vorgekommen sind, d.h. dass ihr Vorhandensein zu jeder Zeit an eine bestimmte Stelle gebunden war.

Die zoologische Auswertung gründet auf 104 quantitativen und qualitativen Proben, die viermal, fallweise an 5 Untersuchungsstellen eingeholt wurden. Unsere Feststellungen basieren wir an die Untersuchung von etwa 22 000 Individuen, die zu 56 Taxa gehören.

Die Auswertung der zoologischen Daten wurde unter Berücksichtigung der Umweltsgegebenheiten den folgenden Gesichtspunkten nach vorgenommen:

- der Umweltscharakter des die Mesofauna in sich fassenden Faunabildes und der einzelnen Untersuchungstellen;
- die Charakteristika der jahreszeitlichen Abweichung des Faunabildes.

Zwischen der Zusammensetzung der Mesofauna der einzelnen Untersuchungsstellen und den Umweltsgegebenheiten der betreffenden Stelle fanden wir folgende Zusammenhänge.

Der stark steinige Charakter des Bachabschnittes der Untersuchungsstelle M 1, sowie die im allgemeinen sehr bescheidene Abflussmenge hat nur das Vorkommen einiger Arten ermöglicht. Es kamen ausser den in geringer Zahl angetroffenen Oligochaeta- und Gammarida-Arten hauptsächlich einige Plecoptera- und Trichoptera-Arten sowie die Repräsentanten von *Rheotanytarsus* sp. in grösserer Zahl, insbesondere im April und Dezember vor. Unter den grossen Steinen der Untersuchungsstelle M 2 wurde die Ansiedlung – bei einer grösseren Abflussmenge – durch die Anhäufungen von kleineren Sedimenten ermöglicht. Im Vergleich zu den erwähnten konnte in grösserer Zahl das Vorkommen von drei Oligochaeta-Arten, von *Limnea peregra, Ancylus fluviatilis,* ferner *Rheotanytarsus,* wie auch das Auftreten ziemlich vieler Chironomiden-Arten festgestellt werden. An der Untersuchungsstelle M 3 sind die Steine schon wesentlich kleiner, das Sediment nimmt einen stets grösseren Raum ein. Im Vergleich zur Untersuchungsstelle M 1 steigt die Zahl der Arten von 21 auf 37. Bedeutend ist die Individuenzahl von *Caenis macrura* und die angewachsene Individuenzahl von *Oecetis ochracea* und der Familie Tabanidae. An der Untersuchungsstelle M 4 fliesst der Bach auf einem offenen, sonnigen Gelände, hie und da mit Steinen im sandig-schlammigen Bett. Die Zusammensetzung der Mesofauna ähnelt sehr der vorangehenden Stelle, der auffallende Unterschied ist ein jedesmal die grosse Individuenzahl von *Hydropsyche angustipennis* sowie die Raumgewinnung von *Eukiefferiella longicalcar.* Die Untersuchungsstelle M 5 führt mehr Wasser, ist an Sediment verhältnismässig reicher, nur hie und da nahm am steinigen Grund die Artenzahl etwas ab: sie beträgt 25, was den in Richtung das stärkeren Sedimentscharakters verschobenen, weniger mannigfaltigen Möglichkeiten entspricht.

In einigen Fällen können in Hinsicht des Vorkommens bzw. Fehlens irgendenier Art die wasserchemischen Zusammenhänge wahrscheinlicher gemacht werden, so bindet sich z. B. das bedeutende Vorkommen von *Ancylus fluviatilis* an die Untersuchungsstellen M 2 und M 3. Ziehen wir den Nahrungsanspruch dieser Art in Betracht (Detritus, Algen, andere pflanzliche Teile), so hätte man ihr Vorkommen auch an den Stellen M 4, M 5 erwartet. Angesichts dessen, dass *Ancylus fluviatilis* eindeutig ein Indikator des reinen Wassers ist, kann angenommen werden, dass ihr Fehlen an den Untersuchungsstellen M 4 und M 5 sich mit der Umweltsbelastung dieses Abschnittes erklären lässt. Die Untersuchungsstellen M 2 und M 3 zwischen Királyrét und Szokolya (wo wir ein bedeutendes Vorkommen von *Ancylus* registrieren konnten) führten wesentlich reineres Wasser, als die folgenden Strecken.

Die Abweichungen des Umweltscharakters der einzelnen Untersuchungsstellen und hiermit der Meso-(Makro-)Fauna trachten wir in den Abb. 7 zu veranschaulichen. Hier werden bezüglich der einzelnen Untersuchungsstellen die für 1 m^2 errechnete Gesamtindividuenzahl und Artenzahl, unabhängig vom Zeitpunkt des Einsammelns, also für die ganze Untersuchungsperiode summiert angegeben.

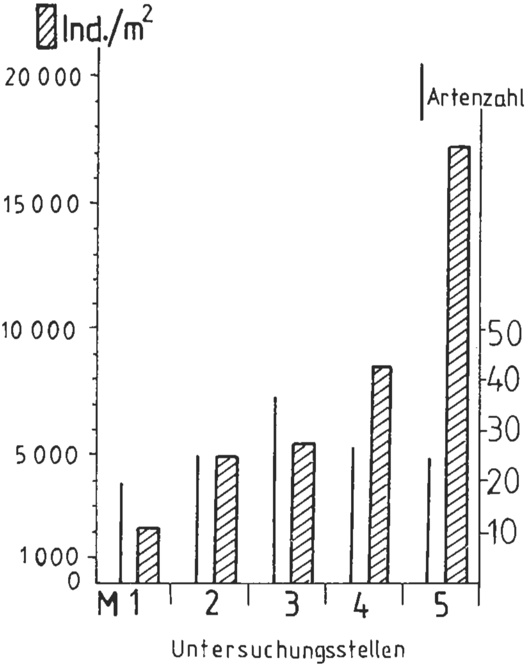

Abb. 7. Durchschnittliche Artenzahlen und Abundanzwerte an den einzelnen Untersuchungsstellen

Das Anwachsen der Individuenzahl in Richtung der Mündung und der hervorspringenden Individuenmaximalwerte an der Untersuchungsstelle M 5 ist dadurch begründet, dass die Gleichmässigkeit der Wasserversorgung der Mündung zu anwächst und in den Bachabschnitten der Untersuchungsstellen dass Angebot der Lebensbedingungen in derselben Richtung zunimmt.

Die Strömungsgeschwindigkeit nimmt – zumindest im grossen und ganzen – ebenfalls in dieser Richtung ab. Die Artenzahl ist an drei Stellen von den fünf (M 2, M 4, M 5) fast gleich; die geringere Artenzahl der Untersuchungsstelle M 1 ist durch den fast ausschliesslich steinigen Grund und die schwankende Durchflussmenge gut begründet; die grössere Artenzahl der Stelle M 3 können wir hingegen ausser der ökologischen Buntheit des untersuchten Abschnittes mit der den Nährstoff bereichernden Wirkung der lokalen Verunreinigung erklären.

Der Erkennung der sich auf die Untersuchungsstellen der Vorkommen bzw. auf den Zeitpunkt beziehenden, nicht leicht erforschbaren Zusammenhänge diente erfolgreich die Anwendung der „Cluster“-Analyse.

Das als Ergebnis der „Cluster“-Analyse erhaltene Dendrogramm führt Abb. 8 vor. Auf dem Dendrogramm können 5 gut trennbare Gruppen wahrgenommen werden. Das Dendrogramm 1., 2. und das letzte enthalten die aus verschiedenen Jahreszeiten stammenden Proben der Untersuchungsstellen M 1 (= 1 – 4), M 2 (= 5 – 8) und M 3 (= 9 – 12). In der Gruppe 3 und 4 kommen die aus verschiedenen Zeitpunkten stammenden Daten der Unterschungsstellen M 3 (= 9 – 12), M 4 (= 13 – 16) und M 5 (= 17 – 20) gemischt vor.

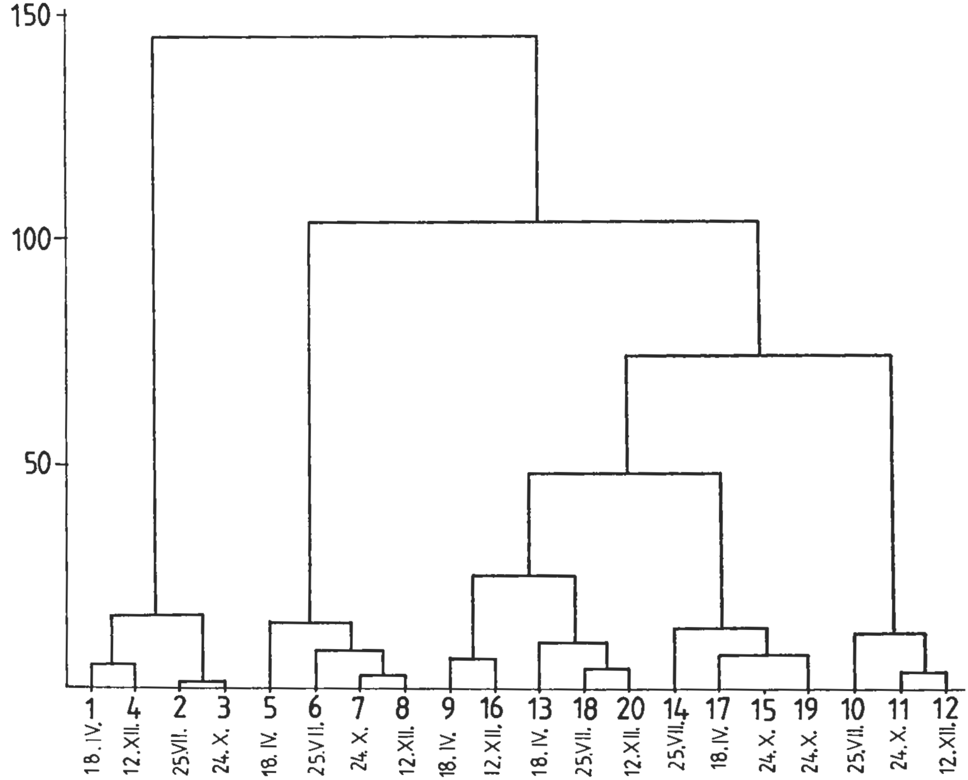

Abb. 8. Dendrogramm für die Untersuchungsstellen und -zeitpunkten (von Dr. J. Nosek)

Wie die Ergebnisse der „Cluster“-Analyse zeigen, sind die Unterschiede zwischen den einzelnen Untersuchungsstellen grösser als die jahreszeitlichen Unterschiede innerhalb der einzelnen Stellen. Diese Tatsache kann mit den ökologischen Verchiedenheiten der Untersuchungsstellen gut erklärt werden.

Diese Feststellung stimmt übrigens mit den Feststellungen der in der Literatur befindlichen ähnlichen Untersuchungen überein (R. G. PEARSON, 1984; R. G. PEARSON & N. V. JONES, 1984).

Die Zustandsänderung des Morgó-Baches im letzten Jahrzehnt

Die Abhandlung der Frau E. CSUTÁK über den Morgó-Bach (CSUTÁK, 1973) gibt eine sehr gute Möglichkeit, den vor 10 Jahren festgestellten Zustand des Baches mit der jetzigen Lage zu vergleichen. Ihre Arbeit ist ebenfalls den Direktiven der Ungarischen Donauforschungsstation der UAW entsprechend entstanden. Ihre Zielsetzungen, Methoden und Anschauung gleicht der von uns durchgeführten Untersuchung. Bei der Auswahl der Untersuchungsstellen hielten wir uns möglicht an die früheren, nach guten Gesichtspunkten ausgewählten Stellen.

In chemischer Hinsicht können wir folgendes feststellen. Der pH-Wert wuchs auch früher vom Quellgebiet der Mündung zu an. Die Werte verschoben sich während der letzten 10 Jahre mit etwa 0,5 pH-Wert in alkalischer Richtung, sie liegen heute von der sich in der Nähe der Quelle befindlichen Untersuchungsstelle abgesehen schon überall über 8,0.

Die sich auf dieselben Monate beziehenden Daten der gelösten Sauerstoffmenge gleichen – aus der Ferne von 10 Jahren betrachtet – sehr stark einander, auch die Eigenartigkeit mit inbegriffen, dass nach den geringeren Werten des Quellgebietes die Zunahme der Werte der Mündung zu nicht unbedingt gleichmässig ist. Dies entspringt offenbar aus der Eigenartigkeit des Bachwassers, dass infolge der Strömung und der ökologischen Abweichungen der nacheinanderfolgenden Abschnitte innerhalb einer verhältnismässig kurzen Strecke beträchtliche Unterschiede auftreten können.

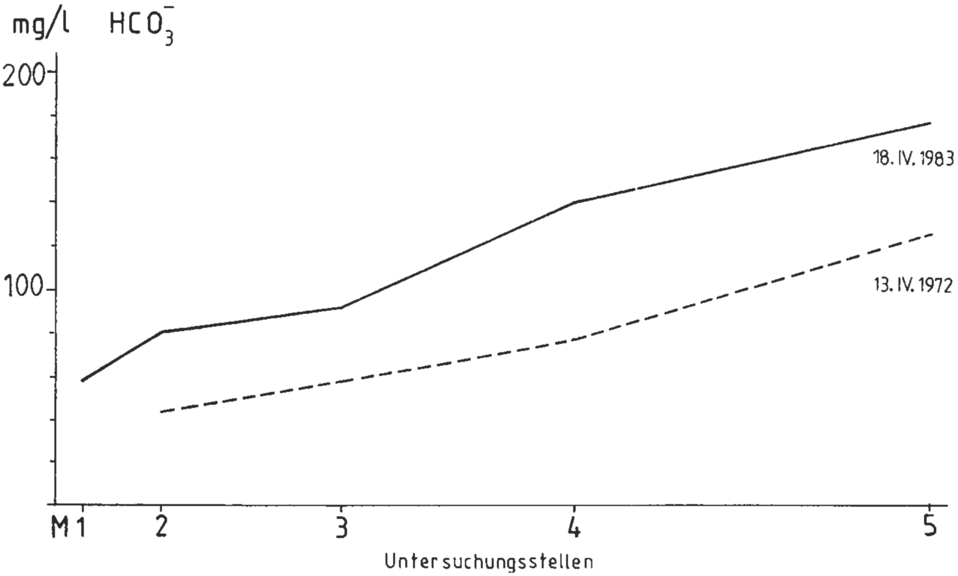

Abb. 9. Schwankung der HCO_3-Werte in IV. der Jahren 1972 und 1983

Die Menge des gebundenen Kohlendioxyds (HCO_3) ist heute wesentlich grösser als vor 10 Jahren. Die abgerundeten Extremwerte der im April 1971/72 gemessenen Daten sind 43 und 127 mg/l, die von uns 1983 gemessenen, entsprechenden Werte waren hingegen 57 und 177 mg/l. Die Änderungstendenz stimmt der Strömungsrichtung folgend überein (Abb. 9). Im Juli stellten wir den früheren Werten 58 – 132 gegenüber die Werte 226 – 360 fest. Den Oktoberwerten 68 – 119 können die Werte 104 – 256 entgegengehalten werden. Anlässlich der Wintermessungen (im Februar bzw. Dezember) erhielten wir den früheren Werten 48 – 132 gegenüber die Werte 104 – 360 mg/l.

Sehr charakteristisch sind die sich im Sauerstoffverbrauch zeigenden Wertänderungen während den vergangenen 10 Jahren. Indessen die Werte im April, Oktober und Dezember aus der Raumsicht von 10 Jahren fast gleich sind, weichen im Sommer die Juliwerte wesentlich voneinander ab. Dem 1971/72 im Juli gemessenen Sauerstoffverbrauch 4,53 – 5,63 mg/l gegenüber war – mit gleicher Methode – im Jahre 1983 der Sauerstoffverbrauch von 10,2 – 13,8 ml/l messbar, auch die Änderungstendenz der Strömungsrichtung folgend ist ähnlich. Der jedenfalls als bedeutend auswertbare Anstieg des Sauerstoffverbrauches im Sommer ist eindeutig dem am Bach inzwischen entstandenen Erholungsgebiet zuzuschreiben (Abb. 10).

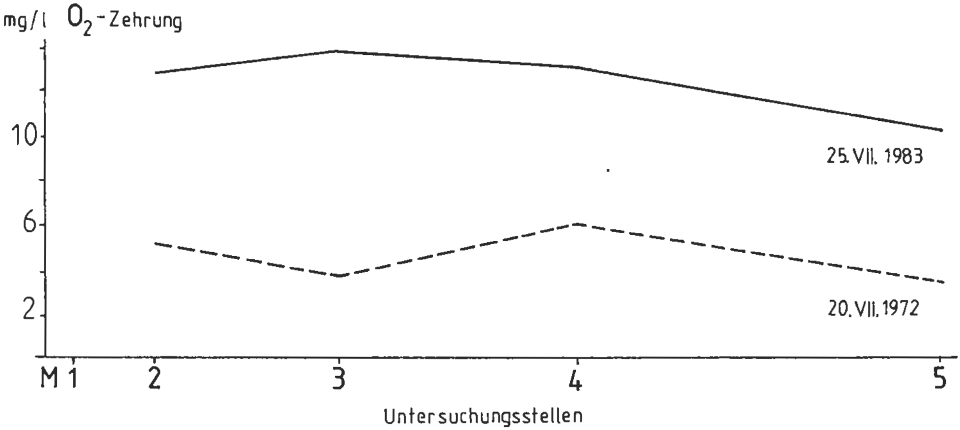

Abb. 10. Schwankung der O_2-Zehrung in VII. der Jahren 1972 und 1983

Im Ammonium-Ionengehalt zeigt sich in den mit 10 Jahren Unterschied entnommenen Proben keine wesentliche Abweichung.

Der Nitrat-Ionengehalt ist heute wesentlich höher als vor 10 Jahren, in den früheren Messungen als die Nitrat-Ionenmenge von einigen hervorspringenden Werten abgesehen unter 1,00 mg/l blieb, konnte hingegen kein Wert unter 2,80 gemessen werden und von 19 Daten fallen 15 zwischen 3,20 und 7,50. Die aus den Aprildaten der Jahre 1972 und 1983 gezeichneten Kurven (Abb. 11) zeigen gut den Anstieg des Nitratgehaltes im Wasser des Morgó-Baches an.

Eine gute Vergleichsmöglichkeit bieten die mit 10 Jahr Unterschied vorgenommenen Trichoptera-Sammlungen. Die folgende Zusammenstellung führen wir aus der Arbeit der Frau E. Csuták an (1973), mit den vor ihr angewendeten Häufigkeitszeichen (Tab. 3).

Aus der Zusammenstellung geht hervor, dass es uns nicht gelungen ist, zahlreiche Repräsentanten der Arten „mit grosser Individuenzahl“ und der „selteneren“ Arten zu finden, mehrere nur in geringer Menge. Diese Verringerung halten wir auf alle Fälle für wertmessend, da wir unsere Sammeltätigkeit in allen vier Jahreszeiten und möglichst sehr gründlich durchgeführt haben. Bei der Auswertung trachteten wir Entwicklungsperioden der Trichoptera also auch die mögliche Zeitdauer ihres Vorkommens zu beachten.

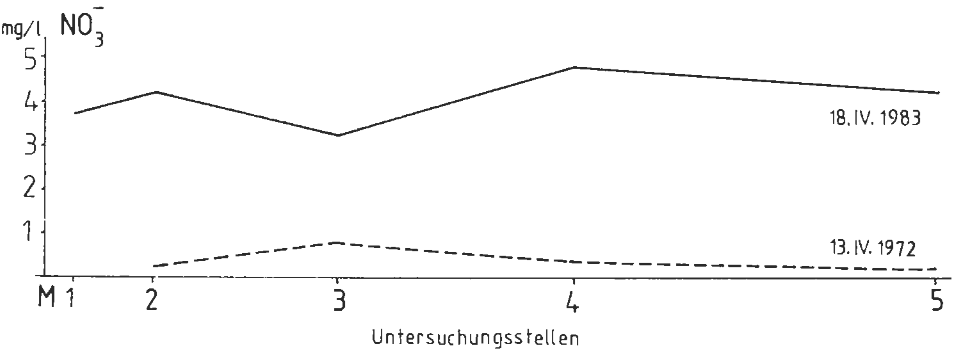

Abb. 11. Schwankung der NO_2-Gehaltes in IV. der Jahren 1972 und 1983

Zusammenfassend kann festgestellt werden, dass die bloss herausgegriffenen wassercheimschen und zoologischen Daten mit Verlauf von 10 Jahren eine gut registrierbare Zustandsänderung widerspiegeln. Die Zustandsänderung wurde eindeutig in der zwischen den beiden Untersuchungen vergangenen Zeitspanne intensiver und kann mit der menschlichen Tätigkeit, insbesondere mit der Einwirkung der im Tal des Morgó-Baches von Szokolya fast bis Verőcemaros ausgebildeten Erholungszone und -siedlung erklärt werden.

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Opusc. Zool. Budapest, XXIII, 1988

Are chitinolytic bacteria present in the gut of Glomeris hexasticha (Diplopoda)?

By

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Abstract. The hind gut of Diplopoda is rich in chitinous structures protruding into the lumen, which offer many sites for colonization of intestinal bacteria. Only very few scattered data are available in the literature on the occurrence of chitinolytic bacteria in the gut of soil invertebrates including millipedes, too. Studying the taxonomic composition of aerobic and facultatively anaerobic microbiota in the hind gut or fresh faecal matter of *Glomeris hexasticha*, we selected altogether 121 representative strains of the most important gut colonizing nocardioform actinomycete, *Pseudomonas, Chromobacterium, Flavobacterium,* etc. species. Neither from among these strains proved to be able to hydrolyse rapidly raw chitin. But 15 strains from among the 121 studied ones proved to be able to decompose partially hydrolysed chitinous preparates. In our opinion during the first selection processes taking place among the pioneer invaders in the gut of the young millipedes strongly active raw chitin-decomposers cannot attain a community position.

As it is known, chitinolytic bacteria occur frequently in lake and river muds, soils, etc. where chitin-containing materials from dead insect bodies desintegrated fungal hyphae etc. are intensely decomposed. Very few information are, however, available on the cocurrence of such microbes in the gut of soil invertebrates. Studying the intestinal microbiology of millipedes we demonstrated (Dzingov et al., 1982; Szabó et al., 1983; Márialigeti et al., 1985; Chu et al., 1987, etc.) many types of bacteria and their physiological abilities, which can colonize the hind gut of these animals. Since the hind gut of millipedes is rich in bristle-like chitinous structures functioning among others in the disruption of the peritoneal membrane, the question arouses: are chitin-decomposers present in this intestinal milieu, where the chitinous bristles play in the digestion an important indirect part? Below we try to answer on this question in the case of the millipede *Glomeris hexasticha* common in Hungarian forest soils.

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Materials and methods used

From aseptically collected, mixed faecal matter of different *Glomeris hexasticha* adult specimens a standard suspension and a dilution series were prepared, and plated on the surface of agar media of different composition. Altogether 1435 isolates were obtained. From among the latters 121 strains representing different types and species of gut bacteria were selected for detailed, computer aided taxonomic analyses (the results are presented in the work of CHU, 1986). These were tested also for chitinolysis. For this purpose the medium of JOHNSTON and CROSS (1976) was used: colloidal (or pulverised raw) chitin 2.0 g; $FeSO_4 \cdot 7H_2O$ 0.01 g; KCl 1.71 g; $CaCO_3$ 0.02 g; $MgSO_4 \cdot 7H_2O$ 0.05 g; Na_2HPO_4 1.63 g; agar 18.0 g; distilled water 1000 ml; pH 7.2. Colloidal chitin was prepared according to LINGAPPA and LOCKWOOD (1962). The inoculated plates were incubated at 28°C for 7 to 14 days. The chitinase production was indicated by clearing of the opaque medium.

Results and discussion

The tested 121 representative bacterial strains were indentified as members of different genera and species. 10 belonged to a new type of true nocardioform intestinal actinomycetes (CHU et al., 1987). 15 strains proved to be members of a *Klebsiella* sp. 51 strains, representing the predominant, indigenous gut bacterial fraction, were identified as organisms showing considerable similarity to *Pseudomonas stutzeri*, but not correctly identifiable with this species. 6 strains were identified at generic level as *Chromobacterium*, etc.

Among these strains many showed positive casein, aesculin, Tween – 80, DNA, starch, gelatin, tributirin, partially degraded chitin etc. hdrolysis, hypoxanthine, xanthine, tyrosine, arbutin, etc. decomposition (see Table 1). But cellulose and raw chitin remained in all cases unattacked by them. We suppose that strongly active raw chitin decomposers do not develope in the hindgut of *Glomeris hexasticha*. Such organisms, presumedly, disappeare already

Table 1. Decomposition of some selected organic compounds by representative gut bacterial strains of Glomeris hexasticha

	Numbers of strains	
	positive	negative
Cellulase production	0	121
Decomposition of raw chitin	0	121
Decomposition of partially hydrolysed chitin	15	106
Urease production	116	5
Starch hydrolysis	71	50
Aesculin hydrolysis	115	6
Casein hydrolysis	87	34
Gelatin hydrolysis	85	36
Tween 80 hydrolysis	110	11
Xanthine decomposition	17	104
Hypoxanthine decomposition	64	57
Testosterone decomposition	16	105

during the pioneer colonization of the intestinal lumen by bacteria and cannot attain community position in the hindgut biota. This seems to be evident if we are considering the fact that the decomposition or destruction of the chitinous intestinal structures of millipedes could influence disadvantageously the digestive processes.

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Opusc. Zool. Budapest, XXIII, 1988

Über die Bestimmung der Konsummenge von Eisenia foetida (Savigny, 1826) (Oligochaeta: Lumbricidae)

Von

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Abstract. Daily food consume of *Eisenia foetida* (SAVIGNY, 1826) was established on the base of feeding experiments carried out with rabbit dung on sandy substrate.

Vermikompostierungsverfahren mit dem Regenwurm *Eisenia foetida* (SAVIGNY, 1826) sind heutzutage überall weitverbreitet und werden für verschiedene organische Dünger und andere landwirtschaftliche und industrielle Abfälle verwandt. Die diesbezügliche Literatur befasst sich vorwieglich mit der Bestimmung des Fortpflanzungspotentials dieser Art, wobei bei vershiedenen Temperaturen und in verschiedenen organischen Substanzen die Menge der Kokons, die Inkubationszeit und Sterilität der Kokons u.s.w. bestimmt wurden (GRAFF, 1974, 1978, 1982, 1983; HARTENSTEIN, NEUHAUSER & KAPLAN, 1979; KNIERIEMEN, 1981; TSUKAMATO & WATANABE 1977; WATANABE & TSUKAMOTO, 1976; ZICSI, 1985).

Über die Ernährungsaktivität bzw. über genaue Konsummengen von *E. foetida* liegen nur wenige Angaben vor. LANGER (1979) ist ebenfalls dieser Meinung und weist auf einen einfachen Versuch hin, wo der Konsum von *E. foetida* mit 65,9 mg/g Lebendgewicht und pro Tag berechnet wurde. Über die Feuchtigkeitsverhältnisse des Ausgangsmaterials standen ihm jedoch keine Angaben zur Verfügung, die Gewichte wurden anhand der Durchschnittswerte von 1 Kubikfuss bestimmt. Genauere Angaben wurden von MITCHELL & & Mitarbeitern (1977) bekanntgegeben, die auf verschiedenen Klärschlämmen die Nahrungsaufnahme von *E. foetida* untersuchten. Aus der Arbeit geht leider nicht hervor, wie die Menge der konsumierten Nahrung berechnet wurde.

Die spärlichen und unsicheren Angaben lassen sich durch diejenigen Schwierigkeiten erklären, die sich beim Nachweis des Konsums dieser Art von der

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orgainschen Substanz selbst ergeben, da die Tiere in diesem Nahrungssubstrat leben, ihre Exkremente in diese ablegen.

Da bei Vermikompostierungsversuchen die von den Regenwürmern zersetzte Menge und die Zeitdauer der Zersetzung von ausschlaggebender Bedeutung ist, wurde versucht, ein Verfahren zur Bestimmung der Konsummenge von *E. foetida* zu erarbeiten, mit welchem annähernd der Konsum dieser Art bestimmt werden kann.

Material und Methode

Als Nahrung wurde Hasenmist aus einem Betrieb angeboten, wo der Kot ständig durch Spülung entfernt und vorübergehend in einem Sickerbassin aufbewahrt wird. Es ist im grundegnommen in der Struktur zerfallener Hasenmist mit 75–80% Wassergehalt.

Die Versuche wurden in 30,5×30,5×13 cm grossen Plastikbehältern, die mit einer Glasplatte abgedeckt werden konnten, durchgeführt. In diese Behälter wurden 2 kg reiner lufttrockener Sand, der später angefeuchtet wurde, und 100 g Nahrung von dem vorangehend angeführten Hasenmist untergebracht.

Die Versuche wurden bei Temperaturen zwischen 15–18 °C durchgeführt.

Die Versuche wurden in zwei hintereinander folgenden Serien in je 5facher Wiederholung durchgeführt. In jedes gefäss wurden 10 Exemplare der Art *E. foetida* eingesetzt. Ein Gefäss wurde mit Regenwürmern nicht beschickt und diente als Kontrolle. Eine Versuchsserie dauerte ungefähr 1 Monat lang. Bei der Bestimmung der Konsumwerte wurde das Durchschnittsgewicht der Regenwürmer eines Gefässes berücksichtigt, die vor und nach dem Versuch gewogen wurden. Nach jedem Versuch wurden die aus der Nahrung erzeugten Kotballen von *E. foetida* und die unzersetzten Nahrungsreste sorgfältig abgelesen und bei 105 °C wieder ausgetrocknet und gemessen.

Wie beobachtet werden konnte, begann erst am 2. Tag nach dem Einsetzen der Regenwürmer ein Konsum von der angebotenen Nahrung. Dies ist offensichtlich auf die ungewöhnliche Trägersubstanz (Sand) zurückzuführen, wo die Tiere sich die Gänge zur Bewegung zurechtlegten. Bei der Berechnung der Konsummenge wurde deswegen die Konsumzeit um 2 Tage verkürzt berücksichtigt. Der Konsum wurde mit Hilfe der Formel nach REIMANN (ZICSI & POBOZSNY, 1977) berechnet. In den Exkrementen wurde durch Glühverfahren die Menge der gesamtorganischen Substanz bestimmt. Mit gleichem Verfahren wurden fortlaufend auch die Veränderungen der gesamtorganischen Substanz im Sand bestimmt.

Wertung der Ergebnisse

Die Ergebnisse der beiden Fütterungsserien werden in Tabelle 1 zusammengefasst.

Wie aus der Tabelle 1 ersichtlich, ist das Gewicht der abgelegten Kotballen etwas höher als die nachweisbar konsumierte Nahrung. Es ist anzunehmen, dass die Tiere auch etwas Sand zu sich nehmen. Diese Menge ist aber sehr gering.

Aufgrund der Durchschnittswerte der beiden Serien kann festgestellt werden, dass der Konsum 71,51±6,29 mg Trockengewicht pro 1 g Lebendgewicht pro Tag beträgt. Die Exkrementmenge beträgt 84,51 ± 14,14 mg, die in den Exkrementen enthaltene gesamtorganische Substanz 32,13 ± 10,99 mg Trockengewicht pro 1 g Lebendgewicht pro Tag.

Tabelle 1. Konsum von E. foetida berechnet in mg Trockengewicht pro 1 g Lebendgewicht pro Tag

Versuchsserie	Konsum $\overline{X} \pm SD$	Kotballen $\overline{X} \pm SD$	Gesamtorganische Substanz $\overline{X} \pm SD$
1	70,70 ± 7,14	84,58 ± 13,32	27,03 ± 4,88
2	72,32 ± 6,03	84,44 ± 17,10	39,25 ± 9,23

Aus den Angaben kann ferner noch berechnet werden, dass 1 kg Regenwürmer (cca. 2000 Stück) der Art *E. foetida* von reifem Hasenmist 261 – 311 g (bei einem Feuchtigkeitsgehalt von 75%) konsumieren können und dabei 280 – 396 g Kotballen pro Tag erzeugen.

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Weitere Angaben zur Lebensweise von Dendrobaena hortensis (Michaelsen, 1890) (Oligochaeta: Lumbricidae)

Von

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Abstract. Reproduction potential of *Dendrobaena hortensis* was established with two different methods and the results compared. For further comparison, the reproduction potential of the species *Eisenia foetida* — used generally in experiments of composting processes — was similarly established with both methods, and results compared with those of *D. hortensis*. Interactions between *D. hortensis* and *E. foetida* were studied in reproduction experiments and it could be established that the reproduction of *D. hortensis* was hindered by the presence of *E. foetida*. On the base of obtained values of the reproduction potential of *D. hortensis* the species is equally suitable for the purposes of composting experiments.

Da in den letzten Jahren zahlreiche biotechnologische Verfahren, u. a. auch das Kompostieren von verschiedenen organischen Abfällen durch Regenwürmer, ın Vordergrund der Interesse getreten sind, wird ausser dem gewöhnlichen Mistwurm *Eisenia foetida* (SAVIGNY, 1826) auch nach anderen Arten gesucht, die als Nutztiere bei der Zersetzung organischer Materialien herangezogen werden könnten. Die bisherigen Untersuchungen haben sich mit Erfolg auf die tropische bzw. subtropische Art *Eudrilus eugeniae* (KINB., 1867) bzw. *Perionyx excavatus* PERRIER, 1872 erstreckt, wobei nachgewiesen werden konnte, dass sich diese unter entsprechenden Verhältnissen neben *E. foetida* ebenfalls zu Kompostierungen verwenden lassen (GRAFF, 1982; GUERRERO, 1983; KNIERIEMEN, 1984). Unlängst wurde auch auf andere Arten noch hingewiesen, die sich aufgrund ihrer biologischen Eigenschaften bei der Zersetzung verschiedener organischer Substanzen heranziehen lassen (ZICSI, 1985; CSUZDI, im Druck).

An dieser Stelle wollen wir uns mit einer Art: *Dendrobaena hortensis* (MICH., 1890) befassen, die potenziell bei Kompostierung verschiedener organisher Abfälle ebenfalls in Frage kommen könnte.

D. hortensis ist ein 20 – 60 mm langer, 150 – 500 mg wiegender, kleiner bis mittelgrosser Regenwurm. Der rote, ungestreifte Wurm stösst aus den Rücken-

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poren eine weisse Flüssigkeit hervor, die nicht übel riecht. In der Holarktis wird sie oft im Mist oder Kompost angetroffen (Zicsi, 1968; Bouché, 1972; Fender, 1985).

Da bisher bezüglich des Vermehrungspotenzials dieser Art keine näheren Angaben vorliegen, sind seit 1984 Vermehrungs- und Züchtungsversuche durchgeführt worden, deren Ergebnisse in diesem Aufsatz zusammengefasst werden.

Um das Vermehrungspotenzial von *D. hortensis* feststellen zu können, musste zuerst die Kokonproduktion, die Zahl der sterilen Kokons und die in einem Ei sich entwickelnden Jungtiere bestimmt werde. Zu diesem Zweck wurden auf reifem Hasenmist (durch Auswaschverfahren deponierter Hasenmist) verschiedene Versuchsserien durchgeführt, deren Ergebnisse nachstehend angeführt werden.

Berechnung der Kokonproduktion

Die Kokons von *D. hortensis* sind äusserst klein, erreichen kaum die Grösse eines Stecknadelkopfes. Sie sind eiförmig, an beiden Enden etwas zugespitzt. Die Kokonproduktion wurde aufgrund eines 76-tägigen Versuches bestimmt, wobei das Substrat, der reife Hasenmist wöchentlich nach Regenwurmkokons abgesucht, die Eier und Würmer gewogen wurden.

In Tabelle 1 wird die Kokonproduktion von 30 Versuchstieren angeführt. Die Kokonproduktionsangaben beziehen sich auf die Produktion der Kokons pro Tag und pro Tier.

Tabelle 1. Bestimmung der Kokonproduktion von 30 Tieren in einem 76-tägigen Versuch

Versuchszeit in Tagen	Durchschnitts-Gewicht 1 Tieres in g	Durchschnitts-Gewicht 1 Kokons in mg	Kokonproduktion pro Tag pro Tier
7	0,20	6,30	0,19
15	0,25	4,10	0,39
27	0,29	3,80	0,71
35	9,32	4,40	1,06
43	0,35	5,36	1,19
50	0,39	3,75	1,54
55	0,40	3,87	1,65
64	0,38	4,28	1,37
70	0,35	3,71	1,03
76	0,35	3,00	0,31

Wie aus der Tabelle 1 ersichtlich, konnte ein beträchtliches Zunehmen der Tiere festgestellt werden, diesem folgte jedoch keine Gewichtszunahme der Kokons. Es konnte entweder zwischen dem Kokongewicht und dem Gewicht der Tiere oder der Kokonproduktion und dem Gewicht der Kokons eine Korrelation nachgewiesen werden.

Den Anteil der sterilen Kokons bestimmten wir zwischen dem 43. und 55. Versuchstag, wo noch eine steigende Tendenz der Kokonproduktion nachgewiesen werden konnte.

Tabelle 2. Bestimmung der unbefruchteten Kokons

Versuchszeit (Tag)	Durchschnitts-Gewicht 1 Tieres in g	Kokon produktion pro Tag pro Tier	Anzahl der untersuchten Kokons	Anzahl der sterilen Kokons	%
43	0,35	1,19	113	11	9,7
50	0,33	1,54	113	39	34,5
55	0,40	1,65	90	49	54,4

Wie aus Tabelle 2 ersichtlich, sind von 316 Kokons 99, also 31,33%, steril. Ein Ansteigen der Kokonproduktion scheint auch zur Erhöhung einer Sterilität zu führen.

Die Zahl der Jungtiere in einem Kokon wurde aufgrund von 154 Kokons bestimmt. Die Ergebnisse werden in Tabelle 3 zusammengefasst.

Tabelle 3. Bestimmung der in einem Kokon sich entwickelnden Jungtiere

Kokonzahl	Jungtiere pro Kokon	Jungtiere insgesamt %	Zahl der Jungtiere zusammen
73	1	47,40	73
64	2	41,56	128
17	3 oder 4	11,04	59
154	–	100%	260

Wie aus Tabelle 3 ersichtlich, entwickeln sich in einem Kokon im Maximum 4 Jungtiere. Im Durchschnitt von 154 Eiern entwickeln sich 1,69 Jungtiere.

Zur Bestimmung der Inkubationszeit der Eier wurden 5 Exemplare auf reifem Hasenmist gehalten und täglich nach Eiern abgesucht. Die Eier wurden einzeln in Petrischalen unter Leitungswasser aufbewahrt und beobachtet. Die Versuche wurden bei Zimmertemperaturen von 18–22 °C durchgeführt. In Tabelle 4 sind die Ergebnisse unserer Untersuchungen dargestellt.

Tabelle 4. Bestimmung der Inkubationszeit bei Kokons von D. hortensis

Inkubationszeit in Tagen	Zahl der Eier
12	3
13	1
14	4
15	6
16	6
17	1
18	1
19	9
21	5
22	2
23	1
24	1
25	4
26	2

Wie aus Tabelle 4 ersichtlich, beträgt die Inkubationszeit bei Eiern von *D. hortensis* 19 ± 4,5 Tage (vergl. auch Zicsi, 1985).

Aus den bisher berechneten Werten (Kokonproduktion, Sterilität der Eier, Durchschnittszahl der Jungtiere in einem Kokon und Inkubationszeit der Kokons) kann das Vermehrungspotenzial eines Tieres bzw. einer Population bestimmt werden. Bei den verschiedenen Kompostverfahren sind die Kenntnisse dieser Werte für die Praxis unerlässlich.

Da die Berechnung des oben erwähnten Vermehrungspotentiales für verschiedene Ausgangssubstanzen immer neu berechnet werden muss, haben wir versucht, ein genaueres und gleichzeitig einfacheres Verfahren zu erarbeiten. Dieses Verfahren eignet sich insbesondere für solche Arten, deren Nachkommen besonders klein sind und so beim Auslesen leicht verletzt, bzw. übersehen werden können. Da bei den vorherigen Berechnungen noch angenommen wird, dass die ausgeschlüpften Tiere alle am Leben bleiben, kann dies zu bedeutenden Ungenauigkeiten führen. Um dies zu vermeiden, sind beim neuen Verfahren die zu den Versuchen herangezogenen adulten Tiere nach einer gewissen Versuchzeit aus den Gefässen entfernt worden. Nachher werden die Jungtiere in bestimmten Abständen ausgelesen. Das Entfernen der adulten Tiere muss unbedingt noch vor dem Erreichen der Geschlechtsreife der Jungtiere erfolgen.

Zur Bestimmung des Vermehrungspotenzials von *D. hortensis* mit dem von uns erarbeiteten neuen Verfahren wurden in 5-maliger Wiederholung die Nachkommen von je 10 Tieren, ebenfalls auf reifem Hasenmist gehalten, bestimmt. Die adulten Tiere wurden nach 68 Tagen entfernt, nachher wurde mit der Auslese der Jungtiere begonnen.

In Tabelle 5 und 6 werden die Vermehrungswerte, die mit 2 verschiedenen Methoden erlangt wurden, zusammengefasst und einander gegenübergestellt.

Tabelle 5. Bestimmung der Jungtiere bei Entfernung der Elterntiere

Versuch	Zahl der juvenilen Tiere	Zahl der Juvenilen pro adulte Tiere und pro Tag
1	487	0,716
2	476	0,700
3	409	0,601
4	456	0,671
5	452	0,665
$\overline{X}$	456 ± 30	0,671 ± 0,044

Tabelle 6. Bestimmung der Jungtiere aufgrund von Berechnung der Kokonproduktion, Sterilität und Durchschnittszahl pro Kokon

Versuche	Zahl der Juvenilen pro adulte Tiere und pro Tag
1	0,781
2	0,937
3	1,242
$\overline{X}$	0,987 ± 0,234

Beim Vergleich der beiden Mittelwerte mit der t-Probe konnte bei P = 0,05 kein signifikanter Unterschied nachgewiesen werden.

Obwohl kein signifikanter Unterschied besteht, kann aus den oben angeführten mit grösster Wahrscheinlichkeit angenommen werden, dass nur 70% der juvenilen Tiere am Leben bleibt. Wenn weiter noch angenommen wird, dass durch die Störung der ständigen Kokonauslese die Zahl der abgelegten Eier abnimmt und auch die Sterilität zunimmt, kann die Überlebungsrate der juvenilen Tiere sich noch kleiner gestalten.

Da *Eisenia foetida* die am häufigsten für Kompostversuche herangezogene Art ist, wurden zum Vergleich auch mit ihr gleiche Untersuchungen durchgeführt. Wie aus Tabelle 7 und 8 ersichtlich, zeigt *E. foetida* einen geringeren Nachwuchs mit diesem Verfahren.

Tabelle 7. Bestimmung der Jungtiere bei Entfernung der Elterntiere von E. foetida

Versuch	Zahl der juvenilen Tiere	Zahl der Juvenilen pro adulte Tiere und pro Tag
1	467	0,658
2	415	0,585
3	489	0,689
$\bar{x}$	457 ± 38	0,644 ± 0,053

Tabelle 8. Bestimmung der Jungtiere aufgrund von Berechnungen der Kokonproduktion, Sterilität und Durchschnittszahl pro Kokon bei E. foetida

Versuch	Zahl der juvenilen Tiere pro adulte pro Tag
1	1,338
2	1,084
3	0,925
$\bar{x}$	1,116 ± 0,208

Beim Vergleich der beiden Mittelwerte konnte bei P = 0,05 ein signifikante Unterschied festgestellt werden. Wie aus den Untersuchungen ersichtlich, ist das Überleben bei den *E. foetida* juvenilen geringer (60%) als bei *D. hortensis*. Dies lässt sich eventuell mit der in einem Kokon sich entwickelnden höheren Nachkommenzahl erklären.

In keinem Fall konnte bei Vergleich der mit gleichem Verfahren erreichten Ergebnisse von *D. hortensis* und *E. foetida* ein signifikanter Unterschied nachgewiesen werden.

Über Wechselbeziehungen zwischen D. hortensis und E. foetida

In Ungarn kommen die beiden Arten sehr selten zusammen in einem Biotop vor. Wie beobachtet werden konnte, leben sie auch im Kompost meistens separiert. Ob dies vom verschiedenen Rottezustand des Kompostes bedingt ist, oder ob andere Wechselbeziehungen bestehen, sollte anhand von Fortpflanzungsuntersuchungen geklärt werden.

In je 2 Versuchen wurden auf reifem Hasenmist 10–10 Exemplare von *D. hortensis* und *E. foetida* gesondert auf Nachkommen getestet. In 5 Wiederholungen wurden auf gleichem Substrat je 10 Exemplare von *D. hortensi* und *E. foetida* zusammen untersucht. Nach 41 Tagen wurden sämtliche Elterntiere aus den Versuchen entfernt. Von da an wurde das Substrat öfters nach Jungtieren abgesucht. Die Jungtiere der gemischten Population wurden abgetötet und aufgrund der Borstenanordnung separiert.

In Tabelle 9 fassen wir die Ergebnisse unserer Untersuchungen zusammen

Tabelle 9. Bestimmung des Vermehrungspotenzials bei D. hortensis und E. foetida in separierter und gemischter Zucht

Art	Zahl der Elterntiere am Anfang des Versuches	Zahl der Elterntiere am Ende des Versuches	Durchschnittszahl der Elterntiere	Gewicht der Elterntiere zu Beginn am Ende des Versuches in g von 1 Tier		Jungtiere	Vermehrungspotenzial Jungtier pro adult	%
E. foetida	20	19	19,75	0,60	0,55	376	0,47	100
D. hortensis	20	20	20	0,30	0,46	367	0,45	100
E. foetida +	50	47	48,4	0,60	0,64	946	0,47	100
D. hortensis	50	42	46	0,29	0,41	213	0,11	24,4

Wie aus Tabelle 9 ersichtlich ist, scheint die Fortpflanzung von *D. hortensis* in Gegenwart von *E. foetida* gehemmt zu sein (24,4%), während bei *E. foetida* sich kein Nachteil nachweisen liess. Ob der Rückgang bei den juvenilen von *D. hortensis* auf die Anwesenheit von *E. foetida* selbst oder auf die Toxizität der Losungen zurückzuführen ist (KAPLAN et al, 1980), muss durch später durchgeführte Untersuchungen entschieden werden.

Obwohl *E. foetida* bedeutend grösser als *D. hortensis* ist, darf letzterer bei Kompostierungsverfahren potenziell nicht ausser acht gelassen werden. Erstens deswegen nicht, da das Vermehrungspotenzial dem von *E. foetida* gleich ist, zweitens auch schon deswegen nicht, weil die Coelomflüssigkeit nicht übel riecht und so bei Verwertung von Tierfutter, wie dies auch bei *E. eugeniae* von KNIERIEMEN (1984) festgestellt wurde, gegenüber *E. foetida* einen Vorteil bedeutet. Es würde sich lohnen, die Zersetzungstätigkeit dieser Art auch an verschiedenen anderen organischen Abfällen zu testen und mit den Ergebnissen von *E. foetida* zu vergleichen.

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Opusc. Zool. Budapest, XXIII, 1988

Eine neue Enchytronia-Art aus Marokko

Von

K. Dózsa-Farkas*

Abstract. A new species of Enchytraeidae, *Enchytronia baloghi* sp. n. is described from Morocco. It may be distinguished from the other species of the genus by the presence of setae in the dorso-lateral bundles.

Im Rahmen der von Prof. Dr. P. Omodeo 1986 in Marokko geleiteten zoologischen Expedition wurden von Prof. Dr. F. Bernini (Siena) auch Bodenproben gesammelt, die mir freundlicherweise auf Nachweis von Enchytraeiden übersandt wurden. Für die Überlassung des Materials spreche ich beiden oben erwähnten Herren auch an dieser Stelle meinen besten Dank aus. Da die Tiere meistens nur *in vivo* bestimmt werden können, ist die Beschreibung der Proben fortlaufend gewesen; an dieser Stelle soll die Beschreibung einer neuen Art, *Enchytronia baloghi* sp. n. erfolgen.

Material und Methode

Wegen der geringen Menge der zugesandten Bodenproben (cca 50 cm^3) wurde der Boden in kleinen Mengen auf einem Planktonnetz ausgewaschen. Mit Hilfe eines Mikroskopes wurden die Enchytraeiden ausgelesen und *in vivo* bestimmt. Nach einem Fixieren in 70% Alkohol bzw. Bouenlösung wurden die Tiere in 70% Alkohol aufbewahrt.

Enchytronia baloghi sp. n.

(Abb. 1 a–e)

Kleine Art. Holotypus: Länge lebend 3,5 mm, Breite 0,18 mm, Segmentzahl 23. Bei den Paratypen: Länge lebend 3–3,5 mm, Breite 0,14–0,20 mm, am Gürtel etwas breiter, Segmentzahl 19–26. Kopfporus O/I, Dorsalporen fehlen. Farbe weisslich. Borsten gerade, mit wohl entwickelten entalen Haken: 2–2 : 2–2. Borsten in den dorsolateralen Bündeln – im Gegensatz zu den übrigen

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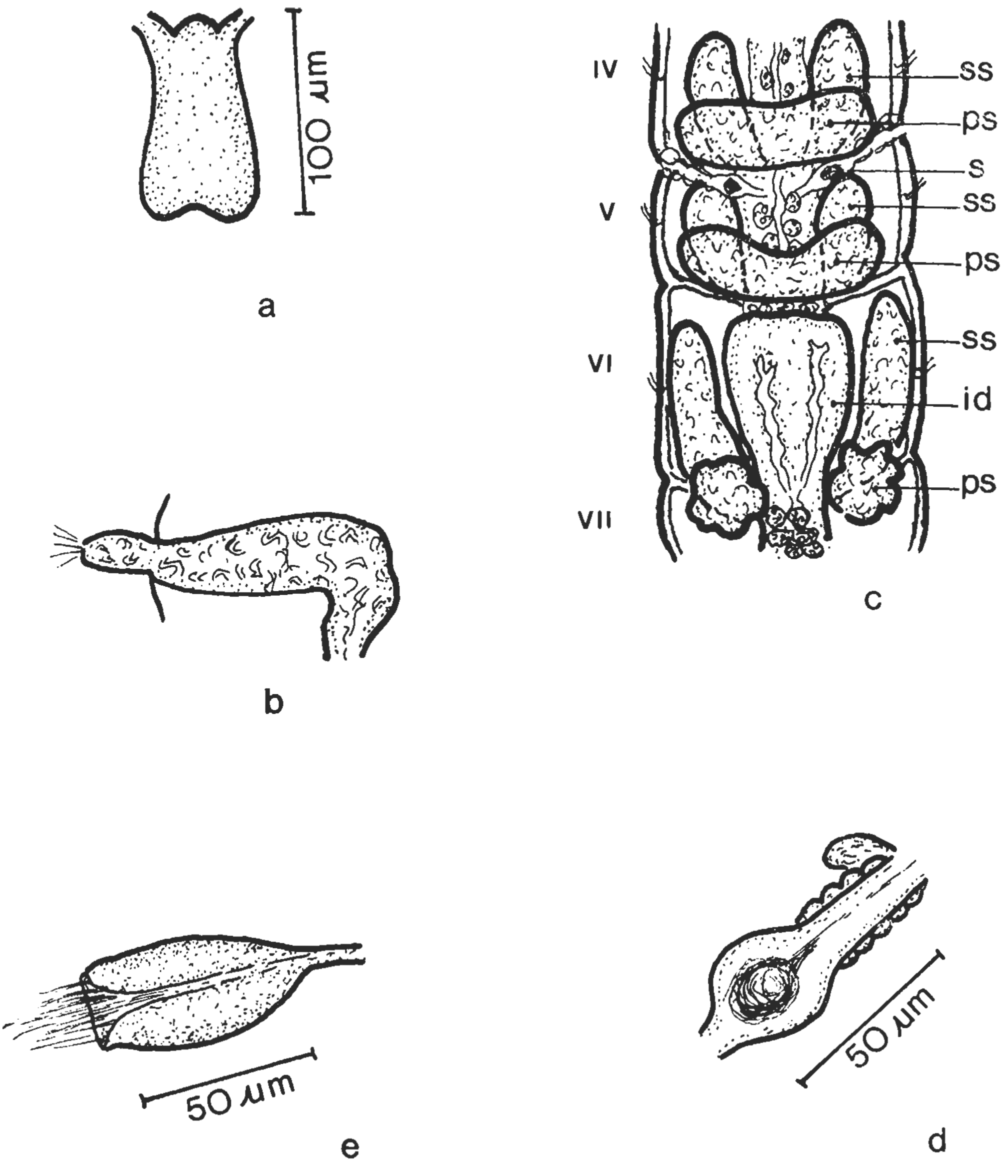

Abb. 1. *Enchytronia baloghi* sp. n. a: Gehirn, b: Nephridium, c: IV–VII. Segment: (id: Intestinaldivertikel, s: Spermatheka, ps: primäre Septaldrüsen, ss: secundäre Septaldrüsen), d: Spermatheka, e: Spermatrichter

Enchytronia-Arten – sind vorhanden, fehlen nicht. Im XII. Segment fehlen die Borsten. Länge der Borsten 25–27 µm. Clitellum vom XII bis 1/2 XIII. Segment; Drüsen in Querreihen geordnet, wohl entwickelt, insbesondere auf der Dorsalseite.

Gehirn 1 1/2 – 2mal länger als breit (Abb. 1 a), vorne konvex, Hinterrand eingeschnitten. Peptonephridien fehlen. Intestinaldivertikel im VI. Segment (Abb. 1 c). Chloragongenzellen sind vom IV. Segment beginnend vorhanden. Grösse etwa 20 μm, mit lichtbrechenden Ölvakuolen gefüllt. Lymphozyten (Länge 25 – 33 μm), oval und fein granuliert. Von den 3 primären Septaldrüsenpaaren die ersten zwei dorsal kommunizierend, die 3. Septaldrüsen getrennt und gelappt umrandet. Ausserdem noch 3 Paar sekundäre Septaldrüsen vorhanden (Abb. 1 c). Rückengefäss entspringt im XII – XIII. Segment. Blut farblos. Ausführungsductus der Nephridien ist posteroventral (Abb. 1 b).

Vesicula seminalis fehlen. Spermatrichter (Abb. 1 e) ungafähr 2mal länger als breit, betragen nahezu 1/3 des Körperdurchmessers. Kragen schwach entwickelt, Samenleiter lang, Durchmesser 3,3 μm. Penialbulbus klein und kompakt.

Spermatheken (Abb. 1 d) bestehen aus einer runden Ampulle; der kurze entale Ausführungsgang der beiden Spermatheken ist miteinander nicht verbunden, mündet so in den Oesophagus. Ektaler Ausführungsgang ungefähr ebenso lang wie Ampulle (24 – 33 μm), mit Drüsen bedeckt, an der Öffnung noch eine grosse Drüse vorhanden.

Zahl der untersuchten Individuen: 4.

Typischer Fundort: Rabat (Marokko), Wald Mamore, 225 m, Wiesenhumus, 1. 5. 1986. Leg.: F. BERNINI.

Holotypus: E. 2. Paratypen: P. 15 (3 Ex.). Das Typenmaterial wird in der Sammlung des Lehrstuhls für Tiersystematik und Ökologie der L.-Eötvös-Universität, Budapest, aufbewahrt.

Die neue Art wird zu Ehren nach Herrn Prof. Dr. J. BALOGH (Budapest) benannt.

Die neue Art unterscheidet sich von allen bisherigen *Enchytronia*-Arten (*E. parva* NIELSEN & CHRISTENSEN, 1959, *E. annulata* NIELSEN & CHRISTENSEN, 1959, *E. christenseni* DÓZSA – FARKAS, 1970, *E. minor* MÖLLER, 1971, *E. hellenica* DUMNICKA, 1979) dadurch, dass vom VIII – XI. Segment in den dorsolateralen Bündeln die Borsten vorhanden sind. Ausser der neuen Art befindet sich noch bei *E. christenseni* keine Verbindung zwischen den beiden Spermatheken, die Spermatheken weisen jedoch eine andere Form auf.

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Nährstoffumsatz des Japanischen Mövchens (domestizierte Form von Lonchura striata [L.]) in den verschiedenen Perioden des Brütens

Von

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Abstract. Daily food consumption (C) and the proportions of food allocated among faeces and urine (FU) and respiration (R) were measured under laboratory conditions in different periods of breeding. The egg production was also studied.

Two types of food were used: millet and millet + boiled egg. Metabolic efficiency of millet was higher than that of the boiled egg, although females needed the latter for egg production. Birds consumed less food — contrary to expectation — from the beginning of nest building till the end of incubation than before. The proportion of food used for respiration was higher during incubation than during other periods of breeding. Food consumption did not increase either during egg formation. We think that birds used their own reserves for egg formation resulting in the decrease of their weight, which can be supplied only during a longer period.

Der Stoffwechsel der Vögel ist sehr eigenartig. Ihr Energieanspruch ist ausserordentlich gross, einen beträchtlichen Teil ihrer Nahrung verbrauchen sie zur Deckung ihres diesbezüglichen Bedarfes. Gleichzeitig sind sie dominante Mitglieder der Mehrheit der Lebensgemeinschaften. Ihre Rolle im Stoff- und Energieumsatz der lebenden Systeme ist von hervorragender Wichtigkeit.

Lasiewski und Dawson (1967) reihen die Vögel von energetischen Gesichtspunkt in zwei Gruppen. In die erste Gruppe gehören die Sperlingsvögel, in die zweite die übrigen. Schildmacher (1982) berichtet darüber, dass die Sperlingsvögel im allgemeinen über einen mehr als 1,5mal grösseren Energieumsatz verfügen als sonstige Vögel von ähnlicher Körpergrösse. Laut Zar (1968) lassen sich hingegen die Vögel von produktionsbiologischem Gesichtspunkt nur je Familie oder Genus gut gruppieren. Kendeigh (1970) vertritt den Standpunkt, dass im Stoffwechsel (existence metabolism) der beiden Gruppen der Unterschied an einer höheren Temperatur (z. B. bei 30°C) nachgewiesen werden kann, bei 0°C eliminiert sich aber schon dieser Unterschied. Jedenfalls müssen wir als Tatsache in Betracht ziehen, dass die Sperlingsvögel die grösste Gruppe der Vögel darstellen und so muss ihre Bedeutung auch dementsprechend ausgewertet werden.

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Aufgrund der obigen Bedenken wandten wir unsere Aufmerksamkeit den Sperlingsvögeln zu. Das zu Versuchszwecken herangezogene Japanische Mövchen *(Lonchura striata*, domestizierte Form) betrachten wir als Modelltier. Unsere Wahl fiel deshalb auf die Individuen dieser Art, da sie die Verhältnisse der Innenraumhaltung und die mit dem Versuch einhergehenden störenden Wirkungen besonders gut ertragen (EISNER, 1960; GERE, 1974). Gleichzeitig wird durch Erfahrungen bewiesen, dass die verschiedenen Arten von produktionsbiologischem Gesichtspunkt in Typen gereiht werden können (GERE, 1979). Die Ergebnisse werden sich also voraussetzlich auch für die Eigenartigkeiten mehrerer anderer Sperlingsvögel als anwendbar erweisen. Nachdem uns der Stoff- und Energiebedarf der in geschlossenem Raum gehaltenen *Lonchura*, also mit beschränkten Bewegungsmöglichkeiten bekannt ist (GERE, 1974), suchten wir auf die Frage eine Antwort, wie weit sich dieser Anspruch im Falle ähnlicher Umweltverhältnisse in den verschiedenen Brutperioden modifiziert.

Methode

Die Versuchsvögel wurden paarweise in Käfigen mit einer Grundfläche von 25×42 cm untergebracht. Auf die Käfige hängten wir zur entsprechenden Zeit, um den Bruttrieb hervorzurufen bzw. das Nisten zu ermöglichen, 10×10×10 cm grosse Nistkästen. Die Zimmertemperatur schwankte zwischen 20–22°C. Es wurde täglich für 12 Stunden lange Beleuchtung gesorgt.

Die Nahrung war bei einem Teil der Vogelpaare nur Hirse, mit Vitaminpräparaten ergänzt. Anderen Vögeln wurde ermöglicht ausser Hirse auch hartgesottene und geriebene Hühnereier in ihrem Bedarf entsprechender Menge zu konsumieren. Wasser stand ihnen unbeschränkt zur Verfügung. Die Nahrung gaben wir ihnen gewogen in lufttrockenem bzw. das Ei in natürlichem Zustand. Gleichzeitig stellten wir den Wassergehalt dieser Nahrung mit Hilfe der bei 104°C bis zur Gewichtskonstanz erfolgten Trocknung einer eigenen Probe fest. Nach 24 Stunden sammelten wir den Nahrungsrest quantitative zusammen und wogen ihn in absolutem Trockenzustand. Den Verbrauch geben wir in absoluter Trockenmenge an. Das produzierte Exkrement (also Fäzes + Harnkomplex) sammelten wir täglich zusammen. Seine Menge teilen wir gleichfalls auf absolutem Trockenzustand bezogen mit.

Die Menge der respirierten Stoffe (R) gaben wir aufgrund des Unterschiedes des Verbrauches (C) und der Menge der Fäzes-Harnstoffe (FU) an, aus der Feststellung ausgehend, dass sich die Körpermenge des Vogels in den einzelnen Perioden des Versuches praktisch nicht veränderte, also es musste in der Relation des Stoffwechsels die Proportion $C = FU + R$ bestanden haben. Davon bildet notwendigerweise eine Ausnahme die Periode des Eierlegens, als ein Teil der Nährstoffe zur Eierproduktion verwendet wurde. In dieser Periode haben wir von der Errechnung der zur Atmung verbrauchten Stoffmenge Abstand genommen.

Untersuchungsergebnisse

Über den Stoffumsatz der Vögel informiert uns Tab. 1. Unter der Zeit ausserhalb der Brutperiode ist die Anfangsphase des Versuches zu verstehen, als der Nistkasten noch nicht auf den Käfig angebracht war. Die Periode des Nestbaues begann mit seiner Anbringung, da durch den Anblick des Nistkastens bei den Vögeln die Aktion des Nestbaues sozusagen sofort ausgelöst wurde.

Tabelle 1

Periode		Zahl der Versuchs-Individuen	Zahl der Versuchstage	$\frac{C\times100}{G}$	Von der Konsumtion		$\frac{FU\times100}{C}$	$\frac{R\times100}{C}$
					Hirse %	Ei %		
A	Ausserhalb der Brutphase	16	125	19,77 ± 1,90	100	–	15,75 ± 1,28	84,25
B		6	18	19,36 ± 2,01	82,9 ± 6,5	17,1	19,74 ± 0,19	80,26
A	Nestbau	12	143	16,37 ± 1,55	100	–	15,81 ± 1,47	84,19
B		12	72	16,77 ± 1,70	83,7 ± 4,2	16,3	18,68 ± 1,41	81,32
A	Eierlegen	8	63	16,67 ± 2,25	100	–	14,10 ± 1,38	
B		6	16	17,04 ± 1,97	83,2 ± 8,1	16,8	15,95 ± 1,88	
A	Brüten	6	69	17,16 ± 0,80	100	–	15,17 ± 0,70	84,83
B		6	39	18,60 ± 1,12	89,0 ± 1,5	11,0	16,46 ± 0,55	83,54

A = Hirse als Nahrung; B = Hirse und Hühnerei als Nahrung; C = absolute Trockenmenge der täglich verbrauchten Nahrung (g); FU = absolute Trockenmenge der täglichen Menge des Fäzes + Urin (g); G = lebende Körpermenge des Vogels (g); R = absolute Trockenmenge der täglich respirierten Stoffe

Die Daten der Tabelle weisen darauf hin, dass die Japanischen Mövchen die Samennahrung in quantitativer Hinsicht zu jeder Zeit mit besserem Wirkungsgrad verwerten als das Hühnerei. Die Menge der FU-Stoffe war nämlich bei den ausschliesslich mit Hirse ernährten Paaren im Verhältnis zur Konsumtion stets geringer, als bei denen, die auch gesottene Eier konsumierten. Gleichzeitig soll aber bemerkt werden, dass die Vögel zur Eierproduktion auch das an tierisches Eiweiss reiche Hühnerei dennoch benötigt haben. Die ausschliesslich mit Hirse ernährten Weibchen produzierten nämlich in keinem einzigen Fall ein ganzes Geheck (4 – 5 Eier), legten ihre Eier – wie ansonsten in üblicher Weise – nie täglich nacheinander und die Eier waren unfruchtbar.

Es scheint, dass sich die Nahrungsverwertung zur Zeit des Eierlegens und des Brütens mässig verbessert. Die Proportion der ausgeschiedenen (FU) Stoffe vermindert sich zu dieser Zeit. Dies stimmt unter anderen mit den an Zebrafinken vorgenommenen Untersuchungen von El-Wailly (1966) überein. Die Untersuchungsergebnisse hatten – abgesehen davon – zu einem nicht erwarteten Resultat gefürt. Den Daten der Fachliteratur nach ist der Energieverbrauch der Vögel in allen Phasen des Brütens grösser als ausserhalb dieser Tätigkeit. Dies ist z. B. im Zusammenhang mit *Troglodytes aedon* (Kendeigh,

1963) und *Passer domesticus* (KENDEIGH, 1970) bekannt. Nach EL-WAILLY (1966) wurde der Energiebedarf des Zebrafinken schon zu Beginn des Nestbaues grösser. Besonders verständlich zu sein scheint, dass der Energieumsatz des Weibchens zur Zeit des Eierlegens beträchtlich zunimmt (SCHILDMACHER, 1982). Trotz dessen konnte in unserem Versuch das Gegenteil der bisherigen Beobachtungen wahrgenommen werden. Die Vögel konsumierten vom Beginn des Nestbaues (bei Anbringung des Nistkastens auf den Käfig) weniger als sonst. Diese Erscheinung lässt sich damit erklären, dass die Mövchen ausserordentlich ruhige Vögel sind. Nach der Anbringung des Nistkastens bezogen sie diesen sozusagen sofort und bewegten sich nur wenig. Zum Bau der (in den gegebenen Fällen) einfachen Nestern beanspruchten sie minimale Energie. Die zum Nestbau benötigte Heumenge legten wir im vorhinein in den Nistkasten. Es kann daher angenommen werden, dass der bei anderen Vögeln während des Nestbaues beobachtete grössere Energiebedarf nicht in der Änderung des physiologischen Stoffwechsels (hormonalen Ursprunges) zu suchen ist, sondern dass dies lediglich durch das Einsammeln des Nestbaumaterials und durch die mit dem Bau des Nestes einhergehende grössere Bewegungstätigkeit hervorgerufen wird. Die zum Brüten der *Lonchura striata* nötige Energiemenge wird durch die infolge der verminderten Bewegungsaktivität hierzu anwendbare Plus-Energie und die bessere Verwertung der Nahrung reichlich kompensiert. Die Nahrungssuche beanspruchte ebenfalls sehr geringe Bewegungsaktivität, da ihre Nahrung in der Nähe des Nestes untergebracht wurde. Es ist gewiss, dass im Freien brütenden Vögel – um die Eier warm halten zu können – ihre Nahrung auf eine kürzere Zeit beschränkt, mit grösserer Suchaktivität einsammeln. Hiermit läst sich die Zunahme ihres Nahrungsverbrauches erklären.

Besonders überraschend ist, dass unsere Versuchsvögel selbst zur Zeit des Eierlegens die Nahrung nicht in grösserer Menge zu sich genommen haben. Im Hintergrund dieser Erscheinung steht, dass die Weibchen die das Ei aufbauenden Stoffe in entscheidender Mehrheit nicht unmittelbar aus ihrer Nahrung, sondern aus ihren eigenen Körpersubstanzen gedeckt haben, was eine nur während einer längeren Zeit sich ersetzende Körpermengenverminderung zur Folge hatte. Die lebende Körpermenge der Weibchen war 13 – 17 g. Die frische Menge ihrer Eier schwankte einzeln zwischen 0,95 – 1,42 g. Während des Eierlegens des aus 4 – 5 Eiern bestehenden Geheckes verloren die Weibchen aus ihrer Körpermenge 1,2 – 4,2 g. Eine ähnliche Erscheinung beobachtete übrigens auch PINOWSKA (1976) im Falle des Haussperlings. Weitere Untersuchungen können entscheiden, wie allgemein dieser eigenartige Stoffumsatz im Kreise der Sperlingsvögel ist.

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Über einige Arthropoden-Gruppen aus dem Biosphäre-Reservat des Pilis-Gebirges (Ungarn)

1. Die Diplopoden, Chilopoden, Weberknechte und Spinnen vom Szamár-Berg und aus der Umgebung der Löss-Wand von Basaharc

Von

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Abstract. Author gives data on the diplopod, chilopod and spider populations of two localities in the Pilis Mountains, viz. from the Szamár Hill and the surroundings of the loess wall at Basaharc. Investigations were carried out with a modified type of Barber's soil traps during a growing season, a year, respectively. The localities are significant both in phytogeographical and zoogeographical respect because of their geographical position.

Das Pilis-Gebirge ist der nördlichste Teil des Transdanubischen Mittelgebirges. Es liegt in der Nähe von Budapest, und ist so dem Turistenverkehr stark ausgesetzt. Am Rande und in den verschiedenen Becken sind alte und blühende Siedlungen vorhanden, die zahlreiche kulturhistorische Andenken hüten. In der Umgebung der Siedlungen wird intensive Landwirtschaft betrieben, doch sind in der letzten Zeit viele Obst- und Weingärten wieder verwildert, da sie nicht mehr gepflegt werden. Trotzdem gibt es noch zahlreiche naturnahe, vom Menschen weniger belastete, meistens unter forstwirtschaftlicher Betreuung stehende Gebiete. Da diese Gebiete in der Nähe einer Weltstadt liegen, und so diesem Anziehungskreis stark ausgesetzt sind, eignen sie sich ausgezeichnet für langfristige Untersuchungen, deren Zielsetzung den Einfluss des Menschen auf Flora und Fauna und deren Veränderungen zu verfolgen, heute in Mittelpunkt des Interesses steht.

Die natur- und kulturhistorischen Schätze dieses Gebietes veranlassten die Naturwissenschaftliche Abteilung des UNESCO vom 17. II. 1981 23 600 ha des Pilis-Gebirges als Biosphäre-Reservat zu erklären. Betreuer dieses Gebietes ist die Staatliche Parkforstwirtschaft von Pilis, während aus dem Gesichtspunkt der Naturschutzverwaltung zwei Naturschutzämter (Budapest und West-Transdanubien) für dieses Gebiet verantwortlich sind.

Aus botanischem Gesichtspunkt ist das Pilis-Gebirge bereits gut bekannt, die floristische Literatur is sehr reich, über die Pflanzenassoziationen unterrichtet uns die grundlegende Arbeit von A. Horánszky (1964). Viel weniger sind die Arthropoden dieses Gebietes erforscht worden. Von den im Titel angeführten Tiergruppen sind kaum einige faunistische Angaben angeführt worden.

Die vielseitige Erkundung der Lebewelt wurde unter Leitung des Ökologischen und Botanischen Instituts der Ungarischen Akademie der Wissenschaften, Vácrátót (Direktor Dr. A. Berczik) im Jahre 1982 begonnen, und wird seither auch fortlaufend von diesem Institut koordiniert. Die Zoologen haben zuerst mit dem Inventar der dort lebenden Tierwelt begonnen, und versucht die Gemeinschaftsverhältnisse einzelner Tiergruppen zu erkunden.

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Das als Pilis-Gebirge bezeichnete Gebiet teilt sich aus geologischem und geographischem Gesichtspunkt in zwei Hauptteile. Der grössere, imposantere Teil ist das auf Andesit-Grundstein gebildete Visegráder Gebirge, der andere, verhältnismässig schmale, in SO–NW Richtung verlaufende, auf Kalkstein gebildete Teil ist das im eigentlichen Sinne als Pilis-Gebirge bezeichnete Gebirge. Bis 1986 standen die Gebiete auf Andesit im Mittelpunkt der Untersuchungen.

Die Untersuchungen der letzten vier Jahre brachten insbesondere über die im Boden lebenden Arthropoden viele neue Erkenntnisse hervor. Die einheitliche Bekanntmachung dieser ist leider an einer Stelle nicht möglich, deswegen werden die Veröffentlichungen des Pilis-Gebirge–Biosphäre-Reservates laufend numeriert, um die in verschiedenen Zeitschriften erscheinenden Arbeiten im späteren leichter erreichbar zu machen. Die einheitlich verfertigte Übersichtsskizze erleichtert das Identifizieren des Untersuchungsgebietes, die Detailskizzen geben über die Verteilung der Bodenfallen oder andere Sammelstellen Aufschluss. Meiner Meinung nach sind diese Angaben äusserst wichtig, da anzunehmen ist – und dies wäre auch erforderlich – dass man diese Untersuchungen nach 15–20 Jahren wiederholen müsste. Nur so kann man sich ein Bild über die Veränderungen, das heisst, über die Tendenz dieser machen.

Bei der Auswahl der Untersuchungsstellen wurden immer die Pflanzenassoziationen zugrunde genommen. Bei der Identifizierung dieser Pflanzengesellschaften war mir stets Herr Dozent Dr. A. Horánszky zur Hilfe, dem ich auch an dieser Stelle meinen besten Dank ausspreche. Für die Feststellung der qualitativen Zusammensetzung der in der Waldstreu und im Boden vorkommenden Arthropoden (Makrofauna) wurden modifizierte Barber-Fallen mit Äthylenglikol verwandt. Die Plastikbecher waren von 3 dl Grösse. Im allgemeinen waren diese Fallen ein Jahr lang im Boden, und wurden während dieser Frist viermal geleert. In der Winterperiode wurden die Fallen nicht ausgehoben. Bei den oft schwierigen Feldarbeiten war mir Frl. M. Seidl stets weitgehend behilflich; für ihre selbstlose Hilfe spreche ich ihr auch an dieser Stelle meinen besten Dank aus.

A) Szamár-Berg (auf einigen Karten auch als Zamár-Berg bezeichnet)

Der nördlichste Berg des Szentendre–Visegrád–Gebirges (1. Skizze: 1) liegt unmittelbar entlang der Donau. Durch seine Randlage sowie durch die Begrenzung von drei Becken wird dieser Teil von den anderen Bergen stark isoliert. Die Pflanzengesellschaften sind hier ziemlich verschieden. Auf der Nordseite stehen Linden- und Eschen-Bestände mit Buchen, Hainbuchen, Eichen zusammen, während auf den südlichen und südöstlichen Hängen zwischen Orno- und Corno-Quercetum-Beständen Flecken von Stipetum stenophyllae und Festucetum pseudodalmaticae anzutreffen sind. Im allgemeinen kann ausgesagt werden, dass die südliche Exposition sehr trocken und heiss ist.

Unsere Untersuchungen erfolgten in vier Assoziationen insgesamt in 11 Beständen vom 29. V. 1985 bis 4. VII. 1986.

a) Stipetum stenophyllae

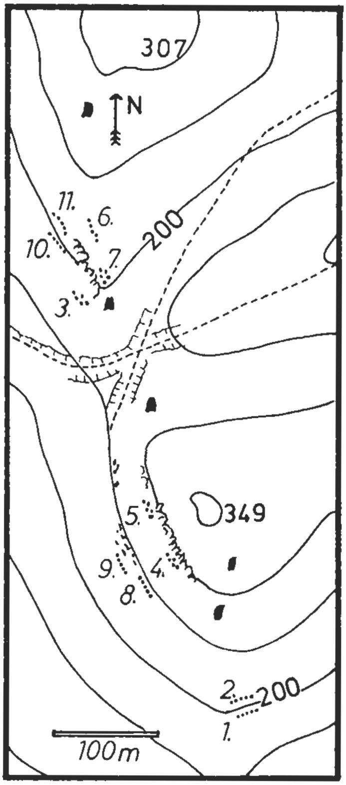
Die erste und zweite Untersuchungsstelle (Tab. 1) war in einem Bestand. Es handelt sich um einen alten, mindestens seit 50 Jahren forstwirtschaftlich bearbeiteten Wald, der im unteren Drittel direkt mit aufgelassenen Weingärten in Verbindung steht. Exposition S.

Der andere Bestand war von SW – Exposition und zieht sich unter Felsen hin, die sich mit Festucetum pseudodalmaticae- und Orno-Quercetum-Beständen berühren, welche auf Tabelle 1 mit einer 8 bezeichnet sind (Tab. 1; 3).

Von den Diplopoden kamen insgesamt 7 Individuen in den Fallen vor, die zu 5 Arten gehören. Das Vorkommen aller Arten weist auf die Nähe des Waldeshin.

Von den Chilopoden kamen 19 Individuen vor, die 2 Arten angehörten.

Die drei Weberknecht-Arten waren mit 4 Individuen vertreten. Das Vorkommen von *Opilio saxatilis* muss wegen ihrer Seltenheit besonders hervorgehoben werden.



Von den Spinnen wurden 573 Exemplare gefangen, die 58 Arten angehören. Die Unterschiede in den einzelnen Beständen sind auffallend gross. Es muss jedoch erwähnt werden, dass wegen der Wühltätigkeit von Wildschweinen in den Beständen 1 und 2 Lücken bei den Fallen vorgekommen sind. Trotzdem war die Art- und Individuenzahl im 3. Bestand bedeutend höher als am 1. und 2. Untersuchungsort. Im 3. Bestand liess sich auch die Nähe des Waldes nachweisen, z. B. weist darauf die hohe Individuenzahl von *Zelotes villicus* hin. Aus faunistischem Gesichtspunkt ist die artlich nicht vollkommen geklärte *Zodarion,* ferner sind die Arten *Callilepis schuszteri*, *Pythonissa exornata*, *Phaeocedus braccatus* und *Neon rayi* von besonderem Interesse.

b) Festucetum pseudodalmaticae

Die in Tabelle 1 mit 4 und 5 bezeichneten Bestände sind als Waldlichtungen in Corno-Quercetum-Beständen aufzufassen. Sie befinden sich auf Hängen von 20 – 30° mit westlicher Exposition. Die Bestände 6 und 7 sind beinahe von Plateau-Lage, felsig (besonders letzterer) und ebenfalls von Corno-Quercetum-Fragmenten umgeben.

Von den Diplopoden sind 5 Arten angetroffen worden, aber nur mit 9 Exemplaren. Von diesen ist nur eine Art, *Megaphyllum unilineatum*, eine wahre Rasen-Art, die übrigen sind offensichtlich aus den Corno-Quercetum-Beständen eingewandert, sie sind besonders im Herbst und im Frühjahr aktiv.

Die 30 Individuen der Chilopoden, die in die Fallen geraten sind, gehören zwei Arten an, und auch davon sind 27 Exemplare *Lithobius muticus* angehörend.

Die 96 Exemplare der Weberknechte konnten zu 6 Arten gestellt werden. Die Verteilung der Individuenzahlen in den einzelnen Beständen ist sehr variabel und widerspiegelt sehr kennzeichnend den Charakter der Bestände. Bestand 4 und 5 (die ingrunde genommen Waldlichtungen sind) verfügen über vier Waldarten, von denen die Individuenzahl von *Zacheus convexus* besonders hoch ist. Im 6. Bestand kamen bloss 6 Exemplare in den Fallen vor; es ist anzunehmen, dass sie aus dem Corno-Quercetum-Bestand eingewandert sind. Im felsigen, steinigen 7. Bestand waren nur 9 Individuen von *Opilio saxatilis* vertreten.

Die Spinnen waren mit 962 Exemplaren, die 82 Arten anghören, anwesend. Die Verteilung in den einzelnen Beständen war ziemlich ausgeglichen, sie wechselte zwischen 213 und 269 Individuen. Weniger lässt sich dies in der artlichen Verteilung aussagen. Wie bei den Weberknechten, waren im 4. und 5. Bestand mehr waldbewohnende Arten anzutreffen, im 6. Bestand wurden Übergangsformen, aus dem Wald stammende Arten nachgewiesen. Der 7. Bestand zeigt die wenigsten Beziehungen zur Waldfauna.

Die vier Bestände miteinander vergleichend, kann festgestellt werden, dass die Spinnen-Gemeinschaften eigentlich sehr interessante Vertreter aufweisen. Von diesen sollen nur einige hervorgehoben werden, wie z. B. *Nemesia pannonica*, für die der Bestand 6 das nördlichste Vorkommen ihrer bisher bekannt gewordenen Verbreitung ist; die drei Arten der Familie Dictynidae sind kennzeichnende Rasen-Tiere; die *Arganna*-Art ist neu, so auch die *Zodarion*-Art.

c) Orno-Quercetum und Corno-Quercetum

In beiden Assoziationen wurden je zwei Beständen untersucht. Von den botanischen Verschiedenheiten abgesehen, ist die ausserordentliche Trockenheit im Sommer ein gemeinsames Kennzeichen der beiden Beständen. In Bezug der Tiergemeinschaften sind nur minimale Unterschiede vorhanden, so dass sie gemeinsam besprochen werden können.

Die 126 Individuen der Diplopoden gehören 4 Arten an. Hinsichtlich der Diplopoden-Gemeinschaften unterscheiden sich die beiden Bestände. Im Orno-Quercetum-Bestand (8 und 9) kamen alle vier Arten vor, die Gesamtindividuenzahl beträgt 110, wobei *Cylindroiulus boleti* mit 24, *Megaphyllum projectum* mit 79 Exemplaren vertreten war. Im Corno-Quercetum-Bestand (10 und 11) waren nur zwei Arten, *Cylindroiulus boleti* und *Megaphyllum projectum* anwesend, insgesamt mit 16 Exemplaren.

Die Chilopoden waren nur mit 3 Arten vertreten, insgesamt 11 Individuen. Zwischen den beiden Assoziationen war kein wesentlicher Unterschied.

Von den Weberknechten kamen in den Fallen 155 Exemplare vor, die 6 Arten angehörten. Zwischen den beiden Assoziationen war kein wesentlicher Unterschied, in beiden dominierte *Zacheus crista* und *Egaenus convexus.* Der Corno-Quercetum-Bestand war etwas individuenarmer.

Die 974 Spinnen-Individuen gehörten 61 Arten an. In den vier Beständen, die zwei Assoziationen angehörten, war die in Fallen geratene Individuenzahl der Spinnen ausgeglichen und bewegte sich zwischen 227 und 269. In der Artenzusammensetzung sind keine bedeutenden Unterschiede, das heisst, die vorhandenen Unterschiede sind bei den Arten die in niederer Individuenzahl vorkommen. Gekennzeichnend ist die Spinnengemeinschaft durch *Amaurobius ferox* und *Leptyphantes flavipes*, die mit hohen Individuenzahlen vertreten waren. Die 11 Arten der Familie Drassidae heben den strauchartigen Charakter des Bestandes hervor, dies wird auch durch das Vorhandensein von *Asagena phalerata* betont.

Im allgemeinen kann festgestellt werden, dass in den untersuchten Beständen des Szamár-Berges in den Assoziationen die Spinnengemeinschaften am kennzeichnendsten und aus faunistischem Gesichtspunkt am interessantesten sind. Es dominieren Arten von südlichem Charakter, die Trockenheit und Hitze bevorzugen.

B) Lössgrube bei Basaharc

Die Untersuchungstelle liegt am Fusse des Berges unweit von der Donau. Die Lössdecke wurde lange Zeit hindurch abgetragen. Die steilen Hänge der Grube (50–60 bis 80°) sind heutzutage von einer Pflanzendecke bedeckt. Die früheren Ausgrabungen wurden von der Erosion in tiefe Klüfte gespaltet. Der grösste Teil des gestörten Gebietes ist von *Festuca*-Rasengesellschaften bedeckt, die breiten Täler führen auf der der Donau zu verlaufenden Seite Ahorn-Eichen-Fragmente, oder sich schwer und schwach entwickelnde Spross-Bestände dieser Assoziationen. Es ist ein sehr trockenes und warmes Gebiet.

Die Untersuchungen wurden während einer Vegetationsperiode vom 27. III. 1985 bis 1. XI. 1985 durchgeführt. Die Fallen wurden dreimal (29. V., 26. VII. und 1. XI.) geleert. Sie wurden in drei Pflanzengemeinschaften in 10 Beständen untergebracht.

a) Astragalo-Festucetum sulcatae

Die Bestände befinden sich an den steilen Hängen der grossen Grube. Die Untersuchungsstelle 1. ist von NÖ-, die Untersuchungsstelle 2. und 3. von NW-Exposition.

Die 101 Individuen der in die Fallen geratenen Diplopoden gehören fünf Arten an. Die Artenzusammensetzung im 1. Bestand weicht bedeutend von der im 2. und 3. Bestand ab. Hier wurden 37 Exemplare vorgefunden, die jedoch nur zwei Arten angehörten; 34 Individuen sind von *Megaphyllum unilineatum* gebildet worden. Interessanter- und unerklärlicherweise fehlte diese Art im 2.

Tabelle 1. Diplopoden-, Chilopoden-, Opiliones- und Araneae-Arten aus den untersuchten Pflanzenassoziationen des Szamár-Berges. (Jede Kolumne enthält die Individuenzahl der Arten von 5 Fallen, die in je einer Pflanzenassoziation vom 29.V.1985 bis 4.VVII. 1986 untergebracht waren. Die mit einem + versehenen Angaben sind nicht vollkommen, da diese Fallen von Wildschweinen während der Untersuchungsfrist zerstört wurden. Die Zahlen unter den Assoziationen dienen zur identifizierung auf der Karte.)

Arten	Stipetum stenophyllae			Festucetum pseudodalmaticae				Orno-Quercetum		Corno-Quercetum	
	1	2	3	4	5	6	7	8	9	10	11
Diplopoda											
Glomeris hexasticha Brandt	–	1	–	–	1	–	–	3	1	–	–
Mastigona bosniensis Verh.	1	–	1	–	2	3	–	2	3	–	–
Proteroiulus fuscus Am Stein	1	–	–	–	–	–	–	–	–	–	–
Cylindroiulus boleti C. L. Koch	–	–	2	1	–	–	–	12	10	2	1
Megaphyllum projectum dioritanum Verh.	–	–	1	1	–	–	–	30	49	5	8
Megaphyllum unilineatum C. L. Koch	–	–	–	–	1	–	–	–	–	–	–
insgesamt:	2	1	4	2	4	3	–	47	63	7	9
Chilopoda											
Lithobius forficatus L.	1	–	–	–	–	–	–	1	–	–	–
Lithobius muticus C. Koch	1	8	8	5	12	9	1	1	1	5	1
Lithobius mutabilis C. Koch	–	–	–	1	1	–	–	1	–	–	1
Monotarsobius aeruginosus Verh.	1	–	–	–	–	–	–	–	–	–	–
insgesamt:	3	8	8	7	13	9	1	3	1	5	2
Opiliones											
Mitostoma chrysomelas (Herm.)	–	–	–	–	1	–	–	–	–	–	–
Trogulus tricarinatus (L.)	–	–	1	–	1	–	–	4	–	1	–
Opilio saxatilis C. L. Koch	–	–	1	–	–	–	9	–	–	–	–
Platybunus bucephalus C. L. Koch	–	–	–	–	–	–	–	1	–	–	–
Lophopilio palpinalis Herbst.	–	–	–	–	–	–	–	1	–	–	–
Zacheus crista Brulé	–	–	–	5	18	–	–	14	27	23	18
Egaenus convexus C. L. Koch	1	–	1	18	32	6	–	32	12	2	19
Lacinius horridus Panzer	–	–	–	–	–	–	–	–	1	–	–
insgesamt:	1	–	3	23	52	6	9	52	40	26	37

Araneae											
Ctenizidae											
Nemesia pannonica Herm.	—	—	—	—	—	1	—	—	—	—	—
Atypidae											
Atypus affinis Eichw.	—	—	—	—	—	—	—	—	—	1	—
Eresidae											
Eresus niger Petanga	—	—	—	—	—	1	—	—	—	—	—
Amaurobiidae											
Amaurobius ferox Walck	—	—	—	1	—	—	—	10	20	12	2
Titanoeca obscura Walck.	—	—	1	—	—	—	—	—	—	—	—
Dictynidae											
Lathys puta O.P.Cambr.	—	—	—	—	—	1	—	—	—	—	—
Bromella falcigera Balogh	—	—	—	—	—	1	—	—	—	—	—
Argenna sp.	—	—	—	—	—	—	1	—	—	—	—
Pholcidae											
Pholcus opilionoides Schranck	—	2	—	3	2	—	3	5	1	8	1
Dysderidae											
Harpactes rubicundus C. L.Koch	5	2	6	10	9	13	10	13	6	15	11
Harpactes hombergi Scop.	—	—	1	—	8	2	—	2	3	2	—
Dysdera erythrina Walck.	—	—	2	2	4	—	—	2	6	1	2
Dysdera longirostris Doblika	—	—	—	—	—	—	—	—	—	1	—
Zodariidae											
Zodarium germanicum C.L. Koch	—	—	—	2	—	1	1	—	1	2	—
Zodarium sp.	—	—	1	—	—	1	—	—	—	—	—

Arten	Stipetum stenophyllae			Festucetum pseudodalmaticae				Orno-Quercetum		Corno-Quercetum	
	1	2	3	4	5	6	7	8	9	10	11
Agelenidae											
Cicurina cicur Fabr.	—	—	—	—	—	—	—	—	—	1	1
Tegenaria agrestis Walck.	—	1	—	—	—	—	—	—	—	—	—
Tegenaria domestica Cl.	—	—	—	—	—	1	—	—	—	—	—
Tegenaria silvestris L. Koch	—	—	—	1	—	—	—	—	—	—	—
Coelotes longispina Kulcz.	9	4	3	16	40	—	—	13	15	4	8
Hahnia nava Blackw.	1	1	—	—	—	—	—	—	—	—	—
Pisauridae											
Pisaura mirabilis Cl.	—	—	—	—	1	—	—	1	—	—	—
Lycosidae											
Pardosa lugubris Walck.	3	8	31	29	13	41	4	7	11	25	5
Alopecosa trabalis Cl.	1	1	—	2	1	—	—	—	—	—	—
Alopecosa accentuata Latr.	3	4	16	—	—	3	13	—	—	—	—
Alopecosa sulzeri Pavesi	—	2	8	6	3	12	8	1	5	10	21
Lycosa radiata Latr.	14	7	16	2	3	6	15	—	—	—	—
Trochosa terricola Thor.	5	—	—	16	10	1	3	1	5	—	3
Aulonia albimana Walck.	1	1	2	1	7	—	—	1	—	—	—
Linyphiidae											
Centromerus incilius C. Koch	—	—	2	—	—	—	—	—	—	—	—
Centromerus serratus O. P. Cambr.	—	—	—	2	1	1	—	8	4	6	11
Meioneta fuscipalpis C. L. Koch	—	—	—	—	—	1	—	—	—	—	—
Microneta spinigera Balogh	1	—	—	—	—	—	—	—	—	—	2
Theonina sp.	—	—	—	1	—	2	—	—	—	1	—
Batyphantes crucifer Menge	—	—	—	—	1	—	—	—	—	2	2
Leptyphantes collinus L. Koch	—	—	—	—	8	—	—	1	—	—	—
Leptyphantes leprosus Ohl.	—	—	—	—	1	—	—	2	—	—	—
Leptyphantes tenuis Blackw.	—	—	—	—	—	—	1	—	—	—	—

Leptyphantes zimmermanni Bertk.	–	–	–	–	–	1	–	–	–	–	1
Leptyphantes mengei Kulcz.	–	–	–	–	2	–	–	–	–	–	–
Leptyphantes flavipes Blackw.	2	–	1	39	32	3	1	89	66	33	38
Leptyphantes mansuetus Thor.	–	–	1	–	26	–	–	–	–	3	3
Leptyphantes keyserlingi Auss.	2	–	5	–	–	–	–	–	–	–	1
Leptyphantes nanus Kulcz.	1	–	9	–	–	4	12	6	–	2	2
Leptyphantes angulipalpis Westr.	–	–	–	–	–	–	–	2	–	1	–
Leptyphantes liguricus Sim.	–	–	–	2	1	–	–	1	2	–	1
Porrhomma convexum Westr.	–	–	–	–	–	–	1	–	–	–	–
Linyphia frutetorum C. L. Koch	–	–	–	–	–	1	–	–	–	–	–
Micryphantidae											
Pelecopsis radicicola L. Koch	–	–	–	1	–	–	–	–	–	1	–
Ceratinella brevis Wider	–	1	–	–	–	–	–	–	–	–	–
Abacoproeces saltuum L. Koch	–	–	11	6	1	–	–	10	4	30	25
Wideria cucullata C. L. Koch	–	–	–	–	–	–	–	2	2	–	1
Wideria fugax O. P. Cambr.	–	–	–	–	–	–	–	1	1	–	–
Wideria simplex Kulcz.	–	–	–	–	–	–	–	5	6	–	–
Tigellinus furcillatus Menge	–	–	1	1	3	–	–	7	6	1	2
Trichoncus scrofa Kulcz.	–	1	–	–	–	–	–	–	–	–	–
Trichoncus sp.	–	–	–	–	–	–	–	1	–	–	–
Gonatium corallipes O. P. Cambr.	–	–	–	–	1	–	–	–	1	–	–
Theridiidae											
Episinus truncatus Latr.	1	–	–	1	–	–	–	1	1	3	11
Episinus angulatus Blackw.	–	1	–	–	1	1	–	–	6	–	–
Asagena phalerata Panz.	–	–	–	–	–	–	–	–	1	–	2
Theridium bimaculatum L.	–	–	–	–	–	–	–	–	–	–	1
Enoplognatha thoracica Hahn	–	–	–	2	–	–	–	–	–	–	–
Dipoena melanogaster C. L. Koch	–	–	–	–	1	–	–	–	–	–	–
Dipoena coracina C. L. Koch	–	–	–	1	–	–	–	–	–	–	–
Mimetidae											
Ero furcata Villers	–	–	1	–	–	–	–	–	2	–	–
Drassidae											
Callilepis schuszteri Herm.	1	2	4	–	–	6	1	–	–	–	1
Pythonissa exornata C. L. Koch	–	1	1	–	–	–	1	–	–	–	–

Arten	Stipetum stenophyllae			Festucetum pseudodalmaticae				Orno-Quercetum		Corno-Quercetum	
	1	2	3	4	5	6	7	8	9	10	11
Phaeocedus braccatus L. Koch	–	–	2	–	–	–	–	–	–	–	–
Echemus rhenanus Bertkau	–	–	–	–	–	–	–	–	1	1	–
Gnaphosa lucifuga Walck.	1	1	–	–	–	–	–	–	–	–	–
Gnaphosa modestior Kulcz.	–	–	1	8	–	2	–	–	–	–	1
Gnaphosa opaca Herm.	–	1	5	–	–	1	16	–	–	–	–
Drassodes lapidosus Walck.	2	1	63	5	7	19	28	3	3	3	4
Haplodrassus silvestris Blackw.	–	–	–	7	–	–	–	3	5	–	–
Haplodrassus signifer C. L. Koch	–	–	–	1	–	5	1	–	–	2	–
Zelotes electus C. L. Koch	5	4	10	1	–	7	7	–	–	1	–
Zelotes villicus Thor.	7	4	29	28	26	19	30	14	33	21	23
Zelotes pedestris C. L. Koch	7	2	12	1	10	1	3	4	11	1	4
Zelotes petrensis C. L. Koch	6	3	20	1	2	6	11	–	–	–	–
Zelotes erebeus Thor.	6	4	9	42	8	25	26	2	3	41	18
Zelotes praeficus L. Koch	1	1	4	2	–	4	6	–	–	–	–
Zelotes hermani Chyz.	–	–	7	–	–	–	1	–	–	–	–
Zelotes gracilis Canestr.	–	–	5	–	–	–	1	–	–	–	–
Zelotes apricorum L. Koch	–	–	6	12	3	–	–	12	5	18	8
Clubionidae											
Clubiona terrestris Westr.	–	–	–	–	1	–	–	–	–	–	–
Micaria fulgens Walck.	–	–	–	4	3	–	–	–	–	–	–
Scotina celans Blackw.	–	–	1	4	4	–	–	4	2	–	1
Agroeca pullata Thor.	–	1	3	–	3	5	–	–	–	2	3
Agroeca brunnea Blackw.	–	–	–	–	–	–	–	–	1	–	–
Phrurolithus festivus C. L. Koch	–	1	–	–	1	–	–	–	–	1	–
Phrurolithus szilyi Herm.	14	1	8	–	–	1	7	–	–	–	–
Anyphaena accentuata Walck.	–	–	–	–	–	–	–	–	1	–	–
Ctenidae											
Zora pardalis Sim.	4	2	3	–	–	–	5	–	–	–	–
Zora manicata Sim.	–	1	–	–	–	–	–	–	–	–	–
Zora nemoralis Blackw.	–	–	2	1	1	–	–	2	–	1	1

Thomisidae											
Oxyptila nigrita Thor.	2	3	4	—	—	5	1	—	—	—	—
Oxyptila praticola C. L. Koch	—	—	—	—	1	1	—	—	—	—	—
Proxysticus robustus Hahn	—	—	—	—	2	1	—	—	—	1	—
Xysticus kochi Thor.	1	—	—	—	—	1	—	—	—	—	—
Xysticus cambridgei Blackw.	—	—	—	1	—	1	—	—	2	11	5
Xysticus audax Schrank	—	—	—	1	—	—	—	—	—	—	—
Salticidae											
Leptorchestes berolinensis C. Koch	—	—	—	—	—	1	—	—	—	—	—
Aelurillus festivus C. L. Koch	—	—	—	—	—	—	1	—	—	—	—
Phlegra fasciata Hahn	—	—	4	—	—	1	—	—	—	—	—
Euophrys obsoleta Sim.	8	3	35	—	—	—	9	—	—	—	—
Euophrys frontalis Walck.	7	4	16	3	—	1	—	—	—	—	—
Neon rayi Sim.	—	1	2	—	—	—	—	—	—	—	—
Neon pictus Kulcz.	—	—	1	—	—	1	—	—	—	—	1
insgesamt:	121	77	377	274	271	213	237	256	269	293	245

Tabelle 2. Diplopoden-, Chilopoden-, Opiliones- und Araneae-Arten aus den untersuchten Pflanzenassoziationen der Lössgrube bei Basaharc
(Die Untersuchungen wurden vom 27. III. 1985 bis 1. XI. 1985. durchgeführt.)

Arten	Astragalo-Festucetum sulcatae			Festucetum valesiacae				Querceto-tataricum		
	1	2	3	4	5	6	7	8	9	10
Diplopoda										
Mastigona bosniensis Verh.	3	13	19	1	—	1	14	41	74	146
Microhordeuma bröleranni Verh.	—	—	—	—	—	—	—	—	2	4
Brachydesmus sp.	—	3	1	—	—	—	—	—	—	—
Polydesmus denticulatus C. L. Koch	—	17	10	—	1	—	—	1	1	—
Julus terrestris L.	—	—	—	21	7	4	1	4	—	—
Julus scandinavius Latz	—	—	—	—	—	—	—	—	2	7
Ophyiulus pilosus Newp.	—	—	—	2	—	—	—	14	9	14
Megaphyllum projectum dioritanum Verh.	—	1	—	—	—	—	—	69	5	4
Megaphyllum unilineatum C. L. Koch	34	—	—	15	26	27	—	—	1	2
insgesamt:	37	34	30	38	34	32	15	129	94	177
Chilopoda										
Lithobius parietum Verh.	1	1	—	1	1	—	—	—	—	—
Lithobius muticus C. Koch	—	2	1	—	—	—	—	—	—	—
Lithobius mutabilis C. Koch.	—	4	6	—	—	—	—	—	2	—
Monotarsobius aeruginosus Verh	2	—	—	—	—	—	—	—	—	—
insgesamt:	3	7	7	1	1	—	—	—	2	—
Opiliones										
Mitostoma chrysomelas Hermann	—	1	—	—	—	—	—	—	—	—
Dicranolasma scabrum Herbst	—	—	—	—	—	—	—	10	—	2
Trogulus tricarinatus L.	3	1	1	—	—	3	2	25	12	22
Opilio saxatilis C. L. Koch	9	7	—	4	2	12	—	1	—	1
Platybunus bucephalus C. L. Koch	—	—	—	—	—	—	5	18	—	8
Lophopilio palpinalis Herbst	—	16	20	—	—	—	1	—	2	1
Zacheus crista Brulé	—	12	6	34	—	—	—	6	2	8
Egaenus convexus C. L. Koch	64	112	52	82	15	32	34	118	21	56
Lacinius horridus Panzer	—	2	1	1	—	—	—	—	—	—

Astrobunus levipes Canestr.	10	37	26	7	—	2	4	39	5	50
Liobunum rotundum Latr.	—	—	—	—	—	—	—	7	—	—
insgesamt:	86	188	106	128	17	49	46	224	42	148
Araneae										
Ctenizidae										
Nemesia pannonica Herm.	—	—	—	7	—	1	2	—	—	—
Amaurobiidae										
Titanoeca schineri L. Koch	—	—	—	—	1	3	2	—	—	2
Dictynidae										
Argenna sp.	—	—	—	1	—	—	—	—	—	—
Pholcidae										
Pholcus opilionoides Schranck	—	—	2	—	—	5	11	—	—	—
Dysderidae										
Harpactes rubicundus C. L. Koch	4	3	1	1	—	8	17	34	2	5
Dysdera longirostris Doblika	15	17	—	14	7	1	10	12	27	33
Dysdera erythrina Walck.	1	3	5	1	—	—	—	—	—	—
Dysdera westringi O. P. Cambr.	—	—	—	—	1	—	—	—	—	—
Agelenidae										
Cicurina cicur Fabr.	1	—	—	—	—	2	2	3	—	1
Tegenaria agrestis Walck.	1	—	—	—	—	—	—	—	—	—
Tegenaria campestris C. L. Koch	—	2	—	1	—	—	—	—	—	—
Coelotes longispina Kulcz.	22	18	13	17	19	9	5	39	9	13
Hahnia nava Blackw.	1	1	2	5	1	2	—	4	—	2
Pisauridae										
Pisaura mirabilis Cl.	—	—	—	1	—	—	—	—	—	—

Arten	Astragalo-Festucetum sulcatae			Festucetum valesiacae				Querceto-tataricum		
	1	2	3	4	5	6	7	8	9	10
Lycosidae										
Pardosa lugubris Walck.	—	—	—	—	2	1	—	—	4	6
Pardosa bifasciata C. L. Koch	—	—	—	—	10	—	—	—	—	—
Pardosa riparia C. L. Koch	—	1	—	3	—	—	—	—	9	12
Pardosa agrestis Westr.	—	—	1	—	—	—	—	—	—	—
Alopecosa accentuata Latr.	2	—	—	23	—	7	—	—	—	—
Alopecosa trabalis Cl.	—	2	1	5	5	—	—	—	2	14
Alopecosa cuneata Cl.	—	—	—	16	12	—	—	—	1	—
Alopecosa mariae Dahl.	—	—	—	11	14	—	—	—	—	—
Lycosa radiata Latr.	—	—	—	—	—	1	—	—	—	—
Trochosa robusta Sim.	2	—	3	11	—	—	—	—	—	—
Trochosa terricola Thor.	3	8	—	2	14	1	9	15	20	35
Aulonia albimana Walck.	3	11	—	13	6	—	2	1	12	17
Linyphiidae										
Centromerus sylvaticus Blackw.	—	—	1	—	—	—	—	—	—	1
Centromerus incilius Kulcz.	—	—	—	—	—	—	—	1	—	—
Sydera gracilis Menge	2	10	4	6	1	—	—	—	1	4
Microneta spinigera Balogh	2	2	3	1	1	—	—	—	—	1
Leptyphantes collinus L. Koch	—	—	—	—	—	—	1	1	—	—
Leptyphantes cristatus Menge	—	—	—	—	—	—	—	1	—	—
Leptyphantes mengei Kulcz.	—	—	3	—	—	—	—	—	—	—
Leptyphantes flavipes Blackw.	4	3	2	—	—	—	3	10	—	—
Leptyphantes pillichi Kulcz.	—	1	—	1	—	—	1	4	1	3
Stylophora concolor Wider	—	—	—	—	—	—	—	3	—	—
Stemonyphantes lineatus L.	—	—	3	8	1	—	—	—	—	—
Linyphia clathrata Sund.	—	1	1	—	—	—	—	1	—	—

Micryphantidae										
Pelecopsis radicicola L. Koch	—	—	—	—	1	—	—	2	—	—
Ceratinella brevis Wid.	—	1	—	2	—	—	—	—	1	3
Mecopisthes silus O. P. Cambr.	—	—	—	1	—	—	—	—	—	—
Wideria antica Wid.	—	1	—	—	—	—	—	—	1	1
Wideria fugax O. P. Cambr.	—	—	—	1	—	—	—	—	—	1
Tigellinus furcillatus Menge	1	13	3	8	2	—	1	—	5	8
Sylometopus sp. I.	1	—	—	4	—	—	—	—	—	2
Sylometopus sp. II.	—	—	—	—	1	—	—	—	—	—
Trichoncus sp.	—	—	—	2	—	—	—	—	—	—
Gonatium corallipes O. P. Cambr.	—	2	2	—	—	—	1	1	—	—
Theridiidae										
Episinus truncatus Latr.	3	2	5	3	3	—	—	2	—	—
Theridium bimaculatum L.	—	—	—	1	—	—	—	—	—	1
Robertus lividus Blackw.	—	—	1	—	—	—	—	—	—	—
Enoplognatha thoracica Hahn	1	—	—	2	—	1	—	—	1	—
Dipoena erythropus Sim.	—	—	—	—	—	—	1	—	1	—
Mimetidae										
Ero furcata Villers	3	—	—	—	—	—	—	—	—	—
Ero aphana Walck.	4	2	—	—	2	—	—	—	—	—
Drassidae										
Gnaphosa lucifuga Walck.	1	—	—	—	—	1	—	—	—	—
Drassodes pubescens Thor.	1	1	—	4	3	—	6	—	1	6
Drassodes lapidosus Walck.	6	1	11	2	2	11	—	1	1	4
Haplodrassus microps Menge	—	—	—	1	—	9	—	—	—	—
Haplodrassus signifer C. L. Koch	—	—	—	1	10	1	1	—	—	2
Zelotes electus C. L. Koch	—	—	—	11	8	7	—	—	1	3
Zelotes villicus Thor.	1	1	—	11	4	5	7	22	5	5
Zelotes pumilus C. L. Koch	1	—	—	2	3	—	—	—	—	—
Zelotes gracilis Canestr.	—	—	—	2	2	1	—	—	—	—
Zelotes pedestris C. L. Koch	—	—	—	—	—	—	—	—	1	—
Zelotes petrensis C. L. Koch	—	—	—	—	1	—	1	—	—	—
Zelotes praeficus L. Koch	—	3	1	1	5	—	—	—	—	3
Zelotes hermani Chyz.	—	—	—	—	—	1	1	—	—	—

Arten	Astragalo-Festucetum sulcatae			Festucetum valesiacae				Querceto-tataricum		
	1	2	3	4	5	6	7	8	9	10
Zelotes apricorum L. Koch	—	—	—	—	—	—	—	—	—	1
Zelotes latreillei Sim.	—	—	—	—	—	—	—	—	—	5
Poecilochroa variana C. L. Koch	—	—	—	1	1	—	—	—	—	—
Clubionidae										
Clubiona terrestris Westr.	—	—	—	—	—	—	—	—	—	1
Clubiona trivialis C. L. Koch	—	1	—	—	—	—	—	—	—	—
Micaria fulgens Walck.	1	—	—	1	—	—	—	—	5	2
Agroeca pullata Thor.	4	13	7	7	15	2	4	—	12	13
Agroeca brunnea Walck.	—	—	—	—	—	—	—	1	—	1
Phrurolithus festivus C. L. Koch.	—	—	1	1	3	—	2	—	1	1
Phrurolithus pullatus Kulcz.	1	—	—	2	—	—	—	—	—	—
Thomisidae										
Oxyptila atomaria Panz.	2	1	4	9	—	—	—	—	1	3
Oxyptila nigrita Thor.	—	3	1	3	13	—	1	—	3	2
Oxyptila praticola C. L. Koch	—	—	—	—	3	—	—	—	—	2
Oxyptila rauda Sim.	2	—	1	8	—	—	—	—	—	—
Proxysticus robustus Hahn	—	—	—	1	5	1	—	—	—	—
Xysticus audax Schranck	—	—	—	1	—	—	—	—	—	—
Xyticus kochi Thor.	—	—	1	—	—	—	—	—	—	—
Xysticus kempelini Thor.	—	—	—	—	—	1	—	—	—	—
Thanatus arenarius Thor.	—	—	—	2	1	—	—	—	—	—
Salticidae										
Myrmarachne formicaria De Geer	—	1	—	1	1	—	—	—	—	—
Aelurillus festivus C. L. Koch	—	—	—	4	1	—	—	—	—	—
Phlegra fasciata Hahn	—	—	—	1	1	1	—	—	—	—
Euophrys obsoleta Sim.	—	—	—	—	—	5	—	—	—	—
Euophrs frontalis Walck.	3	—	—	1	2	4	1	—	—	—
Neon rayi Sim.	—	—	—	1	—	1	—	—	—	—
insgesamt	99	119	83	251	188	93	92	158	128	220

und 3. Bestand. Diesem gegenüber waren die hier in höher Individuenzahl vorkommenden *Polydesmus denticulatus*-Individuen im 1. Bestand überhaupt nicht vorhanden.

Die vier Arten der Chilopoden waren mit 17 Exemplaren in den Fallen vertreten. Interessant ist das Vorkommen von *Lithobius parietum*, es weisst eindeutig auf die Nähe der Donau hin.

Von den Weberknechten konnten 380 Exemplare erbeutet werden, die acht Arten angehören. Auffallend ist das Fehlen von *Lophopilio palpinalis* und *Zacheus crista* aus dem 1. Bestand. Die hohen Individuenzahlen von *Astrobunus levipes* weisen darauf hin, dass die Bodenfeuchtigkeit hier höher ist als in den später zur Erörterung gelangenden Festucetum valesiacae-Beständen.

Die Spinnen gehörten 51 Arten an und waren mit 301 Individuen vertreten. Die artliche Zusammensetzung der Spinnengemeinschaften weist keine Besonderheiten auf. Interessant ist das Vorkommen von *Pardosa riparia* und *Parsoda agrestis*, wenn auch nur mit je einem Individuum.

b) Festucetum valesiacae

Die 4. und 5. Sammelstelle war nahezu am Plateau. Die Untersuchungsstelle 4. war ein in einer kleinen Vertiefung sich ausgebildeter *Calamagrostis epigeios*-Fleck mit wenigen Weissdorn- und Schlehbüschen; diese Stelle unterscheidet sich durch ihren geschlossenen Rasen wesentlich vom Untersuchungsort 5., wo ein offener Festucetum valesiacae-Rasen mit einzelnen verkümmerten Weissdornbüschen vorkommt. Die 6. und 7. Untersuchungsstelle sind von S–SW-Exposition auf einer steilen Lösswand von 60–80°; eine Vegetation konnte sich nur stellenweise ausbilden.

Die 119 Diplopoden-Exemplare gehören fünf Arten an. Interessant ist das Vorkommen der für die Tiefebene kennzeichnenden Art *Iulus terrestris* in allen Beständen. Die Individuenzahlen sind in den *Calamagrostis*-Flecken bedeutend höher (27) als im 7. Bestand, wo nur ein Exemplar in den Fallen angetroffen werden konnte. Auffallend ist das gemeinsame Vorkommen mit *Megapyllum unilineatum*, die im 4., 5. und 6. Bestand mit 15–27 Exemplaren, im 7. Bestand hingegen nicht vorkam.

Die Chilopoden waren mit zwei Exemplaren, die einer Art angehörten, vertreten.

Die 240 Exemplare der Weberknechte gehörten zu sieben Arten. In den *Calamagrostis*-Flecken konnten hohe Individuenzahlen von *Zacheus crista* und *Egaenus convexus* nachgewiesen werden.

Die 624 Individuen der Spinnen gehörten 74 Arten an. Eine ganz besonders hohe Individuenzahl (251) war im *Calamagrostis*-Fleck zu verzeichnen. Auch in der artlichen Zusammensetzung unterschied sich dieser Biotop von den anderen Beständen. Von *Nemesia pannonica* liessen sich 7 Exemplare nachweisen, ferner konnte auch eine *Sylometopus*- und eine *Trichonchus*-Art angetroffen werden. Von den interessanten Arten kamen da *Pardosa riparia*, *Trochosa robusta* und *Oxyptila rauda* vor.

Die Bestände 5., 6. und 7. sind trotz der vielen gemeinsamen Kennzeichen dennoch ziemlich verschieden. Dies ist offensichtlich auf die verschiedene Exposition der Bestände rückzuführen. Von den vielen Arten sind aus faunistischem Gesichtspunkt folgende Arten besonders interessant: *Nemesia pannonica*, *Pardosa bifasciasta*, *Alopecosa mariae*, und eine *Argenna*-Art. Die *Argenna*-Art kam auch im *Calamagrostis*-Flecken vor. Die Arten *Pardosa bifasciata* und *Alopecosa mariae* sind kennzeichnende Arten der Tiefebene, letztere kommt vorwieglich im trockenen, sandigen Rasen vor.

c) *Querceto-tataricum*

Der 8. Bestand liegt in einem vom Wasser ausgewaschenen Tal, die Bestände 9. und 10. liegen auf Hängen in Richtung der Donau. Die beiden letzten sind hinsichtlich der Vegetation etwas kennzeichnender, doch ist es ebenfalls sich schwach entwickelnder sträuchiger Aufwuchs.

Die 403 Exemplare der Diplopoden gehören zu acht Arten. Im 8. Bestand war die hohe Individuenzahl von *Iulus terrestris*, im 9. und 10. Bestand die von *Iulus scandinavius* kennzeichnend. Auffallend hoch war im 8. Bestand die Individuenzahl von *Megaphyllum projectum*, im 10. Bestand die von *Mastigona bosniensis* (Tabelle II). Aus faunistischem Gesichtspunkt ist das Vorkommen der südlichen Art *Microchordeuma broelemanni* im 9. und 10. Bestand von Interesse.

Die Chilopoden waren bloss durch eine Art vertreten: es kamen zwei Exemplare von *Lithobius mutabilis* im 9. Bestand vor.

Die Weberknechte waren mit 414 Individuen vorhanden und gehörten zu neun Arten. Die einzelnen Bestände unterschieden sich bezüglich der Individuenzahlen voneinander, im 8. Bestand konnten 224, im 9. Bestand 42, im 10. Bestand 148 Exemplare erbeutet werden. Die Unterschiede wurden besonders durch die verschiedenen Individuenzahlen von *Egaenus convexus* und *Astrobunus levipes* hervorgerufen. Aus faunistischem Gesichtspunkt ist das Vorkommen von *Liobonum rotundum* im 8. Bestand besonders interessant.

Die 506 Spinnen gehören 51 Arten an. Besonderheiten liessen sich in den einzelnen Beständen nicht nachweisen, es kamen Arten, vor, die auch in Eichenbeständen anzutreffen sind. Als interessantes Element ist im 9. und 10. Bestand *Pardosa riparia* anzusehen, von der neun bis zwölf Exemplare angetroffen werden konnten.

Wie aus den Angeführten hervorgeht, ist die Arthropoden-Gemeinschaft der auf dem Plateau liegenden Festucetum valesciacae-Bestände (inbegriffen die *Calamagrostis*-Flecken) in Hinsicht der Artenzusammensetzung am interessantesten. Mehrere Arten der Spinnen- und Diplopoden-Gemeinschaften gehören zur Fauna der Tiefebene. Weitere Untersuchungen könnten eventuell die ursprüngliche Fauna der Löss-Vegetation rekonstruieren.

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Opusc. Zool. Budapest, XXIII, 1988

Die Bedeutung von Glomeris hexasticha (Diplopoda) beim Abbau von Detritus-Driften am Ufer des Balaton-Sees

Von

M. POBOZSNY*

Abstract. Author carried out feeding ecological experiments in laboratory in order to establish the role of the species *Glomeris hexasticha* — from both qualitative and quantitative points of view — in the decomposition of the plant detritus (hair-weed and reed) accumulating on the shore of lake Balaton. In the population of the species living in the shore areas of Balaton a peculiar to and from periodical migration could be observed between the detritus accumulations on the shore and the nearby forests and grassy vegetation stands.

Die mit den Lebensverhältnissen im Balaton sich befassenden Fachleute (ENTZ et la. 1942; ENTZ & SEBESTYÉN, 1944, 1946; GELLÉRT & TAMÁS, 1959 a, 1959 b, 1960; IHAROS, 1959; SEBESTYÉN, 1942, 1943, 1949, 1949–50, 1957, 1962) haben schon seinerzeit darauf hingewiesen, dass die in der Uferzone sich bildenden Detritus-Drifte sehr interessante, in der Gestaltung der Lebensverhältnisse des Sees eine bedeutende Rolle spielende Biotope sind. In diesen Driften verändern sich – durch ständiges Wechseln der Feuchtigkeitsverhältnisse – die Lebensbedingungen fortlaufend, es bildet sich gleicherweise eine mannigfaltige Wasser- bzw. Bodenlebewelt aus. Die Drifte stellen eigentlich in dieser Beziehung eine Verbindung zwischen der Lebensstätte im Wasser und der des Festlandes dar, da sie einerseits die organischen Substanzen des Festlandes den im Wasser lebenden Organismen zugänglich machen, anderseits die im Wasser erzeugten organischen Materialien der am Ufer bzw. am Festland lebenden Tierwelt als Nahrung zur Verfügung stellen.

Seit 1982 werden im südlichen Ufergebiet des Balaton-Sees, an einer bestimmten Uferstrecke, eingehende faunistische und zoocönologische Untersuchungen in den sich dort gebildeten Detritus-Driften durchgeführt. Anhand unserer mehrjährigen Beobachtungen konnte festgestellt werden, dass *G. hexasticha* zeitweisig in grossen Mengen in den Driften erscheint. Es ist bekannt,

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dass diese Art an der Zersetzung der Laubstreu in verschiedenen Laubwäldern intensiv teilnimmt, sodass mit Recht angenommen werden kann, dass sie an den Degradationsprozessen der Detritus-Drifte sich ebenfalls beteiligt. Da diesbezüglich Angaben in der Literatur nicht vorliegen, wurde zum Ziel gesetzt, die Zersetzungstätigkeit von *G. hexasticha* an den Detritus-Driften am Ufer des Balaton-Sees zu verfolgen.

Material und Methode

Da andauernde Detritus-Driftbildungen nur an natürlichen Uferabschnitten, wo keine Steindämme die Uferregion schützen, sich ausbilden, musste ein solcher flacher Abschnitt gewählt werden, wo es seit Jahren zu solchen Bildungen gekommen ist. Einen der wenigen solcher Uferabschnitte fanden wir zwischen Balatonmária und Balatonberény, wo auf einer ungefähr mehr als 500 m langen Strecke sich am Ufer Schilf, schlammiger Sand und eine Steinbank ausgebildet hatte (Abb. 1). Diesem Uferabschnitt schloss sich in Richtung Festland zuerst ein Rasen, dann ein gepflanzter Waldbestand an (Eiche, Pappel, Kiefer).

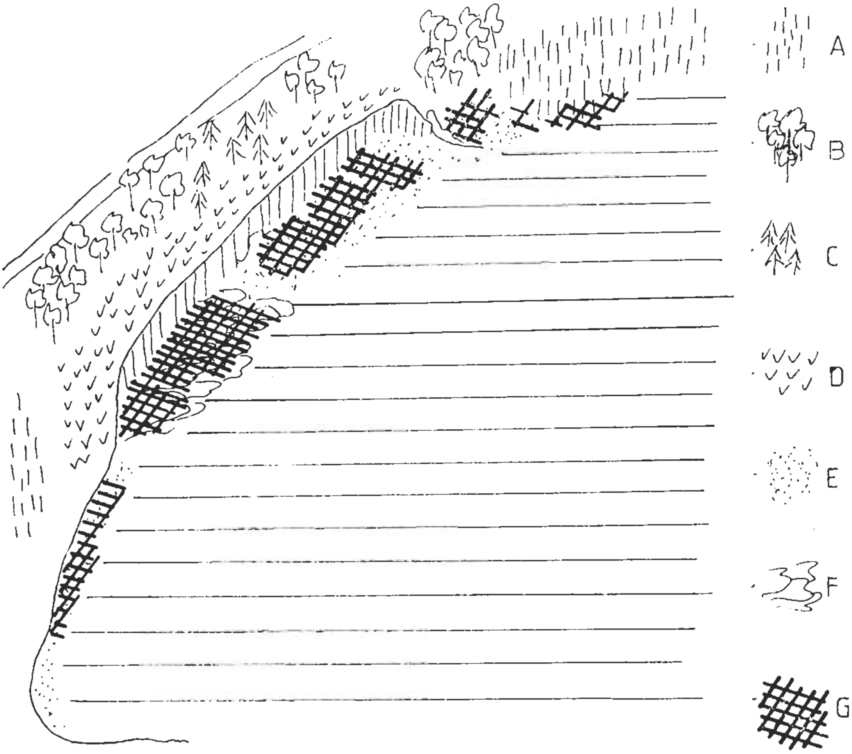

Abb. 1. Skizze des Untersuchungsgebietes am Ufer des Balaton-Sees zwischen Balatonmária und Balatonberény. A = Schilf, B = Eiche-Pappel, C = Fichte, D = Rasen, E = schlammige Uferregion, F = steinige Uferregion, G = Detritus-Drifte

Auf der Steinbank sowie auf dem schlammigen Sandabschnitt häuften sich grosse Mengen von abgestorbenen Wasserpflanzen an (Schilf, Laichkraut). Aus diesen Driftanhäufungen wurde Material zu unseren ernährungsökologischen Untersuchungen gesammelt. Das Laichkraut wurde von den älteren und frischen Schilfteilen separiert aufbewahrt.

Die Versuchstiere wurden ebenfalls von dieser Stelle eingesammelt.

Die Fütterungsversuche wurden in ausgebrannten Tongefässen (Gere, 1958) durchgeführt, wobei von den drei Versuchssubstraten – Laichkraut, alte und frische Schilfteile – je 4–5 g (abs. Trockensubstanz) in den Tongefässen untergebracht wurde. Je 15 Tiere wurden in die Gefässe ebenfalls eingesetzt, das Gewicht dieser wurde vorausgehend bestimmt. Die Versuche wurde in je 5 Wiederholungen durchgeführt. Ebenfalls in 5 Wiederholungen wurden Kontrollversuche eingestellt, um allein die mikrobielle Zersetzung verfolgen zu können.

Die in verschiedener Umgebung, in 3 Versuchsserien durchgeführten Versuche dauerten 2 Monate. Von Mitte April bis Mitte Juni 1984 wurde eine Serie der Versuche im Höhlenbiologischen Laboratorium bei Aggtelek durchgeführt. Hier waren so die Temperaturverhältnisse (10°C) wie die Feuchtigkeitsverhältnisse (relative Luftfeuchtigkeit 100%) für die Nahrungsaufnahme der Tiere besonders günstig. Ebenfalls in dieser Periode wurde eine Serie der Versuche im Kühlschrank (Temperaturen zwischen 6–10 °C) durchgeführt. Hier mussten die Versuche ab und zu mit Wasser besprüht werden, um eine Austrocknung zu vermeiden. Die dritte Serie der Versuche wurde im November-Dezember des Jahres 1985 im Kellerlaboratorium des Institutes durchgeführt. Da hier nicht geheizt wurde, waren die Temperaturen im Keller von den Aussentemperaturen bedingt. Die Versuche wurden hier in feuchten Sand gestellt, um eine ständige Feuchtigkeit sicher stellen zu können.

Nach der zweimonatigen Versuchsperiode wurden die Tiere wieder gewogen, die Reste der angebotenen Nahrung sorgfältig von den Losungen getrennt. Beide Substrate wurden ausgetrocknet und gewogen.

Der Konsum wurde, wie in vorausgehenden Versuchen bereits bekanntgegeben, mit Hilfe der von Reiman errechneten Formel (Zicsi & Pobozsny, 1977) bestimmt. Der Konsum und die Kotproduktion wurde auf 1 g Lebendgewicht pro Tag berechnet.

Für chemische Analysen wurden Proben am Anfang aus dem Ausgangsmaterial (Laichkraut, altes und frisches Schilf) am Ende von den Kotballen die von den Tieren aus den einzelnen Substraten erzeugt wurden, genommen. Aus den Kontrollversuchen wurden ebenfalls am Ende aus den verschiedenen Substraten zur Bestimmung der chemischen Parameter, Proben genommen. Es wurden folgende chemische Analysen durchgeführt: Bestimmung der gesamtorganischen Substanz (Glühverlust), des Gesamtsstickstoffes, Ammonia-Stickstoff, Nitrat-Stickstoff, Rohprotein, Humusgehalt (Tyurin-Methode). Fette und Gerbstoffe, Zucker und Stärke, Hemizellulose und Pektin sowie Zellulose. Die Bestimmungen erfolgten mit den in der bodenkundlichen Praxis üblichen Methoden (Ballenegger & Di Gléria, 1962; Schlichting & Blume, 1966).

Ergebnisse

Die zoocönologischen Untersuchungen von Loksa (mündl. Mitteilung) sowie eigene Beobachtungen erbrachten nicht nur den Nachweis eines Massenvorkommens dieser Art an dieser Stelle, sondern wiesen auch auf Besonderheiten der Lebensweise hin. Im Herbst, Ende Oktober und November waren die Tiere massenhaft im Detritus-Drift der Uferzone anzutreffen. Mit Eintreten der Kälte (Temperaturen um 0 °C und unter 0 °C) konnte ein Abwandern in den Rasen, bzw. in den Waldstreifen beobachtet werden (Abb. 1). Hier waren sie unabhängig von den jeweiligen Witterungsverhältnissen bis zum nächsten Herbst in verschiedenen Bodentiefen anzutreffen. Im Herbst konnte dann wieder ein Einwandern in die Uferzone, in den Detritus-Drift verfolgt werden.

Obwohl Detritus-Drifte — mit Ausnahme des Einfrierens des Sees — das ganze Jahr hindurch gebildet werden, ist doch der Herbst die Periode wo die Makrovegetation des Sees in grösster Menge abstirbt und in der Uferzone abgelegt wird (Entz et al, 1942). Das Wander von *G. hexasticha* kann eventuell mit dieser Erscheinung in Zusammenhang gebracht werden.

Unsere ernährungsökologischen Untersuchungen brachten folgende Ergebnisse (Tabelle 1).

Tabelle 1. Konsum und Kotproduktion von Glomeris hexasticha aus verschiedenen Detritus-Drift-Substanzen

Untersuchungsort	Zeitpunkt der Untersuchung	Laichkraut-Detritus		alter Schilf-Detritus		frischer Schilf-Detritus	
		Konsum	Kotprod.	Konsum	Kotprod.	Konsum	Kotprod.
		mg/g/Tag					
Kellerlabor ...	Nov.-Dez.	42,7 ± 8,0	33,0 ± 8,3	8,6 ± 1,6	6,7 ± 1,7	2,9 ± 1,6	2,8 ± 2,6
Höhlenlabor ..	Apr.-Juni.	23,4 ± 3,3	19,4 ± 2,5	14,3 ± 6,0	13,3 ± 5,2	9,3 ± 3,2	7,9 ± 2,4
Kühlschrank .	Apr.-Juni.	55,2	47,5	—	—	5,1	4,6

G. hexasticha frass in grösster Menge vom Laichkraut (23—55 mg/g/Tag). Am wenigsten konsumierten die Tiere vom frischen Schilf (2,9—9,3 mg/g/Tag). Die Werte vom alten Schilf lagen etwas höher (8,6—14,3 mg/g/Tag). Ohne nähere Erklärung geben zu können, sei bloss festgestellt, dass zur gleichen Periode (April—Juni) die im Kühlschrank gefütterten Tiere 2,3mal mehr Laichkraut konsumierten als die, die im Höhlenbiologischen Laboratorium gehalten wurden. Vom frischen Schilf hingegen konsumierten die in der Höhle gefütterten Tiere mehr (1,8mal mehr).

Chemische Analysen wurden nur von dem preferierten Laichkraut und von dem kaum konsumierten frischen Schilf durchgeführt. Die Ergebnisse der Analysen bezüglich der organischen Komponente werden in Tab. 2, die der verschiedenen Stickstoff-Formen in Tab. 3. zusammengefasst.

Der Glühverlust (gesamte organische Substanz) ist gegenüber dem Ausgangsmaterial (Laichkraut und frisches Schilf) in den Losungen und in den Kontrollversuchen gesunken (Tab. 2). Interessant gestaltete sich die Menge des Humus in den Losungen; die mit der Tyurin-Methode bestimmten Werte sind beim Konsum von Laichkraut bedeutend gestiegen, beim Konsum von Schilf hingegen gesunken. Eine ebenfalls entgegengesetzte Tendenz konnte bei den verschiedenen Gruppen der organischen Substanzen (Fette und Gerbstoffe, Zucker und Stärke, Hemizellulose und Pektin, Zellulose und Rohprotein) bei Fütterung von Laichkraut bzw. beim frischen Schilf in den Losungen verfolgt werden.

Tabelle 2. Gestaltung der chemischen Komponenten nach dem Konsum von Laichkraut und Schilf durch Glomeris hexasticha

	Gesamt org. Substanz (Glühverlust)	Humus (Tyurin) %	Fette u. Gerbstoffe %	Zucker u. Stärke %	Hemizellulose u. Pektin %	Zellulose %	Rohprotein %
Laichkraut							
Ausgangsmat.	60,48	32,21	1,23	0,94	8,79	1,75	10,50
Losung	52,92	40,43	1,72	0,56	3,76	3,55	15,50
Kontroll	53,04	43,52	1,39	1,47	2,86	1,77	13,50
Schilf							
Ausgangsmat. .	91,28	68,95	2,75	1,30	13,32	17,02	2,00
Losung	69,00	58,85	2,05	2,94	5,72	13,87	9,30
Kontroll	89,36	65,01	1,73	1,65	18,58	12,18	7,60

Eine bedeutende Anreicherung liess sich so in den Losungen wie in den Kontroll-Versuchen in der Gesamtmenge des Stickstoffes (Tabelle 3) und aus dieser kalkulierter Rohproteine verfolgen, woraus auf die Vermehrung der Mikroben während der Zersetzungsprozesse gefolgert werden kann. Die Nitratstickstoff-Werte sind äusserst niedrig, von den Ammoniastickstoff-Werten fanden wir nur die höher, die in den aus Schilf gebildeten Losungen gemessen wurden.

Tabelle 3. Gestaltung der verschiedenen Stickstoff-Formen nach der Darmpassage von Laichkraut und Schilf bei Glomeris hexasticha

	Gesamt-Stickstoff mg/100 g	NH_3-N mg/100 g	NO_3-N mg/100 g
Laichkraut			
Ausgangsmaterial	1688	50	7
Losung	2484	45	31
Kontroll	2155	59	14
Schilf			
Ausgangsmaterial	318	61	0
Losung	1486	367	0
Kontroll	1224	49	4

Wertung der Ergebnisse

Glomeris hexasticha ist in Ungarn eine der häufigsten *Glomeris*-Arten. Sie lebt vorwieglich in der Laubstreu von Wäldern, eventuell im morschen Holz und ernährt sich auch von diesen Substraten. Die besondere Lebensweise der von uns jetzt untersuchten Tiere liess darauf schliessen, dass wir es mit einer ganz besonderen, an die Lebens- und Ernährungsweise der Uferzone angepassten Population zu tun haben. Um unsere Annahme zu unterstützen, versuchten wir solchen *G. hexasticha*-Exemplaren, die im Vértes-Gebirge, in einem Hainbuchen-Eichenwald gesammelt wurden, Laichkraut und Schilf als Futter anzubieten. Trotz mehrmaliger Versuche rührten diese Tiere das für sie gänzlich fremde Futter überhaupt nicht an.

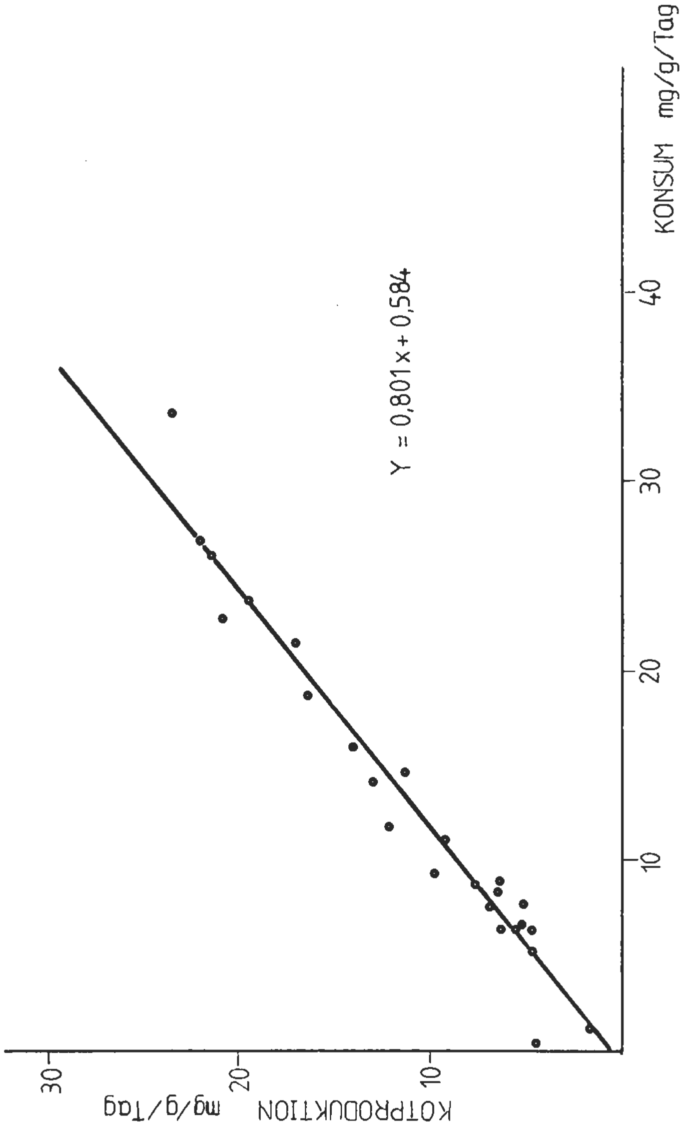

Abb. 2. Zusammenhang zwischen Nahrungsverbrauch und Kotproduktion bei *G. hexasticha*

In einer anderen Versuchsserie wurde bei den von verschiedenen Fundorten stammenden (Uferzone des Balatons und Vértes-Gebirge) *G. hexasticha*-Exemplaren der Laubkonsum verschiedener Laubstreuarten die im April eingesammelt wurden *(Carpinus betulus, Quercus petraea* und *Fagus silvatica)* verglichen. (Tabelle 4). Die vom Balaton stammenden Tiere frassen von allen drei Streuarten bedeutend mehr als die Tiere, die aus dem Vértes-Gebirge stammten. (Von der Hainbuche und Steineiche 1,6 – 1,7mal von der Buche 2,5mal mehr.) Die Unterschiede im Konsum hängen offensichtlich auch mit dem Grössenunterschied der Tiere zusammen (Van der Drift, 1951; Balogh, 1953). Das Durchschnittsgewicht der vom Balaton stammenden Tiere betrug 79 mg, derjenigen, die aus dem Vértes-Gebirge stammenden, hingegen 172 mg. Allenfalls kann aus den Ergebnissen unserer Versuche festgestellt werden, dass die vom Balaton stammende Population ein weiteres Ernährungsspektrum besitzt als die aus dem Hainbuchen-Eichenwald stammende Population.

Tabelle 4. Vergleich des Laubkonsums aus dem Vértes-Gebirge bzw. aus der Uferzone des Balatons stammender Glomeris hexasticha-Exemplare

Fundorte der Tiere	Laubkonsum mg/g/Tag				Kotproduktion mg/g/Tag
	Hainbuche	Steineiche	Buche	Zusammen	
	Streu				
Balaton	3,3	0,3	0,3	3,9	2,9
Vértes	2,0	0,2	0,1	2,3	1,8

Der lineare Zusammenhang zwischen Konsum und Kotproduktion, der wie auch Dunger (1958 a) darauf hingewiesen hat, geht auch aus diesen mit Laichkraut und Schilf gefütterten Versuchen von *G. hexasticha* hervor (Abb. 2).

Bevor noch die chemischen Ergebnisse gewertet werden sollten, sei vorangehend bemerkt, dass – da die Losungen eventuell kürzer oder länger verstärkter mikrobieller Tätigkeit ausgesetzt waren – die chemischen bzw. biochemischen Veränderungen nicht allein den Tieren zuzuschreiben sind, vielmehr handelt es sich um komplexe Transformationsprozesse. Es sind dies Prozesse, die sich nicht trennen lassen, doch dürfen sie auch nicht getrennt werden, da sie auch in der Natur eng miteinander verbunden sind, parallel oder aufeinanderfolgend verlaufen.

Die organischen und anorganischen Komponente der im Balaton lebenden Vegetation wurden chemisch bereits eingehend untersucht (Tóth & Szabó, 1958; Kárpáti & Bedő, 1970). Meinerseits wurden bei der Analysierung der Drifte nur die Komponente berücksichtigt, bei denen aus den Veränderungen eindeutig auf die Zersetzungs- und Abbauprozesse gefolgert werden konnte, und dies waren in erster Linie die organischen Komponente.

Abbildung 3 veranschaulicht die Verteilung dieser organischen Komponente (Fette und Gerbstoffe, Zucker und Stärke, Hemizellulose und Pektin, Zellulose, Rohprotein) in den Proben, u.zw. die Menge der Komponente im Verhältnis zur Menge der gesamtorganischen Substanz. Beim Abbau des Laichkrautes konnten in den Losungen und in den Kontrollversuchen unseren diesbezüglichen Kenntnissen gegenüber entgegengesetzte Ergebnisse erlangt werden, deren Erklärung nur weitere eingehende Untersuchungen liefern könnten. So z. B.

waren folgende Ergebnisse unerwartet: das Ansteigen der Fette und Gerbstoffmengen in den Losungen und Kontroll-Versuchen, oder die Verdopplung der Zellulosemengen in den Losungen. Beim Schilf hingegen fanden wir geringen Zelluloseabbau in den Losungen (im Verhältnis zur Menge der gesamtorganischen Substanz sind die Werte zwar etwas gestiegen), eine bedeutendere Zersetzung der Zellulose erfolgte in den Kontrollversuchen. Im Schilfdetritus des Balaton-Sees haben bereits FELFÖLDY und KALKÓ (1958) eine intensive Zersetzung der Zellulose nachweisen können. Die Ergebnisse scheinen darauf hinzuweisen, dass die Zersetzung der Zelullose nicht auf die Tätigkeit der Bodentiere zurückzuführen ist, sondern in erster Linie auf mikrobiellen Prozessen beruhen.

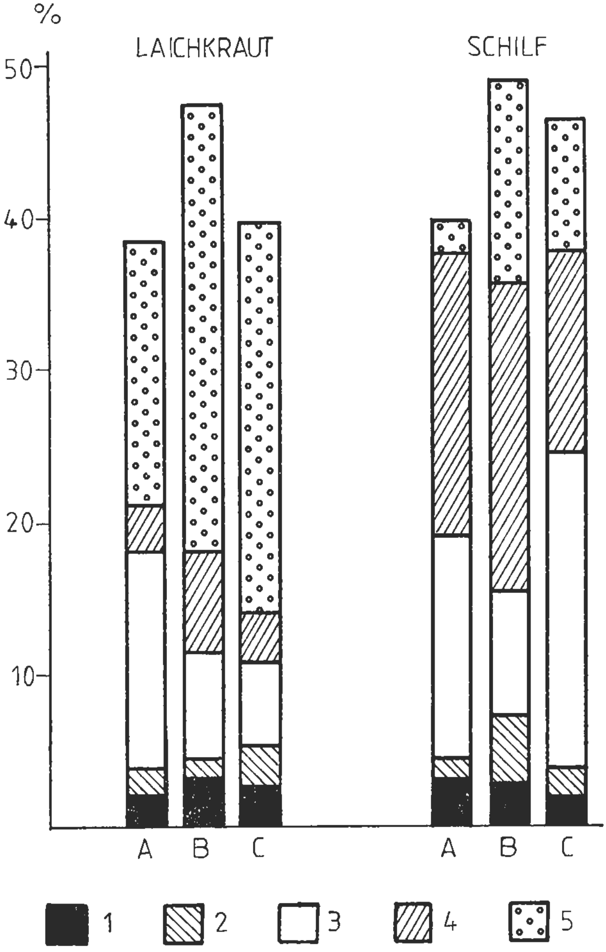

Abb. 3. Veränderungen der Verteilungsverhältnisse der einzelnen organischen Komponente (in % der gesamtorganischen Substanz) im Laichkraut und Schilf nach der Abbautätigkeit von *G. hexasticha*. A = Ausgangssubstanz, B = Exkremente, C = Kontroll; 1 = Fette und Gerbstoffe, 2 = Zucker und Stärke, 3 = Hemizellulose und Pektin, 4 = Zellulose, 5 = Rohprotein

Bei der Verfütterung von Laichkraut liess sich so in den Losungen wie in den Kontrollversuchen ein Ansteigen des Humusgehaltes nachweisen, während beim Konsum von Schilf sich diese Werte verringerten. Diese Beobachtungen stimmen mit den Ergebnissen von Dunger (1958 b) gut überein, da auch er in denjenigen Losungen verschiedener Diplopoden-Arten eine gewisse Humifikation nachweisen konnte, die sich mit solcher Streu ernährten, die einen höheren Stickstoffgehalt besassen, während beim Verfüttern von niederen stickstoffhaltigen Blättern die Menge der Huminsäure in den Losungen geringer wurde (vergl. Tabelle 2 und 3). Im Vergleich der gesamtorganischen Substanz sind die Humuswerte in den Losungen der mit Laichkraut und Schilf gefütterten Tiere gleicherweise gestiegen (Abb. 4). beim ersteren um 1,4-fache, beim letzteren um 1,1-fache.

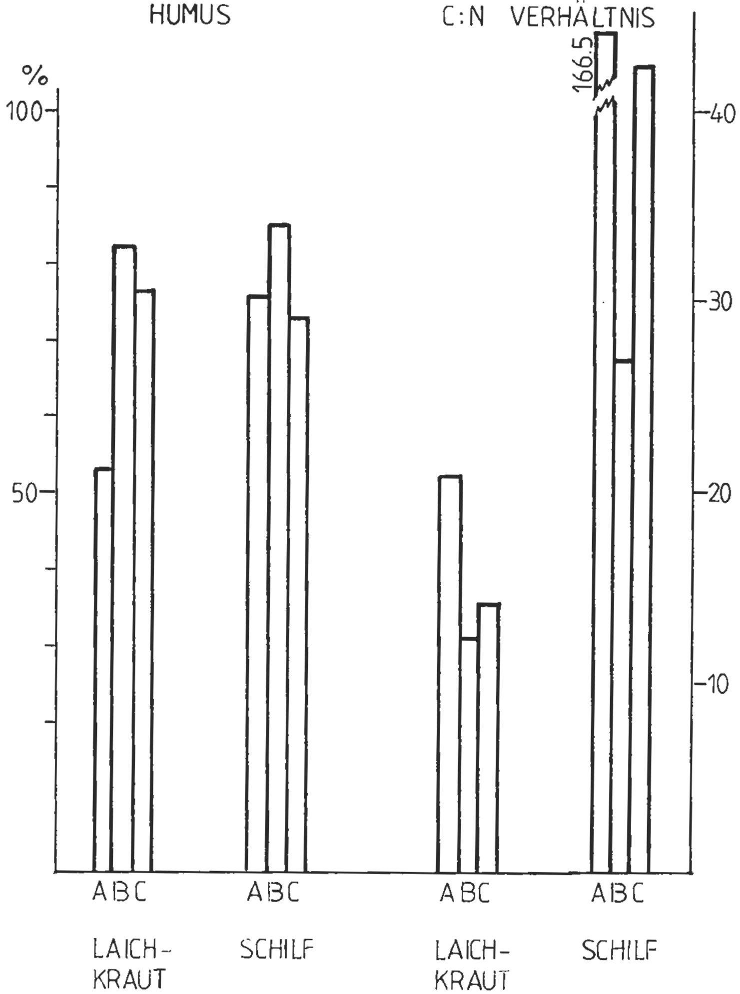

Abb. 4. Die Veränderungen des Humusgehaltes (ausgedrückt in % der gesamtorganischen Substanz) und die Veränderung des C/N-Verhälnisses in Laichktaut und Schilf nach der Abbautätigkeit von *G. hexasticha.* A = Ausgangssubstanz, B = Exkremente, C = Kontroll

Die Veränderungen der Stickstoffverhältnisse werden auf Abb. 5 veranschaulicht. Der einzige hervorspringende Wert ist der hohe Ammonium-Stickstoffgehalt der aus Schilf erzeugten Losungen, der in absoluten Werten das 6-fache des Ausgangsmaterials an Ammonium-Stickstoff beträgt, in Prozent des Gesamtstickstoffgehaltes ausgedrückt jedoch nur eine Erhöhung von 5,6% bedeutet. Es ist anzunehmen, dass es sich um eine eben abgelegte Losung gehandelt hat.

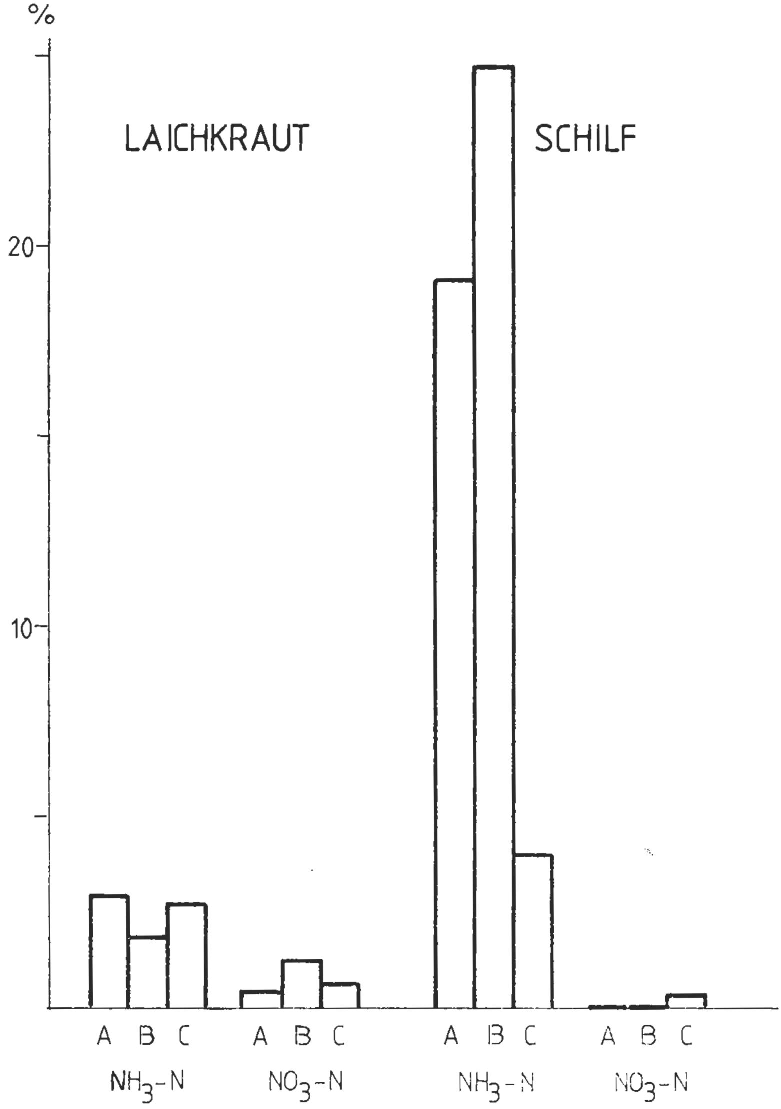

Abb. 5. Gestaltung der NH_3 N- und NO_3 N-Werte (ausgedrückt in % des Gesamtstickstoffes) im Laichkraut und Schilf nach der Abbautätigkeit von *G. hexasticha*. A = Ausgangssubstanz, B = Exkremente, C = Kontroll

Abbildung 4 veranschaulicht auch die Veränderungen des C/N – Verhältnisses. Diese Werte zeigen insbesondere bei der Verfütterung von Schilf eine bedeutende Verengung, aber dies ist auch verständlich, wenn berücksichtigt wird, dass die Menge der organischen Substanz sich stark verringert, der Stickstoffgehalt so in den Losungen wie in den Kontroll-Versuchen ansteigt (Tabelle 2 und 3).

Zusammenfassend kann festgestellt werden, dass *G. hexasticha* als akzessorisches Element des Detritus-Driftes am Ufer des Balaton-Sees (ENTZ et al., 1942) sich an der Zersetzung dieser organischen Substanzen intensiv beteiligt und dadurch an der Zufuhr der biogenen Elemente im See teilnimmt. Seine Lebensweise ist ein ausdruckvolles Beispiel der engen Verbindung der in beiden Biotopen lebenden Organismenwelt. Leider kommen diese saprophagen Tiere immer seltener dazu, ihre nützliche Tätigkeit auszuüben, da der Mensch durch Errichtung der Steindämme das Anhäufen dieser Detritus-Drifte verhindert. Anderseits, wo es noch ganz selten zur Anhäufung solcher organischen Substanzen kommen könnte, werden diese aus ästhetischen Gründen sorfältig entfernt. Dadurch wird diese biologisch so wichtige natürliche Verbindung zwischen Ufer und See ständig unterbrochen bzw. gänzlich ausgeschlossen.

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The isopod fauna of the Pilis Biosphere Reserve
I. Basaharc loess mine

By

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Abstract. The terrestrial isopod fauna of Basaharc, an abandoned loess mine in the Pilis Biosphere Reserve was studied. Five species were found, among which *Armadillidium vulgare* was highly dominant. The abundance of isopods increases along a humidity gradient. The isopod fauna of Basaharc is poor, which is probably due to the dryness of the area.

Introduction

The flora and fauna of the Pilis Mountains have been studied for decades. So far only plant studies led to a comprehensive work (HORÁNSZKY, 1964), much less is known about the animals, especially the invertebrates there. In 1981 a large part of the area became a Biosphere Reserve resulting in a more coordinated research (BERCZIK, 1984), that includes not only faunistic surveys but ecological studies as well (e.g. TÖRÖK, 1987).

Research on the terrestrial isopod fauna of the area began in 1982. Although the isopod species ocurring in Hungary are relatively well known, very little data are available on the population characteristics of this arthropod group (but see HORNUNG, 1988). In this paper such data on the isopod fauna of Basaharc, an abandoned loess mine in the Pilis Mountains are given.

Materials and methods

The Basaharc area lies on the Pilis foothills, near the river Danube. The steep (50 – 60°) walls of the lately abandoned mine are covered with vegetation. The area of the old mine is cut by erosion. The whole study site is warm and dry. The following sites were used for collection: *1.* Astragalo-Festucetum sulcatae, NE slope of the mine; *2.* Astragalo-Festucetum sulcatae, N slope of the mine; *3. Calamagrostis epigeios* vegetation, on the top the loess wall; *4.* Festucetum valesiaceae, slight SE slope; *5.* Festucetum valesiaceae Diplachneval, a ravine; *6.* A gully

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with stagnant water; *7.* Festucetum valesiaceae, another ravine; *8.* Fragment of an *Acer tataricum-Quercus petraea* forest. For further details of the study site see LOKSA (1988).

Animals were collected by pitfall traps during the growing season of 1985. Five traps (modified Barber-traps) were placed at each site except sites 2 and 8 where ten traps were used (samples 2, 2a and 8, 8a). Traps were emptied three times: May 29, July 26 and October 1. Isopods were stored in 70% methanol. Each individual was identified, its sex, maturity (adult or juvenile) determined. In case of females the existence of full or empty marsupium was also recorded.

Results and discussion

Species composition and distribution

The 50 traps caught a total of 2365 individuals belonging to one of the following five species: *Hyloniscus riparius* C.L. KOCH, *Porcellium collicola* VERH., *Protracheoniscus amoenus* C. L. KOCH, *Trachelipus nodulosus* C. L. KOCH, *Armadillidium vulgare* LATR. (Table 1). Both spatially and seasonally *A. vulgare* is the dominant species. The two exceptions are site 2 and 8 where in certain periods of the year *A. vulgare* and *P. collicola* were about equally abundant.

Table 1. Occurrence of the five isopod species on the eight collecting sites. Spring, summer and autumn samples are pooled. (H. rip. = Hyloniscus riparius; P. coll. = Porcellium collicola; P. am. = Protracheoniscus amoenus; T. nod. = Trachelipus nodulosus; A. vulg. = Armadillidium vulgare)

Site	H. rip.	P. coll.	P. am.	T. nod.	A. vulg.	Total
1		8		14	196	218
2		178			402	580
3		19		2	127	148
4		22		3	69	94
5		1		3	177	181
6	14	12			275	301
7		9			131	140
8		303	1		399	703
Total ..	14	552	1	22	1776	2365
D (%) .	0.59	23.34	0.04	0.93	75.10	100%

Although direct measurements were not performed to determine the exact humidity of the different collecting sites, a rough ranking was possible based upon their geographical and topographical characteristics, vegetation and our field observations. Fig. 1 shows the changes in the abundance of isopods along this humidity gradient. Both the total number of isopods and the abundance of *A. vulgare* increase with humidity, which indicates that even for this relatively drought tolerant species humidity may be a limiting factor.

The highest (416) and lowest (94) abundances were found in collecting sites 8a and 4, respectively. This is partly due to the humidity of the area. Isopods do occur in dry areas but there they seek for humid microhabitats or have other behavioural mechanisms to avoid desiccation. On the relatively dry areas (sites 3, 4, 5) only the more tolerant species *(A. vulgare, P. collicola, T. nodulosus)* occur. It is very interesting, however, that between the two ravines where stagnant water is found, the traps cought *H. riparius*, this extremely hygrophyl species throughout the whole collecting period. On site *8 P. amoenus* was found. This species probably used to be much more abundant, when the *Acer tataricum-Quercus petraea* forest was bigger. Now only patches of this forest remained on the area.

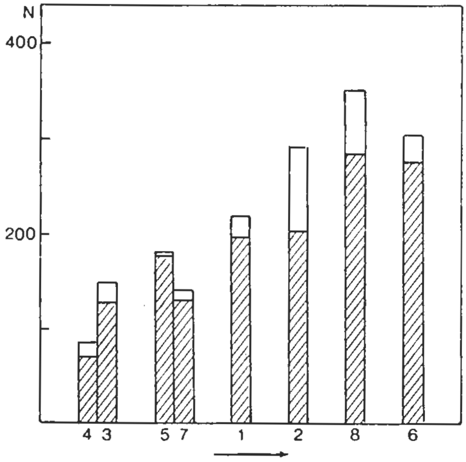

Fig. 1. Change in the total number of isopods along a humidity gradient. (Hatched columns: *A. vulgare* only. Sites 3 and 4 as well as sites 5 and 7 belong to the same category. Columns 2 and 8 represent the average of samples 2 – 2a and 8 – 8a, respectively)

Population characteristics

Only *A. vulgare* and *P. collicola* had high enough abundances to obtain population data. Since collecting with pitfall traps is a relative method, it cannot provide density data. It is appropriate, however, for comparison among the collecting sites. The results are shown on Fig. 1 and Tables 2 and 3.

Percentage of females with full or empty marsupium was highest in summer for both *A. vulgare* and *P. collicola* (44% and 95%, respectively) indicating a breeding period this time of the year. In case of *A. vulgare* high number of juveniles in periods II. and III. confirms this. Among these juveniles there were many very young, recently released ones. In case of *P. collicola* the low number of juveniles is due to their very small size. These tiny animals do not fall into the traps. Even the very few individuals noted as juveniles were rather subadults. They are fairly difficult to distinguish from young adults, especially in case of females. In autumn the percentage of *P. collicola* females with brood pouch was still relatively high (39%) showing a breeding period at this time of the year as well.

Table 2. Distribution of Armadillidium vulgare by sex and maturity on the eight collecting sites. The material of five traps is pooled in one sample. (I = March 27 – May 29; II = May 30 – July 26; III = July 29 – September 1. M = males; Fbp = females with brood pouch; Fnbp = females without brood pouch; Juv = juveniles)

Site		Armadillidium vulgare			Total
		I.	II.	III.	
1	M	11	14	28	196
	Fbp	1	7	1	
	Fnbp	7	2	21	
	Juv	15	54	35	
2	M	16	25	19	203
	Fbp	0	8	4	
	Fnbp	11	14	18	
	Juv	17	47	24	
2a	M	13	28	16	199
	Fbp	0	3	3	
	Fnbp	6	5	20	
	Juv	12	48	45	
3	M	8	26	3	127
	Fbp	0	7	0	
	Fnbp	6	8	2	
	Juv	14	40	13	
4	M	11	2	0	69
	Fbp	0	2	0	
	Fnbp	10	0	1	
	Juv	34	7	2	
5	M	12	11	8	177
	Fbp	1	3	0	
	Fnbp	10	3	12	
	Juv.	23	56	38	
6	M	21	21	5	275
	Fbp	0	11	0	
	Fnbp	19	1	10	
	Juv	17	82	88	
7	M	12	16	8	131
	Fbp	0	5	1	
	Fnbp	6	3	8	
	Juv	24	30	18	
8	M	21	26	15	168
	Fbp	0	3	3	
	Fnbp	21	19	16	
	Juv	4	14	26	
8a	M	41	26	24	231
	Fbp	0	5	0	
	Fnbp	14	13	7	
	Juv	17	56	28	
Total		455	751	570	1776

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	Fnbp	6	5	20	
	Juv	12	48	45	
3	M	8	26	3	127
	Fbp	0	7	0	
	Fnbp	6	8	2	
	Juv	14	40	13	
4	M	11	2	0	69
	Fbp	0	2	0	
	Fnbp	10	0	1	
	Juv	34	7	2	
5	M	12	11	8	177
	Fbp	1	3	0	
	Fnbp	10	3	12	
	Juv.	23	56	38	
6	M	21	21	5	275
	Fbp	0	11	0	
	Fnbp	19	1	10	
	Juv	17	82	88	
7	M	12	16	8	131
	Fbp	0	5	1	
	Fnbp	6	3	8	
	Juv	24	30	18	
8	M	21	26	15	168
	Fbp	0	3	3	
	Fnbp	21	19	16	
	Juv	4	14	26	
8a	M	41	26	24	231
	Fbp	0	5	0	
	Fnbp	14	13	7	
	Juv	17	56	28	
Total		455	751	570	1776

Table 3. Distrubution of Porcellium collicola by sex and maturity on the eight collecting sites. (For further explanation see Table 2)

Site		Porcellium collicola			Total
		I.	II.	III.	
1	M	5	0	0	8
	Fbp	1	0	0	
	Fnbp	2	0	0	
	Juv	0	0	0	
2	M	19	6	11	93
	Fbp	0	4	7	
	Fnbp	28	1	14	
	Juv	0	0	3	
2a	M	16	2	14	85
	Fbp	3	8	1	
	Fnbp	12	2	21	
	Juv	5	0	1	
3	M	1	3	0	19
	Fbp	0	8	4	
	Fnbp	1	0	2	
	Juv	0	0	0	
4	M	18	0	0	22
	Fbp	1	0	0	
	Fnbp	3	0	0	
	Juv	0	0	0	
5	M	0	0	0	1
	Fbp	0	1	0	
	Fnbp	0	0	0	
	Juv	0	0	0	
6	M	3	0	2	12
	Fbp	0	1	0	
	Fnbp	2	1	3	
	Juv	0	0	0	
7	M	4	0	1	9
	Fbp	0	2	0	
	Fnbp	2	0	0	
	Juv	0	0	0	
8	M	15	0	16	118
	Fbp	5	11	12	
	Fnbp	8	0	51	
	Juv	0	0	0	
8a	M	30	10	8	185
	Fbp	2	45	48	
	Fnbp	21	0	21	
	Juv	0	0	0	
Total		207	105	240	552

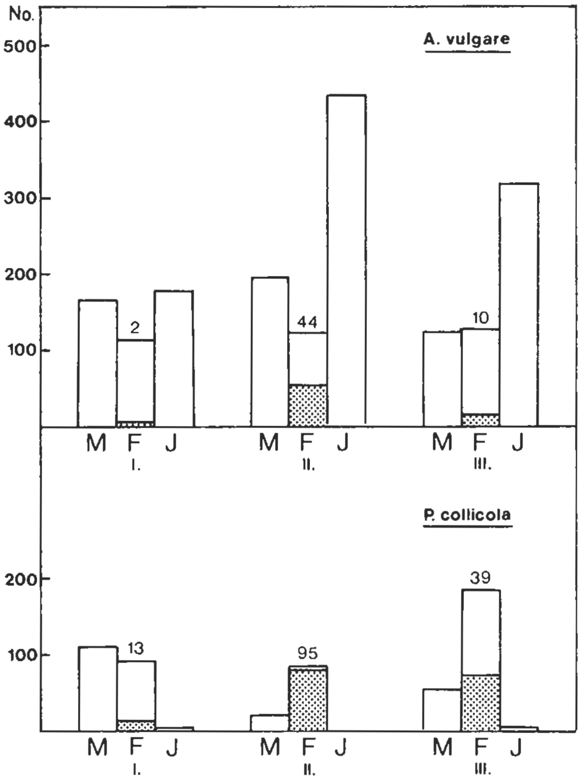

Fig. 2. Seasonal change in abundance of the two dominant isopod species in the Basaharc area. (Columns represent the sum of the individuals caught at the eight sites. M: males, F: females, J: juveniles. Shaded columns: females with brood pouch. Numbers above the columns: percentage of females with brood pouch)

Isopods are known to show reproductive cycles in the field. This is especially well represented for *A. vulgare* (eg. HOWARD, 1940; HATCHETT, 1947; PARIS and PITELKA, 1962) while to my knowledge no such data have been reported for *P. collicola*. For a more exact determination of the breeding period, more frequent (at least monthly) sampling would de necessary.

Neither male nor female *A. vulgare* showed large fluctuations in numbers (Fig. 2). For *P. collicola* the fluctuations are greater, here however the abundance was lower.

Summary

Comparing these data to those obtained from different areas of the Pilis Mountains (SZLÁVECZ unpubl.) it is fair to say that the isopod fauna of the Basaharc area is poor. Since the area is warm and dry, only the more drought tolerant species are widely distributed, but even their abundance is limited by these physical factors.

Acknowledgement

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Opusc. Zool. Budapest, XXIII, 1988

Food resource partitioning between two Dendrocopos species during the breeding season

By

J. Török*

Abstract. Diet niche relationship of *Dendrocopos medius* and *D. major* was studied in the parental care period. Food samples were obtained by placing neck-collars on the nestlings. Caterpillars, dipterans and aphids predominated in the food of the middle spotted woodpeckers; caterpillars, coleopterans, dipterans, spiders and hemipterans in the food of the great spotted woodpeckers. The larger great spotted woodpecker utilized a wider spectrum of prey sizes. The greatest degree of segregation between the two bark-foraging bird species was found in prey composition.

The resource partitionong in avian communities has been intensively studied in the last ten years (Cody, 1974; Ulfstrand, 1976; Wiens & Rotenberry, 1979; Alatalo, 1978). Primary aims of these studies have been to obtain information on the mechanisms regulating the structures of these communities.

Dendrocopos species *(major, medius, minor, syriacus)* use a clearly defined resource while feeding, the bark of trees. Hence recently the spatial distribution of this resource has been intensively studied for these species (Winkler, 1973; Alatalo, 1978; Hogstad, 1978; Jenni, 1983). Almost all of these studies have been restricted to the winter season when the observation not too difficulte even in a forest with dense vegetation. Unfortunately, there are very few data on the diet relationships between bark-foraging species in the breeding season. In this study I have examined the food resource partitioning (food composition and prey-size dimensions) of two species of birds that feed on tree trunks *(Dendrocopos major* and *D. medius)* in the nestling period.

Study area and methods

The study was carried out in a medium-age turkey-oak forest (Quercetum petraeae cerris) near Budapest. The predominant tree species of the 12 ha study area are *Quercus cerris* and *Q. petraea*. Shrubs occurring in appreciable numbers are *Ligustrum vulgare*, *Sambucus nigra*, *Cornus mas* and *Rosa* and *Crataegus* species.

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Food samples were collected from nestlings 2–15 days old using the neck-collar method (KLUIJVER, 1933; TÖRÖK, 1981). Length of the prey items was measured to the nearest mm and their dry weight taken after drying at 104 C for 4 hrs.

Food niche analysis was made on two dimensions (food composition and prey size). In the food composition dimensions categories of food items identified to familial level, rarely because of identification problems to the ordinal level, are presented. Categories were distinguished in 1 mm intervals for the prey size dimension.

The level of prey identification greatly influences niche metrics (GREENE & JAKSIC, 1983), therefore the niche breadth values obtained from figures of ordinal level of identification are underestimates, the values of niche overlap are overestimates of values of generic or species levels. In this report most of the identification are to the family level, hence they are of an intermediate state as compared to the levels examined by GREENE & JAKSIC (1983). The results presented are a better estimates of the true niche dimensions than those obtained from calculations made at ordinal level.

Niche breadth (diversity) was computed using the Shannon formula (SHANNON & WEAVER, 1949):

$$H = -\sum p_i \log_2 p_i,$$

where p_i is the relative abundance of category i (family or size interval) as compared to total number. Evenness was computed using the formula $J = \frac{H}{H_{\max}}$ (PIELOU, 1966), where $H_{\max} = \log_2 S$, S being the total number of categories.

Niche overlap (similarity) was calculated using RENKONEN'S (1938) proportional similarity index:

$$S_{1-2} = \sum_{i=1}^{i=S} \min(p_{1,i}, p_{2,i}),$$

where $p_{1,i}$ is the relative proportion of category i in bird species 1 and $p_{2,i}$ is the proportion of category i relative to the total number of categories in bird species 2.

Results

As regards the number of prey categories, the diet of the middle spotted woodpecker was more diverse than that of the great spotted woodpecker (Table 1). The middle spotted woodpecker fed on lepidopterans, while the great spotted

Table 1. Food composition diversity and evenness of the two woodpecker species (based on number of individuals)

	Dendrocopos medius 1981	*Dendrocopos major*	
		1981	1982
Diversity	3.26	2.47	1.89
Evenness	0.65	0.52	0.46

woodpecker mainly consumed aphids and hemipterans. The prey items which are obtained in the characteristic "woodpecker way" (e.g. coleopteran larvae living in the wood) were absent in the food of both species of woodpeckers in the nestling period.

Of the dipterans both species fed mainly on the larger *Limonia* and *Tipula* species. The prey item of greatest size was the maybeetle, which was found only in the food of great spotted woodpecker nestlings. Both woodpecker species consumed considerable quantities of harvestmen, the great spotted woodpecker specializing on larger ones.

As based on dry weight, the predominant food of the middle spotted woodpeckers were caterpillars, those of the great spotted woodpeckers were coleopterans. Among the groups representing abundant yet small-sized species only the proportion of mirid larvae was significant in the food of the great spotted woodpeckers.

Food composition diversity based on number of items higher in the middle spotted woodpecker than in the great spotted woodpecker (Table 1). Evenness was also greater in the middle spotted woodpecker.

The food composition overlap was 0.50 between the two species based on number of prey items (Table 2).

Table 2. Prey size similarities in five food categories relative to the total number of prey between two woodpecker species (NI – based on number of individuals, DW – based on dry weight)

	Similarity	
	NI	DW
Aphidoidea	0.71	0.60
Heteroptera	0.55	0.50
Diptera	0.50	0.49
Lepidoptera larva	0.79	0.75
Arachnoidae	0.44	0.38
Total	0.51	0.52

In the two *Dendrocopos* species body size was inversely proportional to mean prey size calculated from the number of individuals (Table 3). Carrying out the computations separately for the various prey groups, woodpecker species were segregated mainly as regards sizes of spiders and dipterans (Table 2).

The hemipterans had a bimodal size distribution, the peak around 4 mm representing larvae, the one at 7 mm standing for imagos. The middle spotted woodpecker took few hemipterans and those were mainly imagos, the great spotted woodpecker fed on many hemipterans but those were larvae.

Taking into consideration the number of different sized prey items, the greates similarity was observed between the two species in Aphidoidea and Lepidoptera larvae (Table 2). Tendencies similar to the above were observed in the segregation as calculated from the dry weights of the various food categories (Table 2).

Mean prey size (calculated from dry weight) and the size range of preys increased with increase in body size of bird species (Table 3). Prey size niche breadth calculated from number of individuals was greater in the middle spotted woodpecker than that of the great spotted woodpecker. Calculated from dry weight the greatest niche breadth was observed for the great spotted woodpecker (Table 3).

Table 3. Body size, prey size (mean, $\bar{x}$ and standard deviation, SD), prey size diversity (H) and evenness (J) in the two woodpecker species (sample size in parentheses)

	Dendrocopos medius	*Dendrocopos major*
Body size of adult birds		
mean mass (g)	59.5 (3)	79.2 (14)
mean bill length (mm)	24.6 (3)	27.7 (14)
Prey size		
based on number of individuals		
$\bar{x}$	9.0	5.6
SD	5.4	4.2
H	4.14	3,25
J	0.88	0.65
based on dry weight		
$\bar{x}$	14.0	18.3
SD	4.8	11.7
H	4.12	4.59
J	0.88	0.92

Discussion

The literature on the resource partitioning of the bark-foraging guild of birds is scantly (WILLIAMS BATZLI, 1979). There are, however, data on the food composition of *Dendrocopos* species, but those were obtained from various geographical localities, habitats and seasons (CSIKI, 1905; PYNNÖNEN, 1943; BLUME, 1968; LÖHRL, 1972; GNIELKA, 1978; JENNI, 1983; PETTERSON, 1983).

The results suggest that the most important prey groups of *Dendrocopos medius* were caterpillars and aphids (numerically) and dipterans (in dry weight). In the food samples collected from nestlings in Switzerland (JENNI, 1983) also caterpillars were the predominant prey and the proportion of Tipulidae, Formicidae, Cantharidae and Panorpidae were also in accordance with my findings. PETTERSON (1983) studied the food of nestlings of middle spotted woodpecker in oakwoods in Sweden, where Coccidea, Hymenoptera and Lepidoptera larvae, as well as insects from the surrounding littoral habitat occured frequently in the samples. Since with his method nearly 50% of the prey taken to the nestlings could not be identified, the importance of the various prey groups is only approximative. CSIKI (1905) and BLUME (1968) found ants, coleopterans and hemipterans in the stomach contents of this bird species. Since these data were obtained from various habitats and seasons, and because of the method of study the less cutinized prey items could be identified only with difficulty, any discussion of the relative proportion of the various prey categories would be misleading.

Consumption of aphids, harvestmen and caterpillars by great spotted woodpeckers in this study was similar to that reported by JENNI (1983). In this woodland in the outskirts of Budapest the parents fed more Heteroptera and *Tipula* and less Hymenoptera to the nestlings than in the Swiss habitats. According to stomach content analyses the proportion of Lepidoptera was 5.6%, that of Coleoptera 18.5% in Finland, 22.2% and 57.1% in Germany, respectively (PYNNÖNEN, 1943). The studies of CSIKI (1905) show that this species feeds mainly on coleopterans, and to a lesser extent on ants.

It is a fundamental feature of resource partitioning of competitive communities that there is a positive correlation between body size and prey size in the species of similar feeding strategies (HESPENHEIDE, 1971; SCHOENER, 1974). My results suggest that the species with greater body mass and longer bill utilized a wider spectrum of prey sizes. Since large prey are scarcer than smaller ones (SCHOENER, 1974), the bird species of larger body size also frequently take small prey (like great spotted woodpecker). Mean prey size calculated from dry weight was related to the mean body mass and bill length of the adult birds. WILLIAMS & BATZLI (1979) also found positive correlation between prey size and bill length, and prey size and body mass in the winter food of bark-foraging birds.

The results presented here suggest that the greatest degree of segregation in the studied niche dimensions of two woodpecker species was found in prey composition. This dimension is also an important factor in other avian communities (TÖRÖK, 1986).

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Breeding and feeding of two tit species in sympatric and allopatric populations

By

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Abstract. Breeding phenological parameters (density, clutch size, breeding success, nestling weight on day 15) and the food size distribution of the great tit *(Parus major)* and the blue tit *(P. caeruleus)* were studied in sympatric and allopatric populations, the latter one created by excluding one species from nest-boxes. An asymmetrical type of competition for food was found to be restricted to the parental care period. Blue tits fed their nestlings with larger caterpillars on the manipulated plot composed of blue tits only and with smaller ones when they bred sympatrically with great tits. Blue tits' specialisation on the smaller caterpillars does not present a disadvantage in the sympatric situation because these prey size categories are the most abundant ones in the supply. The utilization of differently sized prey items can be a possible cause of the differences in competitive abilities of the species during the parental care peroid.

Introduction

The great tit *(Parus major)* and the blue tit *(Parus caeruleus)* are the two most common breeding species in Central European deciduous forests. Competition and resource partitioning between the two species during different periods of the year was subject to a number of studies (reviewed by ALATALO, 1982). Several of these (GIBB, 1954; BETTS, 1955; DHONDT & EYCKERMAN, 1980; ALATALO, 1981; LISTER, 1981; ALATALO, 1982) showed that competition for food is important during winter. It has recently been suggested (DHONDT, 1977; MINOT, 1981) that food can be a limiting factor during the breeding period, too.

This paper presents the results of a removal experiment where breeding phenological parameters and prey size distribution of the two tit species were compared in sympatric and allopatric situations. We hypothesized that if competition for food were important during breeding in allopatric populations (where the other species was prevented from breeding) the breeding phenological parameters would be better than in sympatric populations. This can result in higher breeding density, more eggs laid, larger nestling weights and

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higher fledging success of the allopatric population. If competition occurs during the whole breeding period (from the occupation of the territories to the fledging of the young), then we can expect a difference in all the parameters listed above. If, on the other hand, the competition is restricted to certain periods of the breeding season, then some of the above parameters would show a difference between sympatric/allopatric populations while others would not. If, for example, competition for food occurs during egg laying only, it will be reflected in clutch size; if competition is acting during the nestling period, the nestling weights will differ.

To prevent nesting site availability to become a limiting resource, we established a nest-box density of more than 10/hectare.

Study area and methods

The study was carried out in a mixed oak/hornbeam forest (Querco Petraeae-Carpinetum) near Budapest, Hungary. Two years before this study was started, most of the hornbeam trees were cut and the dead or fallen trunks were removed. Nest boxes were put out during the autumn 1981.

Three plots, 9 ha each, were established about 2 km from each other.

Plot 1: removal plot, allopatric for blue tit (BT). 100 nest-boxes were put out. The entrance hole diameter was 25 mm. Because of the small entrance diameter only BTs could breed on this plot.

Plot 2: control plot, sympatric populations of BT and great tit (GT). 200 nest-boxes were established. The entrance hole diameter was 32 mm. These nest-boxes could be utilized by the collared flycatcher *(Ficedula albicollis)* and the two tit species too. Some other species which occasionally bred here and on Plot 3 were marsh tit *(Parus palustris)*, nuthatch *(Sitta europaea)*, pied flycatcher *(F. hypoleuca)* and wryneck *(Jynx torquilla)*.

Plot 3: removal plot, allopatric for GT. 100 nest-boxes with an entrance diameter of 32 mm were put out. The entrance of boxes where we noticed a breeding attempt of the BT were closed. Breeding attempts of the BT were prevented this way throughout the whole breeding season.

Nest-boxes were checked every 3–4th day; clutch size, fledgling success (number of fledglings/number of eggs) and nestling weight (measured on the 15th day) were registered.

During the 1984 season, food samples using a modified neck-collar method (TÖRÖK, 1981) were taken from nestlings on Plots 1 and 2. Low number of GT nests on Plot 3 prevented sampling for food on that plot. Nestlings from which food samples were taken were excluded from weight analysis.

Size distribution of the caterpillars on the trees was determined by measuring caterpillars collected by beating at the same time when food samples from nestlings were taken.

The niche width values were calculated using the SHANNON formula (SHANNON & WEAVER, 1949).

Results

Breeding parameters

The breeding density of the two tit species varied between 0.8 and 1.8 pair/ha in different years and plots. The difference between the mean clutch size in the control and the removal plots was not statistically significant (Table 1), nor fledging success differed significantly for either species in any of the plots. We note, however, that all nests were included in the fledging success calculations including those which failed to hatch. Especially in 1984, the fledging success of both species was very low due to the heavy rainfall which caused a low hatching rate.

Table 1. Breeding density, clutch size and fledging success of the two species

Year	Species	Plot	Density (pair/ha)	Mean clutch size	Fledging success
1982	Blue tit	control	1.2	12,1	.74
		removal	1.2	12.1	.88
	Great tit	control	1.0	9.6	.76
		removal	1.1	10.3	.70
1983	Blue tit	control	1.0	12.8	.91
		removal	0.8	12.4	.91
	Great tit	control	1.6	11.4	.69
		removal	0.8	10.9	.50
1984	Blue tit	control	0.8	11,7	.56
		removal	1.3	12.5	.74
	Great tit	control	0.8	10.7	.47
		removal	0.9	10.5	.38

Nestling weights

Nestling weights, measured on the 15th day, did not differ significantly between the control and the removal plots in 1982 (Table 2). In 1983 and 1984, however, BT youngs were heavier in nest-boxes on plot 2 than on plot 1. This difference was slight in 1983 ($t = 2.45$, $p = 0.02$, two tailed test) and higher

Table 2. Nestling weight of the great tit and the blue tit at 15 days of age (g). (n is the number of nestling)

Year	Species	Control plot			Removal plot			Student's t-test two-tailed
		$\bar{x}$	S.D.	n	$\bar{x}$	S.D.	n	
1982	Great tit	18.3	1.03	107	18.4	1.13	60	ns
	Blue tit	12.0	0.81	103	11.9	0.69	105	ns
1983	Great tit	16.6	1.81	100	18.1	1.81	26	$p = 0.001$
	Blue tit	11.8	0.79	104	11.5	0.74	79	$p = 0.02$
1984	Great tit	16.3	1.48	38	17,4	1.26	40	$p = 0.002$
	Blue tit	12.0	0.73	43	11.5	0.89	83	$p = 0.001$

in 1984 (t = 3.39, p = 0.001). The opposite trend was found for the youngs of the GT: they were heavier on plot 3 (BT removed) than on the control (plot 2). This difference was statistically highly significant (1983: t = 3.61, p = 0.001; 1984: t = 3.42, p = 0.002).

Food of the nestlings

Caterpillars dominated in the food of the nestlings of both species (Table 3). BT parents fed their young with more spiders and lepidopterous pupae and fewer small-sized tortricid caterpillars on plot 1 than on plot 2. GT parents brought more large-sized noctuid larvae than the BT parents did. The size analysis of the most important prey group, the lepidopterous larvae, showed that BT nestlings were fed with larger caterpillars on plot 1 (where GT was excluded) than on plot 2 (where both species bred, see Table 4). GT prefered the larger caterpillars on the latter plot. Mean prey size of the BT was 2.1 mm larger than the mean size of the caterpillars in the supply on plot 1. This difference was only 0.8 mm on the control plot (plot 2). The prey size niche width of the BT was larger (3.91) on the plot 1 where GT was excluded than on plot 2 where it bred with the GT (3.66).

Table 3. The food composition of the two tit species in 1984

Taxa	Great tit control plot	Blue tit	
		removal plot	control plot
Isopoda	–	–	1
Coleoptera			
Melolonthidae	1	–	–
Coleoptera larvae	–	–	2
Lepidoptera larvae			
Tortricidae			
Tortrix viridana	1	3	24
Tortricidae indet.	–	9	6
Lymantriidae	2	–	–
Geometridae			
Colotois pennaria	1	15	1
Operophtera brumata	7	3	16
Erannis spp.	24	33	38
Geometridae indet.	10	15	36
Noctuidae			
Orthosia stabilis	25	–	15
Orthosia cruda	24	1	–
Agrochola sp.	–	–	1
Noctuidae indet.	6	6	9
Lycenidae	1	1	–
Lepidoptera indet.	–	–	1
Lepidoptera pupae	2	33	2
Diptera			
Muscidae	–	–	3
Araneidea			
Thomisidae	1	43	17
Argiopidae	–	8	2
Lycosidae	1	–	–
Salticidae	–	7	1
Araneidea indet.	–	10	1
Total	106	187	176

Table 4. The mean size of caterpillars (mm) in the supply and in the food of the two tit species on the control and removal plots in 1984. (n is the number of caterpillars)

	Control plot			Removal plot			F-test
	$\bar{x}$	S. D.	n	$\bar{x}$	S. D.	n	
In the supply	15,0	4.01	521	16.2	6.09	252	p = 0.001
In the food							
blue tit	15.8	3.24	146	18.3	4.40	87	p = 0.001
great tit	19.9	4.68	101	–	–	–	–

Discussion

Recent studies have shown that the two common tit species, the GT and the BT, can compete in certain periods of the year. Competition during winter is well documented (Gibb, 1954; Betts, 1955; Alatalo, 1981; Lister, 1981; Alatalo, 1982): food is in short supply and roosting hole availability is also limited (Dhondt & Eyckerman, 1980). Early in the spring there is intraspecific competition for territories in areas of high population density in both the GT (Krebs, 1971) and the BT (Dhondt et al., 1982).

Opinions are different on the importance of competition during the breeding season. Research workers in England (Hartley, 1953; Gibb, 1954; Betts, 1955; Edington & Edington, 1972) argue that food is superabundant during this period and therefore this resource is not competed for. On the other hand, studies of the breeding success (Dohndt, 1977; Minot, 1981) and the food of the nestlings (Minot, 1981) showed that food can be a limiting factor during the breeding period, too.

Our results suggest that there is no competition for food during the period of egg laying because the breeding parameter characterizing this, the clutch size, did not differ among the control and the removal plots in either of the species. Food supply increases gradually during the incubation period and as the nestlings are not yet hatched, the consumption does not increase so competition is not probable during this period, either. During brood raising, however, the amount of the food can become a limiting factor which is reflected in the differences found in the weights of the nestlings on different plots. An asymmetric effect was found: GT youngs were smaller in broods on plots where BT also bred than on plots where BT was excluded from. This trend was not found in the BT nestling weights. Nestling weights do not allow an exact interpretation of the effect of GT on BT, but the study of the food of the nestlings showed that BT parents brought smaller caterpillars when breeding together with the GT and larger ones when breeding alone. The prey size niche width of the BT also decreased when it was sympatric with the GT. This shift, however, means no disadvantage for the BT because the direction of the shift along the prey size spectrum brings it to the size of the most abundant prey items. The abundance of the smaller caterpillars (14 – 18 mm) is so high that their biomass (dry mass × abundance) exceeds that of the large ones (18 – 22 mm). Collecting larger caterpillars is a less efficient way of feeding the young as it was reflected in the smaller fledgling weight of the GT youngs on the plot where it bred with the BT. Unfortunately, the effect of BT on GT prey size preference was not possible to evaluate (see Methods). The utilization of differently sized prey items can be a possible cause of the differences in competitive abilities of the two species.

Although food is an important factor in the outcome of the competition between the two species, further studies are needed to clarify the role other factors like intraspecific competition, predation risk, the abundance and feeding of another potential competitor, the collared flycatcher play in the interspecific competition of the two tit species. This latter can especially be important as the collared flycatcher is one of the most abundant hole-nesting species in Central European forests whose breeding phenology and food is similar to the tits'.

Our data seem to support DHONDT'S (1977) suggestion that the two tit species are in asymmetric competition and the BT is superior. However, our data suggest that this competition is restricted to the parental care period only.

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Über einige Thamnodrilus-Arten und andere Regenwürmer aus Ekuador (Oligochaeta: Glossoscolecidae, Lumbricidae, Megascolecidae)

Regenwürmer aus Südamerika, 3

Von

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Abstract. *Thamnodrilus* species collected in Ecuador were re-examined upon the base of the type-material and their descriptions completed. Two *Thamnodrilus* species new for science: *Th. baloghi* sp. n. and *Th. botari* sp. n. are described. Further species of the families Lumbricidae and Megascolecidae, new for the fauna of Ecuador, are enumerated.

Im Februar 1986 und April 1987 konnten zahlreiche der Gattung *Thamnodrilus* Beddard, 1887 angehörende Arten von verschiedenen Fundorten aus Ekuador gesammelt werden. Da die bisherigen Angaben über das Vorkommen dieser Arten in Ekuador sehr sprärlich sind, die Stichhaltigkeit der Arten umstritten ist, soll anhand des neugesammelten Materials den Arten gegenüber Stellung eingenommen werden.

Ferner werden noch einige peregrin verbreitete Arten aus der Familie Glossoscolecidae, Lumbricidae und Megascolecidae, die bisher grösstenteils aus Ekuador nicht erwähnt wurden, angeführt.

In einer vorausgehenden Arbeit wurde nachgewiesen (Zicsi, 1988), dass sich *Aptodrilus festae* Cognetti, 1904 fälschlicherweise als Typusart der Gattung *Aptodrilus* Cognetti, 1904 in der Literatur eingebürgert hat (Cognetti, 1906, p. 226, Subgen. *Aptodrilus,* Tipo: *Rhinodrilus [Aptodrilus] festae;* Michaelsen, 1918). Bei der Erstbeschreibung (Cognetti, 1904, p. 15) wurde jedoch einwandfrei *A. excelsus* nov. gen., nov. spec. als Typusart designiert. Nachdem anhand von neugesammeltem Material festgestellt werden konnte, dass die bisher beschriebenen *Aptodrilus*-Arten zwei verschiedenen Gattungen angehören, wurde von Zicsi (1988) für die als *A. festae* angeführte Art und für weitere in Ekuador gesammelte Arten eine neue Gattung aufgestellt *(Onoreodrilus* Zicsi, 1988).

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Als MICHAELSEN die Typusart der Gattung *Thamnodrilus (T. guliemi* BEDDARD, 1887) einer Nachbestimmung unterziehen konnte, stellte er fest, dass die Typusart von *Thamnodrilus*, aufgrund der 6 Paar Chylustaschen, mit den Arten von *Aptodrilus* zu vereinen ist. Aus Prioritätsgründen wurde die Gattung *Aptodrilus* eingezogen, sämtliche Arten der Gattung *Thamnodrilus* eingeordnet (MICHAELSEN, 1935).

Die meisten bisher bekanntgewordenen *Thamnodrilus*-Arten stammen aus Ekuador: *T. excelsus* (COGNETTI, 1904), *T. ruvidus* (COGNETTI, 1904), *T. uncinatus* (MICHAELSEN, 1910). Nur *T. uncinatus* var. „?", die im späteren als *T. fuhrmanni* (MICHAELSEN, 1918) und als selbständige Art beschrieben wurde, ist in Kolumbien gesammelt worden. Die voraus angeführten 3 Arten sind einander sehr ähnlich, MICHAELSEN neigte 1910 noch dazu, sie bloss als verschiedene Formen zu betrachten. Später jedoch werden sie zusammen mit *T. fuhrmanni* und *T. ohausi*, als selbständige Arten belassen (MICHAELSEN, 1918).

In den vorliegenden Aufsammlungen konnten mit Ausnahme von *T. ruvidus* (COGNETTI, 1904) alle bisher aus Ekuador gemeldeten Arten dieser Gattung, sowie auch *T. fuhrmanni* (MICHAELSEN, 1918) aus Kolumbien angetroffen werden. Dieser Umstand ermöglicht es, die Originalbeschreibungen, die auf einer sehr beschränkten Anzahl von Exemplaren beruhen *(uncinatus* 2 Exemplare, *fuhrmanni* 4 Exemplare, *excelsus* einige Exemplare), zu ergänzen. Ausserdem ist es uns gelungen, durch das freundliche Entgegenkommen von Herrn Prof. Dr. M. DZWILLO, Zoologisches Institut und Museum, Hamburg, das Typenmaterial von *uncinatus*, *fuhrmanni* und auch ein Exemplar von *excelsus*, welches COGNETTI seinerzeit an MICHAELSEN übersandte und ebenfalls zum Typenmaterial gehört, einzusehen. Für die Überlassung des Typenmaterials sprechen wir Herrn Prof. Dr. M. DZWILLO auch an dieser Stelle unseren besten Dank aus.

Fam. GLOSSOSCOLECIDAE MICHAELSEN, 1900

Gattung *Thamnodrilus* BEDDARD, 1887

Diagnose: Normale Borsten in 8 Längslinien. Männliche Poren intraclitellial. Vordere Dissepimente verdickt. 5–6 Paar Chylustaschen (Rispenschlauchtaschen) im 9., 10–14. Segment; sie münden frei in die Leibeshöhle. Geschlechtsapparat holoandrisch und metagyn. Samensäcke kurz, nicht weit nach hinten reichend.

Thamnodrilus fuhrmanni (MICHAELSEN, 1918)

Laut Originalbeschreibung aus dem Jahre 1913, wo sie noch als *Rhinodrilus (Aptodrilus) uncinatus* var. „?" fungiert (MICHAELSEN, 1913, p. 242–245), wird eine Lage des Gürtels vom 14., 15–21. oder 1/2 23. Segment angegeben. Bei der Beschreibung der Art, also bei *fuhrmanni* sp. n. (MICHAELSEN, 1918, p. 159–160), wird die Originalbeschreibung aus dem Jahre 1913 von MICHAELSEN als massgebend betrachtet und mit einigen Angaben ergänzt. Unter anderem wird in einer Tabelle auf p. 157 auch die Lage des Gürtels und die der Pubertätsstreifen von *T. fuhrmanni* angeführt. Hier jedoch wird nur eine Lage vom 15–1/2 23. Segment erwähnt.

Im vorliegenden Typenmaterial (*Aptodrilus fuhrmanni* MICHAELSEN, Inv.-Nr.: V 7749, Finca Camelia bei Titribi, leg. FUHRMANN) konnten tatsächlich drei Exemplare mit einem Gürtel von 15. bis 1/2 23. Segment, und mit Pubertätsstreifen vom 1/2 19. bis 1/2 24. Segment nachgewiesen werden, die auch in den anderen Merkmalen mit der Originalbeschreibung übereinstimmten. Ausser diesen drei Exemplaren liegt noch ein Tier vor, welches jedoch nicht zu *T. fuhrmanni* gehört, sondern eine andere Art darstellt, und der von ZICSI neuerdings (ZICSI, 1988) aufgestellten Gattung *Onoreodrilus* eingereiht werden muss. Ob MICHAELSEN bei der endgültigen Beschreibung von *T. fuhrmanni* im Jahre 1918 dies ebenfalls erkannt hat und deswegen die Gürtellage vom 14., 15–21. Segment nicht mehr anführt, bleibt offen. Allenfalls ist für uns die Tatsache, dass im Typenmaterial von *T. fuhrmanni* keine Tiere mit einem Gürtel vom 14., 15–21. Segment vorliegen, besonders wichtig, da im jetzigen Material zahlreiche Exemplare vorkommen, bei denen sich der Gürtel vom 15. bis 21. Segment erstreckt, die Pubertätsstreifen vom 1/2 19. bis 1/2 24. Segment reichen. Da die Arten der Gattung von *Thamnodrilus* aus Ekaudor sich vorwieglich in der Lage des Gürtels und der Ausdehnung der Pubertätsstreifen voneinander unterscheiden und diese Merkmale bei verschiedenenen Populationen konstant verfolgt werden können, werden sämtliche Tiere, bei denen sich der Gürtel vom 15–1/2 21., 21. Segment erstreckt, als neue Art für die Wissenschaft beschrieben.

Anhand unseres Materiales führen wir eine kurze Beschreibung der Art *fuhrmanni* MICHAELSEN an. Es liegen uns von mehreren Fundorten zahlreiche Exemplare in verschiedenen Entwicklungsstadien vor.

Länge 65–85 mm, Dicke 4–6 mm, Segmentzahl 90–125.

Farbe weiss, pigmentlos.

Kopflappen kuppelförmig, eingezogen, prolobisch.

Borsten eng gepaart. Borstendistanz am Vorderkörper: *aa* : *ab* : *bc* : *cd* = = 27 : 7 : 29 : 4; hinter dem Gürtel: *aa* : *ab* : *bc* : *cd* = 38 : 8 : 20 : 8; am Körperende: *aa* : *ab* : *bc* : *cd* = 30 : 12 : 23 : 8.

Ventrale Borsten vom 6–10. Segment und die des 18. Segmentes au Drüsenpapillen angeordnet und in Geschlechtsborsten umgewandelt.

Weibliche Poren auf dem 14. Segment, hinter den Borsten *ab*. Männliche Poren auf Intersegmentalfurche 19/20, in Höhe der Pubertätsstreifen.

Gürtel sattelförming, vom 15–23., 1/2 24. Segment. Pubertätsstreifen bei allen Exemplaren konstant vom 1/2 19–1/2 24. Segment.

Samentaschenporen zwischen Intersegmentalfurche 6/7–8/9, drei Paar.

Innere Organisation: Dissepimente 6/7–9/10 stark verdickt, 10/11 und 11/12 weniger stark, die übrigen nicht verdickt.

Die ventralen Borstenpaare des 6–10. Segmentes sind von innen durch mehrteilige in die Leibeshöhle hineinragende Drüsenfelder gekennzeichnet.

Muskelmagen im 6. Segment, sehr gross. Lateralherzen im 7–9. Segment, mächtige Intestinalherzen im 10. und 11. Segment. Chylustaschen 5 Paar im 10–14. Segment, entspringen ventrolateral auf einem kleinen Stiel, stehen in dorsaler Richtung frei. Rispenschlauchtaschen im Querschnitt einfach fjordförmig (Abb. 1).

Männliche Geschlechtsorgane: 2 Paar kleine Testikelblasen im 10. und 11. Segment, die ventromedian durch einen dünnen Schlauch verbunden sind.

2 Paar grosse Samensäcke von Dissepiment 11/11 und 11/12 nach hinten ragend. Samensäcke des 12. Segmentes auch bis ins benachbarte Segment reichend. Samentachen drei Paar im 7–9. Segment. Es sind keulenförmige Gebilde mit langem Stiel, der nicht scharf von der Ampulle absgesetzt ist.

Fundorte: AF/425, 1 Ex., Ekuador, Prov. Pichincha, zwischen Quito und Sto. Domingo, 2650 m, neben der Hauptstrasse im Urwald, 19. II. 1986, leg. Benavides + Loksa + Zicsi. – AF/321, 6 Ex., in verschiedenen Entwicklungsstadien, Fundort wie bei AF/425. – AF/257, 1+1 juv. Ex., Prov. Cotopaxi, San Francisco de las Pampas, 1800 m, 8. II. 1986, leg. Loksa + Onore + + Zicsi. – AF/285, 2 Ex., Ebenda, Naranchito, 10. II. 1986, leg. Loksa + Onore + Zicsi. – AF/531, 70 Ex., Prov. Chimborazo, Cerca Juan de Valesco, 3200 m, Wiese, Paramo, 4. IV. 1987, leg. Loksa + Coloma + Zicsi. – AF/532, 2 Ex., Prov. Bolivar, Las 4-esquinas, 3200 m, 3. IV. 1987, leg. Loksa + Coloma + Zicsi. – AF/533, 27 Ex., Prov. Bolivar, Cashca Totoraz, 3200 m, Paramo, Waldgrenze, 3. IV. 1987, leg. Loksa + Coloma + Zicsi. – AF/534, 40 Ex., Prov. Bolivar, Cashca Totoraz, 3100 m, Strauchvegetation, 3. IV. 1987, leg. Loksa + Coloma + Zicsi. – AF/535, 71 Ex., Prov. Chimborazo, Pohaluin, 3100 m, Paramo-Vegetation, Schwarzerde, 2. IV. 1987, leg. Loksa + Coloma + Zicsi. – AF/545, 1 juv. Ex. Prov. Chimborazo, 3900 m. 3. IV. 1987, leg. Loksa + Coloma + Zicsi. – AF/544, 5 juv. Ex., Prov. Bolivar, Las 4-esquinas, 3000 m, 2. IV. 1987, leg. Loksa + Coloma + Zicsi. – AF/546, 2 juv. Ex., Prov. Chimborazo, San Juan de Trigloma, 2200 m, 5. IV. 1987, leg. Loksa + Coloma + Zicsi.

Thamnodrilus baloghi sp. nov.

Dimensionen: Länge des Holotypus 60 mm, Dicke 4 mm, Segmentzahl 125; bei den übrigen Tieren: Länge 50–90 mm, Dicke 4–6 mm, Segmentzahl 110–140.

Farbe weiss, pigmentlos.

Kopf kurz, kuppelförming, prolobisch, manchmal ganz eingezogen. Segmente vom 7–11. Segment wallförmig erhaben, Segmente 12. bis 14. mehrfach geringelt.

Borsten am Vorderkörper eng gepaart, hinter dem Gürtel Borstenreihen allmählich grösser werdend, Borsten stark gebogen. Borstendistanz am Vorderkörper: $aa : ab : bc : cd : dd = 19 : 7\ 15 : 2 : 45$; hinter dem Gürtel: $aa : ab : bc : cd : dd = 25 : 6 : 20 : 5 : 70$; am Schwanzende: $aa : bc : cd : dd = 26 : 19 : 26 : 19 : 50$.

Borsten *ab* des 7–10., 17., 18. Segmentes meistens von kleinen Drüsenpapillen umgeben, Borsten zu Geschlechtsborsten umgewandelt. Von innen sind bei einigen Tieren in diesen Segmenten kleine Drüsenfelder zu erkennen.

Nephridialporen im 3. Segment beginnend, in der Borstenlinie *cd*. Weibliche Poren am 14. Segment, hinter der Borstenlinie *b*. Männliche Poren münden im vorderen Teil des 20. Segmentes, in Höhe der Pubertätsstreifen.

Gürtel beim Holotypus vom 15. bis 21. Segment, bei den übrigen Tieren auch vom 15–1/2 21., 21. Segment, bei einigen Tieren ist manchmal ein dünner Dorsalstreifen auf dem 22. Segment zu erkennen.

Pubertätsstreifen beim Holotypus vom 1/2 19–1/2 24. Segment, bei den Paratypen auch vom 1/2 19–1/4 oder 1/2 24. Segment. Samentaschenporen drei Paar, in Intersegmentalfurche 6/7–8/9, in der Borstenlinie *cd*.

Innere Organisation: Dissepimente 6/7–10/11 verdickt, 11/12–12/13 schwach verdickt. Muskelmagen im 6. Segment, Lateralherzen vom 7–9. Segment, mächtige Intestinalherzen vom 10–11. Segment. Perlschnurartiges Dorsalgefäss vom 11–22 Segment stark angschwollen. Fünf Paar Chylustaschen vom 10–14.

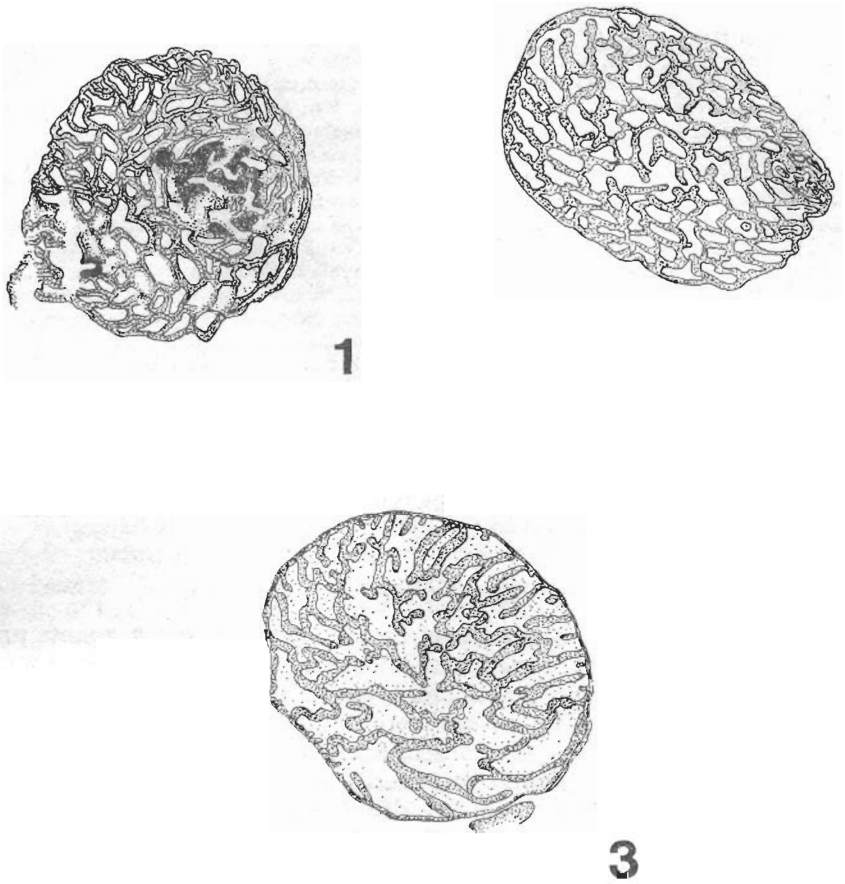


Abb. 1–3. Querschnitte durch Chylustaschen mit fjordförmiger Struktur. 1: *Thamnodrilus fuhrmanni* (MICHAELSEN, 1918); 2: *Thamnodrilus baloghi* sp. n.; 3: *Thamnodrilus uncinatus* (MICHAELSEN, 1910)

Segment, entspringen ventrolateral von einem kleinen Stiel, stehen in dorsaler Richtung frei, der obere freie Teil der Chylustaschen etwas abgeschnürt. Rispenschlauchtaschen im Querschnitt einfach fjordförmig (Abb. 2).

Männliche Geschlechtsorgane: Zwei Paar kleine, unpaarige Testikelblasen im 10. und 11. Segment, die ventralmedian durch einen kleinen Schlauch miteinander verbunden sind. Zwei Paar kleine, wurstförmige Samensäcke im 11. und 12. Segment. Drei Paar Samentaschen im 7–9. Segment, erstes Paar mit kurzem Stiel, zweites und drittes Paar mit langem Stiel, und platter löffelförmiger Ampulle.

Die neue Art unterscheidet sich von den übrigen *Thamnodrilus*-Arten eindeutig durch die Lage des Gürtels. Von *Thamnodrilus uncinatus,* der sie am nächsten steht, unterscheidet sie sich auch in der Form der Samensäcke und Samentaschen.

Die neue Art wird zu Ehren nach Herrn Prof. Dr. J. BALOGH (Budapest) benannt.

Fundorte: Holotypus: AF/539, Ekuador, Prov. Cotopaxi, San Francisco de las Pampas, 1600 m, am Wegrand, 8. II. 1986, leg. Loksa + Onore + Zicsi. = Paratypen: AF/262, 132 Ex., Fundort wie beim Holotypus. – AF/256, 1+7 juv. Ex., Fundort wie zuvor, 1800 m. – AF/261, 14 Ex., Fundort wie zuvor, 1700 m. – AF/265, 21+4 juv. Ex., AF/271, 1 Ex., AF/272, 7+4 juv. Ex., Prov. Cotopaxi, San Francisco de las Pampas und Umgebung, 9. II. 1986, leg. Loksa + Onore + Zicsi. – AF/278, 38 Ex., Prov. Cotopaxi, San Francisco de las Pampas, zwischen Naranchito und Galapagos de las Pampas, im Urwald und auf Wiese, 10. II. 1986, leg. Loksa + Onore + + Zicsi. – AF/319, 2+1 juv. Ex., zwischen Quito und Sto. Domingo, 2300 m, Urwald, 19. II. 1986, leg. Loksa + Benavides + Zicsi. – AF/325, 1 Ex., Fundort wie zuvor, 1200 m, Urwald. – AF/310, 2+2 juv. Ex., Prov. Pichincha, Saloya, 1450 m, Urwald, 20. II. 1986, leg. Loksa + Benavides + Zicsi. – AF/523, 7+6 juv. Ex., 32 km von Otavalo in Richtung Selva Allegre, 3700 m, Grenze zwischen Paramo und Wald, an feuchten Stellen, 22. IV. 1987, leg. Benavides + Loksa + + Zicsi. – AF/524, 5+9 juv. Ex., 53 km von Otavalo, vor Selva Allegre, subtropischer Urwald, 22. IV. 1987, leg. Benavides + Loksa + Zicsi. – AF/525, 2 Ex., 15 km hinter San José de Minas vor Otavalo, 21. IV. 1987, leg. Benavides + Loksa + Zicsi. – AF/526, 12 Ex., 10 km hinter San José de Minas, am Wegrand, sehr feuchte Stelle, 21. IV. 1987, leg. Benavides + Loksa + + Zicsi. – AF/527, 3+1 juv. Ex., 39 km von Otavalo in Richtung Selva Allegre, 3900 m, Paramo Vegatation, 22. IV. 1987, leg. Benavides + Loksa + Zicsi. – AF/528, 6+1 juv. Ex., 5 km hinter San José de Minas, Bachrand, 21. IV. 1987, leg. Benavides + Loksa + Zicsi. – AF/529, 10+5 juv. Ex., 200 m vor San José de Minas, feuchte Stelle am Berghang, 21. IV. 1987, leg. Benavides + Loksa + Zicsi. – AF/530, 4+4 juv. Ex., 500 m hinter Tandajapa, Waldrand, 7. IV. 1987, leg. Loksa + Zicsi. – Prov. Imbabura Urcuqui, 3000 m, VII. 1986, leg. Onore.

Thamnodrilus uncinatus (Michaelsen, 1910)

Von den als Typen bezeichneten zwei Exemplaren dieser Art konnte unter Inv.-Nr. V 3313 („*Aptodrilus uncinatus* Michaelsen, Ecuador, leg. Rivet“) nur ein Tier in der Sammlung des Zoologischen Institutes und Museums von Hamburg angetroffen werden. Da unsere Tiere mit diesem Originalstück und der Beschreibung von Michaelsen übereinstimmen, reihen wir unsere Exemplare dieser Art ein, und führen eine kurze ergänzende Beschreibung an.

Kopflappen prolobisch, Borsten *ab* des 7–11. Segmentes auf kleinen Drüsenpapillen angeordnet. Bei einigen Exemplaren lassen sich auch von innen in diesen Segmenten kleine Drüsenfelder erkennen, die beim Typusexemplar nicht vorhanden waren. Dieses Merkmal scheint zu variieren, da auch bei *Thamnodrilus baloghi* sp. nov. Populationen vorkamen, bei denen von innen keine Drüsenfelder zu erkennen waren, bei anderen Populationen hingegen diese deutlich in Erscheinung traten.

Weibliche Poren am 14. Segment hinter den Borsten *ab*. Männliche Poren auf Intersegmentalfurche 19/20 in Höhe der Pubertätsstreifen, sie sind auch von aussen bei einigen Exemplaren gut zu erkennen. Struktur der Chylustaschen einfach fjordförmig (Abb. 3).

Fundorte: AF/268, 1 Ex.; AF/270, 1+1 juv. Ex., AF/273–274, 3+1 juv. Ex., AF/281, 3 Ex., Ekuador, Prov. Cotopaxi, San Francisco de las Pampas, Naranchito, im Urwald und auf Wiesen, immer nur im Boden, 9–10. II. 1986, leg. Loksa + Onore + Zicsi. – AF/314, 11 Ex., Prov. Pichincha, zwischen Sto. Domingo und Quinindé, 17 km hinter Sto. Domingo, am Bachufer, 20. II. 1986, leg. Benavides + Loksa + Zicsi. – AF/543, 1 Ex. Prov. Chimborazo, Malpote 5. IV. 1987, leg. Loksa + Coloma + Zicsi.

Thamnodrilus botari sp. n.

Dimensionen: Länge des Holotypus 95 mm, Dicke 7 mm, Segmentzahl 158, bei den übrigen Tieren: Länge 65–100 mm, Dicke 5–6,5 mm, Segmentzahl 117–160.

Farbe weiss, pigmentlos.

Kopf prolobisch, erste Segmente nicht verwachsen, Kopf manchmal eingezogen. Segmente 7 – 11 schwach wallförmig erhoben. Segmente vom 11 – 14. doppelt geringelt.

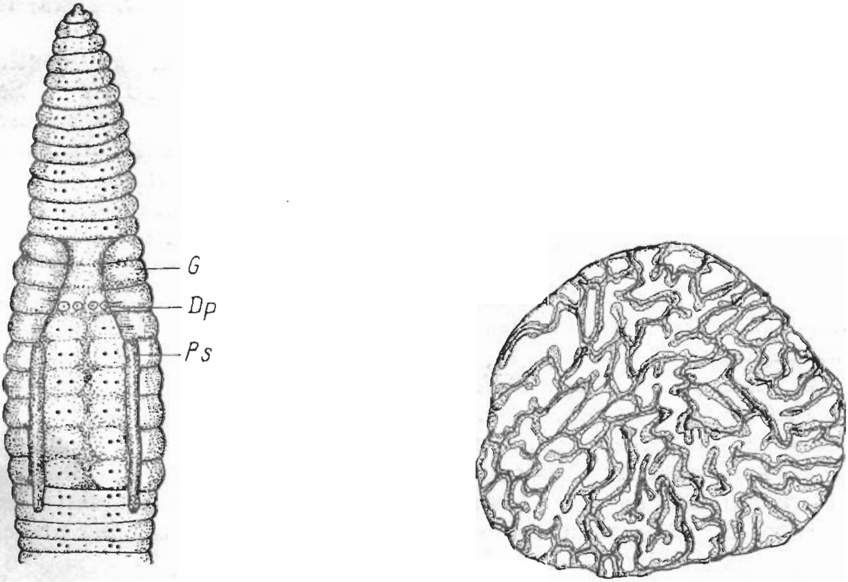
Borsten am Vorderkörper eng gepaart, hinter dem Gürtel gehen die Borstenreihen allmählich auseinander, Borsten am Hinterkörper gebogen. Borstendistanz am Vorderkörper: *aa* : *ab* : *bc* : *cd* : *dd* = 25 : 7 : 25 : 5 : 50, hinter dem Gürtel *aa* : *ab* : *bc* : *cd* : *dd* = 35 : 10 : 25 : 7 : 50, am Schwanzende *aa* : *ab* : *bc* : *cd* : *dd* = 20 : 15 : 25 : 15 : 50.

Borsten *ab* des 6 – 10. Segmentes sowie die des 17. Segmentes von kleinen Drüsenpapillen umgeben und in Geschlechtsborsten umgewandelt. Von innen sind an diesen Segmenten keine Drüsenfelder zu erkennen.

Nephridialporen am 3. Segment beginnend, in der Borstenlinie *cd*. Weibliche Poren am 14. Segment, hinter der Borstenlinie *b*. Männliche Poren münden in der Intersegmentalfurche 19/20 in Höhe der Pubertätsstreifen aus. Männliche Poren von aussen nicht erkannt.

Gürtel beim Holotyus vom 15 – 23. Segment, Pubertärsstreifen vom 1/4 19 – 25. Segment. Gürtel bei einigen Tieren nur bis 1/2 23. Segment reichend. Gürtelsegmente 15, 16 und 17 ventromedian genähert (Abb. 4).

Innere Organisation: Dissepimente 6/7 – 9/10 stark verdickt, 10/11 nur etwas verdickt, die übrigen nicht verdickt. Muskelmagen im 6. Segment. Lateralherzen vom 7 – 9. Segment, mächtige schwarze Lateralherzen im 10. und 11. Segment. Perlschnurartiges Dorsalgefäss vom 11 – 18. Segment. Fünf Paar Chylustaschen vom 10 – 14. Segment, entspringen ventrolateral und stehen



4

5

Abb. 4 – 5. *Thamnodrilus botari* sp. n. 4: Ventralansicht (G: Gürtel, Dp: Drüsenpapillen, Ps: Pubertätsstreifen); 5: Chylustaschen mit fjordförmiger Struktur in dorsaler Richtung frei. Der obere freie Teil der Chylustaschen abgerundet aber nicht abgeschnürt. Rispenschlauchtaschen im Querschnitt fjordförmig (Abb. 5).

Männliche Geschlechtsorgane: Zwei Paar kleine, unpaarige Testikelblasen im 10. und 11. Segment, die ventromedian durch einen Schlauch miteinander verbunden sind. Zwei Paar kleine Samensäcke im 11. und 12. Segment. Drei Paar Samentaschen im 7–9. Segment, Samentaschenporen in Intersegmentalfurche 6/7–8/9, in der Borstenlinie *cd*. Samentaschen mit langem Stiel und plattgedrückter Ampulle. Samentaschen nahezu gleich gross.

Die neue Art unterscheidet sich von allen übrigen *Thamnodrilus*-Arten durch die Lage der Pubertätsstreifen und durch die Form der Samensäcke.

Die neue Art wird zu Ehren von Herrn F. Botár, Quito, benannt, der uns bei der Verwirklichung unserer Sammelreisen weitgehend behilflich war.

Fundorte: Holotypus AF/540, Ekuador, Prov. Chimborazo, bei Malpote Bachrand am Waldufer, 1750 m, 4. IV. 1987, leg. Loksa + Coloma + Zicsi. – Paratypen: AF/541, 7 Ex., Fundort wie beim Holotypus. – AF/542, 4+1 jv. Ex., Prov. Chimborazo, Chagmala, 1750 m, 4. IV. 1987, leg. Loksa + Coloma + Zicsi. – AF/547, 2+1 juv. Ex., Prov. Cimborazo, Malpote hinter dem Dorf, 4. IV. 1987, leg. Loksa + Coloma + Zicsi.

Thamnodrilus excelsus (Cognetti, 1904)

Es liegen uns einige Exemplare von verschiedenen Fundorten vor, die im wesentlichen mit dem von Cognetti de Martiis an Michaelsen übersandten Exemplar aus der Typenserie übereinstimmen (Zoologisches Institut und Museum, Hamburg, Inv. Nr. V 3295, *Thamnodrilus excelsus* Cogn. Festa, leg. Ecuador):

Bei der Nachuntersuchung dieses Exemplares konnten wir deutlich erkennen, dass die Pubertätsstreifen sich auch auf das 1/4 19. und 1/2 24. Segment erstrecken. Der Gürtel liegt bei diesem Exemplar auf dem 15–23. Segment. In der Originalbeschreibung wird die Lage der Pubertätsstreifen eindeutlich vom 20–23. Segment angegeben und dies wurde auch von Michaelsen angenommen, obwohl bei dem auch von ihm eingesehenen Exemplar diese auch auf die benachbarten Segmente übergehen. Bei allen von uns untersuchten Exemiplaren, bei adulten und präadulten gleicherweise, die in allen übrigen Kennzeichen mit dem Originalstück und der Originalbeschreibung übereinstimmten, erstreckten sich die Pubertätsstreifen in konstanterweise auch auf das 1/2 19. und 1/2 24. Segment.

Laut Originalbeschreibung sollen paarige Testikelblasen vorhanden sein. Unsere Beobachtungen stimmen mit denen von Michaelsen überein, der behauptet, dass die Organe eines Segmentes „durch ein querzylindrisches medianes Stück miteinander verbunden“ sind, also als unpaarige Testikelblasen aufgefasst werden können. Dies konnte auch bei unseren Exemplaren festgestellt werden, die ansonst im übrigen mit der Originalbeschreibung übereinstimmen.

Fundorte: AF/536, 5 Ex., Prov. Chimborazo, Cerca Juan de Valesco, 2600 m, 5. IV. 1987, leg. Loksa + Coloma + Zicsi. – AF/537, 16 juv. Ex., Funodrt wie AF/536. – AF/538, 3 Ex., Prov. Cotopaxi, San Francieo de las Pampas: 4. und 10. 1986, leg. G. Onore. – Prov. Cotopaxi, AF/263, 13 Ex., San Francisco de las Pampas, 8. II. 86, leg. Loksa + Onore + Zicsi. – Ebenda, 1 Ex., IV. 1986, leg. Onore. – Prov. Cotopaxi, AF/298, 20 Ex., Pueblo Quemado, 4000 m, 16. II. 1986, leg. Loksa + Zicsi. – Prov. Pichincha, AF/320, 4 Ex., zwischen Quito und Sto. Domingo. 2300 m, 19. II. 1986, leg. Benavides + Loksa + Zicsi. – Ebenda, AF/324, 3 Ex., 1200 m, 19. II, 1986, leg. Benavides + Loksa + Zicsi.

Pontoscolex corethrurus (Fr. Müller, 1857)

Fundorte: Ecuador, Prov. Cotopaxi, AF/283, 3 Ex., San Francisco de las Pampas, Naranchito, 10. II. 1986, leg. Loksa + Onore + Zicsi. – Prov. Pichincha, AF/312, 2+3 juv. Ex., Pto. Quito, 20. II. 1986, leg. Loksa + Benavides + Zicsi. – AF/313, 4 Ex.; AF/315, 20 Ex.; AF/326, 8+4 juv. Ex., zwischen Sto. Domingo und Quinindé, 20. II. 1986, in Ölpalmenplantagen und am Ufer eines Baches, leg. Benavides + Loksa + Zicsi. – Prov. Napo, AF/340, 5 Ex., Pto. Misahualli, 250 m, Urwald, 14. II. 1986; AF/345, 8+9 juv. Ex., AF/346, 11+3 juv. Ex., zwischen Tena und Misahualli am Wegrand, 14. II. 1986, AF/347, 4+2 juv. Ex., Tena, 14. II. 1986, leg. Loksa + Benavides + Zicsi. – AF/248, 2 Ex., am Weg in Urwald, 14. II. 1986, leg. Benavides + Loksa. – Prov. Pastaza, AF/349, 15+2 juv. Ex.,AF/353, 1+1 juv. Ex., Tnte. Hugo, Ortiz, 17. II. 1986, leg. Benavides + Loksa + Zicsi. – AF/351, 15 Ex., hinter Puyo, 15. II. 1986, leg. Benavides + Loksa + Zicsi.

Fam. LUMBRICIDAE Claus, 1876

Aus der Familie Lumbricidae wurde aus Ekuador nur die Unterart *Allolobophora caliginosa trapezoides* (Ant. Düg., 1828) gemeldet. Alle anderen Arten, die nachstehend angeführt werden, sind neu für die Fauna Ekuadors.

Allolobophora caliginosa trapezoides (Ant. Düges, 1828)

Fundorte: Prov. Pichincha, Z/10805, 1 Ex., Quito, 2. III. 1986, leg. Onore. – Z/10791ı 4 Ex., Z/10807, 3 Ex., Pifo, 18. II. 86, leg. Loksa + Zicsi, – Z/10789, 4 Ex., Pasochoa, Wiese. 6. II. 86, leg. Loksa + Benavides + Zicsi. – Z/10793, 1 Ex., zwischen Nona und Sto. Rosa, am Bachrand, 2750 m, 4. II. 1986, leg. Benavides + Loksa + Zicsi. – Z/10794, 9 Ex., Cumbaya Finca Igor, 23. II. 1986. leg. Loksa + Zicsi. – Z/10799: 20 Ex., Puembo Finca Szabó, 25. II. 86 leg. Zicsi.

Allolobophora rosea (Savigny, 1826)

Fundort: Prov. Pichincha, Z/10806, 1 Ex., Quito, 2. III. 1986, leg. Onore.

Dendrobaena octaedra (Savigny, 1826)

Fundorte: Prov. Pichincha, Z/10792, 1 Ex., Quito, 6. I. 1984, leg. Naruchez. – Z/10804 1 Ex., Puembo, Finca Szabó, 25. II. 1986, leg. Zicsi.

Eisenia foetida (Savigny, 1826)

Fundort: Prov. Pichincha, Z/10801, 5 Ex., Puembo Finca Szabó, 25. II. 1986, leg. Zicsi.

Eiseniella tetraedra tetraedra (Savigny, 1826)

Fundort: Prov. Pichincha, Z/10802, 10 Ex., Puembo Finca Szabó, 25. II. 1986, leg. Zicsi.

Octolasium lacteum (ÖRLEY, 1885)

Fundorte: Prov. Imbabura, Z/10790, 5 Ex., Ibarra 22. II. 1986, leg. LOKSA + ZICSI. – Prov. Pichincha, Z/10795, 7 Ex., zwischen Cumbaya und Tenebaco, Finca Igor, 23. II. 1986, leg. LOKSA + ZICSI. – Z/10797, 1 Ex., Quito, 21. II. 1986, leg. ZICSI. – Z/10798, 9 Ex., zwischen La Merced und Alangasi, Finca Los Cypreses, 25. II. 1986, leg. LOKSA + BENAVIDES + ZICSI. – Z/10800, 8 Ex., Puembo Finca Szabó, 25. II. 1986, leg. ZICSI.

Octolasium cyaneum (SAVIGNY, 1826)

Fundort: Prov. Pichincha, Z/10808, I Ex., Quito I. 1986, leg. ORRONEZ.

Fam. MEGASCOLECIDAE ROSA, 1891

Amynthas corticis (KINGBERG, 1867)

Fundorte: Prov. Pichincha. Quito, AF/404, 1 Ex., 5. XII. 1983, leg. N. Davulas. – AF/406, 8 Ex., 12. XII. 1984, leg. E. FIALLO. – AF/411, 1 Ex., 24. XII. 1984, AF/412, 1 .Ex., 25. XII. 1983, leg. R. LEON. – AF/417, 1 Ex., 3. II. 1985, leg. A. FREIRE. – AF/422, 1 Ex., 6. I. 1985, leg. PAZMINO. – Conocoto, AF/420, 2 juv., 5. I. 1984, leg. L. SANTA MARIA. – AF/421, 1 Ex., 7. XII. 1983, leg. L. SANTA MARIA. – AF/329, 11. Ex., Pasochoa, 6. II. 1986. leg. BENAVIDES + LOKSA + ZICSI. – AF/402, 14 Ex., zwischen La Merced und Alangasi Finca Los Cypreses, 26. II. 1986, leg. BENAVIDES + LOKSA + ZICSI. – AF/409, 1 Ex., Puembo, Finca Szabó, 25. II. 1986, leg. ZICSI. – AF/410, 10 Ex., Cumbaya Finca Igor. 23. II. 1986, leg. LOKSA + ZICSI.

Amynthas morrisi (BEDDARD, 1892)

Fundort: Prov. Pichincha, Cunuyacu, AF/395, 1+3 juv. Ex., 25. I. 1986, leg. P. VEGA + S. M. PAZ.

Die beiden *Amynthas*-Arten sind neu für die Fauna Ekuadors.

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