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**AN EXPERIMENTAL APPROACH TO THE INTERSPECIFIC COMPETITION
BETWEEN TWO SPECIES OF DAPHNIA; D. HYALINA AND D. PULICARIA
(CRUSTACEA)¹⁾**

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Abstract: An experimental design was followed for analysing the influence of interspecific and intraspecific competition on the population dynamics of two related species. The effect of competition on eggs production and on population densities is studied. Finally an analysis is made of the fecundity and death rates and of the rate of population change at different levels of competition.

INTRODUCTION

The competitive interaction represents one of the major factors determining the relative abundance of related species in natural environment. In spite of the importance of this phenomenon, only a few quantitative studies concerning zooplanktonic populations have been published.

Frank (1952), in his paper on competition between *Daphnia pulicaria* and *Simocephalus vetulus*, concluded that, under certain experimental conditions, competition with *Daphnia* undoubtedly causes the extinction of *Simocephalus* and that this extinction "results in part from the intrinsic differences between natality and mortality of the two species and in part from the greater power of interference displayed by *Daphnia*".

Bossoni and Tonolli (1954) analyse the possibility of coexistence of two species of high mountains Diaptomids, *Arctodiaptomus bacillifer* and *Acanthodiaptomus denticornis*, living together in Lago di Moncenera (Italian Western Alps) and the role displayed on this coexistence by the predator *Heterocope saliens*.

Tappa (1965), analyzing the association of six species of *Daphnia* in Aziscoos Lake, found that some species live specially isolated during the growing season to avoid the competition pressure.

Allan (1973) found that *Daphnia* and *Simocephalus* should coexist in the Hummingbird Lake, despite the competition, according to a niche overlap model, and that the differences between the expected and found densities in the lake should be attributed to the predation pressure by *Chaoborus* and perch on *Daphnia* population.

Neill (1975 a, b) studied the effects of age and/or size specific competition on zooplanktonic community structure in laboratory and on resources utilization, discussing the different kinds of feeding strategies in filter-feeding zooplankters.

¹⁾ This work was carried out at the Slapy laboratory of the Hydrobiological laboratory, Botanical Institute (Československá akademie věd, Praha).

The objects of my research is the analysis of the influence of inter- and intraspecific competition on the dynamics of laboratory populations of two related species: *Daphnia hyalina* Leydig and *Daphnia pulex* (Forbes), frequently living in similar environment.

MATERIAL AND METHODS

Daphnia pulex from Chotilsko village pool and *Daphnia hyalina* from Čim (Central Bohemia) were chosen as a material for the experiment.

Zooplankton samples, collected in the two pools, were cultured in laboratory at a 20 °C constant temperature and daylight conditions.

Immature individuals, derived from the third generation of a single isolated female, both of *D. pulex* and *D. hyalina*, were used. In each experiment, groups of five immature individuals were used as starting population, placed in experimental bottles of 600 ml capacity filled to a volume of 500 ml of 40 µm filtered Slapy water from 0.7 m depth.

During the experiments the populations were maintained at two food level: natural food concentration (40 µm filtered Slapy water) and high food concentration, corresponding to 8 times the 40 µm filtered Slapy water by using a continuous flow centrifuge at 20.000 g and with a flow rate of approximately 8 liter. hour⁻¹. The phytoplankton composition in the surface water of Slapy Reservoir, during the experiments, resulted, in the sense of decreasing relative abundance, as follows: *Cryptomonas curvata*, *C. reflexa*, *Rhodomonas lacustris*, *Melosira granulata*, *Asterionella formosa*, *Oocystis* sp., *Chodatella ciliata*, *Coelastrum microporum* (Desor-tová, pers. comm.).

The starting experimental design was as follows:

Natural food concentration	<i>D. pulex</i> 5 individuals	<i>D. pulex</i> 5 individuals plus <i>D. pulex</i> 5 individuals	<i>D. hyalina</i> 5 individuals
8 times concentrated food	<i>D. pulex</i> 5 individuals	<i>D. hyalina</i> 5 individuals plus <i>D. hyalina</i> 5 individuals	<i>D. hyalina</i> 5 individuals

The culture medium was changed at 24 hour intervals and the food concentration was measured daily as Kjeldahl-nitrogen of particles concentrated from two liters of 40 µm filtered Slapy water, by a continuous flow centrifuge. The results were recalculated to Joules, assuming that crude proteins are 55 % of total caloric content of the particulate matter (Blažka, pers. comm.).

At 3-4 days intervals in all the experimental bottles the number of individuals, ovigerous females and the clutch size of the two species were recorded by direct count. In addition, with the same frequency, the length (the distance between the apex of the head and the base of the spine) of all the individuals present was measured by means of an eyepiece micrometer.

The data obtained from the direct microscopical counts were elaborated using the Edmondson's method (1960; 1968) and a simple mathematical model of compartmental analysis (Argentesi, de Bernardi, Di Cola and Giussani, 1973; Argentesi, de Bernardi and Di Cola, 1974), in order to evaluate the fecundity, birth and death rates and the rate of population change.

The values of the developmental time for eggs and embryos (De) required by both the methods and the time from new-born to primiparae (Dy) required by the compartmental model, were calculated according to Hrbáčková-Esslová (1963), Hrbáčková (1971, pers. comm.) and Kořínek (1970).

The symbols insert to this paper to refer the particular experimental conditions (food concentration, mixed or isolated culture) and the species of *Daphnia* are the following:

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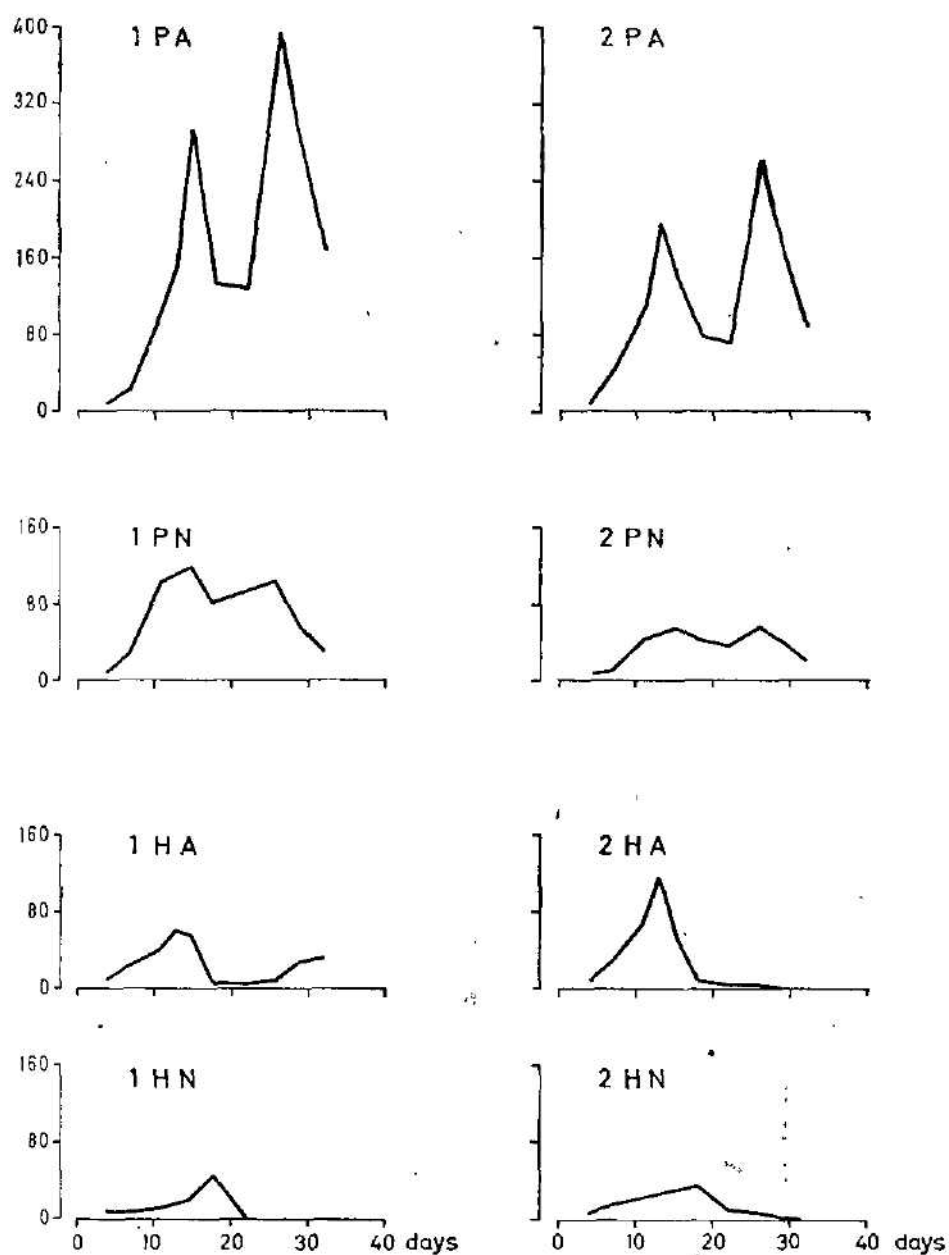


Fig. 1 - Population densities

1 = isolated population
 2 = mixed population
 N = natural food concentration
 A = eight times concentrated food
 P = *Daphnia pulicaria* population
 H = *Daphnia hyalina* population

RESULTS

The growth of the 8 experimental populations was studied during a 33 days period. At both the food levels investigated and both in the isolated and mixed cultures *Daphnia pulicaria* shows a greater increase than

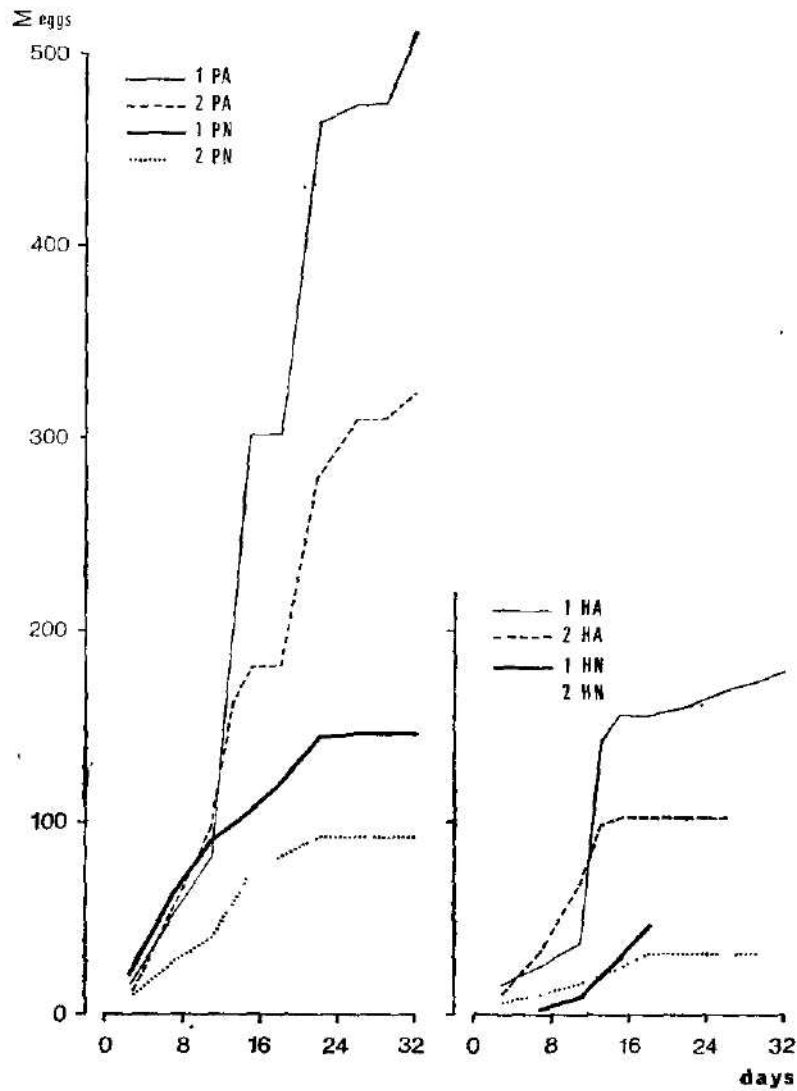


Fig. 2 - Cumulative curves of eggs production

Daphnia hyalina (Fig. 1). However, after 22 days from the beginning of the experiments, all the populations were crowded. The appearance of males in a relative high frequency was observed in *D. pulicaria* populations both in natural and high food concentrations and in isolated and mixed cultures. On the contrary, males were never found, during those experiments, in *D. hyalina* populations. However, during the same period of time, the populations of *D. hyalina*, after a small peak in densities, disappeared except the isolated population at high food concentrations. It is interesting to observe (Fig. 1) that the different food levels resulted also in a difference in the time necessary to reach the peak of density. The first peak appeared in populations with enriched

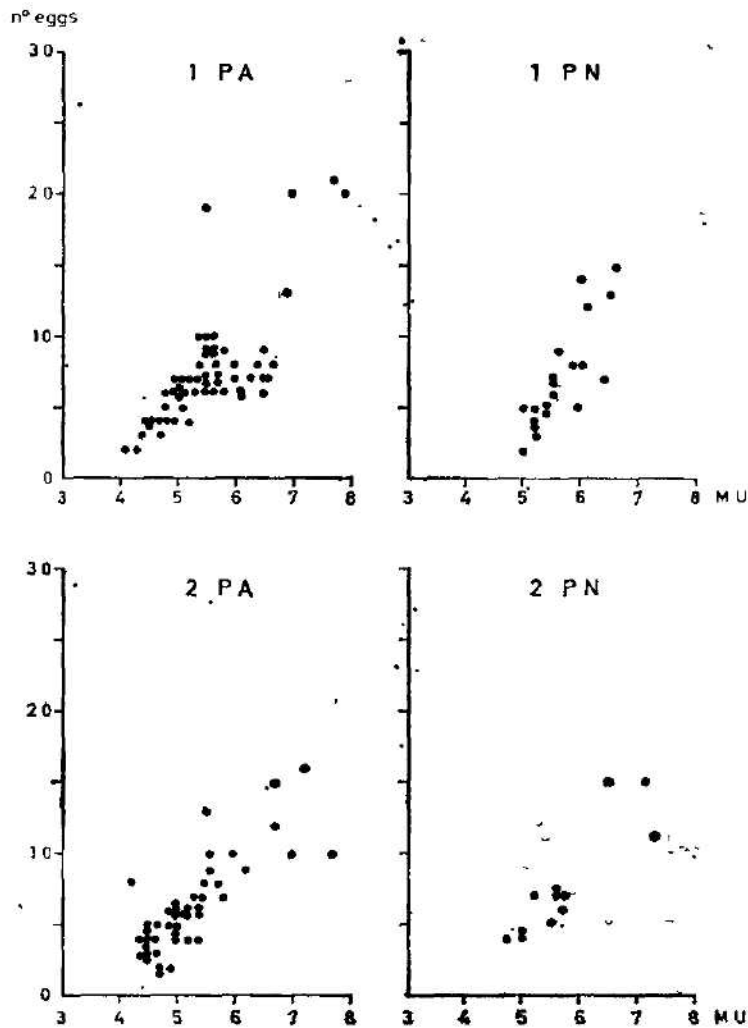


Fig. 3 — Relation between size of mother and clutch size in *Daphnia pulicaria* populations

food after 15 days in both species in isolated cultures. Under natural food conditions it appeared five days later. In mixed cultures the peak appeared 2 days earlier in both species. In *D. pulicaria* the peaks of isolated populations were about twice as high in mixed populations. In *D. hyalina* there was not a comparable tendency. This can be explained by the fact that food availability influences the time from new-born to primiparae and also number of eggs per brood (Hrbáčková-Esslová, 1963; Hrbáčková, 1974).

It is interesting to observe that, as it appears from Figure 1, the intra-specific competition (difference between the two food levels in isolated cultures) is more effective in controlling the populations growth of the

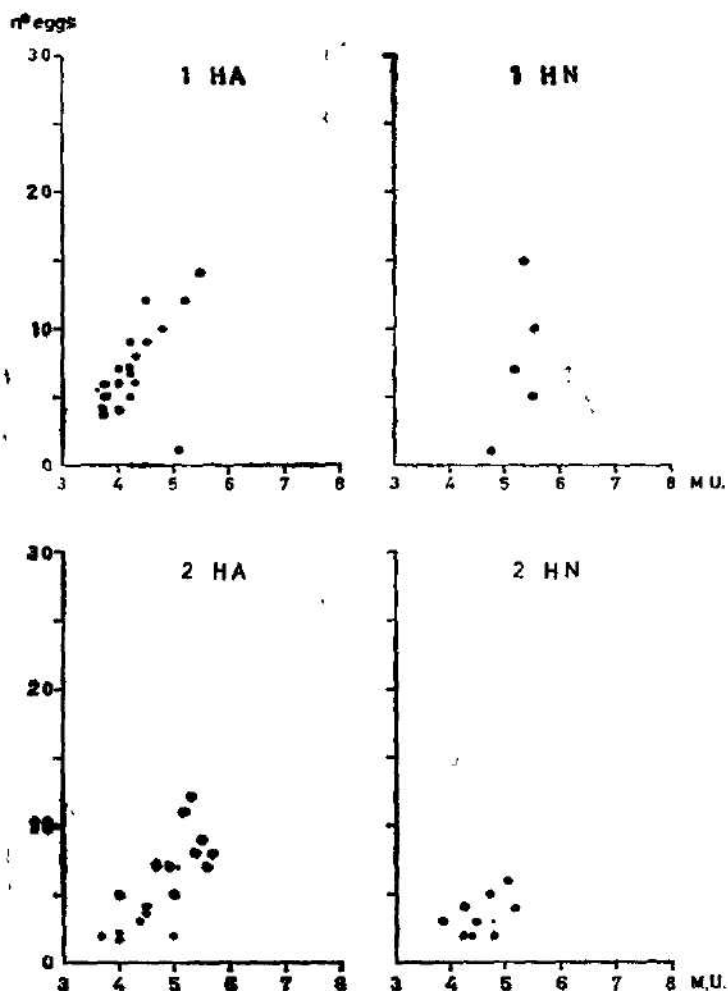


Fig. 4 — Relation between size of mother and clutch size in *Daphnia hyalina* populations

species than the interspecific competition (difference between isolated and mixed cultures).

The same results can be derived also from the cumulative curve of eggs production in the different populations of the two species (Fig. 2). It is possible to observe, in fact, that the difference in total eggs production between isolated and mixed cultures is lower than the difference

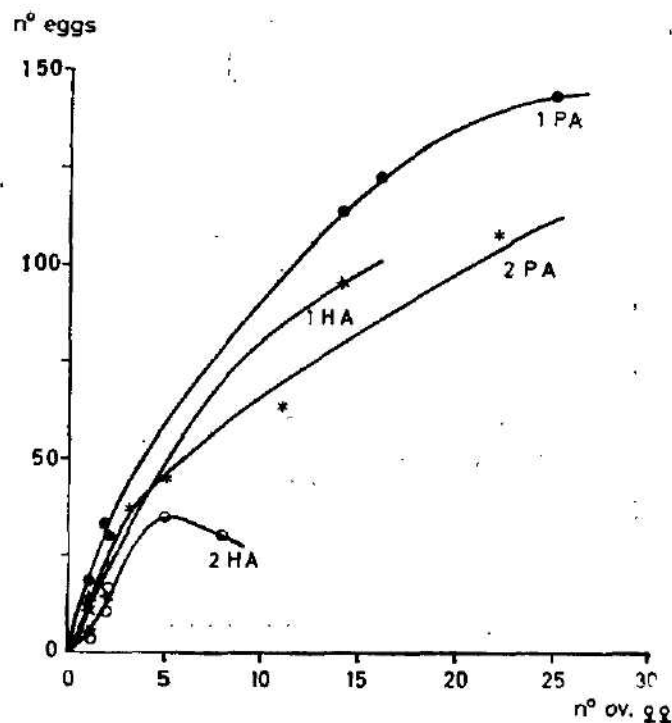


Fig. 5 — Relation between the total number of eggs in the populations and the number of ovigerous females

between the two food levels for both the species. The same figure shows a greater efficiency in utilizing the food resources, in high and natural concentrations, of *D. pulicaria* than of *D. hyalina*. The different level of intraspecific competition results also in a different shape of the curves of cumulative eggs production. This is more evident in *D. pulicaria* populations. In fact, in the isolated population at high food concentration the curve of cumulative eggs production is exponential. On the contrary, in the isolated population at natural food concentration the curve is sigmoid. The difference between those curves can be assumed as a measure of the intraspecific competition. In the same way, the difference between the two curves of cumulative eggs production in mixed and isolated cultures can be assumed as a measure of interspecific competition.

Finally, the comparison between the curves of cumulative eggs production in mixed cultures at the two levels of food can be assumed as a measure of the interactions between inter- and intraspecific competition.

The food concentration affects also the clutch sizes in the different populations, as it appears in Figures 3 and 4. The females cultured at high food concentration usually reach the maturity at smaller sizes than the females at natural food concentration. This can be explained by the fact that both *D. pulicaria* and *D. hyalina*, at natural food concentrations, reach the maturity at 1 to 4 molts later than females at high food

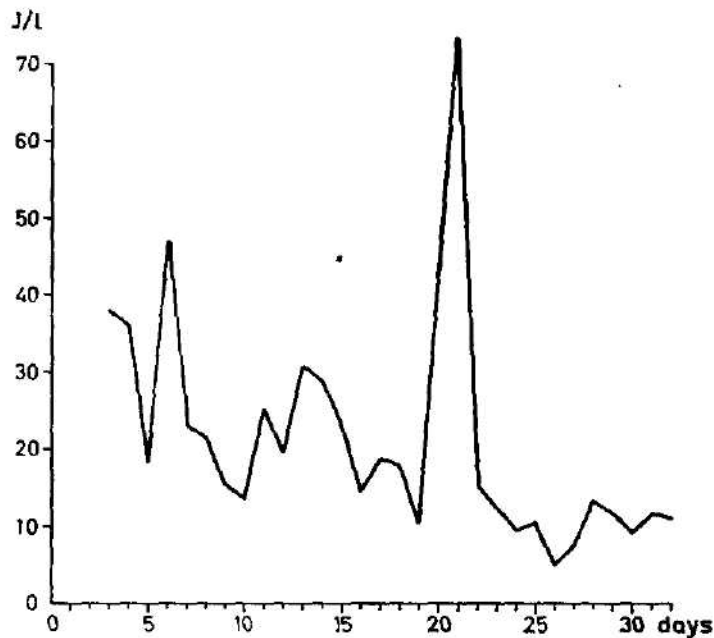


Fig. 6 — Food concentration (as Joules/liter) in 40 μ m filtered Slapy water during the experiments

concentrations (Hrbáčková-Esslová, 1963). In addition, females of the same size at different food level show a difference in the number of eggs carried per brood.

In the four populations of *D. pulicaria* examined in this study the relation between clutch sizes and size of mother appears to be linear (Fig. 3), if we neglect the data referring to the crowding populations. In the crowding populations, in fact, no relationship between size of mother and clutch size was found, but all the ovigerous females carried 1 to 3 eggs per brood. This is in agreement with natural field observation on *D. pulicaria* in Velký Pálenec fish pond (Southern Bohemia), reaching high densities in relation to the food availability (de Bernardi, in preparation). Fott et al. (1974) observed a similar phenomenon in the ponds Jezárko and Smyslov (Southern Bohemia) during the annual spring phytoplankton depression.

A decrease in egg production caused by crowding even in the presence of abundant food was observed also by Warren (1900) and by Langhans (1909) (in Green, 1956).

The decrease of clutch sizes in relation to the density and to the food availability appears also from Figure 5. We can observe, in fact, that, even in the *D. pulicaria* population at high food concentration the relation between the total number of eggs in the population and the number of ovigerous females is not linear, but asymptotic. This means that even if in the population the number of ovigerous females is increasing, the total number of eggs produced does not change.

It is well known that the competitive interactions for food results in

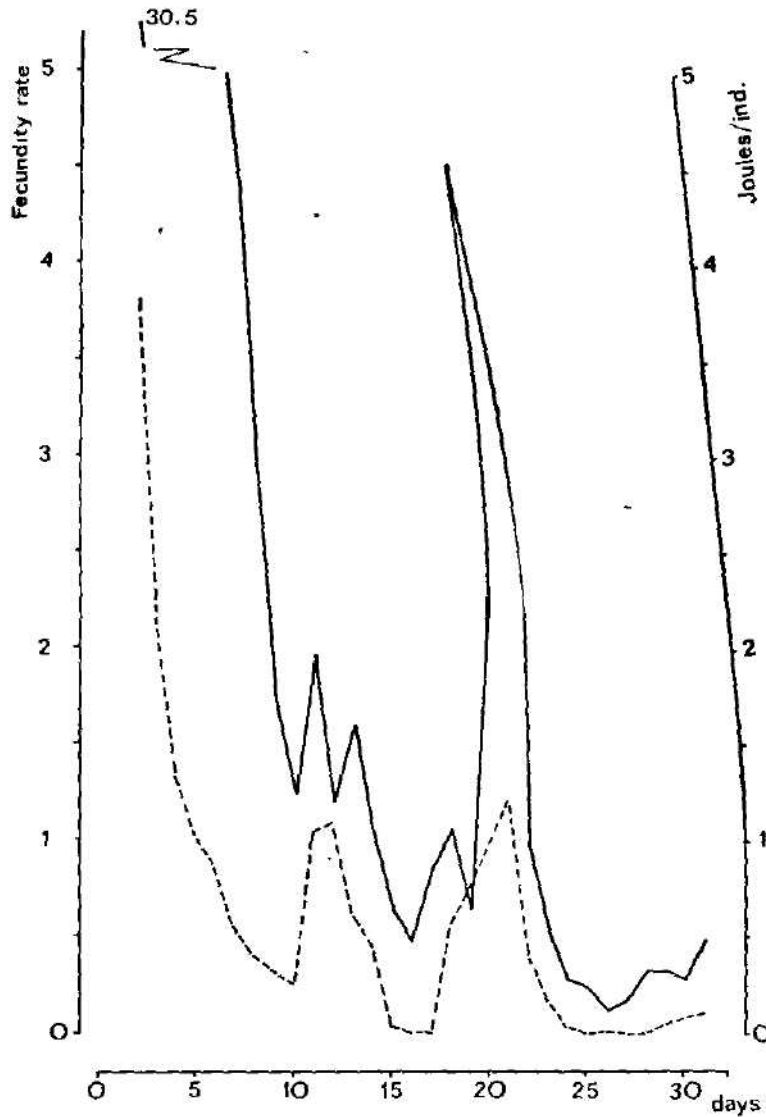


Fig. 7 — Food availability on per capita basis (—) and unitary fecundity rate (---) in IPA population

Tab. 1. Daily fecundity (α) and mortality (d) rates of the eight experimental populations calculated by means of the compartmental model

Days	1PA		1PN		2PA		2PN		1HA		1HN		2HA		2HN	
	α	d	α	d	α	d	α	d	α	d	α	d	α	d	α	d
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	3.800	0.0	5.399	0.0	3.200	0.0	2.800	0.0	2.999	0.0	2.999	0.0	2.000	0.0	1.400	0.0
3	2.148	0.048	2.507	1.507	2.269	0.419	1.117	0.967	0.893	0.843	0.050	0.0	1.412	0.312	0.333	0.383
7	0.563	0.230	0.717	0.310	0.766	0.355	0.673	0.281	0.392	0.142	0.326	0.026	0.840	0.287	0.237	0.049
11	1.027	-0.020	0.153	0.153	0.467	-0.078	0.463	0.122	2.303	-0.021	0.964	0.214	0.328	0.010	0.276	0.094
15	0.040	0.502	0.084	0.221	0.007	0.202	0.143	0.559	0.023	0.483	0.662	0.362	0.007	0.340	0.152	0.172
18	0.545	0.008	0.193	0.093	0.698	0.013	0.163	0.150	0.333	0.168	0.101	0.544	0.0	0.188	0.044	0.293
22	0.412	0.334	0.087	0.170	0.589	0.480	0.069	0.069	2.773	0.525	0.0	1.294	0.0	0.001	0.0	0.125
26	0.007	0.157	0.003	0.166	0.013	0.215	0.0	0.092	0.353	0.086	0.0	0.0	0.0	0.333	0.0	0.222
29	0.043	0.132	0.0	0.149	0.058	0.157	0.0	0.159	0.109	0.061	0.0	0.0	0.0	0.0	0.0	0.0
32	0.103	0.224	0.0	0.213	0.142	0.284	0.0	0.233	0.099	0.056	0.0	0.0	0.0	0.0	0.0	0.007

a double effect: it reduces the fecundity rate of the population and increases the mortality rate. This schema is confirmed in this experiment as it appears from the analysis of Table 1.

At the beginning of the experiments, the high fecundity rates in the experimental populations (Table 1) indicate that because of the low densities, the competition does not have peculiar effects. During this period the food availability (Fig. 6) exceeds the individual food requirement. The high fecundity rates results in a high rate of populations growth; the population densities reach high values that overcome the carrying capacity of the system. The importance of competitive phenomena is more evident: the fecundity is depressed and the mortality increases (Tab. 1) in such a sequence that a crash in the population densities is observed.

While in *D. pulicaria* these low values are followed by a new peak in densities, the four populations of *D. hyalina* during the thirty — three day period of study show a unimodal curve of growth (Figure 1).

It is to be noted that a strong correlation was found between food availability "pro capite" and the unitary fecundity rate as can be observed in the example with population of *D. pulicaria* IPA given in Figure 7.

CONCLUSION

It appears to me that the results of this research demonstrate that the two species of *Daphnia* tested in these experiments show a different behavior. In particular, *D. pulicaria* exhibits a much more effective utilization of food resources than *D. hyalina*, what confirms the data by Hrbáčková-Esslová (1963). The differences observed between the two species are partially due to the greater efficiency of *D. pulicaria* in filtering the culture medium. *D. pulicaria* has a greater size than *D. hyalina* and, according to Ryther (1954), Burns (1969), Burns and Rigler (1967), Chisholm and Stross (1975), the filtering rate and metabolism of cladocerans is correlated to their body size; however Hrbáček (1975) believes that it depends on size only if we compare either r or K specialists separately. Moreover, the differences in population growth observed in the two species are partially due to the different rudimentary niche they occupy. In fact, *D. pulicaria* is able to scrape the food settled on the bottom, while *D. hyalina* is able only to graze the suspended food. However, recent studies by Hrbáčková (Hrbáček ex litteris) show that *D. pulicaria*, from the point of view of competition for food, is definitely superior of *D. hyalina*, also in continuously moved cultures, when the argument of scraping is irrelevant (Hrbáčková, in prep.). Those behavioral characteristics can explain the differences in population growth of these two species in laboratory conditions. This fact can be observed in the field too. Where the two species are present together and no predation pressure acts on one of them, *D. pulicaria* is always dominant by number.

However, it must be noticed that the extinction of *D. hyalina* in natural environments, as a consequence of competition pressure by *D. pulicaria* is not easily found. The laboratory environment of the two species has been designed in such a way that competition between them is intense.

The rudimentary niches favourable to *D. pulicaria* we observe in laboratory cultures do not play the same role in natural environment. In fact, in natural environments, competition between the two species tends to be reduced also because of the greater possibilities of differences in dispersion.

The above experiments give a preliminary indication of the effect of the competitive interactions, both interspecific and intraspecific, on the population dynamics of *Daphnia* species and on related parameters of populations growth. From those experiments it appears that food availability is one of the major factors determining the population growth and the fluctuation of the population densities in *Daphnia* species. Moreover, they indicate that the quantity of available food in water bodies plays an important role in species selection between filter feeding cladocerans and that low food levels may hinder the existence of some species as a result of the competitive interactions.

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SUMMARY

The competitive interaction represents one of the major factors determining the relative abundance of related species in natural environments. In this study I try to analyze the influence of both inter- and intraspecific competition on the dynamics of laboratory populations of two related species: *Daphnia hyalina* Leydig and *Daphnia pulicaria* (Forbes).

The research, carried out at the Hydrobiological Laboratory of the Czechoslovak Academy of Sciences, has brought to the following results:

- *D. pulicaria* was better adapted to the experimental conditions than *D. hyalina*, as it can be deduced from the highest densities and eggs production in all the populations
- Both species show a linear relation between size of mother and clutch size. However, this relation assumes different evidence in the two species and when different food quantities are available. It has to be noticed that in crowded populations this relation does not exist, but all the ovigerous females carried one to three eggs independently of their own size.
- The different food availability affects the time requested for reaching the maximum peak of density. Populations at low food concentration require more time to reach the maximum densities.
- As regards the considered experimental conditions, the intraspecific competition exerts a more relevant influence than interspecific competition on the population dynamics of both *D. pulicaria* and *D. hyalina*.

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ON THE SPECIES *TRICHOSPIRURA TEIXEIRAI*
(NEMATODA: RHABDOCHONIDAE) PARASITIZING CUBAN REPTILES

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Abstract: *Trichospirura teixeirai* was found in two new hosts, *Anolis sagrei* and *A. homolechis* in Cuba. On the basis of the new material the specific diagnosis has been emended and the features differentiating *T. teixeirai* from other species of the genus *Trichospirura* are discussed.

INTRODUCTION

Trichospirura teixeirai (Baruš et Coy Otero, 1968) is a single representative of nematodes of the family Rhabdochonidae in the helminth fauna of reptiles. It was originally placed in a new genus *Freitasia*, but Moravec (1975) synonymized the genus *Freitasia* Baruš et Coy Otero, 1968 with *Trichospirura* Smith et Chitwood, 1967. *T. teixeirai* has been found only occasionally; three males and four females have been reported (Baruš and Coy Otero 1968, 1969; Coy Otero 1970).

Further specimens of this species were found during a wide investigation of helminth fauna of reptiles on the Cuban islands in 1969—1975. The study of the new material revealed some hitherto unknown morphological features which are reported in this paper. The relation of *T. teixeirai* to other *Trichospirura* species is also discussed.

MATERIAL

A total of 1,636 hosts belonging to 93 species of Cuban reptiles of 23 genera were examined. *T. teixeirai* (53 males and 84 females) was found in the small intestine of the following species: *Anolis baracoae* (syn. *A. equestris baracoae*), *A. homolechis*, *A. sagrei*, *Chamaeleolis porcus* and *Leicephalus cubensis*. All these hosts belong to the family Iguanidae and were caught in the localities of the province Oriente (in the vicinity of Baracoa) and on the isles of Los Canareos archipelago (Cayo Piedras, Cayo Cantiles and Cayo Rosario).

RESULTS

The morphology of nematodes from known hosts (*A. baracoae*, *Ch. porcus* and *L. cubensis*) was compared with that of nematodes from the new hosts (*A. sagrei* and *A. homolechis*). No differences were found in females and the new material fully conforms to the description published by Baruš and Coy Otero (1969) and Coy Otero (1970), and complemented by Moravec and Puy-laert (1970). In contrast to the original description, the males possess one additional pair of postcloacal papillae (Fig. 1A) and a weakly

pseudochitinized gubernaculum-like formation (see also Moravec and Puylaert 1970). In agreement with Moravec and Puylaert (1970), in the new material the excretory pore is located approximately in the middle of length and in addition to the nerve ring a peculiar muscular ring is visible in the area around the end of the vestibule, evidently attaching the posterior part of the vestibule to the body wall. The nerve ring encircles the muscular oesophagus at the anterior end.

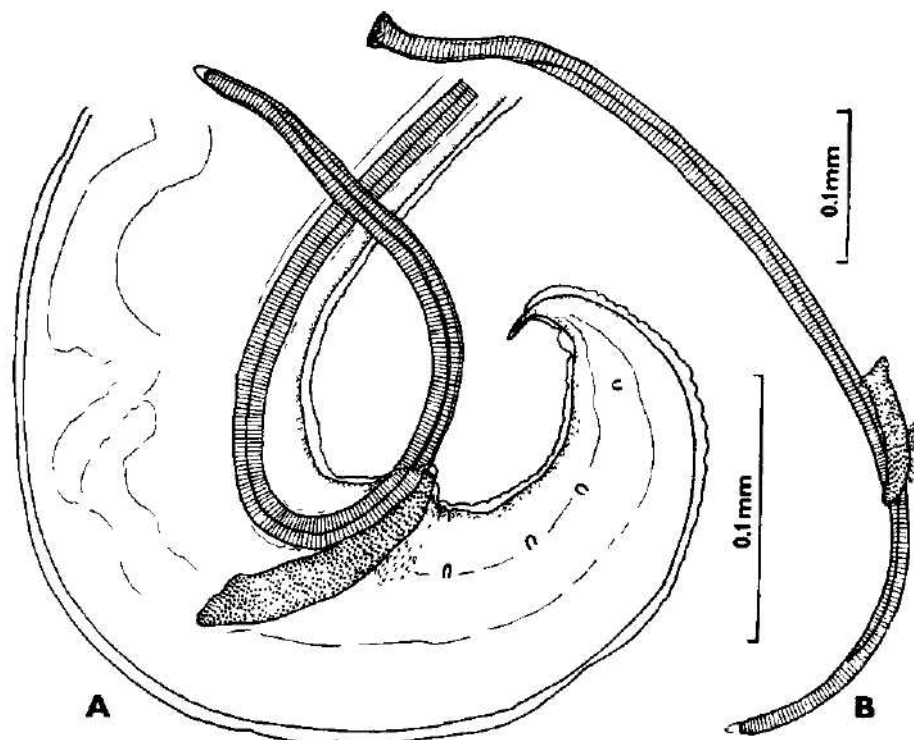


Fig 1. *Trichospirura teixeirai* (Baruš et Coy Otero, 1968) from the intestine of *Anolis sagrei*. — A posterior end of male body (lateral view), B — spicules; length ratio (lateral view). Orig.

Measurements of ten males of *T. teixeirai* from *A. sagrei* are given to supply additional data on the variability of this taxon. Compared to the original description (Baruš and Coy Otero 1968), the specimens from the new host differ in greater length of body, vestibule and spicules, and smaller length of glandular oesophagus.

Measurements: Body length 9.30–13.62 mm, maximum width 0.20 to 0.26 mm. Width of head end 0.011 mm. Vestibule tubiform, well pseudochitinized of fine transverse structure. Length of vestibule 0.77–0.82 mm. Oesophagus distinctly divided in to two portions, anterior muscular portion measuring 0.20–0.27 mm in length and 0.029–0.037 mm in maximum width and glandular portion measuring 0.68–0.83 mm in length and 0.059–0.084 mm in maximum width. Cervical papillae absent. Excretory pore situated 0.35 to

0.39 mm from anterior end of body. Two spicules unequal and dissimilar (Fig. 1 B). Longer spicule with transversely striated structure, bearing small cuticular alae in its central third and measuring 0.73–0.80 mm in length. Its proximal end slightly funnel-shaped, distal end covered with small cuticular envelope. Short spicule massive, of granular structure, 0.088–0.120 mm long. Gubernaculum-like formation adjacent to short spicule and measuring 0.030 to 0.040 mm in length. Posterior end of body conical, with short process on tip. Cloaca situated 0.14–0.19 mm from tail end. Four pairs of postcloacal papillae, and one pair of praecloacal papillae (sometimes absent).

DISCUSSION

The genus *Trichospirura* Smith et Chitwood, 1967 (= syn. *Freitasia* Baruš et Coy Otero, 1968) includes now three species. The type species is *T. leptostoma* Smith et Chitwood, 1967 parasitizing in the pancreatic ducts of *Callithrix jacchus* (L.) (Primates) in Brazil. The other two are *T. teixeirai* parasitizing in the intestine of Cuban reptiles and *T. willmottae* Chabaud et Krishnasamy, 1975, parasite of the salivary ducts of *Tupaia glis* (Diard) (Primates) in Malaysia. Chabaud and Krishnasamy (1975) reported another form from this region indentified as *Trichospirura* sp. from the intestine of *Myotis mystacinus* (Kuhl) — (Chiroptera).

As it follows from the paper by Baruš and Coy Otero (1968), the genus *Trichospirura* (or *Freitasia*) belongs evidently to the family Rhabdochonidae. This opinion is supported also by other authors, as Moravec and Puylaert (1970), Moravec (1975), and Chabaud and Krishnasamy (1975). The genus *Trichospirura* differs distinctly from other genera of this family in enormous length of vestibule, shape of spicules, location of vulva in posterior part of body and other features. Of the five valid genera of the subfamily Rhabdochoninae (see Moravec 1975) only *Trichospirura* includes species parasitizing reptiles and mammals. The remaining four genera comprise only species parasitizing freshwater and marine fishes.

The species parasitizing mammals, *T. leptostoma* and *T. willmottae*, are closely related in their morphology and measurements (Chabaud and Krishnasamy 1975). In *T. leptostoma*, the vestibule is 0.47–0.50 mm long and the spicules are 0.190 mm and 0.090 mm long (after Smith and Chitwood 1967). In *T. willmottae*, the vestibule is 0.38 mm long and the spicules measures 0.150 mm and 0.080 mm (after Chabaud and Krishnasamy 1975). The Cuban species *T. teixeirai* parasitizing reptiles differs from these two both in the length of vestibule (0.62–0.82 mm) and in the length of spicules (0.41–0.80 mm and 0.088–0.120 mm). The ratio of spicule length is 2 : 1 in *T. leptostoma* and *T. willmottae*, while in *T. teixeirai* it is 5–8 : 1.

The known distribution areas of *Trichospirura* species are geographically isolated, which is stressed by their occurrence in systematically very distant definitive hosts (Reptilia and Mammalia). These differences give evidence of the high ability of adaptation of these species to insectivorous hosts (of different systematic position) living in tropical regions.

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Zoological Garden Prague and The National Museum Prague

NOTES ON THE CHILOPODS OF BRAZIL IN THE COLLECTION
OF THE NATIONAL MUSEUM PRAGUE

Luděk J. DOBRORUKA

Received June 9, 1977

Abstract: List of the chilopods of Brazil in the collection of the National Museum of Prague is given. The full species rank to *Pectiniunguis bolbonyx* (Brolemann & Ribaut, 1912) is proposed and two species, i. e. *Otostigmus clavifer* Chamberlin, 1921 and *Otostigmus beebei* Chamberlin, 1950 are noted as new for the territory of Brazil.

Mr. Jaro Mráz, a Czech lithographer working in São Paulo in 1920–1927, collected enthusiastically Brazilian insects for the National Museum in Prague. His collection, however, contains some Chilopoda, too, which have been uninspected up to the present. This short article is the first note on this interesting collection of 41 specimens in 11 species. It is dedicated to the memory of this distinguished collaborator in the year of the 50th anniversary of his untimely death; Jaro Mráz died in Santa Anna near São Paulo on July 22, 1927, not yet 40 years old.

List of species (all labeled São Paulo only)

Pectiniunguis bolbonyx (Brolemann & Ribaut, 1912)

2 specimens. Originally described as a variety of the species *P. imperfossus* (Brolemann, 1902), and this was accepted also by Attems (1929). I do not know the typical *P. imperfossus* from autopsy but I doubt the conspecificity of both species because of the difference in the 1st maxilla (which should be without accessory palp in *imperfossus*) and differences in the sternal pore-fields. Therefore I prefer giving *P. bolbonyx* the status of full species.

In the specimens examined (Nr. 1330/III. Evert. of the coll. Nat. Mus. Prague) the teeth-lamellae of mandible are with 3 + 3 + 5 teeth (Fig. 1), the 1st maxilla with two long accessory palps, the proximal one slightly bent at its end (Fig. 2). The claw of the 2nd maxilla is bulbous at its base (Fig. 3). Labrum with 14 teeth (Fig. 4). The pore-field on the first 16 sternites is solid, oval shaped (Fig. 5), further sternites with two pore-groups which are gradually smaller to the caudal end (Fig. 6 and 7). Sternites 40–44 with a great solid pore-field again, with the shape as given in Fig. 8. The last sternite without pores.

Aphilodon angustatus Silvestri, 1909

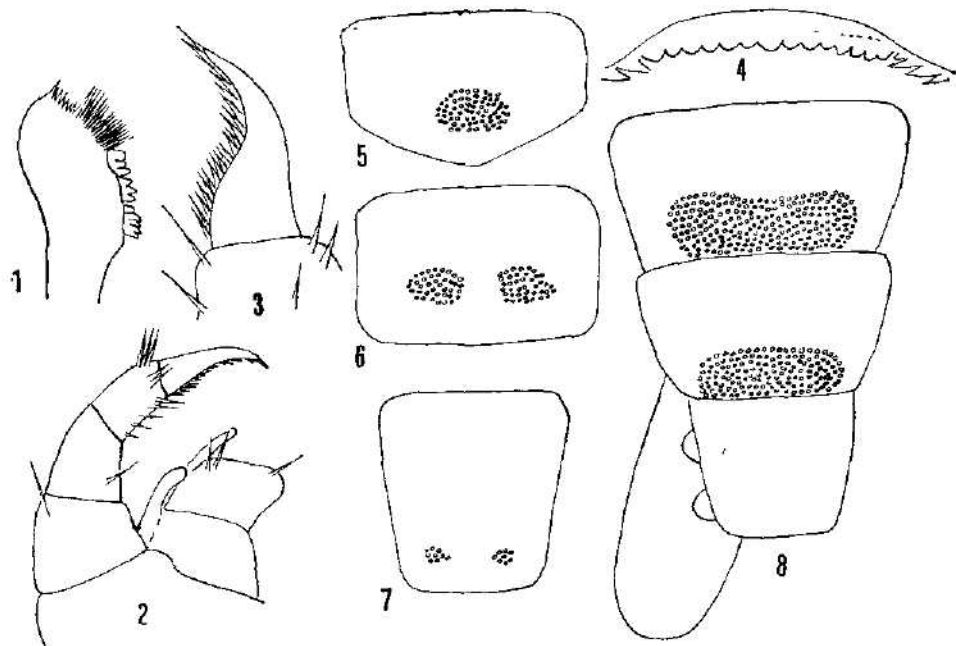
2 specimens with 55 and 45 pairs of legs, respectively. The last number mentioned is very low, in my opinion exceptionally in this species only.

Mecophilus neotropicus Silvestri, 1909

2 specimens, 18 mm in length and with 39 pairs of legs. In other characters however, they do not differ from the original diagnosis.

Arthrorhabdus spinifer (Kräpelin, 1903)

1 specimen, length 47 mm



Figs 1-8: *Pectiniunguis bolbonyx* — 1 — mandible; 2 — 1st maxilla; 3 — claw of the 2nd maxilla; 4 — labrum. 5 — 3rd sternite; 6 — 17th sternite; 7 — 27th sternite; 8 — last three sternites and coxa.

Otostigma (*Parotostigma*) *scabricauda* (Humbert & Saussure, 1870)

3 specimens

Otostigma (*Parotostigma*) *limbatus* Meinert 1886

5 specimens

Otostigma (*Parotostigma*) *clavifer* Chamberlin, 1921

6 specimens. Up to the present known from Guayana only. New for the territory of Brazil.

Otostigma (*Parotostigma*) *tibialis* Brolemann, 1902

1 specimen, provisionally classified in this species because the first five (instead of two) legs are with 2 tarsal spines.

Otostigma (*Parotostigma*) *beebei* Chamberlin, 1950.

2 specimens, which agree perfectly with the original description and confirm the distinction with *O. (P.) goeldi* Brol., 1898.

The paper in which the description is given and the species itself is omitted in the list of neotropical scolopendromorphs given by Bucherl (1974). The species was known from Venezuela only and is new for the territory of Brazil.

Cryptops galathea, Meinert, 1886

8 specimens

Scolopocryptops melanostomus Newport, 1845

9 specimens

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Zoological Garden Prague

**ALLOTHEREUA WILSONAE SP. N. A NEW CENTIPEDE FROM NEPAL
(CHILOPODA: SCUTIGEROMORPHA: THEREUONEMINAE)**

Luděk J. DOBRORUKA

Received July 20, 1977

Abstract: New species of the genus *Allothereua* Verhoeff, 1905, i. e. *Allotereua wilsonae* sp. n. from Nepal is described. This confirms the distribution of the genus *Allothereua* in Central Asia, first mentioned with doubt by Lignau, 1929.

Only very little is known about the Scutigeromorpha of Central Asia. In spite of the papers by Lignau (1929) and Verhoeff (1936, 1942), our knowledge about the distribution and even taxonomy is very scarce.

In 1971, Miss Jane M. Wilson, University Laboratory of Physiology, Oxford, collected some chilopods during her caving expedition to Nepal. She was kind enough to send me these specimens for examination. One of the few specimens was very interesting as it belongs to the genus *Allothereua*, which was up to the present known from Australia only and with doubt recorded by Lignau (1929) from the neighbourhood of Lake Balkhash.

The Scutigeromorpha are a very difficult systematic group and up to date we know very little about the valuability of their characters. Recently, Würmli (1973, 1974) analysed single characters of Scutigeromorpha and recommended the availability of some of them. These recommended characters are used in the present paper for describing the new species.

Allothereua wilsonae sp. n.

Derivatio nominis: The new species is named to the honour of the collector, Miss Jane M. Wilson, Oxford.

Locus typicus: Nepal, Pokhara Valley, near Mahendra Cave, altitude about 4000 ft (1333 m), 14. 10. 1971, J. M. Wilson legit. The specimen was found dead in one of the tents of the camp.

Holotypus: 1 ♀, matus, No. 1761/III. Evert. in the collection of the National Museum, Praha (Fig. 1–5).

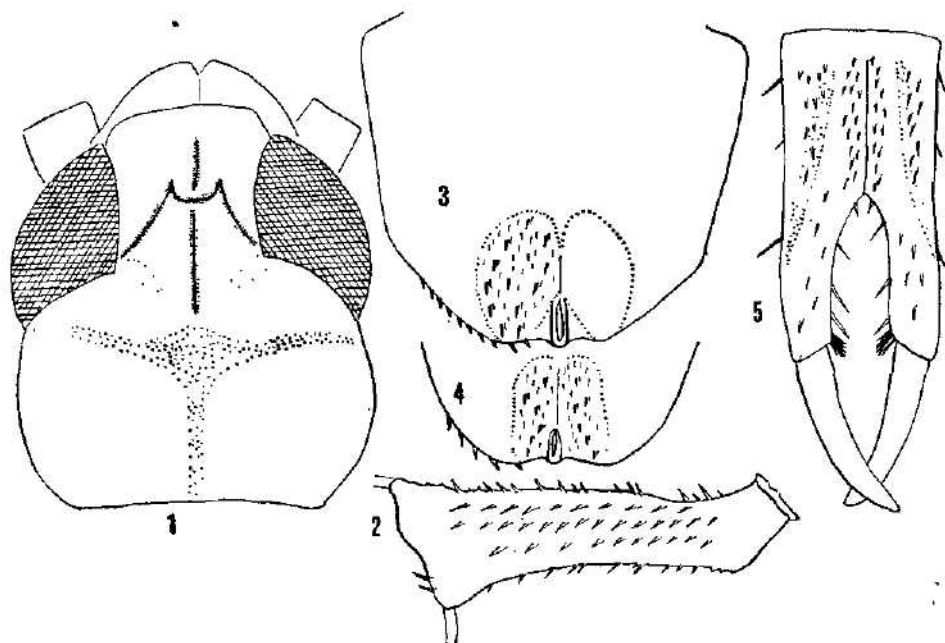
Diagnosis: Tergites with spines, which are mostly associated with bristles. Stomal saddle of the tergite 6 with 12 + 12 spines, that of the stomatotergite 7 with 6 + 6 spines. Praefemur 7 posteriorly with numerous (34) spinules in 3 rows. Flagellum 1 of the antennae with 60 joints, with nodus. Female gonopods with outer margins slightly convergent, almost parallel.

Description: ♀, matus, length 19 mm. Colour (in dry specimen) of the anterior tergal plates dark brown, on the posterior tergal plates yellowish with dark brown spot which surrounds the stigma in the extent of about stigmal saddle.

Head: Head capsula shallowly divided into four convexities, frontal transverse suture very deep, with two oral protruding peaks, crossed by deep median sulcus (Fig. 1).

Antennae: Flagellum 1 with 60 joints, with nodus.

Legs: Praefemur of the leg 7 posteriorly with 34 spicules in 3 rows, posterior-dorsally with 14 spines, postero-ventrally with 9 spines, distal with 2 spines (Fig. 2).



Figs. 1-5: *Allothereua wilsonae* sp. n., 1 - shape and structure of the head; 2 - praefemur of the leg 7, posterior view; 3 - stomatotergite 6 with stigmat saddle (spines and bristles shown on the saddle only and partially on the posterior margin, otherwise omitted); 4 - stomatotergite 7 with stigmat saddle (spines and bristles shown on the saddle only and partially on the posterior margin, otherwise omitted); 5 - ♀ gonopods.

Tergal plates: The stomatotergite 6 with short spines mostly associated with bristles. Saddle of the stomatotergite 6 with 12 + 12 spines, that of the stomatotergite 7 with 6 + 6 spines. Saddles high convex. The stigma reaches over the posterior margin of the stomatotergite. Margines of tergal plates with numerous spines (Fig. 3 and 4).

Gonopods: Slender, the outer margins only slightly convergent, almost parallel. The indices (Würmli 1973, 1974) as follows:

- A/B (greatest length/greatest width) = 3.00
- C+D/E (length of proarthron + mesarthron/length of metarthron) = 1.92
- C/D (length of proarthron/length of mesarthron) = 1.1
- F/G (width of one mesarthron/width of the sinus between the two mesarthra) = 1.1

$\frac{H-I}{C+D}$ (a measure for the divergence of the outer margins of the pro- and mesarthron; H- width at the basis of proarthron, I- width of gonopods)
= 0.04

Discussion: As shown above the only species of the genus *Allothereua* Verhoeff, 1905 which was described outside Australia is *Allothereua* (?) *kirgisorum* Lignau, 1929 which was found 108 km SE of the Lake Balkhash. Lignau described this species on the basis of a single male and he doubts about the generic status of his new species. Our specimen, however, confirms the distribution of the genus *Allothereua* Verhoeff, 1905 in Central Asia. Both *Allothereua kirgisorum* Lignau, 1929 and *Allothereua wilsonae*, sp. n. agree mutually in the quite dark colour characters and a rich spinulation of the legs. But both species differ from each other in some characters, which, in my opinion, separate them on the specific level.

	<i>A. kirgisorum</i>	<i>A. wilsonae</i> sp. n.
Flagellum I	66—67	60
saddle of the stomatotergite 6	8—6	12
saddle of the stomatotergite 7	4—2	6
spines of the praefemur 7 posteriorly	12	34

As shown by Verhoeff (1925, 1936) and Würmli (1973, 1974), the most important taxonomic character in the Scutigeromorpha are the female gonopods, and the males which are found alone may be determined with certainty mostly in genera only. No doubt, the *Allothereua kirgisorum* Lignau, 1929 is a good species which differs strongly from all Australian species of the genus *Allothereua* Verhoeff, 1905. The differences between *Allothereua kirgisorum* Lignau, 1929 and *Allothereua wilsonae* sp. n. are significant, but after finding the female of *Allothereua kirgisorum* Lignau, 1929, detailed relationship between these two species may be stressed out according to the comparison of ♀ genitalia of both species.

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**NOTE ON THE BUTTERFLYFISH (*PANTODON BUCHHOLZI*)
(PISCES, PANTODONTIDAE)**

Lubomír HANEL & Jindřich NOVÁK

Dedicated to Professor Sergěj Hrabě DSc. on the occasion of the 80th anniversary
of his birthday

Received August 29, 1977

Abstract: 23 specimens of the butterflyfish (*Pantodon buchholzi* Peters, 1876) representing the single monotypical genus of the suborder Pantodontoidei, order Clupeiformes (Berg 1955), were examined with regard to 9 plastic and 6 meristic characters. The meristic characters agree with the description of Boulenger (1909), plastic characters show differences caused either by the larger number of specimens examined by us, or by the origin of our material donated from aquaria.

MATERIAL AND METHODS

All measurements were made on formalin fish by means of dividers with the accuracy ± 0.5 mm, except the longitudinal eye diameter, measured with the accuracy ± 0.1 mm. The rows of scales were counted by use of binocular microscope with regard to the description and characters used by Boulenger (1909). All specimens were purchased to the Department by the courtesy of many anonymous aquarium hobbyists and were kept until their death in their tanks. Help showed in this way especially Messrs Chvojka, Hábel, Petrovický nad Polak. Thanks for help are due to Dr. O. Oliva who offered us all the material being at disposal.

Table 1. Meristic and plastic characters of *Pantodon buchholzi* compared with Boulenger's data.

	our data	average	Boulenger
Scales in lateral line	26–30	28	28–30
Scales above lateral line	4	4	3 1/2
Scales below lateral line	5	5	5
Scales between occiput and dorsal fin	22–26	24	22–23
Rays in dorsal fin	1/5	1/5	6
Rays in anal fin	2/12–2/13	2/12	9–14
In % of total length head length	16.9–25.5	19.1	23–25
In % of total length length of pectoral fin	25.4–38.2	31.2	40–50
In % of total length body depth	15.8–22.7	18.7	27–30
In % of head length eye diameter	19.3–30.0	24.5	28
In % of interorbital distance eye diameter	38.6–62.5	49.2	37
In % of predorsal distance postdorsal distance	13.6–25.0	18.4	25–28
In % of caudal peduncle depth length of caudal peduncle	90–140	105.4	100

Table 2. Plastic characters of *Pantodon buchholzi* with regard to the length group.

length group	I	II	III
TL (in mm)	50—75	76—100	101—125
no. of sp.	17	8	3
In % of total length			
head length	16.9—25.5 (20.0)	18.0—20.4 (19.0)	18.5—19.4 (19.0)
In % of total length			
length of P	25.4—38.2 (31.6)	28.4—31.2 (29.2)	30.1—35.3 (32.7)
In % of total length			
body depth	15.8—21.8 (17.7)	17.3—22.6 (19.7)	20.4—22.7 (21.7)
In % of head length			
eye diameter	19.3—30.0 (23.7)	20.7—28.1 (24.5)	20.5—23.6 (22.0)
In % of interorbital			
distance eye			
diameter	38.6—56.0 (47.7)	44.3—62.5 (52.5)	45.6—52.0 (48.8)
In % of predorsal			
distance postdorsal			
distance	15.6—25.0 (18.7)	16.7—20.0 (18.0)	13.6—22.6 (17.9)
In % of caudal peduncle			
depth length of			
caudal peduncle	100—140 (124.4)	91—130 (109.6)	90—110 (100.0)

RESULTS AND DISCUSSION

Our results, compared with the data of Boulenger (1901, 1909), who examined 10 specimens and 1 skeleton of butterflyfish from Lower Niger, Victoria River, Old Calabar, Cameroon, Upper Congo and Ubanghi River, are summarized in Table 1. There are very broad ranges in plastic characters found in individual specimens, therefore we have divided our material into three length groups according to total length (TL). With regard to the post-mortal malformancy or lack of the part of the caudal fin in 12 specimens we calculated the total length in these specimens using the ratio between total and standard length in specimen with undamaged caudal fin. The changes of plastic characters with regard to the size of specimens are summarized in Table 2 (the averages in brackets). It is evident that the averages in individual length groups coincide, except the ratio between total length and body depth and ratio between caudal peduncle length and its depth, where the values increase with size. Very interesting are broad ranges in values of eye diameter in interorbital width in all three length groups. We have therefore divided our material into still smaller length groups (10 mm) but there are no significant differences in their averages. We can summarize that the meristic characters shown by Boulenger (1909) and found by us are identical and stable, but we have found larger differences in plastic characters, due probably to the fact that Boulenger obtained his material from collections in aequatorial West-Africa, while our specimens were bred in aquaria of Czechoslovak fish hobbyists. Sterba (1959) used Boulenger's data.

SUMMARY

28 specimens of the Butterflyfish (*Pantodon buchholzi* Peters, 1876) were examined. The total length ranged from 50—125 mm, scales in lateral line 26—30 (ave. 28), 4 scales above and 5 scales below lateral line, 22—26 scales (24) between occiput and dorsal fin insertion, D 1/5, A 2/13—14, head length

16.9—25.5 (19.1) % of total length. length of pectoral fin (P) 25.4—38.2 (31.2) % of the same proportion. body depth 15.8—22.7 (18.7) % of total length. Eye diameter 38.6—62.5 (49.2) % of the interorbital width, postdorsal distance 13.6—25.0 (18.4) % of predorsal distance, length of caudal peduncle 90—140 (105.4) % of caudal peduncle depth. The meristic characters agree with Boulenger's diagnosis (1909), the plastic characters show some differences.

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HELMINTH INFESTATION OF THE INDIAN GERBIL, *TATERA INDICA INDICA*

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Received August 15, 1977

Abstract: An examination of the helminth fauna harboured by the Indian gerbil, *Tatera indica indica*, revealed that it is polyspecific comprising three nematodes, viz., *Streptopharagus indicus* Johnson, 1969, *Rictularia taterae* Johnson, 1969, and *Trichuris barusi* Johnson, 1973, and one cestode, *Rodentolepis fraterna* Stiles, 1906, as against the monospecific helminth fauna, represented by *Trichuris bahanus* Tenora, 1969 in the same host in Afghanistan. The gerbils in the oriental region had a higher percentage of both incidence as well as intensity than their palaearctic counterparts.

S. indicus contributed 53.5%, *T. barusi* 29.6%, *R. taterae* 9.1% and *R. fraterna* 7.6% to the total helminth burden. The between-sex differences in the incidence and intensity in the two sexes of the host and the FMR (female to male ratio) in different nematode populations have been reported and discussed.

The Indian gerbil or the Antelope rat *Tatera indica indica* was examined for helminth parasites during the rainy season, July 1969 through September 1969. The helminth fauna included three nematodes, viz., *Streptopharagus indicus* Johnson, 1969, *Rictularia taterae* Johnson, 1969 and *Trichuris barusi* Johnson, 1973, and a cestode *Rodentolepis fraterna* Stiles, 1906.

The results of this study were submitted and accepted for publication in August 1972 but due to certain unavoidable circumstances could not be published then. The opportunity thus provided has been utilised in bringing the contents up-to-date.

MATERIAL AND METHODS

The gerbils were trapped and collected from sandy fields around Bikaner (Rajasthan) located in the Indian or Thar Desert. Zoogeographically, the Indian Desert is a continuation of the Saharo-Iranian Desert. Each gerbil examined was sexed and a careful count was kept of all the helminths harboured by it. For each nematode species the male and female worms were counted separately and a record maintained.

RESULTS

64 gerbils, 37 female and 27 male, were examined. Of these 87.5% or 56 including 30 or 81.08% female and 26 or 96.2% male were infected. The infected gerbils yielded 590 helminths, 338 or 57.2% in female and 252 or 42.7% in male host. The overall mean burden carried by the infected gerbils was 10.5, and that by female gerbils 11.2 and male gerbils 9.6. Thus, although the incidence of infection was higher in male gerbils, the intensity was greater in female.

The total helminth burden consisted of three nematodes, viz., *Streptopharagus indicus*, *Trichuris barusi* and *Rictularia taterae*, and a cestode *Rodentolepis fraterna*. The nematodes accounted for 92.3% of the total helminth load,

Table 1. Helminth infestation of *Tatara indica indica*.

Sex	Examined	Host Infected	Per cent Infected	Total	Helminth Burden		Invasion Index
					Mean	Dominance %	
Female	37	30	81.08	338	11.2	57.2	2.47558
Male	27	26	96.2	252	9.6	42.7	1.69960
Total	64	56	87.5	590	10.5	—	8.08640

Table 2. Distribution of helminths in the two sexes of *Tatara indica indica*
(Host examined 64 : 37 female and 27 male.)

Species	Female		Host Male		Total %	Burden		Dom- nance %	Parasite		FMR
	% Infected	Mean Burden	% Infected	Mean Burden		Total	Mean		Invasion Index	Male	
<i>S. indicus</i>	35.1	13.8	59.2	8.6	45.3	316	10.8	53.5	0.02632	98	218
<i>T. barusi</i>	37.8	5.8	62.9	5.4	48.4	175	5.6	29.6	0.01558	55	120
<i>R. tatarus</i>	37.8	3.2	13.7	2.0	28.1	54	3.0	9.1	0.00279	—	54
<i>R. fraternus</i>	37.8	1.8	37.0	1.9	37.5	45	1.8	7.6	0.00310	—	—

while the cestode contributed a mere 7.6 %. The split of the helminth burden in the two sexes of the host is tabulated in Tables 1 and 2.

Streptopharagus indicus was the most populous helminth parasite of *Tatera indica indica*. It was followed by *Trichuris barusi* which was also found in the largest number of hosts. Comparatively fewer rats were infected with

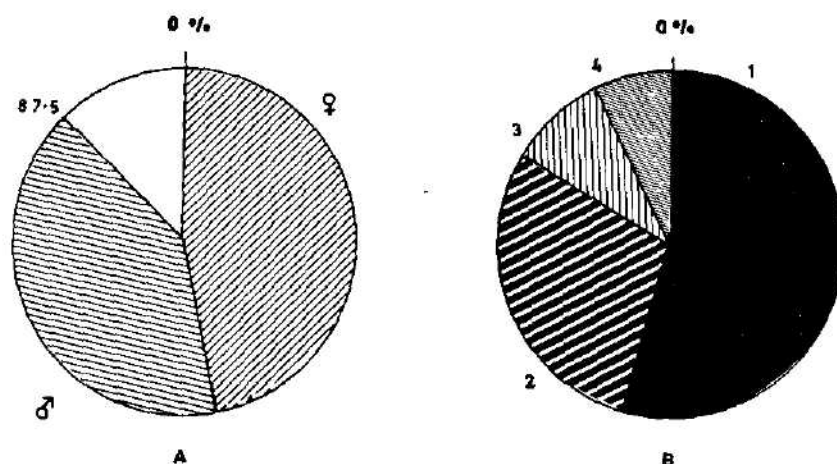


Fig. 1 A. Between-sex incidence of infection in *Tatera indica indica*. — B. Composition of helminth burden in *Tatera indica indica*. 1 — *Streptopharagus indicus*, 53.5 %, 2 — *Trichuris barusi*, 29.6 %, *Rictularia taterae*, 9.1 %; 4 — *Rodentolepis fraterna*, 7.6 %.

Rictularia taterae than the cestode *Rodentolepis fraterna*, although the total species burden as also the mean burden was higher in the former than in the latter. It is interesting to note that the same percentage 37.8 % of female gerbils were found to be infected with *R. taterae*, *T. barusi* and *R. fraterna*, while a slightly less, 35.1 %, harboured *S. indicus*. In male gerbils, however, various species infected different percentages of host.

Consideration of the linear distribution of helminths in the G-I tract of the host revealed that the largest infestation, 53.5 %, contributed by *S. indicus*, was harboured by the proximal part of the ileum, followed by the distal part which supported 37.2 % shared by *T. barusi* and *R. fraterna*. To the pyloric stomach was confined the residual infestation, 9.1 %, made up by *Rictularia taterae*.

Between-sex difference in the female and male gerbils appeared to be non-existent as far as the cestode *Rodentolepis fraterna* is concerned. However, the nematode distribution clearly demonstrated it. Thus, more male gerbils harboured *S. indicus* and *T. barusi*, while *R. taterae* was more prevalent in the female host. However, in all the three species it was the female host which carried a higher mean burden than its male counterpart.

It is interesting to note that although the male gerbils carried a lower mean burden, 8.5, of *S. indicus* than the female, 13.8, the FMR (female to male ratio) was higher in the former, 2.7, than in the latter, 1.9. Same is true of *Trichuris barusi* although in this case both sexes of the hosts carried almost equal mean burdens. In *R. taterae* only female populations were encountered.

DISCUSSION

Tenora (1969) investigated the helminth parasites of *Tatera indica indica* in Afghanistan. These were collected from two sources viz., tea houses from a synanthropic population and free nature. The latter did not harbour any helminth, while 29% of the former were infected with *Trichuris bahanus*

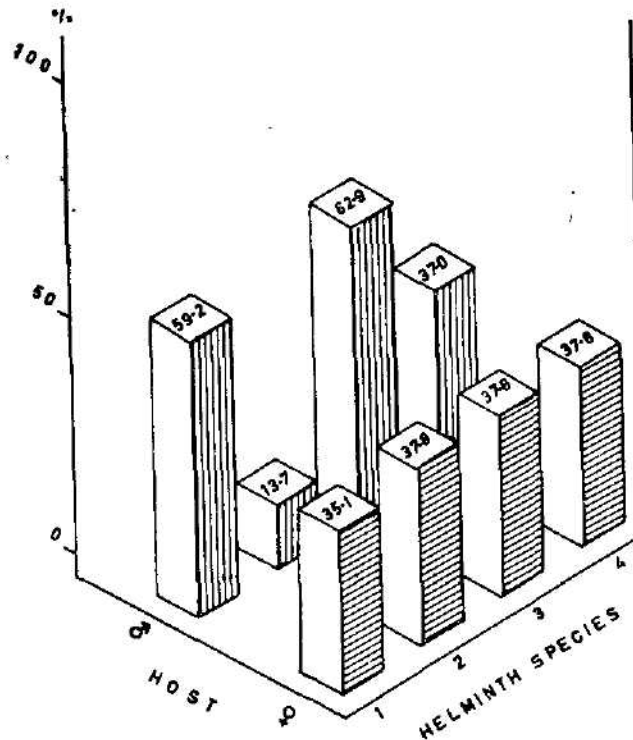


Fig. 2. Helminth infestation in male and female *Tatera indica indica*. 1 — *Streptopharagus indicus*; 2 — *Rictularia taterae*; 3 — *Trichuris barusi*; 4 — *Rodentolepis fraterna*.

Tenora, 1969 only. It appears, therefore, that whereas in the palaearctic zone the gerbil's helminth fauna is monospecific, in the adjacent oriental region it is polyspecific harbouring four helminths, three nematodes and one cestode. Moreover, in our study 87.5% gerbils, all captured from fields, were found infected, while in Afghanistan these are reported to be free of any helminth infection (Tenora, 1969). A comparison of the intensity of infection of the two trichurids, *T. bahanus* Tenora, 1969 and *T. barusi* Johnson, 1973 found in the Afghanistan and Indian desert respectively, reveal that the latter support a heavier trichurid load (5.6) compared to the former (3.0). It is evident that the total helminth load carried by gerbils in the Indian desert is still greater, more than three times, than that supported by their counterparts in Afghanistan.

The between-sex differences observed in our study are not unusual. Many nematode species show a preferences for one sex the host over the other

(Bull, 1959, 1964; Smyth, 1962; Dunsmore, 1966a and b; Singhvi & Johnson, 1976). It is interesting to note that as reported above in *Tatera i. indica*, in another rodent, *Rattus rattus*, also the between-sex difference in cestode population appears to be negligible (Singvi & Johnson, 1976). These authors also reported (*l. c.*) that although the incidence of infection is about the same in both sexes of *R. rattus*, the intensity is heavier in male rats. However, in *T. i. indica* the percentage of incidence is higher in male gerbils but the females carry an heavier load of mean helminth burden. As pointed out by Singhvi & Johnson (1976), these differences, perhaps, relate to the internal regulators, particularly the reproductive hormones.

FMR higher than unity appear to be a common feature of nemic populations (Roche & Patrzek, 1966; Singhvi & Johnson, in press). Such a disparity in the numbers of the two sexes of nematodes, among other factors, is, perhaps, due to a shorter span of the male (Singhvi & Johnson, in press). The absence of male in all the 18 populations of *Rictularia taterae* encountered in the present study is not unusual and appears to be quite common in rictularid populations. Singhvi & Johnson (in press) have reported similar populations of *R. jodhpurensis* Singhvi and Johnson, 1976, found in *Rattus rattus*. It is interesting to note that these authors have also reported (*l. c.*) that the average size of the rictularid populations in *R. rattus* is 3.2 worms which is very close to that found in the present study, viz., 3.0.

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BLOOD PARASITES OF BATS FROM BULGARIA AND CZECHOSLOVAKIA

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Abstract: 239 bats of 22 species were examined for hematozoa. The parasites were found in 42 bats (12 species) and belonged to the following genera: *Eperythrozoon* (in *Myotis myotis*), *Grahamella* (in *Rhinolophus euryale*, *R. mehelyi*, *R. blasii*, *M. myotis*, *M. capaccini* and *Barbastella barbastellus*), *Borrelia* (in *Eptesicus serotinus*), *Babesia* (in *R. mehelyi*, *R. blasii* and *E. serotinus*), *Trypanosoma* (in *M. brandti* and *M. myotis*), *Polychromophilus* (in *M. myotis* and *Mimopterus schreibersi*) and *Litomosia* (in *R. ferrumequinum*, *Pipistrellus savii*, *Plecotus austriacus* and *M. schreibersi*). There is no qualitative difference between bat parasites from Czechoslovakia and from Bulgaria. The Bulgarian bats, however, are more frequently infected than those from Czechoslovakia. The results of examinations revealed that there exists a relationship between the occurrence of the blood parasites in European bats and the migratory abilities of bats. Parasites of the genera *Babesia*, *Polychromophilus* and *Trypanosoma* most frequently occur in migratory bats, whereas in non-migratory host species they occur very rarely. No similar relationship was observed with parasites of the genus *Grahamella*.

INTRODUCTION

Members of three groups of organisms, rickettsiae and spirochaetes, protozoans, and microfilariae, parasitize in the blood of bats. Although these parasites have been studied in many European countries [e.g., Bergey et al. (1948), Bengtson and Weinman (1948), Wenyon (1926), Hoare (1972), Garnham (1966, 1972), Skrjabin (1949, 1954), Sonin (1975) and others], there are only few data available from Czechoslovakia and none from Bulgaria.

In Czechoslovakia, the blood parasites of bats were studied by Jirovec and Keller (1942) and Šebek (1958, 1970, 1975). Jirovec and Keller examined 36 bats of 5 species and found parasites of the genus *Trypanosoma* in the blood of three *Myotis myotis* and one *M. mystacinus*. Šebek examined 111 bats of eight species and found these parasites: *Grahamella* in one *Myotis emarginatus* and one *M. myotis*, *Babesia* in five *M. emarginatus* and two *M. myotis* and *Trypanosoma* in three *M. myotis*.

Results of parasitological investigation of bats carried out in Czechoslovakia and during two expeditions in Bulgaria in the years 1974—1976 are presented in this paper.

MATERIAL AND METHODS

The bats from Czechoslovakia examined in 1974—1975 originate from central and southern Bohemia and from southern and eastern Slovakia. In the central Bohemia they were caught mainly in Český kras (Czech Karst), i. e. in the caves, galleries

and lofts of houses in the region between Karlštejn, Koněprusy, Beroun and Křivoklát, some bats were also caught in the lofts in Zbraslav. The bats from southern Bohemia originate from galleries and lofts of houses in Velhartice, Klatovy, Horaždovice and Sušice regions. In Slovakia, the material was collected from bats from the Dobšiná Ice Cave and from the localities in the vicinity of Rožňava and Plešivec.

The bats from Bulgaria were caught during two summer expeditions in 1975 and 1976. The bats originated from three regions: the karst in the vicinity of Karlukovo and Cherven Bryag, Pirin mountains (Popina Laka, Ploska and Lilyanovo) and the cave Zmiové dubky near Sliven.

The blood was taken either from live bats from vena brachialis near elbow joint or from the heart of killed animals. The blood smears were fixed in methanol and stained using a conventional Giemsa staining. The blood smears were examined by immerse objective (magnification 100X). The smear was considered negative if no parasites were observed within 30 minutes.

RESULTS

The blood parasites were found in 43 bats (12 species) of the total number of 239 bats (22 species) examined. A survey of examined bats and of the parasites recovered is given in Table 1.

Parasites of the genera *Eperythrozoon*, *Grahamella*, *Trypanosoma* and *Polychromophilus* were found in Czechoslovak bats and members of the genera *Grahamella*, *Borrelia*, *Babesia*, *Polychromophilus* and *Litomosa* were found in bats from Bulgaria.

Mixed infection with two parasite species was encountered in twelve cases: in one case *Eperythrozoon* with *Trypanosoma* and *Babesia* with *Borrelia*, respectively, in three cases *Babesia* and *Grahamella* and seven cases *Polychromophilus* with microfilariae of *Litomosa*.

Eperythrozoon Schilling, 1928

Members of this genus were found in two *M. myotis* caught in Kružná near Rožňava (Slovakia) in August 1974. More than 75% of erythrocytes were infected in both bats.

The parasites (Fig. 1-4) occurred most frequently in form of red-violet cocci or coccoid rings measuring 0.5 μ m on the average. Some of them were found free in blood plasma, but a majority distinctly parasitized the erythrocytes. The cocci were sometimes joined in short chains or merged on the periphery of the corpuscle. Less frequently there occurred rodshaped formations measuring 1-3 \times 0.5 μ m, often bent. The number of parasites on one erythrocyte ranged from 1 to 30, most frequently there were 10-15.

I have found only three records of similar parasites in the literature. Bengston and Weinman (1948) cited the finding of Faria and Pinto from 1926. These authors described *Bartonella* (*Haemobartonella*) *rocha-limai* from the tropical bat *Hemiderma breviceuda*. Rickettsial bodies were also found in the erythrocytes of South-American bat *Glossophaga soricina* by Garnham, Lainson and Shaw (1971). Anciaux de Faveaux (1973) included in his list of parasites of unidentified African bats also the genus *Eperythrozoon* found by Rodhein in Zaire.

Grahamella Brumpt, 1911

Parasites of the genus *Grahamella* were found in six bat species, namely in one *Barbastella barbastellus* caught in Český kras (Bohemia) in December 1974 and in one *M. myotis* caught in Slovenský kras (Slovakia) in July 1974.

Table 1. General survey of examined bats with found parasites

Host species*	examined	No. of bats: infected	<i>Eperythrozoon</i>
<i>Rhinolophus ferrumequinum</i> (Schreber, 1774)	26 (8; 18)	2 (0; 2)	
<i>R. hipposideros</i> (Bechstein, 1800)	4 (0; 4)		
<i>R. euryale</i> Blasius, 1953	20 (0; 20)	2 (0; 2)	
<i>R. mehelyi</i> Matschie, 1901	6 (0; 6)	3 (0; 3)	
<i>R. blasii</i> Peters, 1866	17 (0; 17)	3 (0; 3)	
<i>Myotis mystacinus</i> (Kuhl, 1819)	1 (1; 0)		
<i>M. brandtii</i> (Eversmann, 1845)	4 (4; 0)	1 (1; 0)	
<i>M. emarginatus</i> (E. Geoffroy, 1806)	12 (4; 8)		
<i>M. nattereri</i> (Kuhl, 1818)	5 (5; 0)		
<i>M. myotis</i> (Borkhausen, 1797)	73 (61; 12)	8 (8; 0)	2 (2; 0)
<i>M. blythi oxygnathus</i> (Monticelli, 1885)	2 (0; 2)		
<i>M. daubentoni</i> (Kuhl, 1819)	3 (3; 0)		
<i>M. capaccini</i> (Bonaparte, 1837)	6 (0; 6)	1 (0; 1)	
<i>Pipistrellus savii</i> (Bonaparte, 1837)	1 (0; 1)	1 (0; 1)	
<i>Nyctalus noctula</i> (Schreber, 1774)	1 (0; 1)		
<i>Eptesicus nilssonii</i> (Keyserling et Blasius, 1839)	6 (6; 0)		
<i>E. serotinus</i> (Schreber, 1774)	6 (2; 4)	1 (0; 1)	
<i>Vesperugo murinus</i> Linnaeus, 1758	6 (0; 6)		
<i>Barbastella barbastellus</i> (Schreber, 1774)	1 (1; 0)	1 (1; 0)	
<i>Plecotus auritus</i> (Linnaeus, 1758)	18 (18; 0)		
<i>P. austriacus</i> (Fischer, 1829)	1 (0; 1)	1 (0; 1)	
<i>Miniopterus schreibersii</i> (Kuhl, 1819)	20 (0; 20)	18 (0; 18)	
Total	239 (113; 126)	42 (10; 32)	2 (2; 0)
%	100 (100; 100)	17.6 (8.8; 25.4)	0.8 (1.8; 0)
No of species	22 (11; 15)	12 (3; 9)	1 (1; 0)

* Scientific names of bats after Hanák and Heráň (1975)

The first figure shows total number of bats, the first figure in parenthesis shows number of bats from Czechoslovakia, the second one from Bulgaria.

Other records were from Bulgaria: two *Rhinolophus euryale* and one *Myotis capaccini* were caught in the karst near Karlukovo in July 1975 and 1976; two *Rhinolophus mehelyi* together with two *R. blasii* in Sliven in July 1975.

The parasites from all host species closely resemble in their morphology (Figs. 5, 6). They occur in the erythrocytes as short, rod-shaped structures, measuring $0.1 \times 1-1.5 \mu\text{m}$. Sometimes they are joined in bent chains up to $3.4 \mu\text{m}$ long. Most frequently there are 10-20 parasites in one erythrocyte, the highest number was 34 parasites. In all bats examined only very light infestations were involved.

The host specificity of *Grahamella* has not yet been sufficiently elucidated. Yakimoff (1929), Bengston and Weinman (1948) and Kreier and Ristic (1968) reported only three described species to occur in bats, namely *Grahamella brumpti* Ribeiro et del Aquila, 1918 from *Desmodus rotundus* and *Rhinolophus ferrumequinum*; *G. dschukowskii* (Tartakovsky, 1910) from *Nyctalus noctula* and *G. pipistrelli* (Markov, 1926) from *Pipistrellus nathusii*. However, the validity of these species is questionable, since they were described only on the basis of blood stages from the mentioned hosts. The grahamellae are now considered to be only little host-specified (see e. g. Fiset et al., 1973) and it is therefore very probable that the described species are synonyms.

The *Grahamella* are relatively frequent parasites of bats. Krampitz (1957)

Total (in Czechoslovakia; in Bulgaria) infected with parasites of the genus					
<i>Grahamella</i>	<i>Borrelia</i>	<i>Babesia</i>	<i>Trypanosoma</i>	<i>Polychromo- philus</i>	<i>Litosoma</i>
					2 (0; 2)
2 (0; 2)					
2 (0; 2)		2 (0; 2)			
2 (0; 2)		3 (0; 3)			
			1 (1; 0)		
1 (1; 0)			5 (5; 0)	1 (1; 0)	
1 (0; 1)					
					1 (0; 1)
	1 (0; 1)	1 (0; 1)			
1 (1; 0)					
					1 (0; 1)
				16 (0; 16)	9 (0; 9)
9 (2; 7)	1 (0; 1)	6 (0; 6)	6 (6; 0)	17 (1; 16)	13 (0; 13)
3.8 (1.8; 5.6)	0.4 (0; 0.8)	2.5 (0; 4.8)	2.5 (5.3; 0)	7.1 (0.9; 12.7)	5.4 (0; 10.3)
6 (2; 4)	1 (0; 1)	3 (0; 3)	2 (2; 0)	2 (1; 1)	4 (0; 4)

reported them from the same hosts as those mentioned by us, Krampitz and Kleinschmidt (1960) from *R. euryale* from Sicilia and southern France and Šebek (1970, 1975) from *M. myotis* from Czechoslovakia.

Borrelia Swellengrebel, 1907

Spirochetes of this genus were found in one *Eptesicus serotinus* caught in Karlukovo (Bulgaria) in July 1976.

The parasites (Fig. 7) occurred in blood plasma as redviolet spirals 11–24 μm long and about 0.3 μm thick. The number of threads ranged from 5 to 10, according to the length of the spirochete, and their amplitude measured about 1 μm .

The spirochetes are not very abundant in bats. They were recorded by Nicolle and Comte (1906), Gonder (1910), Coles (1914), Anciaux de Faveaux (1965) and others (see McCoy 1974). Their assignment to individual species is not quite clear, since the *Borrelia* are very little host-specified. Of the species reported from bats (see Bergey et al. 1948) only *B. vespertilionis* (Novy et Knapp, 1906) is now generally recognized. This species was originally described from *Pipistrellus kuhlii*. The situation is still more complicated due to the fact that the bats seem to serve as reservoir hosts of many *Borrelia* species pathogenic even for man (Pavlovsky, 1960). Felsenfeld (1965), Smibert (1973) and McCoy (1974) found natural infection or succeeded in infecting the bats with *B. hispanica*, *B. crocidurae* group and *B. persica*. All these species are transmitted by ticks and may produce so-called recurrent fevers.

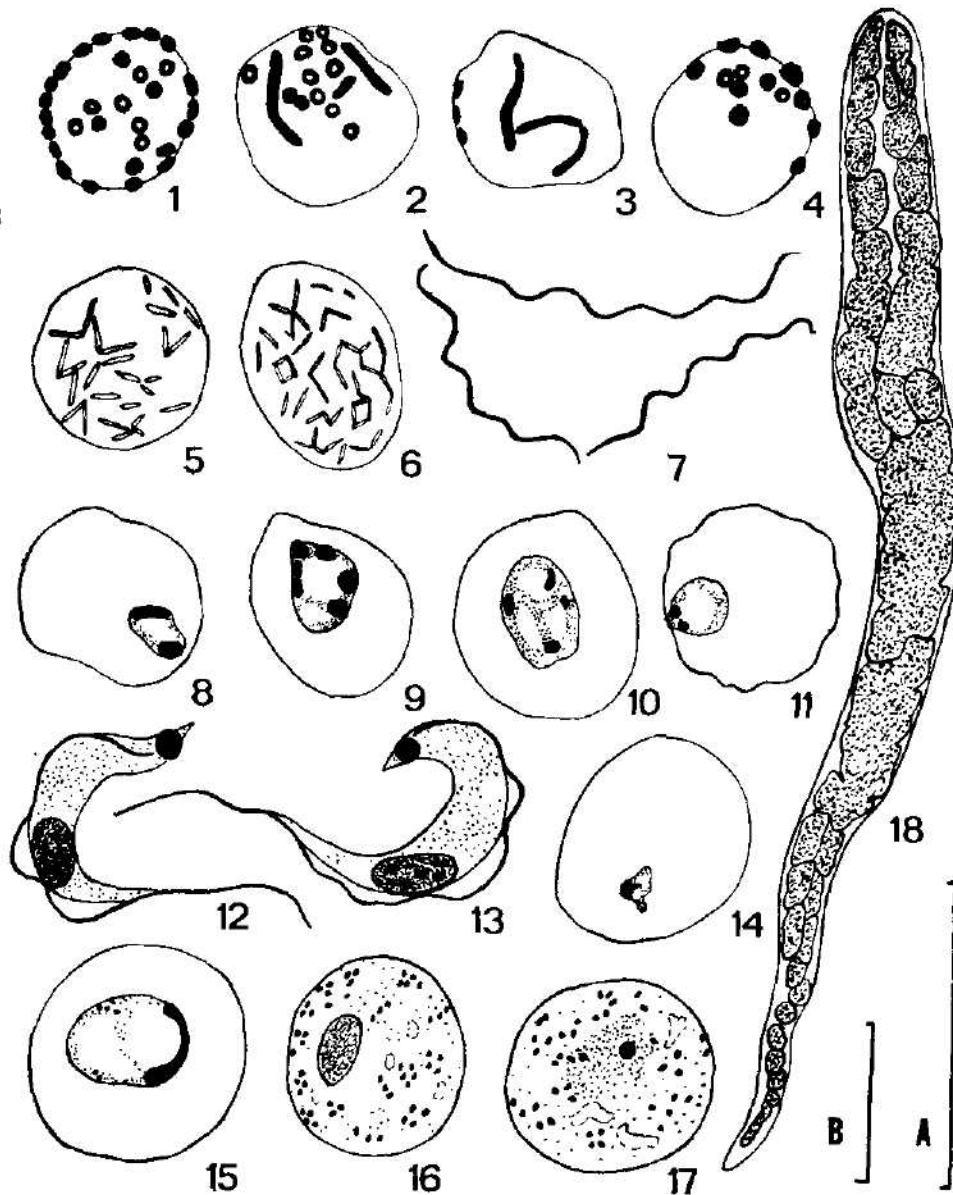


Fig. 1-4: *Eperythrozoon* sp. from *Myotis myotis*, 5: *Grahamella* sp. from *Barbastella barbastellus*, 6: *Grahamella* sp. from *Rhinolophus blasii*, 7: *Borrelia* sp. from *Eptesicus serotinus*, 8, 11: *Babesia* sp. from *Rhinolophus blasii*, 9, 10: *Babesia* sp. from *Eptesicus serotinus*, 12: *Trypanosoma* sp. from *Myotis brandti*, 13: *Trypanosoma* sp. from *Myotis myotis*, 14-17: *Polychromophilus melanipherus* from *Miniopterus schreibersi*, 18: microfilariae *Litomosa* sp. from *Pipistrellus savii*.
A: scale 10 μm for fig. 1-17, B: scale 10 μm for fig. 18

Table 2. Comparison of size of parasites of the genus *Trypanosoma* in *Myotis brandti* and *M. myotis*

Host	PK	KN	PN	NA	Size of parasites (in mm)			TL	BW	K	N
					PA	FF					
<i>M. brandti</i>	0—1.2	6 —7.7	7 —8.8	2.2—3.4	9.2—13.4	5.5—7.7	14.7—21	2 —2.3	1.1 × 1.1	2.2—2.5 × 1.1	
<i>M. myotis</i>	0—1.6	5.5—7.7	6.6—8.8	2.3—4.5	11 —13.3	4.5—6.6	16.8—19.9	1.6—2.3	0.9—1.5	1.1—1.6 × × 2.2—3.4	

PK: Distance of posterior end of body to middle of kinetoplast; KN: Distance from middle of kinetoplast to middle of nucleus; PN: Distance from posterior end of body to middle of nucleus; NA: Distance from middle of nucleus to anterior end of body (except free flagellum); FF: Length of free flagellum; TL: Total length of trypanosoma including free flagellum; BW: Maximum width of body (except undulating membrane); K: Size of kinetoplast; N: Size of nucleus.
After Hoare (1972) and Woo and Hawkins (1975)

Table 3. Comparison of size of microfilariae from the blood of four species of bats.

Host	Microfilariae	
	Body width (μm)	Body length (μ)
<i>Rhinolophus ferrumequinum</i>	44—85	6,6—7,7
<i>Pipistrellus savii</i>	55—77	6,6—12,5
<i>Plecotus austriacus</i>	40—88	5,5—6,6
<i>Miniopterus schreibersi</i>	50—120	5,3—8,8

Babesia Starcovici, 1893

Parasites of this genus were found in three bat species in Bulgaria. Two *Rhinolophus mehelyi* and three *R. blasii* were caught near Sliven in July 1975 and one *Eptesicus serotinus* near Karlukovo in July 1976.

The parasites from all the three host species are very similar in their morphology. Only the parasite from *E. serotinus* somewhat differs from the other in larger size, larger number of nuclei and in that it did not occur freely in blood plasma, which was commonly observed with the parasites of the remaining two host species. The trophozoites (Fig. 8—11) are usually irregularly ring-shaped, with 1—3 vacuoles, blue cytoplasm and 1—3, in those from *E. serotinus* even 6, red-violet, relative small nuclei. The parasites from both *Rhinolophus* species measured 1.3×1.1 to $3.2 \times 2.6 \mu\text{m}$, those from *E. serotinus* 1.6×1.6 to $4.2 \times 3.2 \mu\text{m}$. In the erythrocytes of one *R. blasii* rarely occurred elongated formations resembling pyriform structures described by Goedbloed et al. (1964) in parasites of Holland bats. These forms do not possess vacuoles, their average size is $2 \times 0.5 \mu\text{m}$ and they have a nucleus on one end. They are often V-shaped, with the nucleus situated on the top. The dividing stages are obviously concerned.

Parasites of the genus *Babesia*, often recorded under the synonymous name *Achromaticus* Dionisi, 1898, occur rather frequently in the blood of European bats (see e. g. Wenyon 1926, Goedbloed et al. 1964, Cox 1970, Sebek 1970, 1975). Only one species, *B. vesperuginis* (Dionisi, 1898) has been described from *Nyctalus noctula* (see Goedbloed et al. 1964). There are no papers available on the host specificity of these parasites so that it is difficult to decide whether this species of *Babesia* was involved in our case.

Trypanosoma Gruby, 1843

The trypanosomes were found in the blood of two bat species caught in Dobšiná Ice Cave, Slovakia (*Myotis brandti*) and church towers in Plešivec and Kružná near Rožňava (*M. myotis*) (Slovakia) in July 1974.

The parasites from both host species are almost identical in their morphology (Figs. 12, 13) and measurements (Table 2).

Three different types of *Trypanosoma* occur in the blood of bats. According to Hoare (1972) they belong to three different subgenera: *Megatrypanum* Hoare, 1964, *Herpetosoma* Doflein, 1901 and *Schizotrypanum* Chagas, 1909. Members of the last group have been found in European bats and also the parasites found by me belong to this subgenus. Besides other authors also Jirovec and Keller (1942) and Sebek (1958, 1975) found these parasites in *M. myotis*. Although the blood stages of bat *Trypanosoma* of the subgenus *Schizotrypanum* originating from various host species are almost identical in their morphology and measurements, now

it seems that a complex of various species is concerned. This hypothesis is supported also by the papers by Baker and Thompson (1971), Soria and Dusanic (1975) and Baker et al. (1972).

Many species of *Trypanosoma* of the subgenus *Schizotrypanum* have been described from various bat species. Their validity, however, is often questionable, since they were mostly described on the basis of blood stages (Hoare 1972). In bats of the genus *Myotis* these parasites are often named *T. vespertilionis* Bataglia, 1904, but this species was originally described from *Nyctalus noctula*. According to Baker and Thompson (1971) and Soria and Dusanic (1975) it differs from the related species in different stages during cultivation in vitro. Therefore it cannot be decided whether this species was involved in my records from *M. myotis* and *M. brandti*.

Polychromophilus Garnham, 1953

Gametocytes of parasites of this genus were found in the blood of one *Myotis myotis* caught in a cave in Brzotín (Slovakia) in August 1974 and in 16 *Miniopterus schreibersi* caught near Karlukovo (Bulgaria) in July 1975 and 1976. There were both macrogametocytes and microgametocytes (Figs. 16, 17) and less frequently also ring-shaped structures (Fig. 14, 15). The parasites from both host species were identical in the morphology, shape and size and conformed to the description published by Garnham (1966).

There are three genera of protozoans of the family Haemoproteidae occurring in bats, namely *Hepatocystis* Garnham, 1948, *Nycteria* Garnham et Heisch, 1953 and *Polychromophilus* Garnham, 1953. Only members of the genus *Polychromophilus* have been found in European bats, since the remaining two genera occur only in tropical bats (Garnham 1966, 1972).

The species specificity of these parasites has not yet been dealt with. Garnham (1966) mentions two recognized species of this genus which differ only slightly in the morphology of their blood stages so that it is almost impossible to separate them on the basis of this character. *Polychromophilus melanipherus* Dionisi, 1899 was described from *Miniopterus schreibersi* and it is therefore very probable that also the parasites found by me belong to this species. The other species, *P. murinus* Dionisi, 1899, was originally described from *Vespertilio murinus*. Many authors reported these protozoans from *M. myotis*, some under the name *P. murinus*, others as *P. melanipherus* (see Garnham, 1966 and others).

Litomosa Jorke et Maplestone, 1926

Microfilariae of this genus of nematodes were recovered from two *Rhinolophus ferrumequinum*, one *Pipistrellus savii*, one *Plecotus austriacus* and nine *Miniopterus schreibersi* caught in Karlukovo (Bulgaria) in July 1975.

The microfilariae from various host species did not differ in the size except those from *M. schreibersi* which were somewhat longer (Table 3). Also the morphology was almost identical differing in some details only (Fig. 18). The worm-shaped body of all parasites was filled with dark red-violet somatic nuclei. It was covered with a transparent cuticle, which in the microfilariae from *R. ferrumequinum* and *M. schreibersi* had fine transverse the striations. Approximately at one third of body there was excretory pore and at three fifth of body length the anal pore, both appearing like deep incision on body side.

Four genera of Filariata have been reported to parasitize in body cavity of bats in adult forms and their microfilariae are transferred by blood-sucking arthropods. These genera are *Litomosa* Jorke et Maplestone, 1926, *Litomosoides* Chandler, 1931; *Migonella* Lent, Freitas et Proenca 1946, and *Chiropterofilaria* Jeh, Symes et Mataika, 1958. Only members of the genus *Litomosa* have been reported to occur

in European bats (Sonin, 1975). Five species have been described on the basis of adult worms (Sonin, 1975) recovered from the same bat species in which I found the microfilariae. Three of them *L. chiropterorum* Ortlepp, 1932, *L. mini-optimi* Mackerras, 1962 and *L. skarbilovitchi* Petrov et Tscherkova, 1954 were found in African, Asian and Australian populations of *M. schreibersi*, so that rather the remaining two species, *L. filaria* (Beneden, 1882) and *L. ottaviani* Lagrange et Bettini, 1948 found in European bats even in Bulgaria should be taken into consideration. *L. filaria* has been reported also from *R. ferrumequinum*, *P. austriacus*, and *M. schreibersi* and *L. ottaviani* from *R. ferrumequinum* and *M. schreibersi*. No parasites of this genus, either adults or microfilariae have been recorded from *P. savii*.

DISCUSSION

The results of the present work, as well as those of the papers by Jirovec and Keller (1942) and Sebek (1958, 1970, 1975) show that parasites of the genera *Eperythrozoon*, *Grahamella*, *Trypanosoma*, *Polychromophilus* and *Babesia* occur in the blood of bats in Czechoslovakia. The microfilariae have not yet been reported, but adult worms of the genus *Litomosa* have often been encountered in the body cavity of bats in Czechoslovakia (Ryšavý, 1956).

I found parasites of the genera *Grahamella*, *Borrelia*, *Polychromophilus*, *Babesia* and *Litomosa* in bats from Bulgaria. With regard to the fact that the parasites of the genus *Trypanosoma* occur in bats in the whole Europe (Hoare 1972), it may be supposed that they will be present also in the bats from Bulgaria.

These results indicate that there is no difference between the fauna of blood parasites of bats in Bulgaria and Czechoslovakia. There is only some difference in the relative occurrence of these parasites (Table 1); in Bulgaria, 25.4% of bats were infected, whereas in Czechoslovakia only 3.8%. This may be explained by the fact that Bulgaria is situated in warmer regions of Europe than Czechoslovakia.

During the studies of the distribution of blood parasites in European bats it was observed that some genera of these parasites are strikingly abundant in certain host species (e. g., *Polychromophilus* in *Min. schreibersi*, *Vesp. murinus* and in the genus *Myotis*). On the other hand, they are almost completely lacking in other bats (especially of the genera *Rhinolophus* and *Plecotus*). In my opinion, this phenomenon is related with the ecology of bats, particularly with their migratory abilities. Geisler and Hanák (1969) and Roer (1971) divide the bats into three ecological groups: 1. migrants or facultative migrants, 2. vagrant or obligatory vagrant species and 3. stationary species.

Four most abundant genera of blood parasites of European bats divided into these three ecological groups are compared in Table 4. The incidence of parasites is derived from the number of their records by various authors in various bat species. The table clearly shows, especially if rare species as *N. leisleri*, *P. nathusii*, *E. nilsoni*, *R. blasii* and *R. mehelyi* are omitted, that the blood parasites occur mostly in the first and second group of bats, whereas in the stationary bat species they have been found only rarely. This is especially true for the protozoans of the genera *Babesia*, *Polychromophilus* and *Trypanosoma*, whereas rickettsiae of the genus *Grahamella* are equally abundant in all the three groups of hosts. This indicates that distribution of blood protozoans in individual species of European bats is directly related to the migratory abilities of the hosts. They occur more frequently in regularly mi-

grating bats than in the stationary ones. However, this does not concern the bacterial parasites of the genus *Grahamella*. This difference may be explained by the different parasite-vector-host relation in *Grahamella*.

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**MICRODISTRIBUTION OF STONE FLY (PLECOPTERA) LARVAE
IN TWO CREEKS IN THE BESKYDY MTS., MORAVIA**

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Abstract: In the period from May 1966 to April 1969, the preference for the place in the stream line or at the creek bank was investigated in the larvae belonging to six species of stone flies. The larvae of *Perla marginata*, *Isoperla oxylepis* and *Amphinemura sulcicollis* were found to prefer places in the stream line; *Nemoura cambrica* and *Leuctra albida* prefer those at the bank; and the larvae of *Leuctra hippopus* have no special requirements. Except for *Nemoura cambrica* larvae, no movements of grown-up larvae towards the bank were observed before hatching.

INTRODUCTION

In the period from May 1966 to April 1969, complex hydrobiological investigations were carried out in the Lušová and Brodská creeks in the Beskydy Mts. by the workers of the Department of Biology of Animals and Man, Purkyně University, in Brno (Helan & al., 1973). The author of this paper had worked out his dissertation on stone fly larvae on the basis of the material gathered. General results were already published (Helan & al., 1973). In this study, attention is paid to a single problem, namely to the distribution of six most abundant species in the stream line and at the bank in the creeks under investigation. The comprehensive studies dealing with investigations of benthos do not include, as a rule, data on the special requirements of stone fly larvae upon the microbiotope. Data concerning this problem are included in the work by Raušer (1956). Ulfstrand (1967) studied the requirements of water-born insect larvae on water depth, bottom structure and stream velocity; Englishaw (1964), on detritus supply. There are scarce data in the literature on the movements of stone fly larvae during their development. Raušer (1956) found that higher instar larvae and nymphs of *Perla burmeisteriana* occur mainly at the banks. Helan & al. (1973) mention only that stone fly larvae move towards the bank before hatching of adults. The requirements on stream velocity of organisms living in the water were studied by Ambühl (1959).

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METHODS AND MATERIAL

Characterization of the basins and description of the localities: The Lušová and Brodská creeks are the right-side tributaries of the Bečva River. They spring in the Vsetínské vrchy Mts. reaching the elevation of

1024 m above sea level (Mt. Vysoká). The drainage area is covered by woodland (90%) and meadows (8%); the remaining area is shared by human dwellings, communications and arable land. Owing to scarce settlements and absence of industrial facilities, both creeks have remained almost untouched by human activities. Their pollution is negligible and, if any, domestic animals are the only source. The bottom of both creeks is covered with loose stones mostly 15–160 cm² in surface. Their surface is overgrown by diatoms and sporadically also by filamentous algae. In autumn, the structure of the bottom changes owing to fall of leaves from trees and shrubs that border the banks. Both creeks are almost without any canalization; there are, of course, frequent transversely laid logs which reduce the stream velocity and form short sections with deeper water. The fish stock included only two species, brown trout (*Salmo trutta* m. *fario*) and sculpin (bullhead) (*Cottus poecilopus*).

The Lušová creek springs at the height of 665 m above sea level and empties itself into the Bečva River at 425 m above sea level. The stream is 6 km long, its drainage area covers 9.75 km². The locality L 1 lies about 460 m above sea level, L 2 at about 40 m above sea level. The Brodská creek springs at the height of 750 m above sea level. The stream is 9.95 km long, its drainage area covers 11.8 km². The locality B 1 is situated at 480 m above sea level, B 2 at 530 m above sea level. (For further data see Kubíček & al., 1972, Helan & al., 1973).

Material: Stone fly larvae were taken in the L 1, L 2, B 1 and B 2 localities from May 1966 to April 1967 in month's intervals except for December and February. From May 1967 to April 1969 the material was taken monthly, and only in the localities in the lower parts of both creeks (L 1 and B 1). In the lower part of Brodská creek the material was taken in three sections — A, B, C — which were separated by small sluices. In the A section the initial fish density was retained; in the B section the stock was increased, in the C section it was reduced in an artificial way. This had no influence on stone fly larvae (Helan & al., 1973).

Benthic organisms were taken by washing the stones by running water which washed them away towards the opposite circle net of 25 cm in orifice diameter; the bottom surface equalled the surface of the stones washed. Also a metal frame — the benthometer — was used of which the frame triangle demarcated 0.2 m² of bottom surface (Helan et al., 1973). The total surface covered in one sampling was 0.2 m². The benthometer was used only from March 1968 to the end of the period of investigations, namely for the samplings done in the stream exclusively.

The stream velocity in the stream line was 20–50 cm/sc and only exceptionally higher; at the bank it was lower than 15 cm/sc; the stream direction was often irregular. The shape of the whole bottom profile was the same in both creeks.

The taken organisms were fixed and preserved in 4% formalin, then determined and measured in the laboratory. The obtained measurements were used for biomass estimates according to the length-weight relationships. The material of stone fly larvae for obtaining the latter data was taken in various localities, then it was weighed in vivo as early as possible after having been taken by means of a medicinal balance, then fixed and preserved in 4% formalin. In the laboratory the larvae were measured and the average length and corresponding weight were computed. Before being weighed the larvae were deprived of water in a battery centrifuge (Kubíček, 1969).

RESULTS

(1) **Number and size of larvae:** In all, 5340 larvae of 21 stone fly species 2–31 mm in size were taken (Helan & al., 1973). The 4 mm sized larvae predominated (30.25%). The 3 mm larvae occurred in 9.06% and 2 mm larvae in 2.19%. Hence, by the sampling method used the larvae 4 mm in size and all larger were intercepted, but only a part of the factual number of smaller larvae was taken; namely, one can expect that just the smallest sized larvae should be predominant.

(2) **Microdistribution:** The microdistribution means the occurrence of larvae in the places in the stream line and at the bank. I concentrated at the larvae of the species *Perla marginata* (Panzer, 1799) (fam. Perlidae), *Isoperla oxylepis* (Despax, 1936) (fam. Perlodidae), *Nemoura cambrica* (Stephens, 1835) and *Amphinemura sulcicollis* (Stephens, 1835).

Tab. 1. Number of larvae per m² (ab) and average weight of one larva (w) *Perla marginata*

	V	VI	VII	VIII	IX	X	XI	XII	I	II	III	IV	Average
Stream	ab	8.0	14.0	10.3	18.0	25.3	44.8	25.3*	20.0		8.3	13.3	
1966	w	92.8	165.3	161.8	72.3	118.3	147.0	163.1	129.1		144.7	220.3	
Bank	ab	1.5					2.8	1.0	5.3				
1967	w	110.3					104.9	297.5	108.0				
Stream	ab	17.5	8.5	19.0	37.0	23.3	71.5	18.8	23.8	11.5	23.3	18.8	
1967	w	159.4	72.0	83.2	82.4	134.7	100.0	96.8	173.9	98.1	69.0	35.5	
Bank	ab	2.5	3.3	10.3	6.3	2.3	3.8	3.3					
1968	w	86.0	75.8	65.8	179.4	86.2	203.3	26.1					
Stream	ab	37.5	21.3	43.8	26.3	18.8	6.3	35.0	17.5	33.8	26.3	13.8	22.6
1968	w	39.0	46.7	73.6	54.5	107.6	46.1	101.8	416.4	32.8	60.0	78.1	105.3
Bank	ab		1.0					0.8			2.0	1.4	
1969	w		85.0					478.1			25.0		111.7

Tab. 2. Number of larvae per m² (ab) and average weight of one larva (w) *Isoperla oxycephala*

	V	VI	VII	VIII	IX	X	XI	XII	I	II	III	IV	Average
Stream	ab	2.0				7.0	12.8		13.3		7.8	9.5	
1966	w	16.0				3.4	3.8		5.8		4.0	7.6	
Bank	ab											0.8	
1967	w											2.8	
Stream	ab	6.0				30.0	60.5	65.5	89.5	50.3	69.5	38.8	
1967	w	17.0				3.3	2.9	4.2	3.8	4.4	4.8	8.0	
Bank	ab						2.5	4.5				35.8	
1968	w						3.5	3.7				9.3	
Stream	ab	25.0				1.3	33.8	63.8	102.5	40.0	52.5	30.0	23.9
1968	w	8.0				4.2	4.1	6.7	4.6	4.8	4.1	13.2	5.2
Bank	ab										1.8	1.3	
1969	w										4.6	8.1	

Tab. 3. Number of larvae per m² (ab) and average weight of one larva (w) *Nemotus umbricus*

	V	VI	VII	VIII	IX	X	XI	XII	I	II	III	IV	Average
1966 Stream	ab	3.0		1.3	10.0	39.8			25.3		23.3	26.5	
1967 Bank	w	4.3		2.5	2.2	3.1			3.0		3.1	3.1	
	ab				22.0	4.8			35.8			75.3	
	w				1.3	2.7			4.4			4.2	
1967 Stream	ab	1.3						8.3	9.8	6.5	4.5		
1968 Bank	w	2.2						3.3	3.9	4.4	2.6		
	ab				5.8	11.0		19.0				17.0	
	w				2.1	2.6		3.2				5.4	
1968 Stream	ab						10.0	2.5	6.3	35.0	2.5	1.3	6.4
1969 Bank	w						3.2	4.3	3.0	3.7	4.2	4.0	3.3
	ab						5.0	25.8	16.1	20.5	26.0	24.5	9.1
	w						3.4	4.8	2.7	6.7	3.6	7.9	4.4

Tab. 4. Number of larvae per m² (ab) and average weight of one larva (w) *Amphinemura sulcatella*

	V	VI	VII	VIII	IX	X	XI	XII	I	II	III	IV	Average
1966 Stream	ab	28.0	21.5			1.5	8.3		6.3		27.8	38.0	
1967 Bank	w	2.9	3.7			1.5	1.5		2.5		2.2	2.6	
	ab	1.3							1.5			3.8	
	w	8.6							1.9			2.4	
1967 Stream	ab	31.0	3.5				7.8	5.0	40.5	29.5	67.5	98.8	
1968 Bank	w	4.3	2.6				2.1	2.4	2.2	2.3	2.8	4.1	
	ab						0.5					157.3	
	w						1.6					3.6	
1968 Stream	ab	88.8	1.3				28.8	31.3	208.8	113.8	250.0	162.5	41.2
1969 Bank	w	3.9	4.1				2.3	2.1	3.5	3.2	2.7	3.9	3.2
	ab	9.5						3.5	3.5	4.0	21.3	18.0	6.6
	w	3.8						3.9	1.5	2.6	2.6	4.5	3.5

(fam. Nemuridae). *Leuctra hippopus* Kempny, 1899 and *Leuctra albida* Kempny, 1899 (fam. Leuctridae). The larvae of the above species belonged to the most abundant ones in both creeks. They represented 75.84% of abundance (*P. marginata* 12.41%, *I. oxylepis* 12.49%, *N. cambrica* 8.10%, *A. sulcicollis* 23.65%, *L. hippopus* 6.73% and *L. albida* 12.40%). The data given in this study on the larvae of the genus *Leuctra* are rather approximate, because about a third of the larvae taken could not be determined reliably.

Perla marginata: It belongs to the largest stone flies and the development lasts several years; that is why they were found in both creeks during the whole year. Tab. 1 shows the larvae to prefer markedly the places in the stream line for those at the bank, even in the period of hatching of adults (May to August). The body size of larvae in the stream almost equals to that of larvae at the bank.

Isoperla oxylepis: The larval development lasts one year; thus the larvae did not occur in the April — September samples; otherwise, they were not intercepted due to their small size. The average abundance, as well as the occurrence in the stream and at the bank had the same character as that of the larvae of *P. marginata*. During all years of study, the average weight of one larva was coincidentally the highest in April, shortly before the hatching of adults. On the whole it can be concluded that the larvae of this species were somewhat more abundant at the bank than in the stream line; before the hatching of adults, further movements of grown-up larvae occurred.

Amphinemura sulcicollis: The larvae of this species belonged to the most abundant ones in the creeks under investigation. The yields of sampling at the bank was less frequent and less abundant; those from April 1968 were exceptional (cf. the high yield in the Brodská C locality, being similar to that of *I. oxylepis* larvae). The annual average weight of one larva at the bank is slightly higher than that in the stream (Tab. 4); before the hatching of adults (April, May) the situation was, of course, reverse (3.8 mg in the stream as compared to 3.7 mg at the bank). The average abundance for the whole period of investigation was by six times higher than it was at the bank, while before the hatching only by three times (91.2 larvae in the stream against 31.7 larvae at the bank). These values are affected by a high yield in April 1968 in the locality Brodská C at the bank, which I consider to be exceptional as mentioned above. On the whole it can be concluded that the larvae of *A. sulcicollis* were markedly rheophilous in the creeks under investigation, and even before the hatching of adults no movements occurred of the grown-up larvae towards the bank.

Leuctra hippopus: The larvae were taken in both creeks in winter and early spring months, for the adults hatch in the spring. The larvae occurred more abundantly in the stream than at the bank, and also the average weight of one larva was higher in the stream (Tab. 5). The differences are not great, of course; on the whole, it can be said that the larvae of this species occurred both in the stream and at the banks, and that they slightly preferred the stream environment.

Leuctra albida: This species, contrary to the latter, belongs to late summer stone flies. The larvae were taken in the creeks under investi-

Tab. 5. Number of larvae per m² (ab) and average weight of one larva (w) *Leuctra hippopus*

		V	VI	VII	VIII	IX	X	XI	XII	I	II	III	IV	Average
1966	Stream	ab								26.0			2.3	
1967	Bank	w								4.5			3.4	
		ab								50.0				
		w								3.9				
1967	Stream	ab								13.7	19.8	12.5	8.8	
1968	Bank	w								5.6	3.4	3.9	1.8	
		ab						12.3	8.0				15.0	
		w						2.9	3.9				0.9	
1968	Stream	ab							22.5	70.0	66.3	25.0	2.5	7.9
1969	Bank	w	20.8						4.2	4.2	4.3	5.2	5.0	4.3
		ab								11.5	2.0	52.0		5.0
		w	1.6							3.7	3.7	4.8		3.5

Tab. 6. Number of larvae per m² (ab) and average weight of one larva (w) *Leuctra albidula*

		V	VI	VII	VIII	IX	X	XI	XII	I	II	III	IV	Average
1966	Stream	ab	7.0	78.8		2.8								
1967	Bank	w	1.9	3.8		3.6								
		ab		83.3	22.8			6.3						
		w		4.3	3.8			2.4						
1967	Stream	ab		29.0	109.5	30.8								
1968	Bank	w		2.5	3.3	2.2								
		ab	107.5	72.5	66.8	31.8								
		w	1.9	2.8	2.2	3.2								
1968	Stream	ab		13.8	20.0									8.6
1969	Bank	w	25.3	2.2	2.3									3.1
		ab		61.0	45.0									15.5
		w	1.9	2.4	2.3									2.7

gation from May to September. Tab. 6 shows the number of larvae at the bank to be twice higher than that in the stream. The larvae in the stream were heavier, of course. It can be concluded that the larvae of *L. albida* occurred both in the stream and at the bank, but they preferred fairly markedly the places at the bank. The comparison of the data in Tab. 5 and 6 shows the larvae of both above *Leuctra* spp. to differ markedly by the time of occurrence and, to a certain degree, also by the place of occurrence.

DISCUSSION

Although the bottom of both creeks had approximately the same general character, the larvae of the above species did not occur in the whole profile. The larvae of *P. marginata*, *I. oxylepis* and *A. sulcicollis* preferred the places in the stream; those of *N. cambrica* and *L. albida* occurred in larger numbers at the bank; and only the *L. hippopus* larvae occurred both in the stream and at the bank in almost equal numbers. The causes of such distribution of the larvae in the creek are difficult to explain. The larvae of the species belonging to the genus *Perla* are generally known as rheophilous and they are adapted to this mode of life with their flattened body. Likely, the *P. burmeisteriana* larvae, although they do not require urgently clean water (Hanuška, 1956; Raúšer, 1956), always live in the places with strong stream. Šámal (1924) writes that they have better food conditions in the stream. The food supply for the stone fly larvae in the creeks under investigation was not studied apart. With respect to the bottom character, nevertheless, I suppose that the food supply both in the stream and at the bank was approximately the same mainly for the phytophagous larvae. The requirements on water oxygen by the larvae can be one of possible causes. Rapid running water supplies the larvae with better respiration conditions (Ambühl, 1959). The larvae of *P. marginata*, *I. oxylepis* and *A. sulcicollis* occurred at the bank scarcely, meanwhile the larvae of *N. cambrica*, *L. hippopus* and *L. albida* occurred commonly also in the stream. The species, of which the larvae occurred in greater numbers also at the bank, are known to have smaller requirements on water purity (Hanuška, 1956; Raúšer, 1956) and on water velocity. The larvae of several species belonging to the genus *Nemoura* occur also in slowly running water, and the larvae *N. cinerea* can live even in stagnant water (Illies, 1955). Likely the larvae *L. hippopus* are known to have no urgent requirements on stream velocity (Ulfstrand, 1967) and they were found also in stagnant water (Kühntreiber, 1934). The larvae claiming for certain stream velocity did not find suitable living conditions at the bank where the stream was slower. Contrary to that, the larvae with smaller requirements could find suitable living conditions also in the middle of the stream. Also in the stream line, close to the bottom, behind stones and other small elevations, minor sections with so called dead water develop (Ambühl, 1959) where even the larvae can live, which are not adapted with their body shape to the rapid stream, without being exposed to its mechanical effects.

So far the movements of grown-up larvae towards the bank before hatching are concerned (Helan & al., 1973), they were not observed except for the larvae *N. cambrica*. The larvae *N. cambrica*, of course, preferred the places at the bank during the whole development. Movements

of the grown-up larvae must occur in those flows where the larvae have the possibility to emerge only at the bank for the last larval ecdysis. But in both creeks, the stones rose above the water level even in the middle of the stream. The stone fly larvae could mount them for the last ecdysis and, in such way, had the possibility of hatching even without movements towards the bank.

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**ERSTER FUND DES POLYCHAETEN *HYPANIA INVALIDA*
(POLYCHAETA, AMPHARETIDAE) IM TSCHEHOSLOWAKISCHEN
DONAUABSCHNITT**

Stefan NAGY

Herrn Professor Emeritus RNDr. Sergej Hrabě DrSc., dem weltbekannten
Sachkenner der Süßwasserwürmer zum 80. Geburtstag gewidmet

Eingegangen am 21. April 1977

Abstract: The autor describes the first find of the polychaete *Hypania invalida* Grube, 1860 in the Czechoslovak stretch of the Danube river. Only two specimens found in two arms of the Danube at Baka (river kilometer 1821–1826) in the Danube floodplain. The species found is new for the fauna of Czechoslovakia. The reasons of her rare occurrence are discussed along with the presumable origin of this marine worm in the Danube basin.

Im Rahmen der Erforschung der saisonbedingten Dynamik der qualitativen und quantitativen Zusammensetzung des Makrozoobenthos, die vom März 1976 in zwei Hauptnebenarmen der Donau bei Baka durchgeführt wurde, wurden zum ersten Male Polychaeten gefunden, welche in den bisherigen Arbeiten über die Hydrofauna des tschechoslowakischen Abschnittes der Donau (Ertl et col. 1961, Brtek, Rothschein 1964) nicht angeführt werden. Es handelt sich nach der Bestimmungsliteratur (Hartmann-Schröder 1971 und Gerlach 1967) um die Art *Hypania invalida* Grube, 1860. Da auf dem Gebiet der ČSSR bisher nur die verhältnismässig seltene stygobionte Polychaetenart *Troglochaetus beranecki* Delachaux (Rosol, Kubíček 1971) gefunden wurde, welche der Ordnung der Ur — Ringelwürmer (Archannelida) angehört, während die Art *Hypania invalida* Grube der Ordnung der sedentären Polychaeten (Sedentaria) angehört, handelt es sich um den ersten Fund eines sedentären Polychaeten nicht nur im tschechoslowakischen Donauabschnitt, sondern, auf dem Gebiet der ČSSR überhaupt.

Die bereits erwähnten Untersuchungen werden mit Ausnahme der Wintermonate (Dezember–Februar) in regelmässigen zweiwöchentlichen Intervallen durchgeführt; die eine Untersuchungsstelle liegt im Donaunebenarm Új Osztály (von uns als Nebenarm „B“ bezeichnet), die andere im Hauptnebenarm der Donau bei Baka (von uns als „A“ bezeichnet, siehe Abb. 1). Die Makrozoobenthosproben wurden jeweils an zwei Entnahmestellen dieser Profile mit Hilfe eines Petersen-Greifers entnommen (Greiferfläche 0,1 m²), und zwar wurden aus dem Litoral, wo schlammiger Grund angetroffen wurde, je zwei Proben, aus dem Medial mit schotterigem Grund je nach Bedarf 3 bis 5 Proben entnommen. Es muss noch bemerkt werden, dass beide Nebenarme oberhalb der Entnahmestellen durch Betondämme abgeschlossen sind, welche erst bei einem Pegelstand von etwa 400 cm am Pegel Gabčíkovo vom Wasser überflossen werden.

Ein erstes Exemplar des Polychaeten haben wir in einer am 18. 5. 1976 aus dem Medial des Nebenarms „B“ bei einem Pegelstand von 364 cm am Pegel Gabčíkovo entnommenen Probe gefunden. Die Wassertemperatur war an der Entnahmestelle an der Wasseroberfläche 19,5 °C und am Grunde in einer Tiefe von 3 m 17,8 °C. Ein zweites Exemplar fand Kollege F. Šporka in einer am 3. 2. 1977 aus dem Medial des Nebenarmes „A“ bei einem Pegelstand von 407 cm entnommenen Probe. Beide Exemplare wurden offensichtlich bei dem Durchwaschen der Proben der

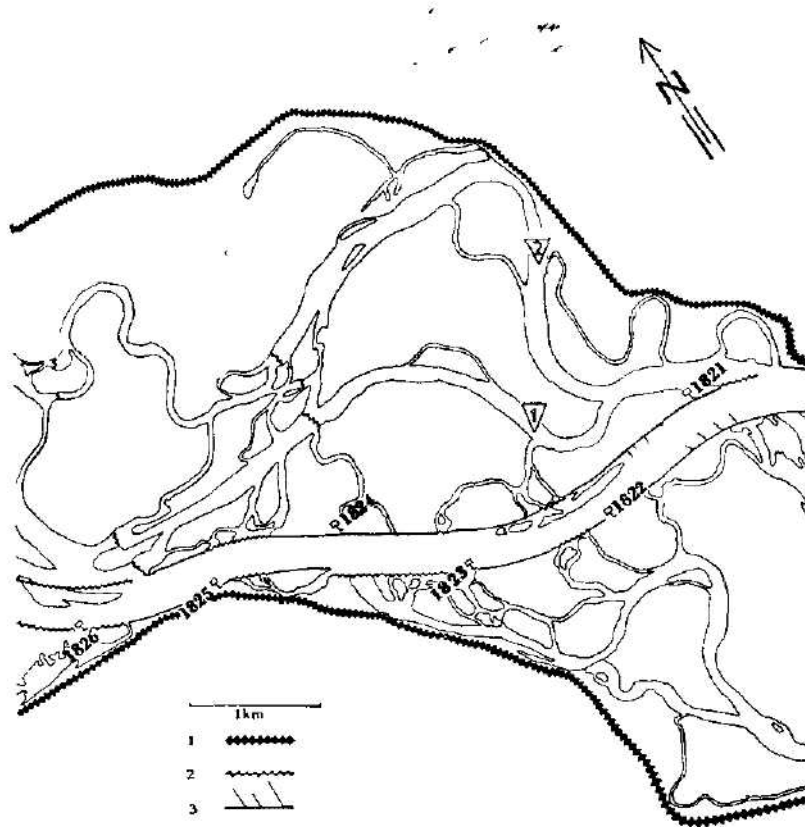


Abb 1. Situationsschema der Donaunebenarme bei Baka mit Bezeichnung der Entnahmestellen an denen *Hypania invalida* Grube festgestellt wurde (Erklärung: 1 – Hochwasserschutzdamm, 2 – Betondamme die schliessen die Nebenarme, 3 – Querdamme aus Steinblöcke).

Röhren entledigt, in denen sie leben. In beiden Fällen wurde also nur ein einziges Exemplar gefunden, sodass *H. invalida* nur einen geringen Anteil des Makrozoobenthos bildete. An der Gesamtbandanz des Makrozoobenthos beteiligten sich folgende wichtigsten Komponenten: auf der Entnahmestelle im Arm „A“ *Dreissena polymorpha* mit 58,6 %, *Oligochaeta* mit 21,5 % und *Chironomidae* larvae mit 14,1 %; auf der Entnahmestelle im Arm „B“; *Oligochaeta* mit 66,4 % und *Chironomidae* larvae mit 28,4 %, soweit die *H. invalida* nur mit 0,2 % resp. 0,4 % vertreten wurde.

Das erste Exemplar hatte eine Körpergrösse von 11 mm, das zweite von 13 mm, (gemessen nach der Fixation mit 4 % Formaldehyd), was der durchschnittlichen Grösse dieser Art entspricht (Russev, Marinov 1964; Kothé 1968). Die äus-

serliche Morphologie des Körpers (siehe Abb. 2) ist prinzipiell mit der in den Arbeiten von Motas, Bacescu 1938, Gerlach l. c. und Hartmann — Schroder l. c. angeführten Beschreibung identisch, bis auf die unvollständige Anzahl der Tentakeln, die höchstwahrscheinlich bei dem Durchwaschen der Proben abgerissen wurden.

Über die Biologie von *H. invalida* weiss man verhältnismässig wenig. Nach Beling 1926, Annenkova 1930 und Popescu 1964 handelt es sich um ein sedentäres Tier, welches eine Röhre bewohnt, in welche auch die Eier 40—100 Stück) abgelegt werden und in welcher sich dieses bis zur Erwachsenheit entwickelt. Es wird vermutet, dass diesem Tier Detritus als Nahrung dient, insbesondere die sich an Stellen mit verlangsamter Strömung dauernd absetzenden organischen Stoffe (Weber 1964).

In ökologischer Hinsicht handelt es sich um eine weitgehend euryhaline, euri-thermale und eurybathische Art. Diese breite ökologische Valenz erklärt ihr Vorkommen sowohl in Meeren mit hoher Salinität (Kaspisches Meer), als auch im Süsswasser, welches für die artenmässig sehr reiche Klasse der Polychaeten mit Ausnahme einiger weiteren Arten unbewohnbar ist (Kothé l. c.).

Was die Anforderungen an die Wasserströmung betrifft, ist diese Art mehr limnophil als rheophil und kommt an Stellen mit stehendem bis langsam fliessendem Wasser — weniger als 0,6 m/sec. — vor (Weber l. c.). Der hohe Grad an Anpassungsfähigkeit von *H. invalida* äussert sich gleichfalls bei der Wahl des Substrates. Sie bewohnt die verschiedensten Typen des Untergrundes wodurch ihre Angehörigkeit sowohl zu den pelorheophilen Biozönosen begründet wird (Brezeanu, Prunescu — Arion 1962, Weber l. c., Popescu 1963), als auch zu den psammorheophilen Biozönosen und argillo-rheophilen Biozönosen (Olivari 1961, Kothé l. c.) den lithorheophilen Biozönosen (Bacescu 1949, Russev, Marinov l. c.) und sogar der anthropogenen scoriorheophilen Biozönose (Russev 1963, Ferencz 1969).

Das Areal der Verbreitung von *H. invalida* umfasst das Kaspische, Asowsche und Schwarze Meer und die unteren Abschnitte der Zuflüsse dieser Meere — Wolga, Dnjepr, Bug, Dnestr und Donau. (Hartmann — Schröder l. c., Morduchaj — Boltovskoj 1964). Es handelt sich also um ein typisch pontokaspisches Faunenelement. Im Einzugsgebiet der Donau wurde *H. invalida* an folgenden Stellen festgestellt: im Deltagebiet ist sie allgemein verbreitet und häufig. So erreicht ihr Abundanz im Kilia — Arm nach Olivari (l. c.) zusammen mit der Polychaetenart *Hypaniola kowalewskii* Grimm, die gleichfalls in die Donau eindringt, bis zu 5280 Exemplare pro 1 m². In den Armen St. Georg und Sulina sind die Polychaeten gleichfalls ein dominanter Bestandteil des Zoobenthos (Brezeanu, Prunescu — Arion l. c., Popescu l. c.). Neben den erwähnten zwei Arten kommt hier noch eine weitere Art — *Manayunkia caspica* Annenk. vor. Im bulgarischen Abschnitt der Donau ist *H. invalida* gleichfalls weit verbreitet. Nach Russev und Marinov (l. c.) erreicht ihre durchschnittliche Abundanz im ganzen bulgarischen Abschnitt den Wert von 41 Exemplaren pro 1 m². Die grösste Abundanz stellen diese Autoren im Stromkilometr 747 fest — 11 467 Exemplare pro 1 m². Im rumänischen Abschnitt der Donau, 150 km oberhalb der Deitas und im Gebiet des Eisernen Tores waren die Polychaeten *H. invalida* und *M. caspica* bereits längere Zeit bekannt. (Motas, Bacescu l. c., Bacescu l. c.). Trotz intensivster Nachforschungen besonders im ungarischen Abschnitt der Donau sind keinerlei Angaben über deren Vorkommen im jugoslawischen und ungarischen Donauabschnitt bekannt (Dudich, Kol 1959). Auf ungarischen Ge-

biet wurde jedoch *H. invalida* bereits in der Theiss bei Seged festgestellt (Ferencz l.c.). Im österreichischen Donauabschnitt wurde *H. invalida* trotz vorübergehender mehrjähriger Zoobenthosuntersuchungen erst im Jahr 1959 in den Stautufen Ybbs — Persenbeug (Skm 2061) und Jochenstein (Skm 2204) festgestellt. Im deutschen Donauabschnitt endlich wurde dieser Polychaet bereits ein Jahr früher als im österreichischen Abschnitt in der Staustufe Passau — Kachlet (Skm 2230) festgestellt (Kothé l.c.). Die bisherigen Fundstellen von *H. invalida* sind in Abb. 3 dargestellt.

Mehrere Autoren haben sich mit der Herkunft des Polychaeten *H. invalida* in der Donau befasst. Nach An der Laan (1967) und insbesondere nach Kothé (l.c.) handelt es sich um eine echte Reliktart, ein Überbleibsel der Fauna des einstigen Tethysmeeres, welche sich allmählich dem Leben im Süßwasser angepasst hat. Der letztgenannte Autor schliesst eine aktive Immigration aus dem Schwarzen Meer aus, da es sich um ein sedentär lebendes Tier handelt, das keinerlei grösserer Bewegungen fähig ist. Auch die Verschleppung im Aufwuchs der Schiffe wird als sehr unwahrscheinlich bezeichnet. Seine Aussage über die relikte Herkunft bezeugt Kothé (l.c.) durch eine eingehende Analyse der geographischen und geologischen Lebensbedingungen und durch den hohen Grad der ökologischen Plastizität dieser Art. Die bisherigen Fundstellen werden als Refugien alter faunistischer Elemente bezeichnet, so z. B. der Kasanpass im Gebiet des Eisernen Tores.

Andere Autoren (Weber, Brezeanu, Jankovič, 1974) lassen eine allmähliche Immigration der Art *H. invalida* aus dem Deltagebiet bis in den deutschen Donauabschnitt zu, wobei sie darauf hinweisen, dass an Stellen mit optimalen Lebensbedingungen (schwache Strömung und dauernde Sedimentation von organischen Stoffen) eine massenhafte Vermehrung erfolgt, so z. B. in den Staustufen Ybbs — Persenbeug und Jochenstein in Österreich (Weber l.c.).

Unserer Meinung nach ist keine der erwähnten Möglichkeiten ausgeschlossen. Die erste Alternative hat eine starke Stütze in den paleogeographischen und geologischen Bedingungen und entspricht auch der Meinung Brtek's (1953), dass die oberhalb des Eisernen Tores lebenden Tierarten wahrscheinlich die Aussüssung des Wassers bedeutend früher als unterhalb des Eisernen Tores lebenden durchgemacht haben, wobei dieses ein natürliches Hindernis ihrer weiteren aktiven Verbreitung in die oberen Abschnitte der Donau darstellt. Die zweite Alternative, insbesondere die Möglichkeit einer passiven Verbreitung ist dank des intensiven Schiffsverkehrs an der Donau gleichfalls sehr wahrscheinlich. Wir vermuten jedoch, dass ihr Vorkommen im tschechoslowakischen Abschnitt der Donau sehr sporadisch bis selten ist. Auf dieses weist einesteils die Tatsache hin, dass von einer Gesamtanzahl von 186 Probenentnahmen, welche im Laufe unserer bisherigen Untersuchungen an den genannten Fundstellen durchgeführt wurden, nur in zwei Proben *H. invalida* und jeweils nur 1 Exemplar festgestellt wurde, und andererseits die Tatsache, dass trotz Untersuchungen keiner der sich bisher mit der benthischen Fauna des tschechoslowakischen Donauabschnittes befassenden Wissenschaftler (Brtek, l.c., Ertlová 1968, 1970, 1973, Rothschein 1976 und insbesondere Hrabě 1941) diesen Polychaeten festgestellt hat. Das vereinzelte Vorkommen ist wahrscheinlich auch dadurch bedingt, dass der tschechoslowakische Donauabschnitt mit seinem überwiegend alpinen Charakter den Polychaeten keine geeigneten Lebensbedingungen bietet.

Die insbesondere im Zusammenhang mit dem geplanten Bau der Wasserkraftwerke Gabčíkovo—Nagymaros immer intensiver sich gestaltenden Untersuchungen der Hydrofauna der Donau werden sicher mehr Licht auch in die Frage des Vorkommens von Polychaeten in der Donau bringen.

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- Bemerkung: die mit † bezeichneten Arbeiten hatte ich nicht im Original zur Verfügung.

Die Abbildungen 2 und 3 sind am Ende des Heftes zu finden.

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NFW PALEARCTIC ANUROPHORINAE (COLLEMBOLA)

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Received July 18, 1977

Abstract: One new genus and two new species from the subfamily Anurophorinae (Isotomidae) are described *Tiancanthella martynovae* gen. nov. sp. nov. from West Tian-Shan and *Tetracanthella gruuae* sp. nov. from South Carpathians. A key to all described *Tetracanthella*-species of the *arctica*-group is given.

Tiancanthella gen. nov.

• **Diagnosis:** Member of the subfamily *Anurophorinae* Börner, 1901 (fam. *Isotomidae*). Body shape resembling *Tetracanthella* Shött, 1891 except last abdominal tergite. Length of preadult specimen is 700 μ m, bluish-gray. Dorsal side of body with reticulated integument. Macrochaetae well differentiated from the microchaetae. Last abdominal tergite with 4 + 4 anal spines on distinct papillae. Retinaculum and furca entirely missing.

Type species: *Tiancanthella martynovae* sp. nov.

Affinities: The new genus is related to *Tetracanthella* Shött, 1891 in having the dorsal side of body reticulated, in the macrochaetae repartition, chaetotaxy of legs, the shape of claw and empodial appendage, etc. The most important character placing *Tiancanthella* to the vicinity of *Tetracanthella* is the morphology of abdominal segments IV–VI. The confusion of tergites IV + V and morphology of sternites and paratergites IV–VI is the same in both genera, with the exception of furcal and retinacular areas. *Tiancanthella* gen. nov. differs from *Tetracanthella* in the absence of retinaculum and furca and in having 2 + 2 more anal spines in front of the last abdominal tergite. All spines are on high papillae with reticulated integument.

Derivatio nominis: The name is derived from Tian-Shan mountain system in the western part of which the locus typicus of the type species lies.

Tiancanthella martynovae sp. nov.

(Fig. 1–7)

Description: Body *Tetracanthella*-like (Fig. 1–2) with the exception of the last abdominal segment, 690 μ m long and 130 μ m wide, bluish-gray. Integument of the dorsal side of body with fine reticulation which is on medial part of nota and third abdominal tergite slightly larger. Largest reticulation between medial chaetae on abdominal tergite IV (Fig. 3). Posteriorly and in front of each tergite small granulae occur. Chaetotaxy of dorsal side of body as in Fig. 1 and 2. Microchaetae on head 10 μ m long, those on

meso- and metanotum 12–15 μm , on abdominal tergites I–III 15–20 μm . Macrochaetae well differentiated. On head one ocular (20 μm), two posterior (17–20 μm) and one lateral (30 μm) macrochaetae occur. Dorsomedial macrochaetae present on abdominal tergites I–IV (31 μm , 40 μm , 50 μm and 50 μm long). Lengths (in μm) of intermedial macrochaetae on meso-, metanotum, abdominal tergites I : II : III : IV (anterior and posterior) — 35 : 35 : 35 : 46 : 55 : 54 and 35. Lengths (in μm) of lateral macrochaetae on meso-, metanotum and abdominal tergites I : II : III : IV — 47 : 47 : 47 : 47 : 47 : 37. 2 + 2 medial macrochaetae present on abdominal tergites I–III (Fig. 2). One intermedial and three lateral sensory rods present on meso- and metanotum (Fig. 1). Repartition of sensory rods on abdominal tergites as in Fig. 2.

Antennae with distinct bases (Fig. 1), as long as head : 130 (μm). Lengths of antennal segments I : II : III : IV — 20 : 30 : 30 : 50 (μm). Antennal organ III consists of two sensory hairs and two short, slightly bent, unprotected sensory rods.

Postantennal organ elliptical (Fig. 5), 13 μm long and 5 μm wide. 7 + 7 eyes (Fig. 5), G and H smaller.

Claw (Fig. 6) without teeth, 18 μm long; empodial appendage narrow, 4 μm long. Tibiotarsal tenent hairs acuminate, 1, 2, 1 in number on legs I, II, III.

Ventral tube with 5 + 5 (?) chaetae. Abdominal sternite III with one medial chaeta, retinaculum missing (Fig. 7). Without trace of furca (Fig. 7).

8 anal spines present on last abdominal tergite (Fig. 4). They are on high papillae with reticulated integument. Anterior row consists of 2 + 2 spines 20 μm long, medial pair of spines 13 μm long and the posterior one is thickest and 22 μm long.

Only juvenile specimens present. Holotype before moulting, chaetotaxy of preadult female visible under the old exuvia.

Remark: All species are juvenile. One specimen (holotype) was in moulting. The chaetotaxy and genital orifice of a preadult female are visible under the old cuticula. Due to the juvenility, the lengths of some organs, macrochaetae, as well as number of the microchaetae given in the description must not correspond with these in mature animals.

Locus typicus: USSR, Uzbekista, West Tian-Shan mountain system, G. Bol. Chimgan, about 90 km ENE of Taschkent, 3 May 1976 13 specimens in sample of mosses from a rock, leg. L. Hlaváčková.

Holotype No. 3 V. 1976/A-371 and paratypes in author's collection, one paratype in the collection of Dr. E. P. Martynova, Institute of Entomology of the University, Leningrad.

Derivatio nominis: Dedicated to Dr. E. P. Martynova, Department of Entomology of the University, Leningrad, whose work is furthering knowledge on Asian Collembola.

Tetracanthella gruiae, sp. nov.

(Fig. 8–14)

Diagnosis: Body 1300 μm long, dark blue. Abdominal tergites I–II without dorsal macrochaetae. All macrochaetae acuminate. 3 + 3 medial microchaetae on abdominal tergites I–IV. 8 + 8 eyes. Claw without teeth, tibiotarsal hairs 1, 2, 2 in number. Retinaculum with 3 + 3 teeth and without chaeta. Furca with mucro, dens with 4 chaetae.

Description: Body of typical *Tetracanthella*-shape (Fig. 8,9). 1310 μm long and 320 μm wide. Dark blue. Integument of dorsal side of body with large reticulation of *pilosa*-type, posteriorly and in front of tergites smaller (Fig. 10). Dorsal chaetotaxy as in Fig. 8 and 9. Microchaetae on anterior tergites 18–25 μm , these on posterior ones 30–40 μm long. Macrochaetae well differentiated. Without dorsal macrochaetae (Md) on abdominal tergites I and II. All macrochaetae acuminate (Fig. 10). Lengths of macrochaetae: dorsal macrochaeta on abdominal tergite III 70 μm , IV 80 μm ; ocular macrochaeta 47 μm , posterior macrochaeta on head 63 μm ; intermedial macrochaeta (Mi) on mesonotum: metanotum: abdominal tergites I:II:III:IV as 60:62:65:72:83:88 μm ; lateral macrochaetae on mesonotum: metanotum: abdominal tergites I:II:III:IV (anterior and posterior) as 78:78:67:78:83:88 and 90 μm . 3+3 medial microchaetae present on abdominal tergites I–IV (Fig. 8). Antennae with distinct bases (Fig. 9), nearly as long as head. Antennae: head as 205:210 μm . Antennal segments I:II:III:IV — 30:50:45:80 μm . Antennal organ II consists of 2 sensory hairs and two short, bent sensory rods partly concealed by a low integumentary fold.

Postantennal organ (Fig. 9) narrowly-elliptical, slightly bent in middle, about 2.3 times longer than the diagonal of front eye. 8+8 eyes present, G and H smaller (Fig. 9).

Claw (Fig. 12) without teeth, 30 μm long, empodial appendage narrow, with fine apical bristle, 15 μm long. Tibiotarsus of first pair of legs with 1, those of second and third pair with 2 dorsal clavate tibiotarsal hairs (Fig. 12). Ventral side of femur of all pairs of legs with one acuminate macrochaeta.

Ventral tube with 5+5 chaetae. Retinaculum (Fig. 11) with 3+3 teeth on rami and without chaetae on corpus. Furca (Fig. 13) reaching to the middle of third sternum. Mucro present, with apical and anteapical teeth. Dens with one ventral and 3 dorsal chaetae (Fig. 13), manubrium with 24 chaetae on dorsal side (Fig. 13). Manubrium: dens: mucro as 70:40:8 μm .

Anal spines on distinct papillae, anterior ones 23 μm , posterior ones 30 μm long (Fig. 8). Anal spines yellow.

Affinities: The new species belongs to the *arctica*-group created here for the *Tetracanthella*-species without dorsomedial macrochaetae (Md) on abdominal tergites I and II. *Tetracanthella gruiae* sp. nov. differs from all species of the *arctica*-group in the chaetotaxy of dentes. A key to all described species of the *arctica*-group follows at the end of this paper.

Locus typicus: Romania, South Carpathian mountains system. Muntii Bucegi, Omul (north of Sinaia), about 2470 m a. s. l., 23 September 1966 661 specimens in a qualitative soil sample from rock crevices (conglomerate) with cushions of mosses, *Sempervivum* sp., *Sedum* sp. and grasses. Soil type: pararendzina, greyish-brown in colour, stony, moist. Leg. J. Rusek.

Further locality: Romania, South Carpathian mountain system, Muntii Bucegi, Virful cu Dor north of Sinaia, 2 km east of Virful cu Dor (terminal of mountain lift), about 1950 m a. s. l., 23 Sept. 1969 6 species in quantitative soil samples from a rock (conglomerate) with cover of *Festuca* sp., *Sempervivum* sp., *Saxifraga aizoon*, *Silene acaulis*, *Gentiana* sp., *Dianthus* sp., mosses and lichens. Soil profile 15 cm deep, black-brown, moist. Soil type: pararendzina. Leg. J. Rusek.

Ecological notes: *Tetracanthella gruiae* sp. nov. lives in great abundance in slightly developed, stony soils in rock crevices with cushions of mo-

ses. *Sempervivum*, *Sedum*, etc. above the tree line. It lives here together with *Pseudisotoma sensibilis*, *Hypogastrura parva*, *Isotomurus palliceps*, *Onychiurus* sp. and some other recedent species.

Holotype ♂ No. 23. IX. 1969/A-421 and the paratypes in author's collection, one paratype in Dr. M. Gruia's collection (Bucuresti), one paratype in the collection of British Museum (Natural History), London.

Derivatio nominis: Dedicated to Dr. M. Gruia, Institutul de Speologie „E. Racoviță“, Bucuresti, who has contributed extensively to the knowledge of the Rumanian Collembola.

Key to all known *Tetracanthella*-species from the *arctica*-group

1. Furca reduced, mucro missing. Dens with 3 chaetae. Retinaculum with 2 + 2 teeth on rami and one chaeta on corpus. *arctica* Cassagnau, 1950
2. Dentes with 3 chaetae 3
- Dentes with more than 3 chaetae 12
3. Empodial appendage $\frac{1}{2}$ of the lengths of claw III or shorter 4
- Empodial appendage $\frac{1}{2}$ – $\frac{3}{4}$ of the lengths of claw III 7
4. Retinaculum without chaetae 5
- Retinaculum with one chaeta 6
5. 8 + 8 eyes. Dorsomedial macrochaetae on abdominal tergite III about twice as long as the medial macrochaetae. *ksenemani* Nosek, 1964
- 6 + 6 eyes. Dorsomedial macrochaetae on abdominal tergite III about 3 times as long as the medial microchaetae. *brevempodialis* Gisin, 1963.
6. Reticulation on abdominal tergites IV–VI very large (Fig. 14). Macrochaetae on last abdominal tergites knobbed on end. Dorsomedial macrochaetae on abdominal tergite III about 4 times as long as the medial microchaetae. *hydrophila* Hüther, 1964
- Reticulation on abdominal tergites IV–VI smaller (Fig. 15). Macrochaetae on all abdominal tergites acuminate. Dorsomedial macrochaetae on abdominal tergite II about twice as long as the medial microchaetae. *britannica* Cassagnau, 1959
7. Retinaculum without chaetae. Manubrium with 7 + 7 or 8 + 8 chaetae. *cassagnau* Gisin, 1962
- Retinaculum with one chaeta 8
8. Macrochaetae on thoracal and abdominal segmets knobbed on the end 9
- Macrochaetae acuminate 11
9. Mucro + dens 75–100% of the length of manubrium. Manubrium with 9(10) + 9(10) dorsal chaetae. *hygropetrica hygropetrica* Cassagnau, 1954
- Manubrium with 8(9) + 8(9) dorsal chaetae 10
10. Mucro + dens 60% of manubrium length. *hygropetrica matthesi* Gama, 1959
- Mucro + dens 63–75% of manubrium length. *hygropetrica luxemburgensis* Stomp, 1968*
11. 8 + 8 eyes. Manubrium with 7(8) + 7(8) dorsal chaetae. *tuberculata tuberculata* Cassagnau, 1954

* The differences between the subspecies are very dubious. A gradual line of the mucrodens: manubrium ratio exists from ssp. *matthesi*, trough *luxemburgensis* to *hygropetrica*. In fact, there do not exist important differences between them and only geographical isolation (?) can be used to determine the subspecies as was pointed out by Ellis (1976). Near to *T. hygropetrica* is *T. strebeli* Hüther, 1969, which has only 2 + 2 medial microchaetae on abd. tergite III (3 + 3 microchaetae in *T. hygropetrica*).

- 6 + 6 eyes. Manubrium with 7(8) + 7(8) dorsal chaetae.
tuberculata oribaicensis Cassagnau, 1954
- 12. Dens with 4 chaetae, retinaculum with 3 + 3 teeth on rami and without chaetae on corpus.
gruiæ sp. nov.
- Dens with 6 chaetae, retinaculum with 4 + 4 teeth on rami and one chaeta on corpus.
sexsetosa Martynova, 1971

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The figures will be found at the end of this issue.

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**TWO NEW SPECIES OF COLLEMBOLA FROM CULTIVATED SOILS
OF CZECHOSLOVAKIA**

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Received January 12, 1979

Abstract: Two new species of Collembola are described from cultivated soils from Czechoslovakia: *Onychiurus arvensis* sp. n. (south Moravia) and *Pseudosinella hrabei* sp. n. (central Bohemia).

In 1974 field experiments were conducted on the effects of the herbicide dinoseb-acetate on soil mesofauna. In soil samples from the experimental plots with alfalfa at Troubsko in south Moravia an undescribed species of the genus *Onychiurus* (*Onychiuridae*) was found and in samples from the second experimental area with barley at Hrnčité in central Bohemia a new species of the genus *Pseudosinella* (*Entomobryidae*) was found. Both new species are described in the present paper.

Onychiurus arvensis sp. n.

(Figs. 1-9)

Diagnosis: Body 1200 μm long. White. Chaetotaxy of plurichaetosae type, with characteristic knobbed and apically bifurcated macro- and microchaetae on the dorsal side of head and whole body. Formula of dorsal pseudocelli: 33/133/33353. Antennal segment IV without conspicuously thickened sensillae. Antennal organ III with two smooth, bent sensory clubs, two sensory rods and five protecting papillae. Postantennal organ with 10 compound vesicles. Claw without teeth, empodial appendage without inner lamella and with long apical filament. Males with ventral organ on ventral side of abdominal segments II and III. Without rudiment of furca. Anal spines two or sometimes missing.

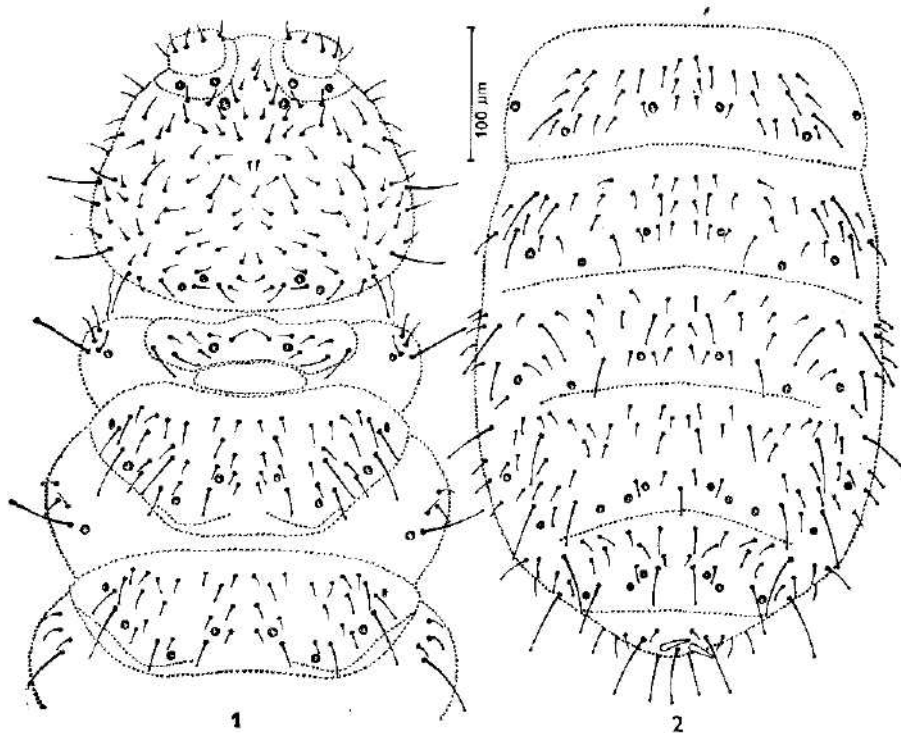
Description: Body elongated, not very thickset, 1200 μm long and 250 μm wide (Figs. 1, 2). White. Granulation uniform on the whole body, secondary granules 2.5-3 μm in diameter. Chaetae well differentiated into macro-, meso- and microchaetae. (Figs. 1, 2, 3). Longest macrochaetae 45 μm long. Many chaetae knobbed and bifurcated apically (Figs. 1, 2, 3, 5, 8). Only some microchaetae acuminate. Chaetotaxy of plurichaetosae type (Figs. 1, 2).

Pseudocelli (Figs. 5, 8) 7 μm in diameter, occur as follows (Figs. 1, 2): 32/133/33353, ventral side: 2/??/0112. Additional pseudocellus on the base of each leg.

Antennae shorter than head (150:210 μm). Length of antennal segments I:II:III:IV as 25:40:30:55 μm . Antennal segment IV without conspi-

cous thickened sensillae. Antennal organ III consists of two smooth, bent sensory clubs, two sensory rods between them and five protecting papillae (Fig. 4).

Postantennal organ (Fig. 5) in shallow, broad depression, 35 μm long. It consists of 10 compound vesicles. Claw without teeth (Fig. 7), 30 μm long. Empo-



Figs. 1-2. *Onychiurus arvensis* sp. n.: 1 - dorsal chaetotaxy of head and thorax; 2 - dorsal chaetotaxy of abdomen. Scale: Figs. 1-2: 100 μm .

dial appendage 18 μm long, without inner lamella and with long filament (Fig. 7). Tibiotarsus without clavate tenet hairs (Fig. 7).

Ventral tube with 6 + 6 chaetae. Males ventral organ on second and third sternites (Fig. 6). Genital plate of males as on Fig. 9. Without rudiment of furca.

Two weakly developed, 25 μm long anal spines present on very low papillae on last abdominal segment (Fig. 2).

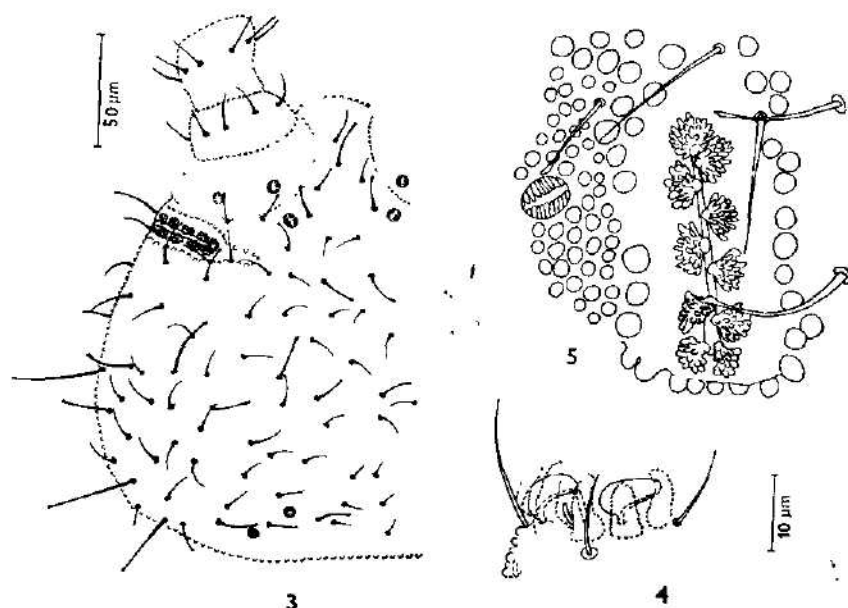
Variability: In two specimens anal spines are missing.

Affinities: The new species is far related with *Onychiurus circulans* Gisin, 1952 and *Onychiurus silvarius* Gisin, 1952. It differs from both by the number of ventral pseudocelli, by the shape of the ventral organ of males, by the weakly developed anal spines, but the most conspicuous differential character of the new species are the knobbed, bifurcated chaetae on the dorsal side of the head and body. Only *Onychiurus silesiacus* Dunger, 1977 has also some dorsal macrochaetae knobbed, but it differs from the new spe-

cies by a set of other characters: by the number of pseudocelli, by the chaetotaxy, by the male ventral organ, by the absence of anal spines, etc.

Holotype ♂ No. 2. VII. 1974/A-352 and paratypes in author's collection.

Locus typicus: Czechoslovakia, Moravia meridionalis, Troubsko (west of Brno), about 1 km north the highway Praha — Brno on alfalfa field on



Figs. 3-5. *Onychiurus arvensis* sp. n.: 3 — dorsal chaetotaxy of head and antennal segments I-II; 4 — antennal organ III; 5 — postantennal organ and granulation, chaetotaxy and pseudocellus around it. Scales: Fig. 3: 50 μ m; Figs. 4,5: 10 μ m.

eastern slope. 2. VII. 1974 6 specimens in soil samples.

Derivatio nominis: The name is derived from locus typicus — cultivated field (with alfalfa) where the new species lives.

Pseudosinella hrabei sp. n.

(Figs. 10-14)

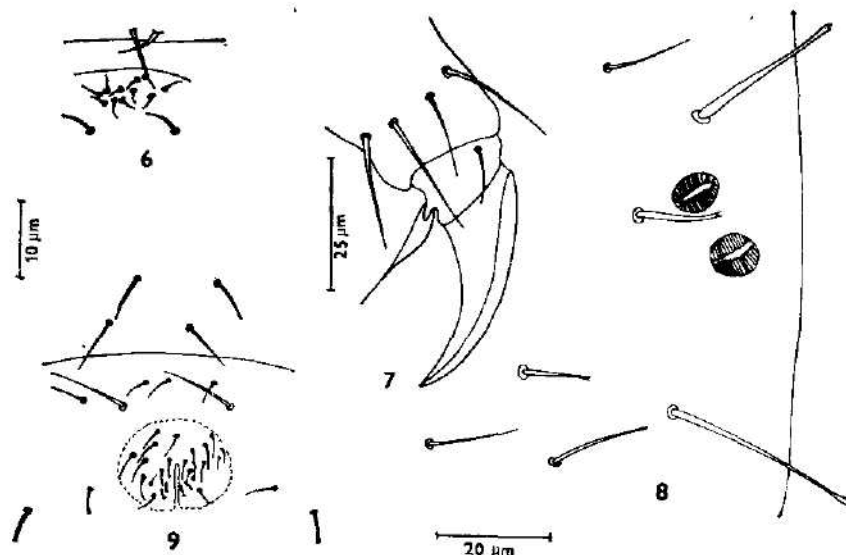
Diagnosis: Body 1500 μ m long. White. Without eyes. Labial chaetotaxy M_1M_2 — EL_1L_2 , chaetae in frontal row weakly ciliated. Dorsal chaetotaxy $R001/00/0201 + 2$. Chaetotaxy of abdominal tergite II: $pABq_1q_2$. Abdominal tergite IV with microchaeta s. Claw with two distal and two proximal teeth on inner lamella. Empodial appendage with large outer tooth. Tibio-tarsal tenent hair weakly spatulated apically. Trochanteral organ with 11 chaetae.

Description: Body 1500 μ m long. White. Without eyes. Antennae longer than head, as 505:270 μ m. Antennal segments I:II:III:IV as 60:125:125:195 μ m. All antennal segments without scales. Antennal organ III consists of two thickened, slightly bent sensory roods and some further sensory hairs, dispersed on the dorsal and dorsolateral surface of antennal

segment III. Antennal organ II consists of one thin sensory rod and some smooth sensory hairs. Antennal segment IV without apical bulb and with numerous smooth sensory hairs between the ciliated chaetae.

Praelabral and labral chaetae smooth. Formula of labral chaetotaxy 4/554.

Labium with chaetal arrangement $M_1M_2 - EL_1L_2$ (Fig. 13). Frontal row of labial chaetae weakly ciliated (Fig. 13).



Figs. 6-9. *Onychiurus arvensis* sp. n.: 6 - male ventral organ; 7 - claw III; 8 - chaetotaxy around the medial pair of pseudocelli on abdominal tergite V; 9 - male genital area. Scales: Figs. 6, 9: 10 μ m; Fig. 7: 25 μ m.

Formula of dorsal macrochaetae: R001/00.0201 + 2 (Figs. 10-12). Chaetotaxy of abdominal tergite II: pABq₁q₂ (Fig. 10). Microchaetae present on abdominal tergite IV (Fig. 12).

Claw of third pair of legs (Fig. 14) 35 μ m long, with two proximal, two distal, one dorsal and two lateral teeth. Empodial appendage 19 μ m long, with large outer tooth (Fig. 14). Claws of the first and second pair of legs of the same shape as on third pair. Tibiotarsal tenent hair weakly spatulated apically (Fig. 14), 22 μ m long. Trochanteral organ consists of 11 smooth chaetae.

Manubrium: dens: mucro as 260:300:12 μ m. Apical part of dens (70 μ m) not crenulated.

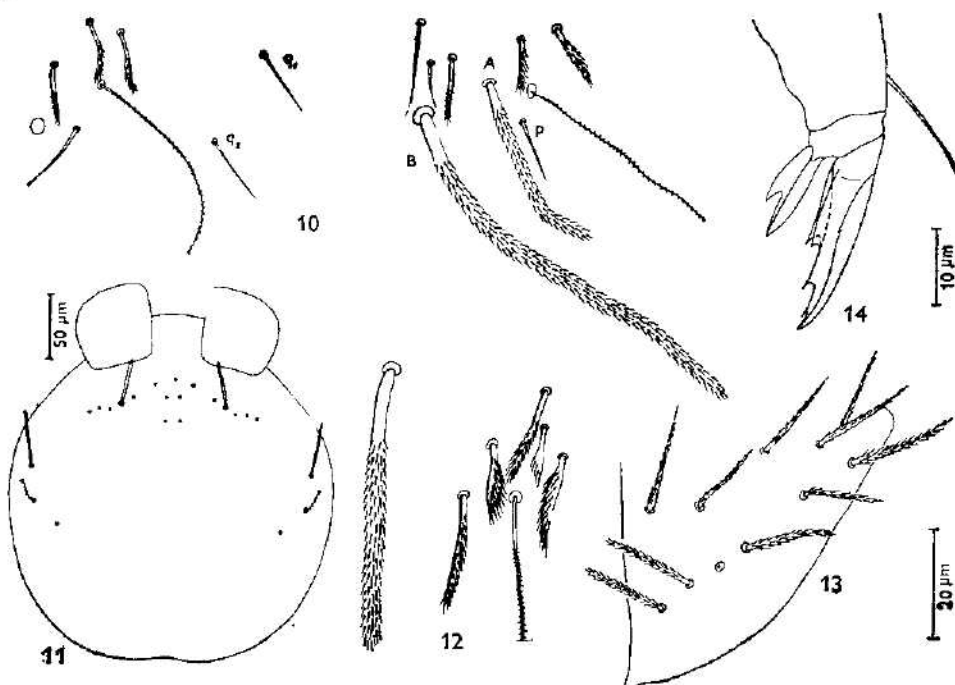
Affinities: The new species is related to *Pseudosinella anderseni* Gisin, 1967. *Pseudosinella hrabei* sp. n. differs from it by two distal teeth on ventral lamella of claw (one distal tooth in *P. anderseni*), by the weakly spatulated tibiotarsal tenent hair (acuminate in *P. anderseni*), by longer antennae (antennae: head 1.8 in the sp. n. and 1.5 in *P. anderseni*) and by the absence of the chaeta r on the labium.

Holotype No. 11. V. 1974/A-340 and paratypes in author's collection.

Locus typicus: Czechoslovakia, Bohemia centralis, Hrnčiče near Pra-

ha (west of Průhonice), field of barley, 300 m north of cemetery. 11. V. 1974
35 specimens in soil samples.

Derivatio nominis: The new species is dedicated to my teacher of zoology, Prof. Dr. Sergej Hrabě, DrSc. of the J. E. Purkyně University in Brno, a well-known zoologist and specialist in Oligochaeta, on the occasion of his 80th birthday.



Figs. 10–14. *Pseudosinella hrabei* sp. n.: 10 – dorsal chaetotaxy of abdominal tergite II; 11 – dorsal chaetotaxy of head; 12 – chaetotaxy around frontal trichobothrium on abdominal tergite IV; 13 – chaetotaxy of labium; 14 – claw III. Scales: Fig. 14: 10 μ m; Figs. 10, 12, 13: 20 μ m; Fig. 11: 50 μ m.

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ON SOME OXYURID NEMATODES OF THE GENUS *TACHYGONETRIA*
PARASITIZING TORTOISES IN AFGHANISTAN AND ALBANIA¹

Bohumil RYSAVÝ and Sylvester JOHNSON

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Abstract: Nematodes belonging to the oxyurid genus *Tachygonetria* Wedl, 1862 have been studied. *Tachygonetria conica conica* (Drasche, 1884) Petter, 1966 and *T. c. nicollei* (Seurat, 1918) Peter, 1966 are considered to be conspecific. *T. robusta* (Drasche, 1884) is compared with earlier accounts from different hosts and geographical regions. *T. longicollis* (Schneider, 1966) Petter, 1966 and *T. l. pusilla* (Seurat, 1918) Petter, 1966, and not as many subspecies or varieties (Petter, 1966) which are regarded as synonyms of one or the other these. *T. macrolaimus palearcticus* Petter, 1966 is compared with the earlier account given by Peter (1961). *T. ro-sickyi* sp. n. is described from *Testudo horsfieldii* and compared with all the other palaeartic forms in the genus.

A large number of nematodes were collected by the senior author from *Testudo hermanni* L. at Butrinti, Albania, during the Czechoslovak Parasitological Expedition organised by Institute of Parasitology to that country in May 1958. The worms from *Testudo horsfieldii* Gray were collected by Prof. Dr. E. Kullmann, Institute of Applied Zoology, University of Bonn, Bonn, in the vicinity of Kabul, Afghanistan, in April 1965. A study of the material revealed the presence of quite a few nematode genera. An account of some of the species belonging to the oxyurid genus *Tachygonetria* Wedl, 1862 is being presented here.

RESULTS

1. *Tachygonetria conica* (Drasche, 1884) (Fig. 1)

Syn.: *Oxyuris conica* Drasche, 1884; *Tachygonetria nicollei* Seurat, 1918; *Tachygonetria conica* ♀ only sensu Thapar, 1925 and Dubina, 1949; *Tachygonetria stylosa* ♂ sensu Thapar, 1925; *Tachygonetria longicollis* ♂ sensu Thapar, 1925 and Dubinina, 1949; *Tachygonetria lobata* Dubinina, 1949, *Tachygonetria conica conica* (Drasche, 1884) Petter, 1966; *Tachygonetria conica nicollei* (Seurat, 1918) Petter, 1966.

Host: *Testudo hermanni* L.

Location: Colon.

Locality: Butrinti, Albania.

Tachygonetria conica (Drasche, 1884) is very commonly met within tortoises. It has been reported from *Testudo graeca* by Drasche (1884), Seurat (1918), Thapar (1925), Shad at al. (1960) and Petter (1966); from *T. horsfieldii* by Dubinina (1949); from *T. hermanni* by Ditmann (1965) and

¹ This study was realised in the Institute of Parasitology (Czechoslovak Academy of Science(s) in Prague and supported by the UNESCO.

Petter (1966). Our material, collected from *T. hermanni*, included a number of mature males and females. The females appear to be longer and more robust while the males not much different than reported hitherto. The principal measurements are set against those of earlier authors in Table 1.

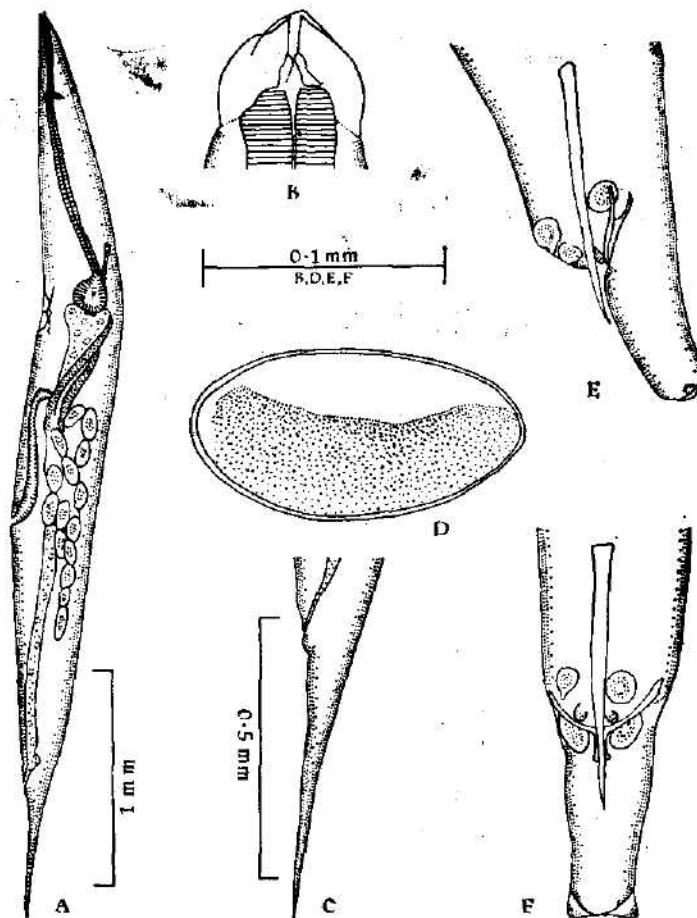


Fig. 1: *Tachygonetria conica* (Drasche, 1884). Female: A. Entire, B. Anterior end, C. Posterior end, D. Egg; Male: E. Lateral view, F. Ventral view.

Discussion. Petter (1966) split *Tachygonetria conica* into two subspecies, viz. *T. conica conica* and *T. conica nicolleti*. Morphologically the two are identical but show some difference in the size of the head and the length of the tail in the females. Although the "size of the head" is not mentioned, the length of the tail has been given as 340 μm for *T. c. conica* and 300 μm for *T. c. nicolleti*. However, "Il est connu en Parasitologie que la taille d'un Parasite varie avec la taille de l'hôte et le pourcentage d'infestation" (Petter, 1966). Again, discussing the important characteristics of *Tachygonetria conica*, Petter (l.c.) remarks "La longueur de la queue des femelles varie avec

Table 1. Principal measurements for *Tachygasteria conica* (Drasche, 1884) (All measurements are in mm).

Author Host: <i>Testudo</i> sp. Distribution Dimensions	Our data <i>T. hermanni</i> Albania		Dubina, 1949 <i>T. horsfieldii</i> Tadjikistan		Petter, 1961 <i>T. gracca</i> Algeria		Ditmann, 1965 <i>T. hermanni</i> Zoological Garden Berlin	
	Female	Male	Female	Male	Female	Male	Female	Male
Length	4.3—4.41	1.85—2.25	2.8—3.4	1.70—1.75	3.56	2.23	3.59	2.77
Maximum thickness	0.42—0.43	0.18—0.19	0.20—0.29	0.10—0.17	0.30	0.14	0.32	0.22
Oesophagus	1.41—1.48	0.78—0.81	1.15—1.26	0.90—0.93	1.35	0.87	1.36	0.84
Nerve ring from anterior end	0.37—0.38	0.16—0.165	?	?	0.23	0.2	?	?
Excretory pore from anterior end	1.43—1.49	0.97—0.99	?	?	1.3	0.91	1.15	1.05
Tail	0.56—0.58	0.065—0.071	0.33—0.40	0.08—0.085	0.35	0.055	0.45	0.046
Vulva from anterior end	1.78	—	2.43—2.46	—	—	1.8—2.1	—	2.2
Eggs	0.138—0.14	—	0.126—0.135	—	0.15	—	?	—
	0.074—0.076	—	0.055—0.062	—	0.075	—	—	—
Spicule	—	0.112—0.114	—	0.130—0.145	—	0.12	—	0.119

Table 2. Principal measurements for *Tachygasteria robusta* (Drasche, 1884)
(All measurements are in mm)

Author Host: <i>Testudo</i> sp. Distribution Dimension	Our data <i>T. horsfieldii</i> Afghanistan		Dubinina, 1949 <i>T. horsfieldii</i> Tadjikistan		Petter, 1962 <i>T. gracca</i> Algeria	
	Female	Male	Female	Male	Female	Male
Length	6.32—6.84	2.803—2.83	4.8—5.0	1.45—2.50	7.0—7.6	2.88
Maximum thickness	0.70—0.73	0.26—0.27	0.57—0.70	0.155—0.245	0.70	0.17
Oesophagus	1.72—1.76	0.732—0.75	1.62—1.77	0.62—0.95	1.9	1.0
Nerve ring from anterior end	0.31—0.32	0.19—0.196	?	?	0.26	0.10
Excretory pore from anterior end	1.91—1.96	0.91—1.02	?	?	2.3	1.1
Tail	0.24—0.27	0.04—0.045	0.30—0.38	0.065	0.20	0.03
Vulva from anterior end	3.31—3.35	—	2.6—3.0	—	4.25	—
Eggs	0.115—0.168	—	0.162—0.179	—	0.18—0.09	—
	×	—	×	—	—	—
Spicule	0.082—0.087	0.108—0.11	0.09—0.10	0.10—0.12	—	0.11

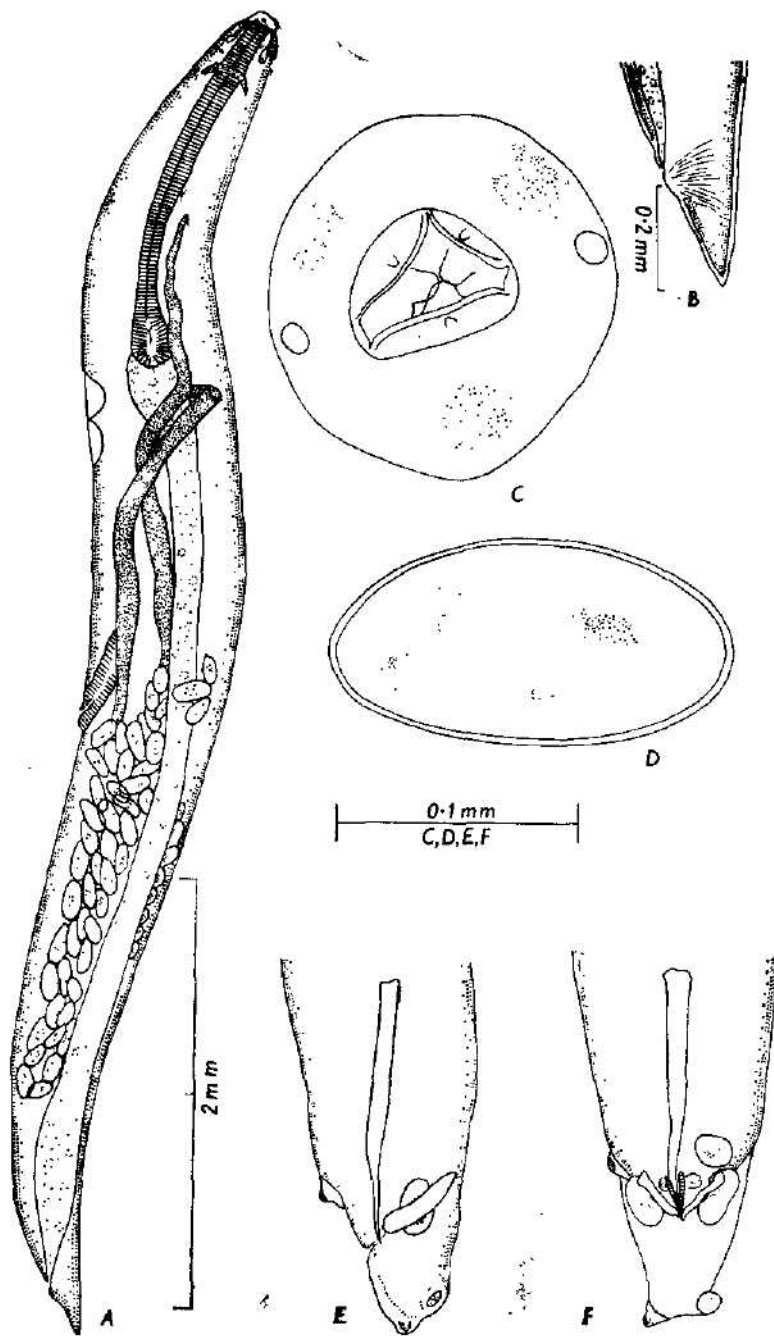


Fig. 2: *Tachygonetria robusta* (Drasche, 1884). Female: A. Entire, B. Posterior end, C. En face view, D. Egg; Male: Posterior extremity, E. Lateral view, F. Ventral view.

Phôte". Thus, under the circumstances, the dimensional differences between the two subspecies do not appear significant enough to warrant their erection and it is thought that the two forms are conspecific and should be treated as synonyms.

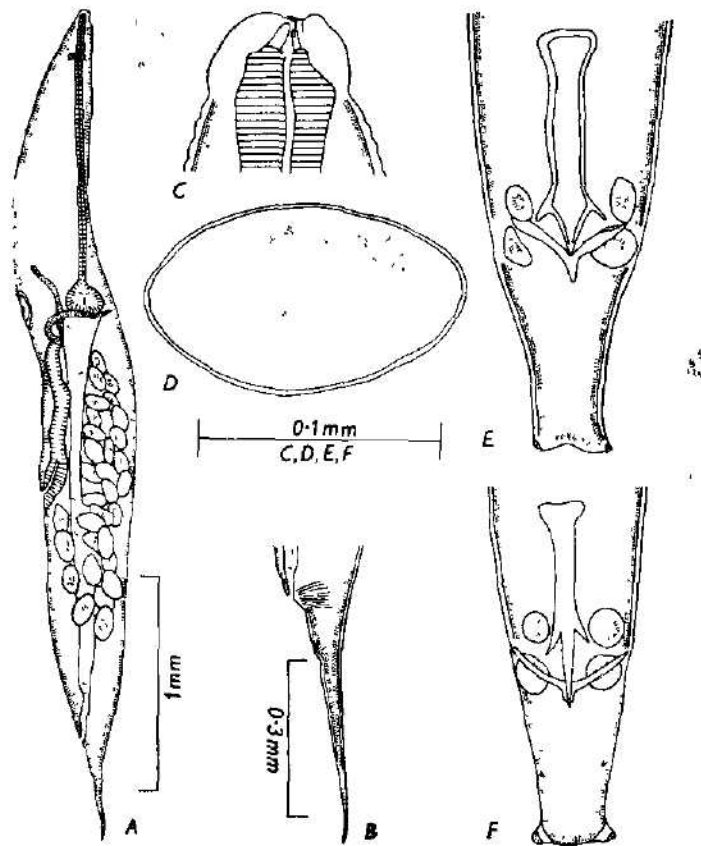


Fig. 3: *Tachygonetria longicollis pusilla* (Seurat, 1918) Petter 1966. Female: A. Entire, B. Posterior end, C. Anterior end, D. Egg; Male: Posterior extremity, ventral view, E. from *Testudo hermanni*, F. from *Testudo horsfieldii*.

2. *Tachygonetria robusta* (Drasche, 1884)

(Fig. 2)

Host: *Testudo horsfieldii*.

Location: Colon.

Locality: Kabul, Afganistan.

Tachygonetria robusta has been reported from *Testudo graeca graeca*, *T. g. zarudnyi*, *T. hermanni*, *T. kleimanni* and *T. horsfieldii* (Peter, 1966). Dubinina (1949) studied this species from *T. horsfieldii* from Tadjikistan. Our specimens, from the same host but from Afganistan, appear to be larger and more robust than hers, with the exception of the tail in both the sexes and the eggs in the females which are smaller. A chitinous sheath enveloping the

distal end of the acicular spicule is present in our specimens. Dubina (l.c.) very briefly described the spicule as being straight, and, unfortunately, figured only the lateral aspect of the posterior extremity of the male. Thus, it is not possible to ascertain whether the sheath is present or not. Petter (1962, 1966) also figured and described such a sheath for her specimens collected from *Testudo graeca* from Algeria. The sheath, better developed on the dorsal side, measures 21 μm in our specimens and 28 μm in those of Petter. As compared to Petter's material the present one appears to be somewhat smaller and slimmer for both the sexes, only the nerve ring is situated more posteriorly in the latter. It would, therefore, appear that *Tachygonetria robusta* specimens are larger and more robust in *Testudo graeca* compared to those from *T. horsfieldii* (Table 2).

3. *Tachygonetria longicollis* (Schneider, 1886)

(Fig. 3)

Host and locality: *Testudo hermanni*, Butrinti, Albania; *T. horsfieldii*, Kabul, Afganistan.

Location: Colon.

A number of worms representing *Tachygonetria longicollis* (Schneider, 1886) were found among those collected from *Testudo hermanni* as well as from *T. horsfieldii*. The principal measurements for our material, along with those for the other subspecies (Petter, 1966), are tabulated in Table 3.

Discussion: According to the geographical regions of prevalence, Petter (1966) divided *Tachygonetria longicollis* into two main groups, viz. North African species existing in the palearctic region and the South African species. She split the former into three subspecies: *T. longicollis longicollis* (Schneider, 1886) Petter, 1966, *T. l. pusilla* (Seurat, 1918) Petter, 1966 and *T. l. setosa* (Seurat, 1918) Petter, 1966. *T. l. longicollis* is further considered to vary with the host and, thus, two varieties of have been reported, one from *Testudo graeca zarudnyi* in Iran and the other from *T. horsfieldii* in Tadzhikistan. From the latter a variety of *T. l. pusilla* has been reported. Thus, the North African species comprises three subspecies and three varieties (Petter, 1966).

Apart from some differences in the size of the worms, particularly the tail in the female, the three subspecies are distinguished from each other mainly by the distal end of the spicule of the male. In *T. l. longicollis* the distal end of the acicular spicule ends in a simple point and its two varieties differ from it, as also from each other, in the size of the tail in the female; in *T. l. pusilla* it possesses two pairs of barbs, while in its variety from *T. horsfieldii* the spicule is truncated immediately posterior to the barbs; in *T. l. setosa* there is one pair of lateral lobes simulating fleur de lys.

The South African form, *Tachygonetria longicollis fitzsimonsi* Petter, 1966, differs from the North African subspecies only in the size of the body and that of the tail in the female while the males are indistinguishable (Petter, 1966).

Female. It appears that as far as the females are concerned the variation in the size of the tail, and to a lesser extent that of the body, constitutes the sole difference between the various subspecies and their varieties. If the two extremes of the length of the tail are taken into consideration the difference certainly seems to be quite appreciable. However, all sorts of intermediate forms occur between these extremes and Petter (1966) opined that: "Cepen-

Table 3. Principal measurements for
(All measurements)

Species	<i>T. l. longicollis</i>		<i>T. l. fitzsimmonsi</i>	
Author	Petter, 1966		Petter, 1966	
Host: <i>Testudo</i> sp.	<i>T. l. graca graca</i>			
Distribution	Morocco		Swaziland	
Dimensions	Female	Male	Female	Male
Length	3.75	3.1	5.4	2.75
Maximum thickness	0.35	0.18	0.35	0.18
Oesophagus	1.5	0.90	1.7	1.0
Nerve ring from anterior end	0.12	0.25	0.3	0.2
Excretory pore from anterior end	1.4	1.15	1.76	1.08
Tail	0.2	0.07	0.61	0.07
Vulva from anterior end	2.45	—	3.12	—
Eggs	?	—	0.15 × 0.07	—
Spicule	—	0.08	—	0.10

dant, il existe certains individus qui paraissent intermédiaires entre les 2 types, et si nous mesurons la longueur de la queue chez un grand nombre d'individus prélevés au hasard, nous constatons qu'elle varie d'une manière continue, si bien que nous ne savons comment délimiter les 2 sous-espèces".

Rarely in the third type of females having an identical apical structure but with a comparatively robust body, the short tail might become still shorter and massive, thus, allowing it to be differentiated from the other two types. Here again the transition appears to be a continuous one with all grades of intermediate forms which led Petter (1966) to conclude that: "Cette variété est également difficile à définir car il existe des individus intermédiaires entre elle et la variété à queue courte dont nous avons parlé plus haut." Moreover it is well known that the relative proportions of the female oxyurid vary considerably within the course of growing and, therefore, the differential proportions in their size, more often than not, represent many separate infestations of the host resulting into females of different ages and, consequently, different sizes.

Male: The structure of the spicule makes it easier to distinguish two types of males in *Tachygonetria longicollis*. In one the spicule is acicular and terminates into a simple point. Such a spicule is met with in *T. l. longicollis* and *T. l. fitzsimmonsi*. In the other, represented by *T. l. pusilla* and *T. l. setosa*, the distal end of the spicule is characterised by certain appendages in the form of barbs or lobes. In our material the spicule is more or less identical in shape in the males from *Testudo hermanni* and *T. horsfieldii*. It has neither the two pairs of barbs like *T. l. pusilla*, nor is truncated as in its variety from *T. horsfieldii*, nor one pair of lobes as in *T. l. setosa*. At best it can be said to possess a pair of short "conical processes" at its distal end. The spicule in *Testudo hermanni* material is longer, more massive and the "processes" are somewhat more posterior than in the spicule from *T. horsfieldii* material. In her exhaustive study Petter (1966) has not described or figured such a spicule.

It is interesting to note that even in the group where the spicule does

Tachygonetria longicollis (Schneider, 1866)

are in mm.)

<i>T. l. pusilla</i> Petter, 1966		<i>T. l. setosa</i> Petter, 1966		<i>T. l. pusilla</i> Our data		<i>T. horsfieldii</i> Afghanistan	
<i>T. graeca graeca</i> Morocco		<i>T. graeca graeca</i> Morocco		<i>T. hermanni</i> Albania			
Female	Male	Female	Male	Female	Male	Female	Male
3.4	3.0	4.6	?	3.78	2.58	3.92	2.64
0.30	0.20	0.45	?	0.45	0.178	0.42	0.19
1.34	1.0	1.82	?	1.41	0.79	1.56	0.725
0.175	0.20	0.20	?	0.22	0.195	0.26	0.175
1.29	1.15	1.75	?	1.42	0.92	1.63	1.0
0.325	0.07	0.14	?	0.47	0.078	0.51	0.063
2.17	—	3.14	—	2.28	—	2.77	—
?	—	?	—	0.133	—	0.139	—
?	—	?	—	0.133 × 0.052	—	0.139 × 0.086	—
—	0.11	—	0.08	—	0.095	—	0.086

not end in a simple point diverse variations are met with at its distal extremity. Thus in the material from Iranian tortoises Petter (1966) never found spicules with two barbs instead of which these possess alae with a denticulate border. Such diversities led her to the conclusion that „La forme des spicules présente une certaine variation suivant les régions.“

In spite of the fact that the spicular structure is of much help in dividing *Tachygonetria longicollis* into two groups, it remains very difficult to assign males with different types of spicules to their respective females. Assuming that there are three subspecies of the North African species, Petter (1966) placed „les femelles à corps robuste avec les males à spicules munis d'une paire de lobes; puisque chacune de ces formes ne se trouve qu'en Afrique du Nord.“ However, spicule armed with one pair of lobes is found in *T. l. setosa* which she has reported (l.c.) in her Table 4 to be also present in *Testudo hermanni* from Europe. For the remaining two subspecies Petter (l.c.) remarks „En ce qui concerne les 2 autres sous-espèces, nous n'avons aucune raison morphologique d'apparier les males à spicules robustes avec une forme de femelles plutôt qu'avec l'autre, mais ceux-ci étant moins fréquents que les males à spicules fins, nous supposons qu'ils correspondent aux femelles à queues longues, moins fréquentes que les femelles à queues courtes.“ Thus in the absence of any other character, Petter had to rely upon the degree of infestation in order to pair off the males and the females of different types.

It appears from the foregoing account and the study of our material that *Tachygonetria longicollis* is a highly variable species. At best, depending upon the structure of the spicule in the male, it can be said to exist in two forms: one in which the spicule terminates into a simple point, and the other where there are present certain appendages in the form of barbs, lobes, denticulate alae, conical processes, or is truncated at the distal end of the spicule. We agree with Petter (1966) that such variations in the shape of the spicule are probably due to the geographical habitat of the host and, therefore, we consider all palaearctic forms having such spicules to be basically conspecific and representing one single species — *Tachygonetria longicollis pusilla* (Seurat, 1918)

Petter, 1966. Since Seurat (1918) described both *T. pusilla* and *T. setosa* in the same year it is impossible to decide the priority between the two and we consider *T. I. pusilla* a better choice since it is more widespread both geographically as well as in its range of hosts.

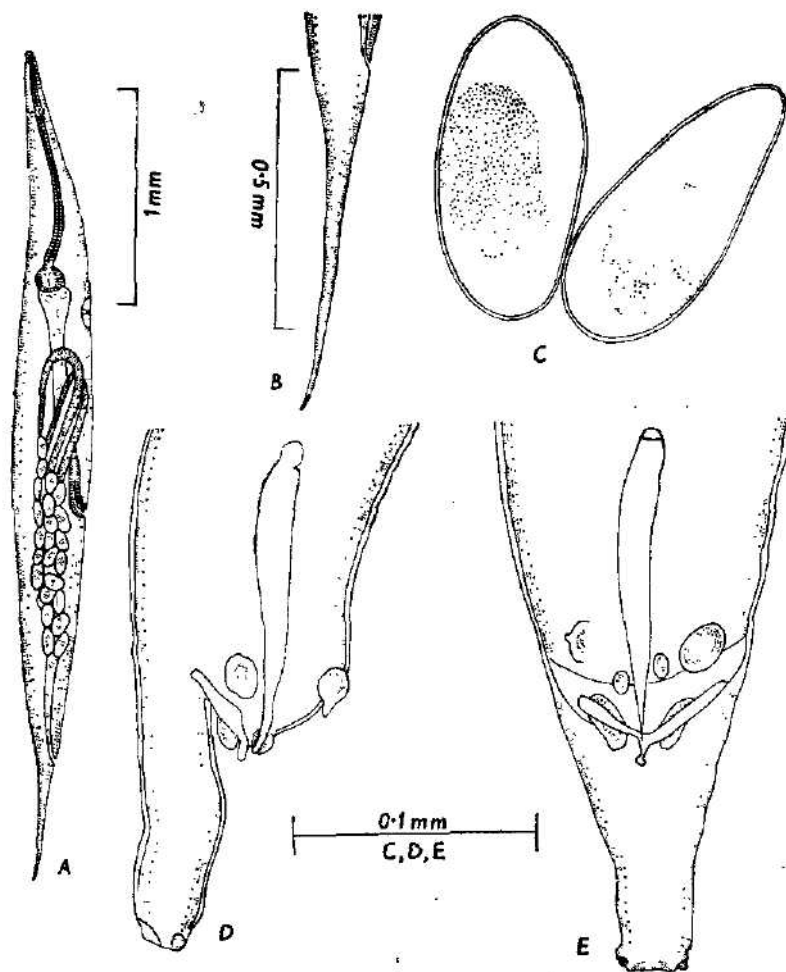


Fig. 4: *Tachygonetria macrolaimus palearcticus* Petter, 1966. Female: A. Entire, B. Posterior end, C. Eggs; Male: Posterior extremity, D. Lateral view, E. Ventral view.

Similarly the forms having simple acicular spicule, *T. I. longicollis* and *T. I. fitzsimmonsi*, are regarded as conspecific. The fact that the latter is a South African form from *Testudo pardalis* has not been overlooked, but considering that *T. longicollis* is a highly variable species and according to Petter (1966) the males of the two are indistinguishable, and further that many a nematode species are cosmopolitan and universal in distribution it seems justified to put the two forms in synonymy.

Table 4. Principal measurements for *Tachygonetria macrolaimus paleuricus* Petter, 1966
(All measurements are in mm.)

Author Host: <i>Testudo</i> sp. Distribution Dimensions	Our data Afghanistan		Petter, 1961 <i>T. gracca</i> Algeria	
	Female	Male	Female	Male
Length	3.76-3.92	2.50-2.66	4.39	2.32
Maximum thickness	0.35-0.36	0.25-0.255	0.30	0.16
Oesophagus	1.13-1.15	0.67-0.675	1.36	0.80
Nerve ring from anterior end	0.28-0.29	0.20-0.205	0.34	0.25
Excretory pore from anterior end	1.23-1.25	0.97-0.99	1.36	0.92
Tail	0.66-0.67	0.095-0.1	0.60	0.07
Vulva from anterior end	2.16-2.19	—	2.83	—
Eggs	0.126-0.131 × 0.06-0.065	—	0.14-0.07	—
Spicule	—	0.12-0.13	—	0.11

4. *Tachygonetria macrolaimus palearcticus* Petter, 1966

(Fig. 4)

Host: *Testudo horsfieldi*.

Location: Colon.

Locality: Kabul, Afganistan.

Tachygonetria macrolaimus (Linstow, 1899) has been reported from various species of tortoises from the palaearctic region, South Africa and Madagascar.

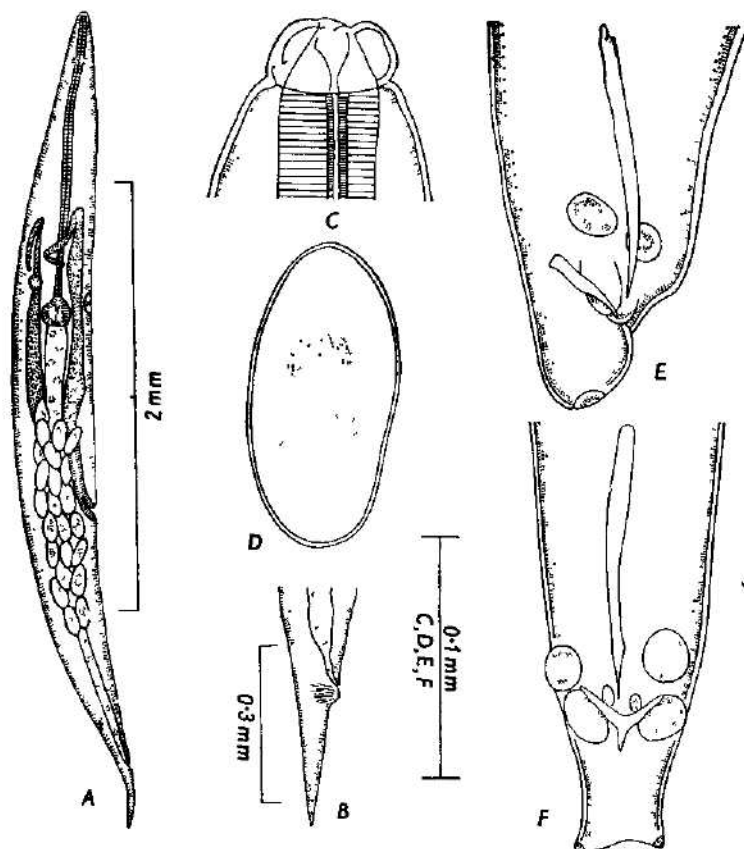


Fig. 5: *Tachygonetria rosickyi* sp. n. Female: A. A. Entire, B. Posterior end, C. Anterior end, D. Eggs; Male, posterior extremity, E. Lateral view, F. Ventral view

Petter (1966) subdivided this species into three subspecies each prevalent in one of these regions, viz. *T. macrolaimus palearcticus* Petter, 1966 in Europe, North Africa, Iran and Tadjikistan, *T. m. macrolaimus* (Linstow, 1899) Petter, 1966 in Swaziland, and *T. m. dessetae* Petter, 1966 in Madagascar.

Our material, collected from *Testudo horsfieldi* in Afghanistan, includes the palaearctic form, *T. macrolaimus palearcticus*. Petter (1961) described it in detail as *T. macrolaimus* before relegating it (1966) to the status of a subspecies. Her specimens were obtained from *Testudo graeca* from Algeria. As compared

to her material, in the present both the sexes appear to be more stout, females smaller and the males longer. In our specimens the eggs are smaller but the spicule is longer. The principal measurements for the two are tabulated in Table 4.

5. *Tachygonetria rosickyi* sp. n.

(Fig. 5)

Host: *Testudo horsfieldii*.

Location: Colon.

Locality: Kabul, Afganistan.

Type specimens: Deposited in the Institute of Parasitology, Czechoslovak Academy of Sciences, Prague.

(All measurements are in mm)

Description. Mouth surrounded by three transparent lips in both sexes. 4 small submedian papillae and 2 amphis present.

Female. Length 3.57–3.78. Principal measurements for a female measuring 3.61: maximum thickness 0.35; oesophagus 1.24; nerve ring, excretory pore and vulva at 0.28, 1.23 and 2.23 respectively from anterior end; tail 0.27; eggs $0.126-0.131 \times 0.06-0.065$.

Male. Length 3.42–3.50. Principal measurements for a male measuring 3.50: maximum thickness 0.25; oesophagus 0.91; nerve ring and excretory pore at 0.19 and 1.09 respectively from anterior end; truncated tail 0.032; spicule 0.115, narrows abruptly to a sharp point 0.012 long.

Gubernaculum V-shaped; caudal papillae 4 pairs: 3 circumcloacal and the last terminal.

Discussion. Six species of the genus *Tachygonetria* Wedl, 1862 have been reported so far from *Testudo horsfieldii*. Out of these, amongst other characters, the species under discussion differs from *T. dentata* (Drasche, 1884) in the absence of the denticles in the mouth; from *T. longicollis longicollis* (Schneider, 1866) Petter, 1966 in the much smaller tail in the male and the size and the shape of the spicule; from *T. longicollis pusilla* (Seurat, 1918) Petter, 1966 in the form on the spicule; from *T. conica* (Drasche, 1884) in the different apical end; from *T. robusta* (Drasche, 1884) in the smaller and less robust body, and the shape of the spicule and smaller tail in the male; and from *T. macrolaimus palearcticus* Petter, 1966 in much smaller tail in both sexes and in the apical structure. Two more *Tachygonetria* species have been described from the palearctic region (North Africa) from *Testudo graeca graeca*, viz. *T. seurati* Petter, 1966 and *T. numidica* Seurat, 1918. The species under consideration differs from the former in possessing much smaller tail and oesophagus in both sexes and a longer spicule in the male, while it can be separated from the latter by the smaller but more robust females with a longer oesophagus and smaller tail and longer and stouter males with a much smaller tail and almost twice as long spicule.

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REVIEWS – RECENSE

R. K. Kinzelbach, 1978: **Die Tierwelt Deutschlands. 65. Teil. Insecta. Fächerflügler (Strepsiptera).** 165 S., 53 Abb. VEB Gustav Fischer Jena, Br. 37,00 M.

V 65. díle serie *Die Tierwelt Deutschlands* zpracovává Prof. Kinzelbach, dnes již renomovaný specialista řádu řasnokřídých (Strepsiptera), tuto po mnoha stankách velice zajímavou a unikátní skupinu parazitického hmyzu. Vyplňuje tak citelnou mezeru, protože dosud chyběla revize středoevropských zástupců této především po teoretické stránce pro všechny zoology velice významné skupiny. Bohatě obrazově dokumentovaná studie stručně shrnuje současné znalosti z morfologie, bionomie a taxonomie řádu, vycházejíc z veškeré původní literatury, kterou sam autor obohatil o práce zásadního významu.

Všeobecná část obsahuje základní morfologu samčího a samičího imaga a všech juvenilních stadií. Dále je stručně popsán životní cyklus řasníků a vzájemný vztah řasníka a hostitele. Následuje kapitola o hostitelích řasníků a jejich specifitě a zmínka o výskytu a rozšíření skupiny. V dalším se autor zabývá příbuzenskými vztahy řádu (domnívá se, že Strepsiptera pravděpodobně prodělala část společné evoluce s řádem Coleoptera), jeho klasifikací a problematikou taxonomie na úrovni druhu; následuje katalog západopalearktických taxonů do úrovně druhu. Všeobecnou část uzavírá kapitola o sběru a preparaci řasníků.

Speciální část, zaujímající přirozeně podstatnou část díla, uvádí taxonomický popis, rozšíření, hostitele, bionomii a základní literaturu o všech západopalearktických druzích, samozřejmě včetně klíčů čeledí, rodů a druhů, oddeleně pro samce a samice. Do definitivního vyřešení, k němuž je třeba množství dalšího, dobře dokumentovaného materiálu obou pohlaví a všech vývojových stadií, navrhuje autor všechny dosavadní západopalearctické „druhy“ rodu *Stylops* Kirby považovat za jediný druh *Stylops melittae* Kirby. Podobný antiatomizační přístup, podložený specifickou, experimentálně sledovanou a doloženou bionomií skupiny, je uplatňován v rámci klasifikace celého řádu. Práci uzavírá rozsáhlá bibliografie originálních prací, v nichž zájemce najde podrobnější údaje, které ho zajímají.

Knižka bude jistě podnětem pro další, zasvěcenější studium této zajímavé skupiny hmyzu, které jsme např. i u nás zůstali zatím ještě mnoho dlužni.

K. Húrka

Nagy S.: Erster Fund des Polychaeten *Hypania invalida* im tschechoslowakischen Donauabschnitt.

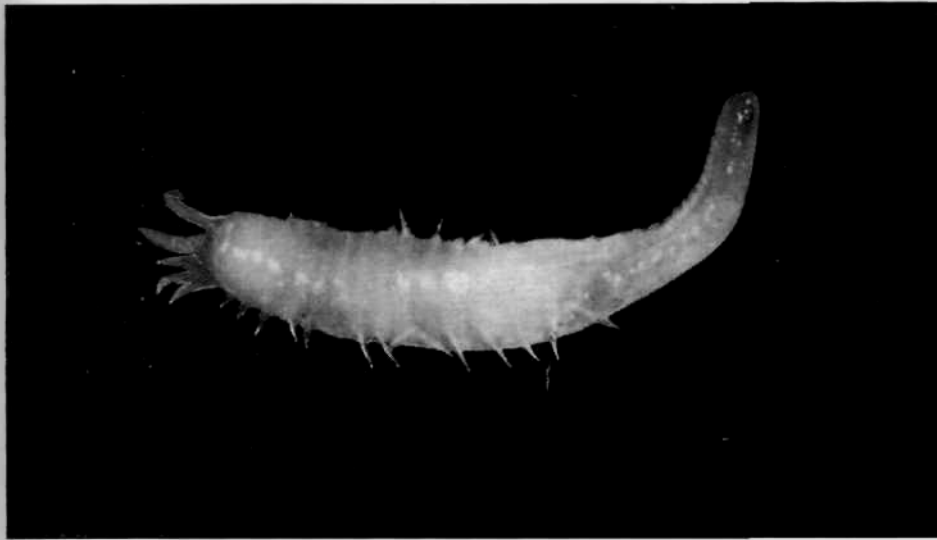


Abb. 2. *Hypania invalida* Grube, 1860 von der Entnahmestelle No 1.

Nagy S.: Erster Fund des Polychaeten *Hypania invalida* im tschechoslowakische Donauabschnitt.

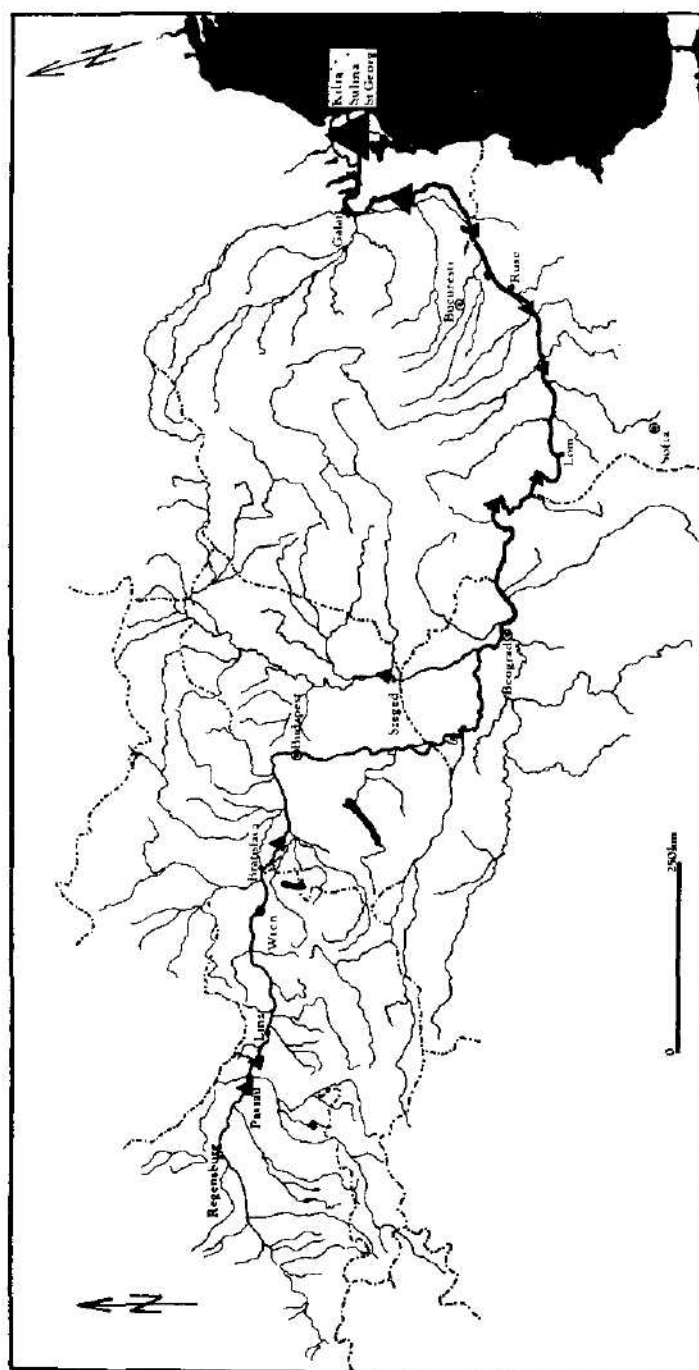
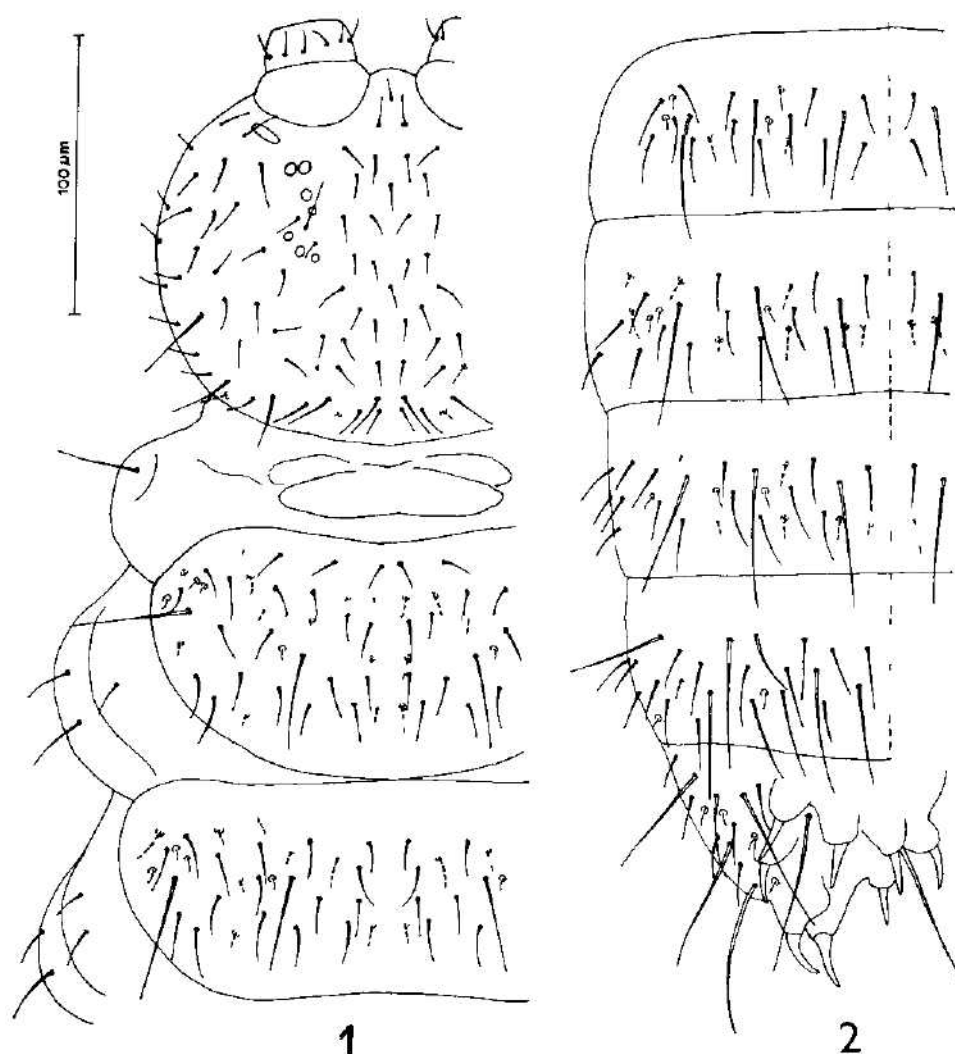
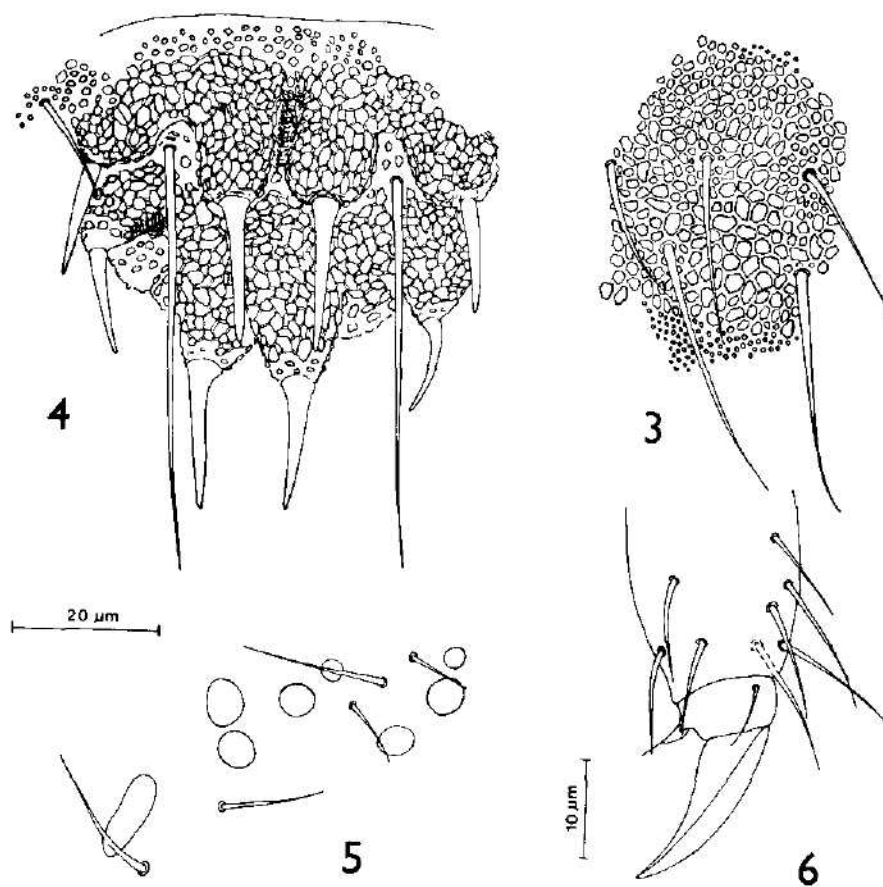


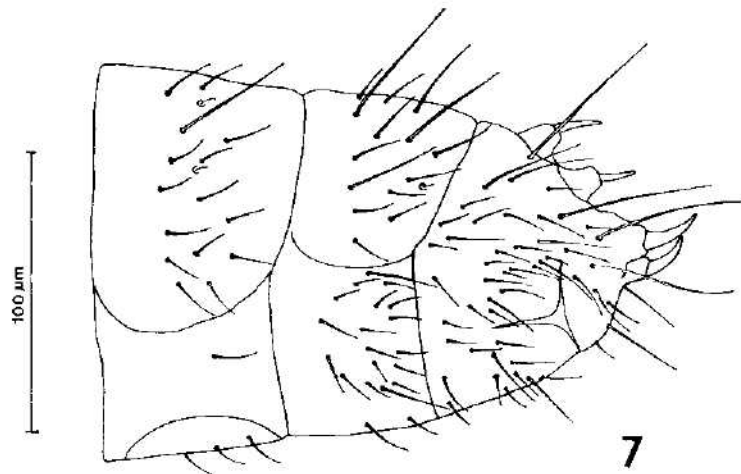
Abb. 3. Überblick der Lokalitäten im Einzugsgebiet der Donau, an denen *Hypania invalida* Grube gefunden wurde.



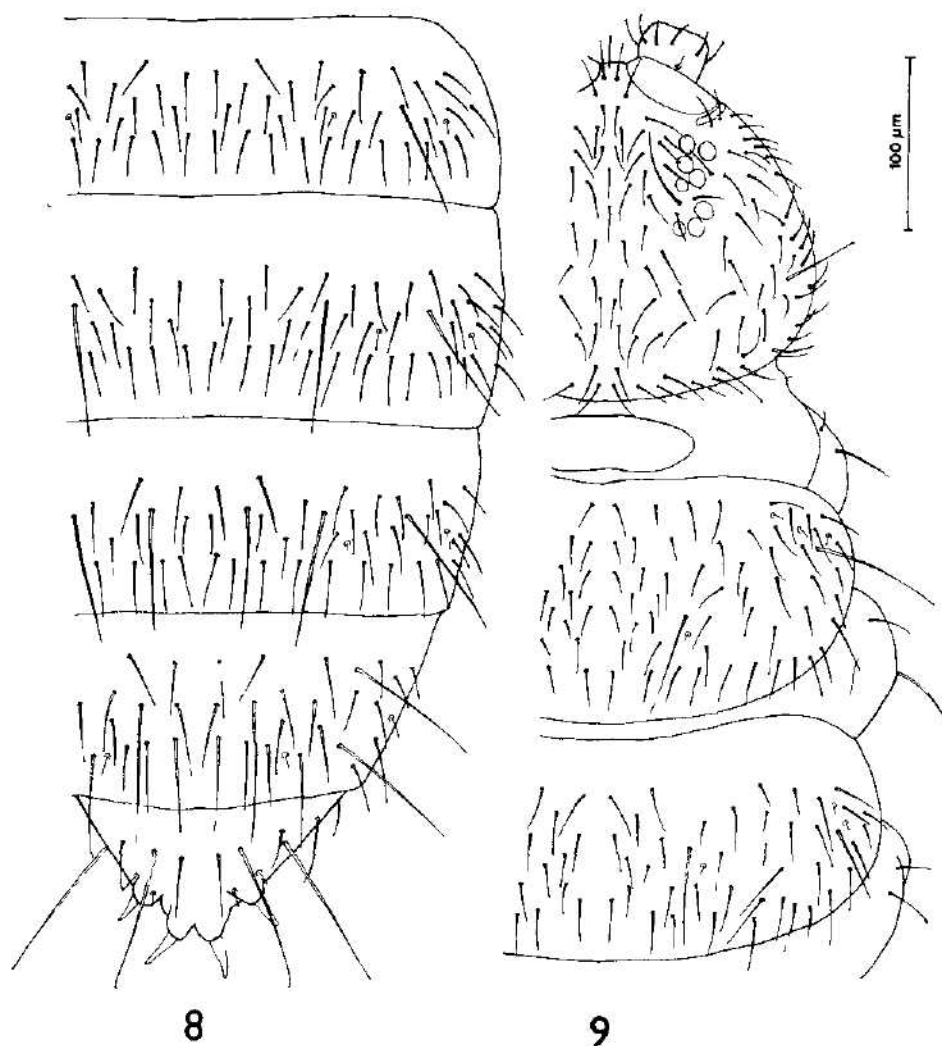
Trancanthella martynovae gen nov sp nov. Fig 1 — dorsal chaetotaxy of medial and left parts of head and thorax, Fig 2 — chaetotaxy of medial and left parts of abdominal tergites I-IV (The additional chaetae which appear in preadult female are drawn dashed)



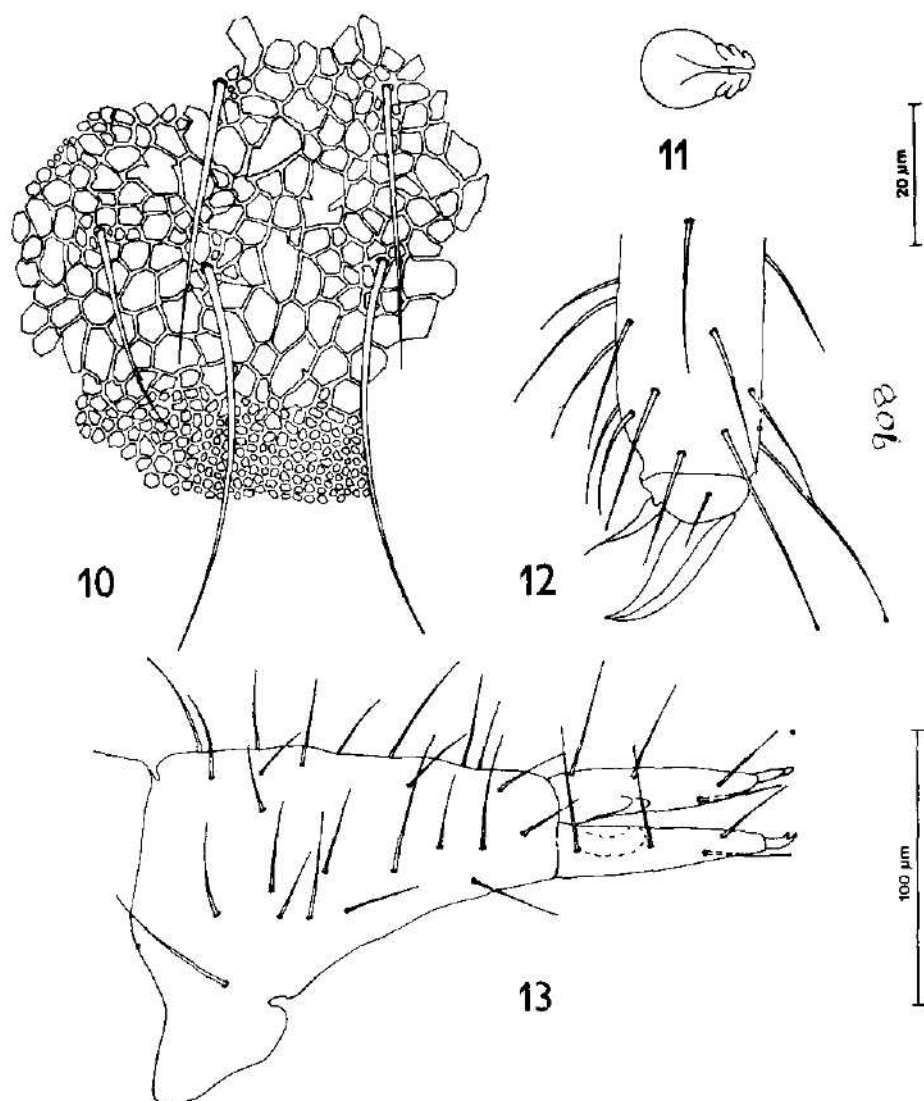
Ticanthella martynovae gen. nov. sp. nov.: Fig. 3 — reticulation of medial part of abdominal tergite IV, Fig. 4 — last abdominal tergite, Fig. 5 — postantennal organ and eyes, Fig. 6 — end of third pair of legs. (20 μ m: Figs. 3-5; 10 μ m: Fig. 6)



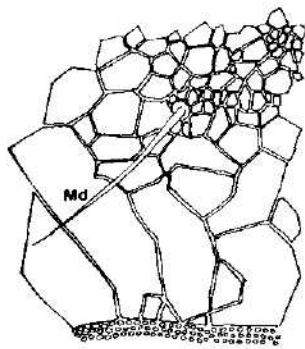
Tiancanthella martynovae gen. nov. sp. nov.: Fig. 7 — chaetotaxy of ventral and lateral parts of abdominal segments III—VI.



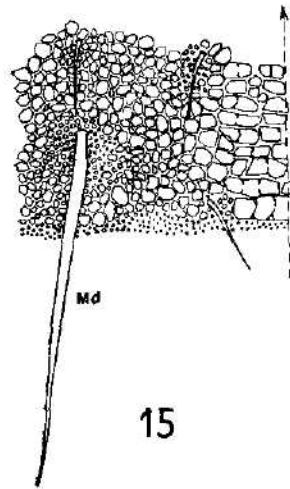
Tetracanthella grunae sp. nov. Fig. 8 -- chaetotaxy of medial and right parts of abdominal tergites I-IV, Fig. 9 -- dorsal chaetotaxy of medial and right parts of head and thoracic segments.



Tetracanthella gruiæ sp. nov.: Fig. 10 — reticulation of medial part of abdominal tergite III, Fig. 11 — retinaculum, Fig. 12 — end of third pair of legs, Fig. 13 — furca. (20 µm: Figs. 10-12; 100 µm: Fig. 13).



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Tetracanthella hydrophila: Fig. 14 — reticulation of abdominal tergite IV (after Hüther, 1964)
Tetracanthella britannica: Fig. 15 — reticulation of abdominal tergite IV (after a Norwegian animal).