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Přední československý zoolog akademik Josef Kratochvíl, předseda Československé společnosti zoologické při ČSAV, se dožil 6. ledna 1979 70 let. Redakční rada Věstníku Československé společnosti zoologické mu k tomuto významnému jubileu přeje mnoho zdraví a úspěchů v další práci.

VĚSTNÍK ČESKOSLOVENSKÉ SPOLEČNOSTI ZOOLOGICKÉ
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SCANNING ELECTRON MICROSCOPY OF THE LIP DENTICLES OF TOXASCARIS LEONINA, TOXOCARA CANIS AND T. CATI (NEMATODA)

Vlastimil BARUŠ[1]), Richard WIGER[2]), František TENORA[3]),
Milan STANĚK[3])

Dedicated to the eminent Czechoslovak zoologist Academician Josef **Kratochvíl on** the occasion of the 70th anniversary of his birthday

Received June 5, 1978

Abstract: The lip denticles of *Toxascaris leonina, Toxocara canis* and *T. cati* were examined by scanning electron microscopy (SEM). The shape of denticles was found to be unsuitable as a criterion for species differentiation. Marked differences in the average number of denticles were observed: *T. leonina* — 72, *T. canis* — 132 and *T. cati* — 126. Photographic documentation is attached.

INTRODUCTION

The method of scanning electron microscopy (SEM) has so far been used in the study of some morphological characters of four species of the suborder Ascaridata. The species *A. lumbricoides* and *A. suum* have been studied in most details, particularly the ultrastructure of lip denticles and surface structure of eggs (Ubelaker and Allison, 1972), Weise (1973) described the denticles and cuticular structures on body surface of *A. suum*, Madden and Tromba (1976) studied in detail the form of denticles in *A. suum* specimens of various age. In addition to the above papers, the ultrastructure of egg surface of *A. lumbricoides. A. suum, Toxocara canis* and *T. mystar* was studied also by Zyngier (1975), Ubelaker and Allison (1975), Ishii and Habe (1973) and others.

The shape and distribution of denticles on lips of ascarids have been considered by some authors to be characters of specific value. However, the significance of these characters cannot be evaluated due to an unsufficient number of species examined. The results obtained by Madden and Tromba (1976) show a great variability in the shape of lip denticles. Our SEM studies of this character in another three species of the suborder Ascaridata, *T. canis, T. cati* and *T. leonina*, the lip denticles of which have not yet been studied, supply some new information on this problem.

MATERIAL AND METHODS

In our studies we used the nematodes *Toxocara canis* and *Toxascaris leonina* in the farm Lejšovka (Czechoslovakia). *Toxacara mystax* originated from *Felis sylvestris* caught in free nature in the locality Kapušany (Czechoslovakia). Ten specimes of each species were used for the SEM studies. After washing in a saline

solution they were fixed in 70 % ethylalcohol, dehydrated through an ethanol series and sonicated for one minute to remove foreign particles from the surface. The specimens were critical point dried, mounted on double-sided tape, coated with gold and examined with a Jeol JSM–SI microscope at 10 KV.

RESULTS

1. *Toxascaris leonina* (Linstow, 1902)

The lips are massive, their outer side is rounded and the inner one flat, their outline is rounded. The distribution and shape of lip papillae are characteristic (Plate I, Figs. 1 and 2). Small denticles are arranged in a line near the inner margin of all three lips (1 dorsal and 2 subventral), reaching caudally almost to the base of lips. There are 70—75 (most often 72) denticles on one lip. The detailed shape and size of denticles are variable. They are mostly triangular (with rounded top and wider base). Some denticles are small, low, almost hemispherical. A great variability in the shape was observed particularly in the denticles of the middle group distributed near the top of lips (Plate I, Figs. 3, 4). A similar variability, but less pronounced, was found also in the lateral groups of denticles. An important feature is the fact that the denticles in the lateral groups (approximately in the last third of the line) are gradually smaller and more sparsely distributed towards the lip base. The last denticles in the line are approximately of half the size or smaller compared to the developed denticles in the middle (upper) portion and upper lateral portions (Plate II, Figs. 5 and 6).

2. *Toxocara canis* (Werner, 1782)

The lips are very massive, their outer side is hemispherical and rounded, the inner one flat and smooth. Their outline is trapezoidal or rounded and they are markedly wider at the base than high. The distribution and shape of papillae on lips are characteristic (Plate II, Figs. 7 and 8). Near the outer margin of all three lips, the denticles are arranged in a line and reach caudally up to the base of lips (Plate III, Fig. 9). The total number of denticles on one lip varies from 122 to 136 (132 on the average). The denticles are rather densely distributed in a line, in some cases they occur even outside the basic line. In such case they are always of smaller size (Plate III, Figs. 12 and 13). We have observed a great variability in the shape of denticles. Most often they are triangular (with massive, wide base and rounded top – Plate III, Figs. 11 and 12) or finger-like (of approximately equal width and length — Plate III, Fig. 13). The latter shape occurs usually in denticles in the middle portion of the line near the top of lips; the lateral groups of denticles are rather triangular. It should be stressed that the size of denticles in the lateral lines is gradually decreasing posteriorly (but the density of their distribution remains unchanged) approximately to half the size of denticles in the upper portion of lateral groups (Plate III, Fig. 10).

3. *Toxocara cati* (Schrank, 1788)

The lips are massive, their inner side is markedly rounded and the inner one flat and smooth. The outline of lips is trapezoidal or triangular, their width at base is smaller than height. The papillae on lips are conspicuous and characteristic (Plaate IV, Figs. 14 and 15). Small denticles are arranged in a line near the inner margin of all three lips and reach caudally up to the

base of lips. The total number of denticles on one lip varies from 115 to 129 (most often 126). They have two basic shapes. In the middle portion of the line near the top of lips they are usually finger-like (higher than wide); in the lateral portions of the line they are more triangular (their width at the base is almost the same as height). The tops of denticles are not always distinctly rounded (Plate IV, Figs. 16 and 17). The shape and size of denticles in the lower parts of lateral row are those than in the upper portion and in the middle group.

DISCUSSION

Sprent (1952) was the first who used the morphology of labial denticles as a taxonomic character for the differentiation of *Ascaris suum* and *A. lumbricoides*. Also Lýsek (1963) in his studies by optical microscopy arrived at the same conclusion. The scanning electron microscopy was used for the observations of lip denticles of *A. suum* and *A. lumbricoides* by Ubelaker and Allison (1972) and by Ansel and Thibaud (1973). The authors reported that this character may be used for the differentiation of both species. A variability of lip denticles of *A. suum* was observed also by Weise (1973). Besides a regular distribution and shape of denticles (characteristic of *A. suum*), an irregular distribution and size denticles were observed in *A. lumbricoides* (see Ubelaker and Allison, 1972). Ansel and Thibaud (1973) add to this character an information about the difference in the general form of lips, especially of their terminal margin. Modern views of the comparative study and variability were presented by Madden and Tromba (1976). The authors analyze the form and size of lip denticles in *A. suum* in relation to the age of nematodes. The shape and size of denticles undergo certain changes with the age which may be regarded as functional changes due to the activity of lips and denticles while attaching to the intestinal mucous membrane of the host. According to our results, the shape and size of denticles of the species examined *(Toxascaris leonina, Toxocara canis* and *T. cati)* are very variable and cannot be used as a reliable criterion for their differentiation. Although the age of the specimens examined was not exactly known, we came to the same conclusion as Madden and Tromba (1976). However, there seems to be a marked difference in the number of denticles in *Toxascaris leonina* (representing the genus *Toxascaris)* compared to *Toxocara canis* and *T. cati* (representing the genus *Toxocara).* In *T. leonina,* the average number of denticles is 72 per lip, whereas in *T. canis* it is 132 and in *T. cati* 126. It is therefore possible that, after more species are studied, the average number of denticles might serve as a character supplementing the generic diagnosis. The denticles of *T. cati* and *T. canis,* due to their higher number, are situated close to one another, while those of *T. leonina* are more sparse.

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

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Department of Animal and Human Biology, Purkyně University, Brno

RESULTS OF BAT CENSUS IN A TOWN (MAMMALIA: CHIROPTERA)

Dedicated to the Academician Josef Kratochvíl on the occasion of the 70th anniversary of his birthday

Jiří GAISLER

Received October 10, 1978

Abstract: Bat community was studied in a town covering 230 km² of the total and 80 km² of the built-up area. Two sources of information are evaluated. The first one results from a twenty years' non-systematical search of bats in their hiding quarters, occasional records by the public and a limited netting of bats when on the wing. Eleven species are represented in the material, the most numerous being *P. pipistrellus*. According to this sample, the minimum population density in the mentioned species can be estimated to 0.08 ind. per ha. The second information results from a short-termed, systematical census, involving visual counts of flying bats. Four categories of bats were distinguished, i. e. *P. pipistrellus*, *E. serotinus*, *P. austriacus* and "undetermined" bats. In *P. p.* the peak of activity occured between 18 Apr. and 28 Aug. and certain reducing effect of moonlight was ascertained. In *E. s.* and *P. a.* the peak of activity occured between 3 May and 28 Aug. and the activity was decreased by temperatures below 10 °C. For the calculation of population densities only the data pertaining to hunting individuals and the periods of the highest activity in both seasonal and daily aspect were considered. Based on the assumption that the seeing frequency in the serotine is three times as high as that in the remaining species the selected observation interval was adequately reduced. The estimated population densities range from 0 to 1.8, the average being 0.57 ind. per ha. The number of hunting bats increases both from the suburbs to the city and in the environments with increasing share of green.

INTRODUCTION

Mammalogists working in the urban ecosystems concentrated mainly on eusynanthropic pests such as members of the genera *Rattus* and *Mus*. There are some studies — even monographs — dealing with the occurence of all mammals in large cities (Fitter, 1945; Herter, 1947; Wendland, 1971, etc.). In spite of certain recent attempts (Obara, Hirata, Okuzaki, 1977), however, we are still missing a modern ecological view, global in scope, on the whole mammal community. The essential cause of this fact can be seen in the insufficient knowledge of some species groups mainly those less obviously interacting man's interest in a town. Bats are considered one of these groups.

Even though it is well known that many bats have their hiding quarters in buildings chiropterological investigations of towns have been largely ignored till recently. From among papers aimed at the autecology of individual species, McClure's (1942) contribution on *Lasiurus borealis* is worthy of mention. As for the whole chiropterofauna, that of both parts of Berlin received relatively most attention (Haensel, 1967, 1972; Klawitter, 1976 a, b).

Hanák (1975) summarized the data on the occurence of bats in Prague. Most of the hitherto information is based on occasional findings only not enabling a quantitative analysis of urban bat communities. An attemt at such an analysis is made in the study presented.

MATERIAL AND METHODS

Two sources of information are evaluated using two different methods.

A. The sample obtained by means of non-systematical search and limited netting in the area of the Brno town during the last 20 years, i. e. from October 1957 (when the author moved in) till June 1978. It includes 712 individuals of 11 species (Tab. 1, Fig 1). The species, ranged according to their abundance in the sample, are as follows: *Pipistrellus pipistrellus, Myotis myotis, Plecotus austriacus, Eptesicus serotinus, Rhinolophus hipposideros, Nyctalus noctula, Myotis daubentoni, Plecotus auritus, Myotis emarginatus, Barbastella barbastellus, Pipistrellus nathusii*. Shortened names of the mentioned taxa are used throughout this paper.

The material was collected mostly using a "traditional" method — search of bats in their hiding quarters stimulated by occasional records by the public, which enabled, a. o., to find out a mass occurence of *P. pipistrellus*. The netting of bats totalling to 42 net-nights was carried out in four localities. The netted sample is represented by 11 *E. serotinus*, 6 *P. austriacus*, 6 *M. myotis*, and 1 *R. hipposideros*.

The catch-mark-release method was usually used. Recoveries were eliminated both in the calculation and Tab. 1 Several specimes including all the species studied are preserved as study skulls and skins in the collections of either the Institute of Vertebrate Zoology, CAS, Brno, or the Faculty of Science, PU, Brno.

B. The sample obtained through visual census carried out also in the Brno area in 1976 and 1977 Theoretical premises and a detailed description of the procedure are given with the results below. The method was elaborated under the cooperation of 16 observers in 1976 30 observers took part in its realisation in 1977; results of 28 of them represented by the total number of 310 filled forms giving data on 669 individual records of bats could be used and evaluated.

The above method which can be defined as a "visual registration of the initial flying activity of bats" consists in recording all the bats observed in a certain locality during a delimited time interval. The programme including 16 observations in the days of full moons and new moons lasted from 4 April till 11 November Every observation interval started 10 minutes after the astronomical sunset and lasted 30 minutes. For records there were uniform forms where the participants in the action entered among others: the description of the route or the area of observation including its size, date, weather, and the number of bats observed. Each participant had to follow the same route during the programme The number of observations per one locality ranged from 8 to 16, the average being 11. The observers distinguished four categories of bats: a small one (= *P. pipistrellus*), a big one (= *E. serotinus*), and a medium one (= *P. austriacus*) provided all the undetermined bats were placed into the fourth category. Besides, individuals only flying over the station were distinguished from hunting bats repeatedly flying over the same — sometimes circular — route within the observer's sight.

RESULTS OF COLLECTING BATS

Within the first sample *P. pipistrellus* prevails a great deal (Tab. 1). This species was obtained in all seasons of the year but was particularly frequent at the end of August and in September when individual bats and groups up to 100 and even more individuals invaded flats, offices, school rooms, etc. seeking shelter between window frames, behind curtains and pictures on the walls, and in some completely unusual places. This phenomenon known from a number of towns, such as Stockholm, Utrecht, Berlin, Bonn, Darmstadt, Alma Ata, this country with Prešov, Brno, and Pilsen not being the exception, was termed "invasions" (Ryberg, 1947; Paláštby, Gaisler, 1965; Grummt, Haensel, 1966; Roer, 1974, etc.). The causes cannot be analysed

here but the connection of this phenomenon with the disintegration of summer nursing colonies demonstrated by Hůrka (1966) is considered an indirect evidence of reproduction and the existence of maternity colonies in the town.

The pipistrelle is concentrated in the central part of the town covering the area of some 6,400 ha (Fig. 1). The most numerous sample of a short period of one year – from 10 Aug. to 1 Sept. — includes 327 individuals, 9.4 % of them being adult males. 8.8 % adult females, 34.5 % juvenile males, and 47.3 % juvenile females. The juveniles obviously prevail a great deal. If completed by the corresponding number of adult individuals providing they inhabited the same area at the same time the minimum abudance of the species could be estimated. Starting from the assumption that both sexes take an approximately equal share in the population and one female gives birth to 1 or 2 young (Stebbings, 1968; Rachmatulina, 1971) we arrive at the minimum total number of 500 individuals representing the population density of 0.08 ind. per ha. The above conclusions reflect the summer time status while only one colony numbering 50–100 individuals (hibernating in the St Thomas Cathedral tower) is known from the winter months. It is possible that part of the summer population hibernates outside the town as evidenced by recoveries of three banded individuals.

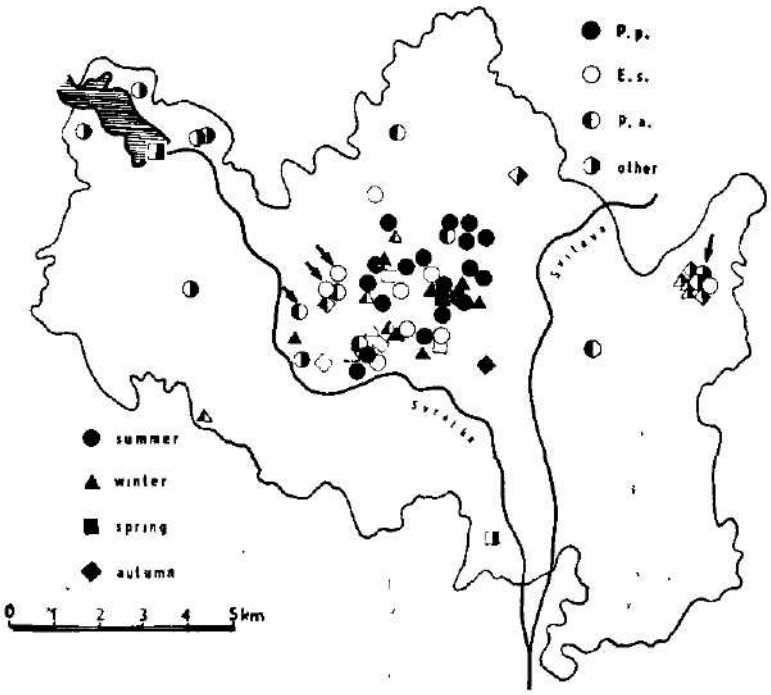

Fig. 1. The distribution of finds of bats on the territory of the town. Explanations: P. p = *P pipistrellus*, E. s. = *E. serotinus*, P. a. = *P. austriacus*.

Tab. 1. A survey of the finds of bats in the town under study: the first (= collected) sample. Explanations: n = (relative) abundance, D_i = species dominance, H' = = species diversity.

Species	Summer		Autumn		Winter		Spring		Total = 712			D_i(%)
	♂	♀	♂	♀	♂	♀	♂	♀	n	%♂	%♀	
P. pipistrellus	246	296	1	3	16	34	11	16	623	44.0	56.0	87.5
E. serotinus	10	4	1	0	2	0	2	0	19	78 9	21.1	2.7
P. austriacus	4	8	1	0	3	4	0	0	20	40 0	60.0	2.8
P. auritus	0	1	0	0	1	0	0	0	2	50 0	50.0	0.3
M. myotis	4	7	0	2	2	9	0	0	24	25.0	75.0	3.4
M. daubentoni	0	0	0	0	0	3	0	0	3	0.0	100.0	0.4
M. emarginatus	0	1	0	0	0	0	0	0	1	0.0	100.0	0.1
N. noctula	1	0	1	0	1	0	0	0	3	100.0	0.0	0.4
B. barbastellus	1	0	0	0	0	0	0	0	1	100.0	0.0	0.1
P. nathusii	0	0	0	0	0	0	0	1	1	0.0	100.0	0.1
R. hipposideros	1	12	1	0	0	0	0	1	15	13.3	86.0	2.1
$H' = -\sum_{i=1}^{s} p_i \log_2 p_i$	0.647		2.321		1.579		0.747			0.849		100.0

The pipistrelle can be thought of as the most frequent bat in the town under study. Nevertheless, it seems to be numerically overestimated by the very high dominance value (Tab. 1). This results from a higher probability of ascertaining individuals if this species' invasion groups compared to other bat species.

M. myotis comig next to the pipistrelle is relatively overestimated as well. Unlike *P. pipistrellus* colonies of this species have not been found in the town. Most of the material consists of individually hibernating and netted bats in the galleries of Stránská skála at the outskirts of the town.

Within the dominance rank, the next two species are *P. austriacus* and *E. serotinus*. Both were found more frequently in the town centre than in the outskirts but the concentration is not so pronounced as in *P. pipistrellus* (Fig. 1). *P. a.* is relatively common in lofts of buildings (in summer), cellars (in winter) and similar hiding quarters within the observers' easy reach. Two small nursery colonies numbering about 10 adult females were ascertained. *E. s.* is the most frequently netted bat. On the contrary, its hiding quarters are difficult to locate being mostly crevices in and outside the buildings (cf. Rumler, 1978). Besides the netted individuals the material collected in Brno is represented by accidental finds of dead animals, individuals that flew in through open windows, etc. Although males prevail in the sample (Tab. 1) the presence of nursery colonies in the town is obvious as documented by observations of a colony of 30 individuals flying regularly out of a school building in one locality of visual census. The abundance of *E. s.* is evidently underestimated in the sample of collected bats.

R. hipposideros is the fifth species within the dominance rank. Except for one individual found on the fence of the botanical garden (town centre) the whole material comes from the outskirts. A small summer colony of about 10 individuals lived in a heated cellar of the Brno ZOO vivarium. *N. noctula*

is worthy of mention from the remaining species. The existence of at least two winter colonies is supposed according to vocalizations recorded in 1965 to 1973, most frequently in October and November. The supposed hiding quarters were inaccessible: above the highest floor of the Medical Faculty building and between the ceiling and floor of a dwelling house respectively. No material has been obtained from there but the presence of the species in the town is evidenced through accidental finds (for details see Gaisler, Hanák, Dungel, 1979). All the remaining species are considered rare both according to their low dominance values and finds coming from the peripheral parts of the town. In the galleries of Stránská skála small numbers of *M. daubentoni* and *P. auritus* can regularly be found. For the whole region, the rarest species is *P. nathusii:* a nulliparous female was found in a crevice of the Brno lake dike on 6 May 1978.

In addition to the relative abundance and dominance also species diversity values are given in Tab. 1. The diversity proved to be considerably low — with the exception of autumnal data — compared to the samples of bats from some other environmental types (Gaisler, 1975). This could be partly due to the pipistrelle unadequate superabundance in the sample but in the author's belief species diversity is really lower in towns. It is in accordance with the information concerning other animals, such as birds (Hudec, 1976).

RESULTS OF VISUAL CENSUS

Preliminary observations

The goal of the visual count is to balance the distortion of quantitative representation of individual species resulting from traditional collecting methods. Theoretically, the new method has to (1) differ from the search of bat hiding quarters; (2) provide us data from the maximum area of the town gathered simultaneously; (3) be simple and standardizable. No equipment better than the human's eye was available to fulfil the mentioned requirements. Various modifications of the visual count of bats flying during the growing season, i. e. approximately from April to October, were tested in 1976. We started from the fact that the activity of most bat species is high and often highest at its beginning (Fenton, Jacobson, Stone, 1973; Gaisler, 1979). Observations carried out in 16 different localities revealed that bats — with very few exceptions — do not appear till 10—15 minutes after the tabular (astronomical) sunset. At that time they are easily noticeable with the naked eyye from the distances up to some 100 m. Getting more dark the visibility decreases and 50 minutes after the sunset an average observer is able to notice a bat on the dark background from about 2 m and against the sky from 10 m. Individual differences in the eye-sight of the respective observer, weather conditions of the observation night, and the body size and manner of flying in different bat species were taken into consideration.

Unfortunately, it is impossible to determine all the bat species presumed to fly in the town. Based on the material of collected bats a small and frequently observed bat was considered *P. pipistrellus*. This determination was confirmed by comparison with the flight silhouette (Gaisler, 1959). In spring and autumn these bats were observed in full day-light several times. The determination using the 10 × 50 fieldglass was conclusive then.

A big frequently observed bat could be identified as *E. serotinus* without any doubt. Its identification in flight, a detailed description of which is given by Klawitter, Vierhaus (1975) is very easy after some training. *N. noctula* can easily be distinguished from other big bats according to its narow pointed wings and quick flight while *M. myotis*, in spite of its wing breadth equalling nearly that of *E. serotinus*, is characterized by a well marked light ventral body part and bigger auricles compared to *E. s.* Neither *N. noctula* nor *M. myotis* were observed, however, to hunt in the built-up area of the town.

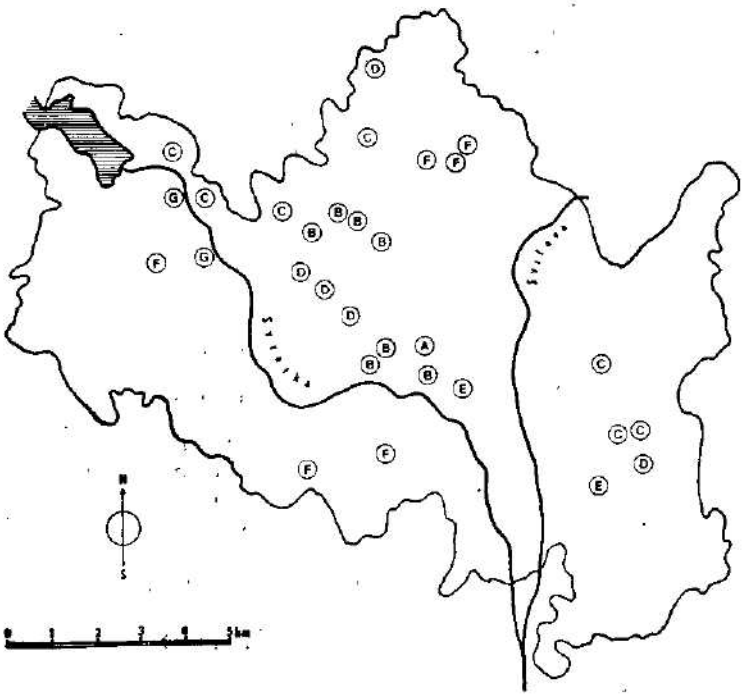

Fig. 2. The distribution of sampling localities of the visual census. Explanations: A – F = types of urban environment (cf. the text).

Another commonly observed medium-sized bat conspicuous for its big auricles was determined as a *Plecotus* species in accordance with its flight silhouette and way of flying (Norberg, 1970). It is impossible to distinguish *P. austriacus* from *P. auritus* in flight but according to the sample of collected bats the former species is a typical inhabitant of the town and thus expected to hunt there. From the remaining species only *M. daubentoni* is easily distinguishable (Klawitter, 1976c) but it was only rarely observed above the river. Besides, medium sized and small bats were observed the determination of which was uncertain. Considering all the above mentioned facts it was decided to distinguish only four categories of bats as indicated in Methods.

Different observation areas and procedures were tested as well. The area proved to be modificable according to the observer's individual eye-sight power

and the local situation. Ideally, the whole area of one locality should be surveyed from one station. However, this was practicable only in five localities represented by large open areas (squares, gardens, vacant lots). In most cases the observer had to walk during the observation interval to follow selected streets. This line or "transect" method has certain disadvantages but in spite of them is commonly used in ornithology (for its detailed discussion see Hudec, 1976).

Each participant in the 1977 census was given the flight silhouettes of three most frequent bat species and had to assess the size of the area of his locality. As the participants in the proper census either took part in preliminary observations of 1976 or accompanied the observers during one of this year's action their previous practical experience played an importatnt part. Besides, instructions were given to minimize rather than maximize the numbers of recorded bats when in doubts.

Sampling localities

Fig. 2 shows the distribution of 28 localities of the census. The localities were selected at random by the observers themselves. Their areas ranged from 2 to 10 ha with the average of 4.6 ha. For further evaluation the localities were grouped according to the prevailing environmental type, which was based mainly on the classification used in ornithology (Hudec, 1976). Seven types of urban environment are covered with the sampling localities, viz.: A — the city, the historical core of the town and geographical centre of the whole territory studied: B — old

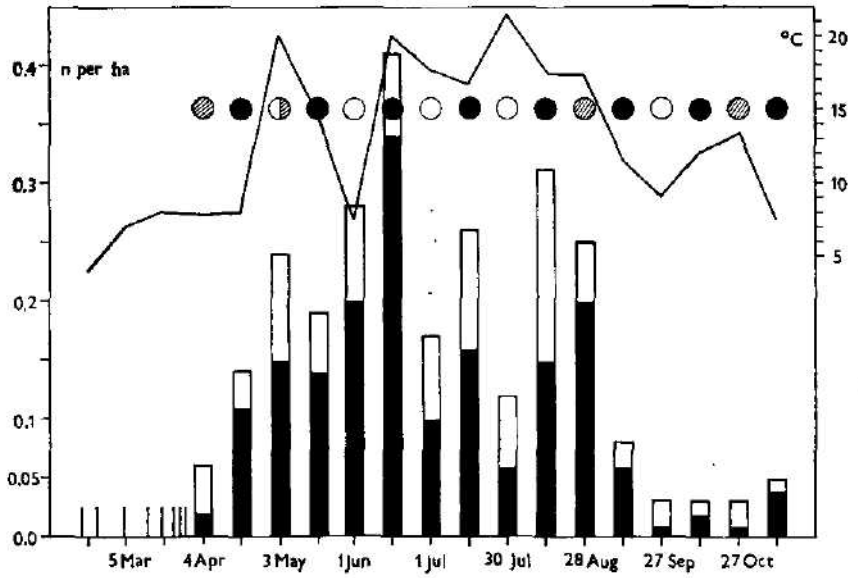

Fig. 3. Results of visual census: *P. pipistrellus*. Explanations: ordinate = number of individuals (left), temperature at the beginning of every observation (right scale and the curve); abscissa = days of the census the dates referring to the days of full moon; vertical columns = number of hunting bats (black), number of bats flying over the station (open); vertical abscissae = observations before the beginning of the count; circles = full moon (open or dashed according to the duration of moonlight during the observation), new moon (black).

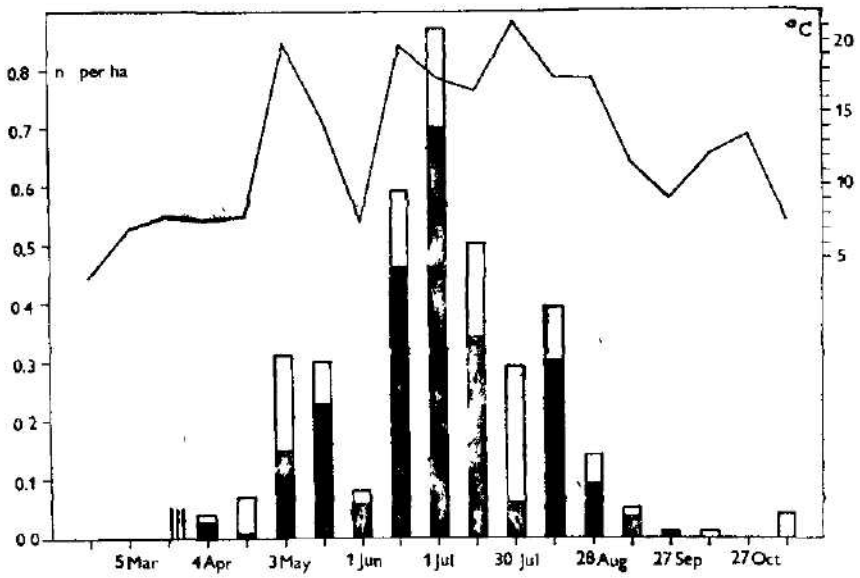

Fig. 4. Results of visual census: *E. serotinus*. Explanations as in Fig. 3.

residential quarters with blocks of high buildings (mostly four to five-storeyed); C — old suburbs consisting of small family houses with gardens; D — garden cities with a great share of green; E — old outskirts with scattered buildings including store houses, factory premises, and large open areas; F — new housing estates of high prefabricated blocks of flats; G — the river and its immediate surroundings. As the town grew it formed a mosaic of different environments and one can, e. g, find localities of the outskirts type close to the centre.

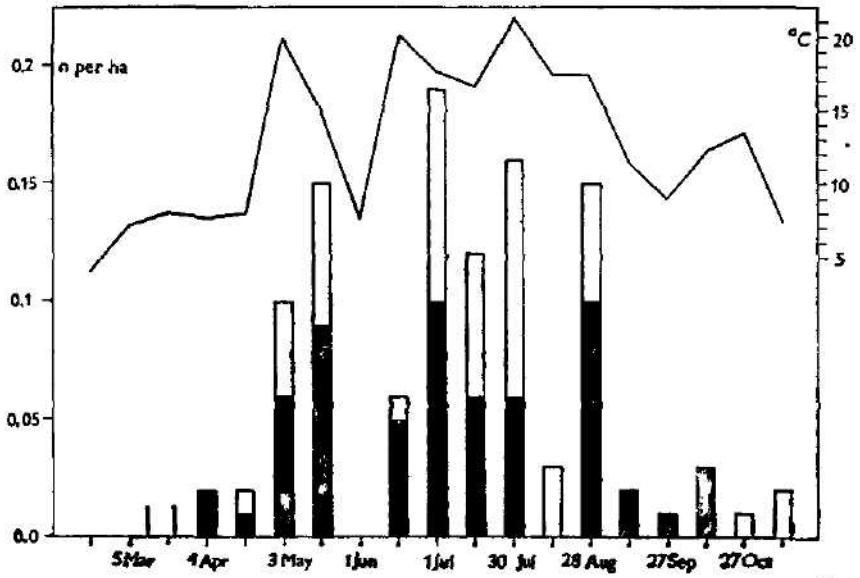

Fig. 5. Results of visual census: *P. austriacus*. Explanations as in Fig. 3.

Activity data

P. pipistrellus (Fig. 3) was observed from the end of February till the beginning of November. A few control observations were made after the programme had ended (after 11 Nov.) but no flying bats of any species were seen. During the highest activity period of *P. p.* from 18 Apr. to 28 Aug. there were no extraordinary influences like heavy precipitations or strong winds. The drop in temperature on 1 June did not influence the activity which proved to be decreased, however, due to moonlight. Between 1 June and 14 Aug. 57 ind. per km^2 were ascertained during three nights of full moon compared to 98 in three nights of new moon thus the difference being statistically significant ($\chi^2 = 10.8$, $P < 0.01$). In *E. serotinus* (Fig. 4) the moonlight had no significant effect but low temperature (1 June) reduced the activity which was generally highest from 3 May till 28 August. Activity patterns in *P. austriacus* (Fig. 5) resemble those in *E. serotinus*. Individuals of this species were observed from mid March, i. e. a little bit later than those of *P. p.* and earlier than those of *E. s.* The remaining sample of undetermined bats is negligible.

In the next graph (Fig. 6) the activity patterns are grouped within the half-hour's observation intervals. In *E. serotinus* the number of individuals observed gradually decreases from the beginning towards the end of the observation interval, which is in agreement with the fact that their activity starts earlier than in the other bat species (cf. Klawitter, Vierhaus, 1975). In both *P. pipistrellus* and *P. austriacus* the peak of activity occurs between the sixth and twentieth minute of visual count.

Estimation of population densities

Numbers of bats observed as described cannot directly be used for the estimation of population densities because of several possible errors, namely: (1) some bats were present but escaped registration; (2) some bats were recorded twice or more times during the same observation interval; (3) the more conspicuous a bat species the higher was the probability of its registration; (4) weather conditions prevented certain individuals or species from leaving their hiding quarters.

The first methodical error cannot be removed; it weighs on a majority of population density estimations after all. The second one could be removed only by the individual marking of all individuals observed, which was technically impracticable. It was minimized, however, by shortening the observation interval and elimination of bats just flying over the stations. The third error is difficult to estimate but several circumstances indicate that *E. serotinus* is relatively overestimated in the sample of observed bats. Comparing the two samples evaluated in this paper it seems that the trends towards distortion are quite opposite in *P. pipistrellus* and *E. serotinus*. While difficult to find in its hiding quarters *E. s.* is very conspicuous when hunting due to its large size, early appearance and the way of flying (cf. Klawitter, Vierhaus, 1975). Therefore, the sample of *E. s.* was reducted compared to those of the other two common species. As to the fourth error, the sample representing the peak activity period only has been chosen and observations influenced by bright full moon (in *P. p.*) or low temperatures (in *E. s.* and *P. a.*) eliminated.

The initial sample was restricted as follows: (1) The material of eight controls was chosen — for *P. pipistrellus* from 18 Apr., 3 May, 18 May, 1 June, 16 June, 16 July, 14 Aug., and 28 Aug.; for both *E. serotinus* and *P. austriacus* from 3 May, 18 May, 16 June, 1 July, 16 July, 30 July, 14 Aug., and 28 Aug. (2). The time interval was reduced to 15 minutes in *P. p.* and *P. a.*

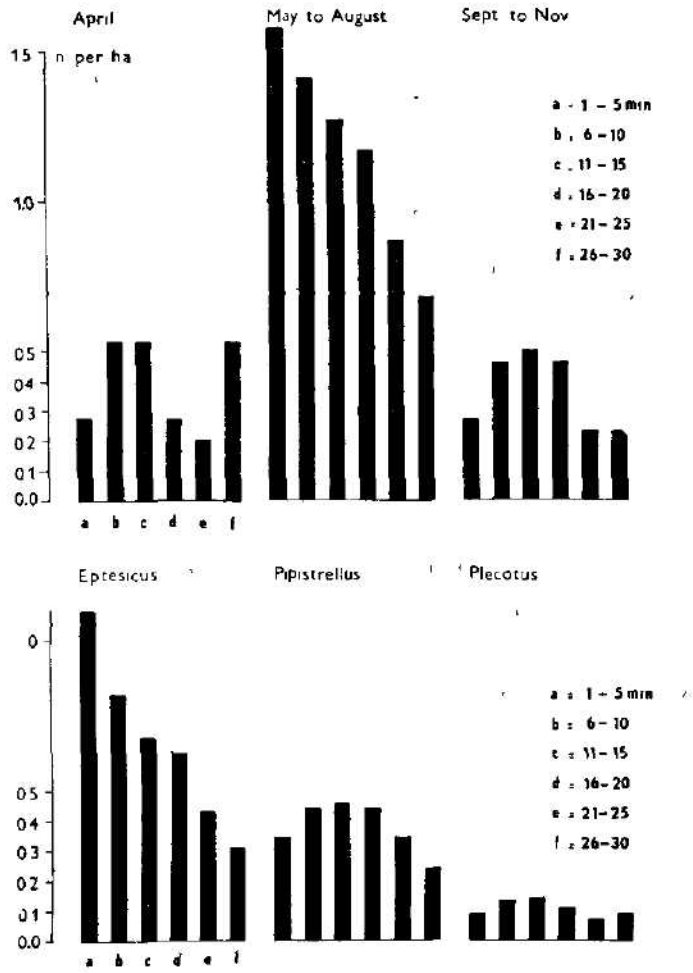

Fig. 6. The activity in five-minute intervals from the beginning of every count above — the whole sample, below — the sample of the three most common species from May to August. Explanations: ordinate = number of individuals, abscissa = time.

and to 5 minutes in *E. s.*, i. e. to the 6th — 20th minute in the two former and to the 1st — 5th minute in the latter species. (3) Only hunting bats (cf. Figs. 3 to 5) were considered.

The resulting population density estimates are summarized in Tab 2. The density of the whole bat community ranges from 0 to 1.8, the average being

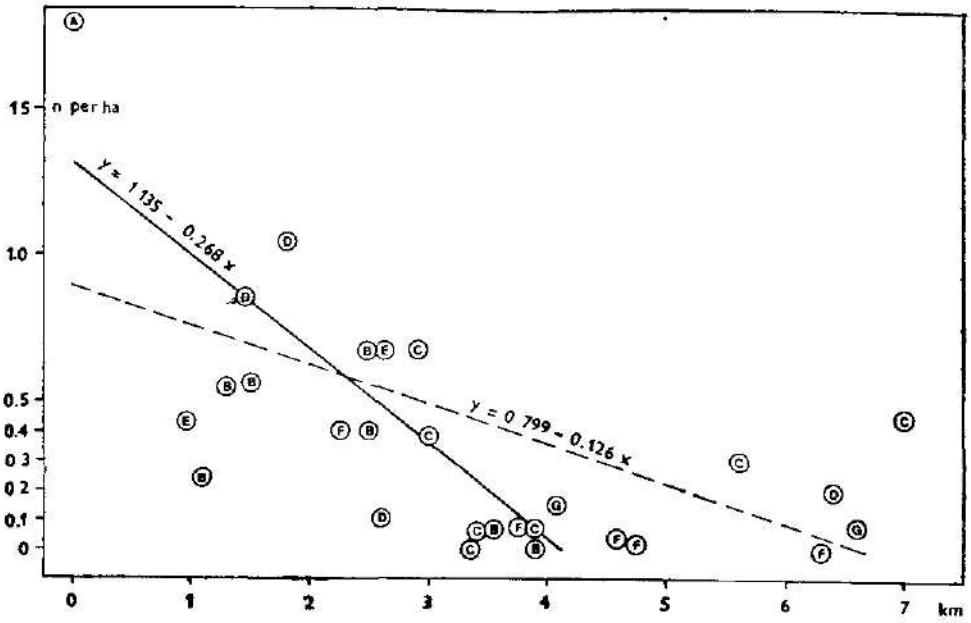

Fig. 7 The relation between the number of hunting bats (ordinate) and the distance of the sampling localities from the town centre (abscissa). Explanations: A – F = types of urban environment (cf. the text).

0.57 ind. per ha. The highest density of hunting bats was ascertained in the city, the lowest one in the new housing estates. Garden cities come next to the town centre, which can be expected considering the amount of natural elements there. On the contrary, surprisingly low density of hunting bats was ascertained above and around the river. The remaining environmental types show values between the two extremes. Data obtained from individual types of environment were tested by the t-test which revealed statistically significant differences for most of the pairs ($t = 2.54$ to 9.36, $P < 0.05$).

Althoug the city is represented by one locality only the concentration of bats in the town centre, obvious from the sample from hiding quarters as well, cannot be omitted. That is why the relation between the number of hunting bats and the distance of the sampling localities from the town centre was subject to further investigation. Regression lines in Fig. 7 show how the number of bats decreases from the city to the distance of 5 and 7 km respectively. Both the negative correlations marked in the graph are significant: $r_1 = -0.742$, $r_2 = -0.582$, $P < 0.01$.

Abundance of bats in the town

According to the material of the Brno Territory Plan kindly submitted through the officials of Brnoprojekt (see Acknowledgements), the whole territory of Brno covers 230 km^2, 80 km^2 of which being the built-up area comprising all the localities of visual count. That is why the abundance of bats in the built-up area only will be considered. Unfortunately, the area of most

Tab. 2. A survey of the population densities of bats estimated in different environments of the town: the second (= observed) sample. Explanations: A to G = types of urban environment involved in the census and described in the text; Min and Max. refer to localities with minimum and maximum densities respectively, all remaining density values are averages from all checks per environment.

Environment	Number of Loc.	Number of Checks	Species (n per ha) P. p.	E. s.	P. a.	other	Community (n per ha) Min.	Max.	$\bar{x}$
A	1	5	1.05	0.70	0.05	0.00	—	—	1.80
B	7	38	0.15	0.18	0.05	0.004	0.00	0.67	0.38
C	7	48	0.11	0.14	0.004	0.02	0.00	0.67	0.27
D	4	23	0.50	0.22	0.05	0.01	0.12	1.32	0.78
E	2	12	0.39	0.07	0.04	0.04	0.43	0.67	0.54
F	5	28	0.01	0.07	0.01	0.00	0.00	0.40	0.10
G	2	10	0.07	0.03	0.00	0.02	0.08	0.15	0.13

of the environmental types distinguished according to our classifications *connot be precised from the Plan with the exception of the city and new* housing estates covering an area of 1.1 and 16 km^2 respectively. An average value obtained from the other environmental types studied has to be used for the remaining area.

The estimated abundance of bats hunting in the bilt-up area of the town equals: 198 individuals in the city (110 ha of area, 1.8 ind. per ha); 160 ind. in the new housing estates (1,600 ha of area, 0.1 ind. per ha); 2,646 ind. in the remaining territory (6,290 ha of area, 0.42 ind. per ha). This round off number of 3,000 bats divided into individual species according to the data given in Tab. 2 includes about 1700 *P. pipistrellus*, 950 *E. serotinus*, 200 *P. austriacus*, and 150 other bats. As human population of the town under study equals 338,000 inhabitants there is approximately 1 bat per each 100 persons in summer.

DISCUSSION

In spite of differences in methods and approach the data from Berlin, capital of GDR (Haensel, 1967, 1972), West Berlin (Klawitter, 1976a), Pilsen (Hůrka, 1973) and Prague (Hanák, 1975) can be used for comparison with our sample. The comparison is given in Tab. 3, where only those species ascertained in the towns mentioned during the last 20 years are listed. In spite of the different sizes of the towns — ranging from 150,000 inhabitants in Pilsen to 2.5 million inhabitants in West Berlin — their bat communities have a lot in common. *P. pipistrellus* was found to be the most *frequent species in Berlin, Brno, and Pilsen. It is quite common in many* other European towns, where the invasions mentioned above were recorded. In Prague, however, this phenomenon has never been observed and the presence of *P. p.* there is proved by old material only. *E. serotinus*, second most frequent species, occurs in all the towns under comparison, at least in summer; it is frequent in other European towns as well (Rumler, 1978; Klawitter, Vierhaus, 1975; Klawitter, 1976 b). *Plecotus* species rank third — *P. auritus* in the regions of colder, *P. austriacus* in that of warmer climate. *N. noctula* is another common species in towns: it has its hiding quarters there but does not hunt in the built-up areas of large towns (cf. Klawi-

Tab. 3. A comparison of bat communities known to occur in four Central European towns (for references see the text). Explanations: S = summer occurence (1 April to 14 October), W = = winter occurence (15 October to 31 March); SW = rare; SS WW = common, SSS WWW = = abundant.

Species	Berlin	Prague	Brno	Pilsen
P. pipistrellus	SSS WWW	?	SSS WWW	SSS WWW
E. serotinus	SSS WW	SSS W	SSS W	SSS ?
P. austriacus	S W	SSS WWW	SSS WWW	SSS WWW
P. auritus	SSS WWW	S W	S W	S W
N. noctula	SS WW	S WWW	S W	SS WW
M. daubentoni	SS WW	S W	S W	— —
M. myotis	SWW	S W	S W	SS W
M. nattereri	SWW	— W	— —	S W
M. mystacinus	— W	— W	— —	— —
M. brandti	— W	— W	— —	— —
M. bechsteini	— W	— —	— —	— —
M. emarginatus	— —	— —	S —	— —
B. barbastellus	— WW	— W	S —	— W
V. murinus	SW	— W	— —	S —
P. nathusii	S —	— —	S —	— —
R. hipposideros	— —	— —	S ?	— —
N. leisleri	in owl pellets	— —	— —	— —

ter, Vierhaus, 1975; Gaisler, Hanák, Dungel, 1979). *M. daubentoni* is common in Berlin only. *M. myotis* is present in all the towns under comparison but only in Pilsen its summer nursing colonies are known. It occurs frequently in the country and apparently avoids large human settlements. The remaining species are considered only accidental visitors to towns or residents in the peripheral parts. The higher number of winter finds in Berlin and Prague compared to Brno and Pilsen results from the existence of more and larger underground spaces in the former two towns; in the case of Brno, such spaces are in the close vicinity (Moravian Kars). The presence of *R. hipposideros* and *M. emarginatus* in Brno only corresponds to the situation of the town in a relatively warm region of Central Europe.

There are no data on population densities of bats in European towns. The only available information of this kind comes from Lewis, Iowa (USA), where McClure (1942) estimated the population density of *Lasiurus borealis* to 1 ind. per acre, i. e. about 2 ind. per ha. The above case represents an unusually high concentration in a small area (65 ha) of optimum habitat with an abundant food supply. Gaisler (1979) summarized the available information concerning population densities of bats in different environments: the values range from 0.01 to 21.9 ind. per ha. The last value is from the tropics — the values from temperate regions do not exceed 1 ind. per ha; they are usually much lower. In this respect the values estimated in Brno can be considered relatively high, which suggests a great adaptability to the life in towns in some bat species.

The distribution of bats in the towns seems to be determined by both availability of hiding quarters and the food supply. The town centre apparently has the best (or most) shelters and/or its high illumination at night is

attractive for nocturnal insects thus attracting the bats too. The new housing estates, on the contrary, are poor in suitable bat shelters and the food supply there seems to be low. Whereas population density and abundance decrease from the town centre outwards species diversity may increase. It would correspond to certain conclusions concerning birds where the problem, however, is a little bit more complicated (Hudec, 1976). One can expect that the distribution of bats in towns is determined by many additional factors such as the distribution of „warm islands" within the town (cf. Eriksen, 1978).

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A CONTRIBUTION TO THE PROBLEM OF RELATIVE SIZE IN VERTEBRATE MORPHOLOGY

Ivan HERÁŇ

Dedicated to the Academician Josef Kratochvíl on the occasion of 70th anniversary of his birthday

Received June 9, 1978

Abstract: The problems connected with the concept of the relative size which represents an important standard to the studies bearing upon the vertebrate morphology are discussed in the present contribution. The main attention is paid to the question to what extent, or if any, it is possible to replace the values which can represent the general size of animal (size of the skeleton, body weight) by the values that could be used as the substitutives (several skull measurements). The attention is also paid to the interrelations of some skull measurements. The contribution results from the examination of the skulls and skeletons of 27 species of Mustelidae.

INTRODUCTION

The problem of the relative size („Beziehungsgrösse" in German publications) is not recent in vertebrate morphology as many authors have already tried do find the adequate measurement for such a purpose. In mammal morphology, Böker (1935) was the first to define this value having used for this aim the direct distance between the glenoid and acetabular joints as the standard. Such a distance represents, as far as the functional viewpoint is taken into account, the most important section of the trunk in tetrapod vertebrates because of the fact that in the terminal points of it the animal body is supported by the fore and hind extremities. Nevertheless, this method is not quite precise as the situation of the glenoid joint cannot be fixed exactly in mounted skeletons, apart from the fact that no account is taken in this case to the curvature of the spine which shows a marked infraspecific variation and which can be only very hardly standardized in the cadavers and skeletons. For all these reasons, the relative size was modified by Müller (1953) into the distance between the first thoracic vertebra and the crossing of the axis of sacrum with the imaginary line which ataches with each other the cranial margins of acetabula; this distance being measured accordingly to the course of the vertebral column.

However, neither of these values is generally used in morphological studies and various authors take also some other measurements for this aim as, for example, the spine length between the first cervical and the last sacral vertebrae (Ondrias, 1961 etc.) or the value of so called skeleton total (Fürbringer, 1888 etc.).

Although none of the methods mentioned above is completely satisfactory as far as various professional viewpoints are considered (compare Hilde-

brand, 1952), they represent a good standard for comparisons made in morphological studies. However, they all have a serious practical disadvantage: the complete skeletons are rather infrequent in most zoological collections so that only an unsufficient material is usually at disposal for the studies made in various fields of osteology where, according to the high variability of many characters explored, the numerous sample is of great importance. That is why various substitutive values must be used, among which the condylobasal length (Petrov, 1958 etc.) or some other skull measurements are the most common. Analogous complications are connected with evaluating the volume or the weight of certain organs. as the body weight is mostly unknown in the respective material.

For these reasons, an attempt is made in the present contribution to compare with each other some of the commonly used standards of the relative size and to state if, at least, some of them can be substituted in such a function. The study results from the examination of the skulls and skeletons of Mustelides which are very suitable for such a purpose because of a rather extensive interspecific variability in the size and morphology of the respective species.

MATERIAL AND METHODS

The mostpart of measurements is assumed of the material which was used for the aims of author's foregoing studies (Heráň, 1973, 1974, 1977). Only certain additional measurings have been performed subsequently partly in the same specimens, partly in the other skulls and skeletons. In total, the measurements of 54 complete skeletons and 814 skulls belonging to 27 species of Mustelidae are evaluated in the present contribution. The size of sample in respective species is indicated separately for each table and graph as it was not constant in all the characters explored.

The present contribution has, primarily, an informative purpose. That is why no complete statistical evaluation has been made and why only values of the mean and the extent of variability stated are given in the respective conclusions. In order to obtain a comparable issues most resulting values are presented in the form of ± deviations of the mean computed in each of the characters ($\bar{x}$ = 1.00).

The values of the "skull total" and "skeleton total" which have not been standardized till now in the morphological literature are constituted by the following measurements in the present paper:

skull total: condylobasal length, greatest length of skull, zygomatic breadth, total height of skull, breadth of postorbital constriction breadth of braincase;

skeleton total: total length of vertebral column, length of sternum. greatest+ +smallest height of thorax. lengths of scapula, humerus, ulna and fore autopodium, length of innominate bone, lengths of stylopodium, zeugopodium and autopodium (including calcaneus) of the hind foot, condylobasal length, zygomatic breadth, total height of skull and breadth of postorbital constriction.

The values of body weight were extrapoled from literature data with regard to the dimensions of the respective material.

RESULTS

In order to compare various standards of the relative size three various measurements of the skeleton were selected, viz. "body length" (after Müller, 1953); "total body length" (length of vertebral column + condylobasal length); and "skeleton total".

Of these measurements the "total body length" seems to be the least acceptable as it is too much influenced by the variation in the length of the cervical and, first of all, of the caudal section of the vertebral column; this being of the special importance in cases when this length is employed for the

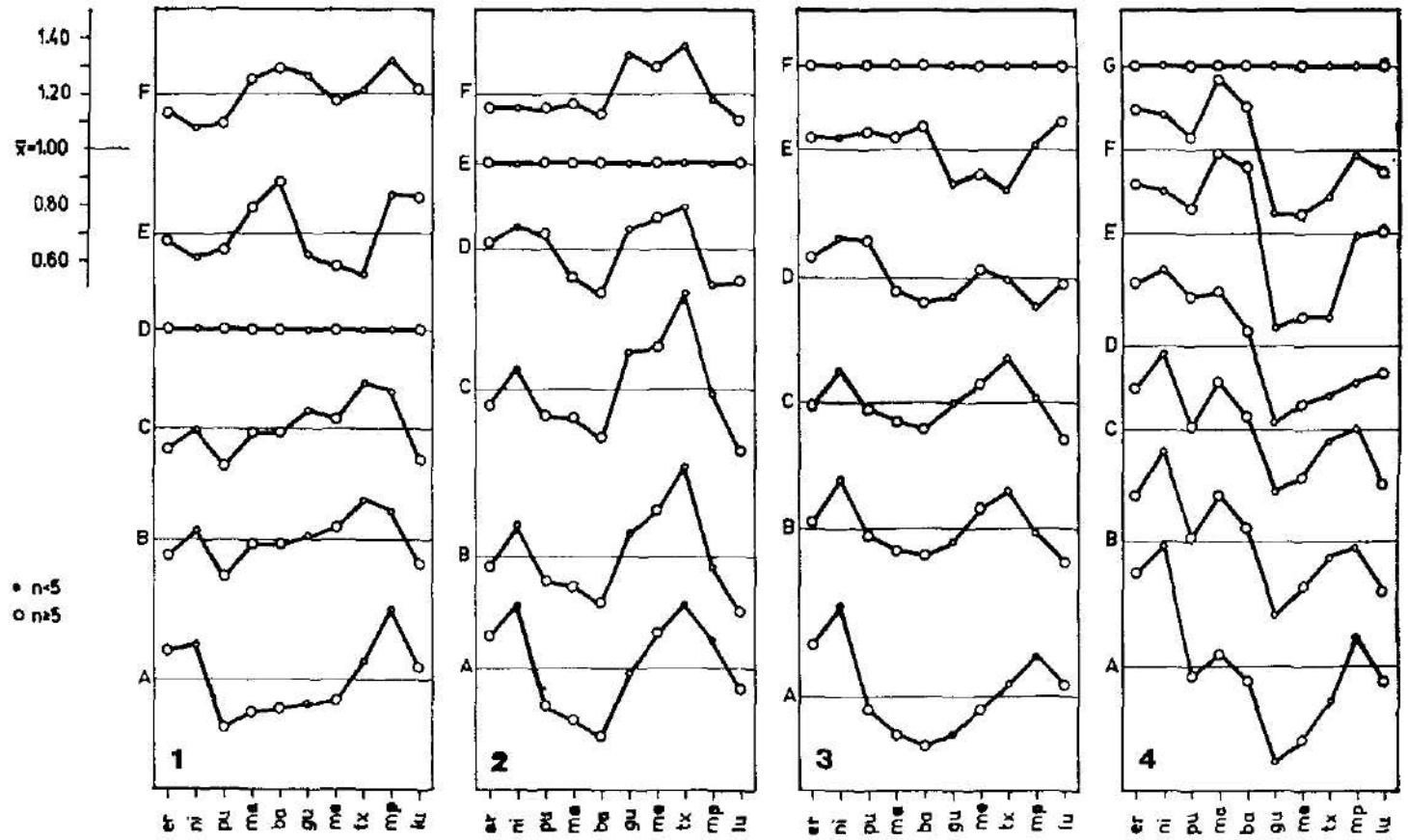

Fig. 1–4: Mean values of measurements (A–F), percentage ratio to "body length" (Fig. 1), "total body length" (Fig. 2), skeleton total (Fig. 3) and $\sqrt[3]{\text{body weight}}$ (Fig. 4); presented as ± deviations of mean in each of characters exlored ($\bar{x}$ = 1.00). Explanations. A — length of brain-stem-basis, B — *condylobasal length*, C — skull *total*, D — "body length", E — "total body length", F — skeleton total, G — $\sqrt[3]{\text{body weight}}$. n — size of sample, ba — *Ezra barbara*, er — *Mustela erminea*, gu — *Gulo gulo*, lu — *Lutra lutra*, ma — *Martes martes*, me — *Meles meles*, mp — *Mephitis mephitis*, ni — *Mustela nivalis*, pu — *Putorius putorius*, tx — *Taxidea taxus*

aims of comparing the species which belong to various orders or classes of vertebrates or of species with a very different body construction (whales, giraffies, anthropoids etc.).

Skeleton total, on the contrary, represents the most suitable value for expressing the general body size as it includes many measurements which influence notedly the general body proportions. However, the character of this

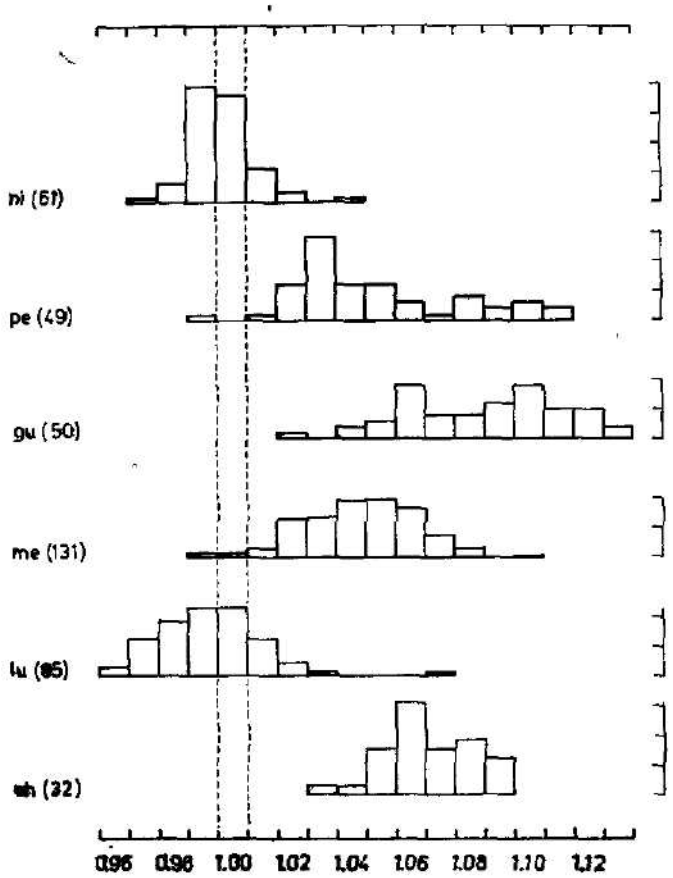

Fig. 5: Ratio greatest length of skull to condylobasal length, extent of variation (horizontal scale) and frequency (vertical scale, divided after 10 per cent); size of *sample is given in parantheses for each species.*
Explanations: eh — *Enhydra lutris*, pe — *Martes pennanti*; for other symbols see Figs. 1—4.

value does not allow to analyse some features of the body construction that are of an essential significance not only for the investigations made in the functional anatomy of locomotory apparatus but also for acquiring the general idea of the body frame in various types of tetrapod vertebrates.

"Body length" makes the latter relations very clear, however, it has also a certain disadvantage in the fact that, in the extreme cases, it misinforms to a certain degree of the real correlations of the total size in different

Tab. I. Ratio skull total to condylobasal length (condylobasal length equated to 1.00)

species	size of sample	variation stated	mean
Mustela erminea	35	3.44 — 3.66	3.55
Mustela nivalis	56	3.30 — 3.75	3.49
Lutreola lutreola	29	3.43 — 3.57	3.50
Putorius putorius	48	3.53 — 3.71	3.62
Martes martes	55	3.57 — 3.79	3.65
Martes flavigula	15	3.51 — 3.67	3.59
Martes americana	21	3.49 — 3.64	3.58
Martes pennanti	43	3.42 — 3.82	3.57
Eira barbara	39	3.51 — 3.74	3.62
Galictis vittata	17	3.53 — 3.70	3.61
Gulo gulo	44	3.63 — 3.94	3.82
Mellivora capensis	34	3.56 — 3.82	3.68
Meles meles	97	3.47 — 3.81	3.61
Arctonyx collaris	9	3.46 — 3.68	3.58
Mydaus javanensis	17	3.36 — 3.66	3.56
Taxidea taxus	29	3.56 — 3.87	3.69
Melogale moschata	7	3.63 — 3.93	3.75
Melogale personata	8	3.52 — 3.73	3.60
Melogale orientalis	3	3.70 — 3.77	3.73
Mephitis mephitis	14	3.58 — 3.79	3.71
Lutra lutra	56	3.42 — 3.66	3.51
Pteronura brasiliensis	11	3.53 — 3.71	3.61
Amblonyx cinerea	11	3.72 — 4.06	3.88
Aonyx capensis	4	3.83 — 4.04	3.90
Paraonyx microdon	1		3.97
Paraonyx congica	3	3.96 — 4.11	4.01
Enhydra lutris	27	3.97 — 4.30	4.10

species. Nevertheless, it seems to be the most suitable standard for investigations made in functional anatomy of tetrapods.

If three standards mentioned above are compared with each other in the species explored (Figs. 1—3, D — F), no outstanding correlations occur among them. The least deviations (7.5 per cent) can be found if the skeleton total is compared with two remaining measurements; however, there is no essential difference between this value and the deviations stated when two other measurements are compared by the same way (8.5 per cent in each of them)

In order to examine to what extent the discussed standards of the relative size might be substituted by some other values the measurements of three skull characters were investigated.

Condylobasal length is the most common of them, being used frequently not only in morphological but also in other mammalogical studies as the standard. Mainly the physiological length of the skull is characterised better by this value than by the so-called "greatest length of skull" the sizable infraspecific variation of which (Fig. 5) occurs conspicuously even in skulls of an equal condylobasal length (see Heráň and Porkert, 1976). However, the

condylobasal length express one of skull proportions only; hence no total size and massiveness of the skulls is shown by this way, since neither a breadth nor a height of them are taken into consideration. This is a certain disadvantage of this measurement, as the marked diversity in the latter proportions occurs in several species; this being evident not only from the visual com-

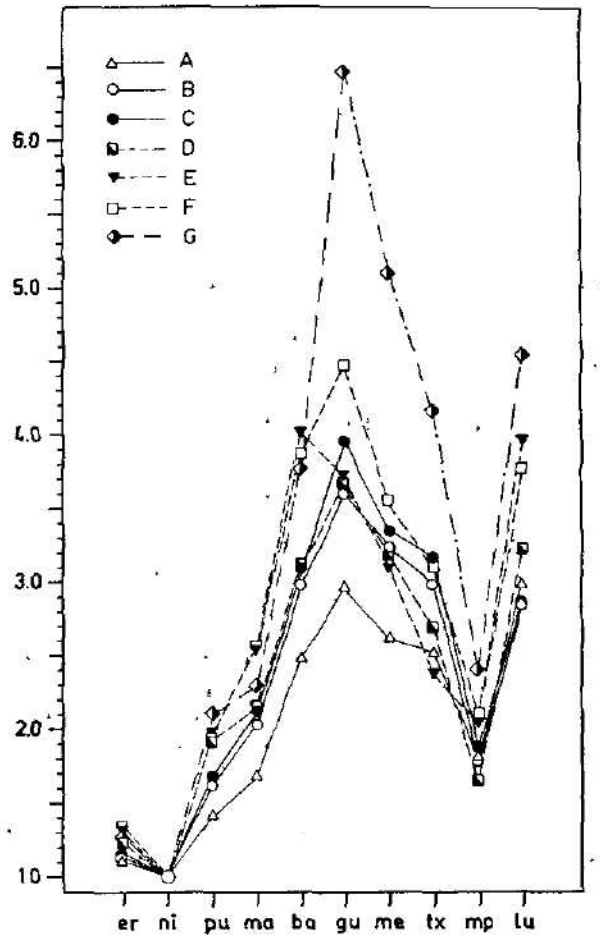

Fig. 6: Mean values of characters examined in 10 species of *Mustelidae;* relative scale, least species (ni) equated to 1.00 Symbols as in preceding figures.

parison of the extremely framed skulls (for example, *Mustela nivalis* to *Enhydra lutris)* but also from comparing the respective values with each other (Tab. 1).

Skull total, on the contrary, corresponds very well to the objective idea of the general size of the skull. Despite certain disadvantages which have been already discussed in the case of the skeleton total, this value seems to be one of the most suitable characters that can be used as the standard for investigations in skull morphology.

In order to find the standard for comparisons made in evolutionary morphology of skulls, Huber (1952 etc.) introduced a new measurement, the so-called length of the brain-stem-basis ("Hirnstammbasis"). However, this standard seems to have too many disadvantages for investigations made in Mustelidae where it is very difficult to find the respective craniometric points because of the very early obliteration of the skull sutures.

No marked correspondence between the respective values occurs when the skull measurements are compared with the selected skeletal dimensions (Figs. 1—3, A—C). Rather close relations can be found only between skull total and skeleton total (average variation 7 per cent) and mainly between condylobasal length and "body length" where the average extent of variation (6 per cent) is even more favourable than if the respective skeletal dimensions are compared with each other. The greatest deviations, on the contrary, can be found especially in the length of the brain-stem-basis where they present 13 per cent on the average.

As far as all the foregoing measurements are compared with the body weight (Fig. 4) there appear very extensive deviations (about 106 per cent in skull measurements and 97 per cent in skeletal measurements) which indicate that the body weight cannot be substituted by any of the linear measurements explored in the present study. This finding follows also from Fig. 6 and is well in line with the numerous concrete results of the explorations made in this field (Stephan, 1959; Schumacher, 1963; Thiede, 1966; Heráň, 1973 etc.).

SUMMARY

The different standards of the relative size ("body length", "total body length", skeleton total, condylobasal length, skull total, length of brain-stem-basis, body weight) were correlated in various species of Mustelidae to find out to what extent they might be substituted by each other.

No marked correspondence was found between the compared measurements of skulls and/or skeletons in the respective species; this is in line with the fact that each of them represents a different body character.

Neither of the skull measurements agrees to any of the skeletal dimensions to such extent that it would be possible to substitute them without any exception.

The least interspecific variation occurs in relations condylobasal length to "body length" and skull total to skeleton total respectively. Only these two skull characters might be used, in the case of need, to substitute the respective skeletal characters provided that the variation mentioned is considered.

The body weight cannot be substituted by any of the linear measurements explored because of the very extensive interspecific variation of the respective interrelations.

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Hochschule für Bodenkultur in Brno und Muzeul Brukenthal, Sibiu—Romania

NEUE ANGABEN ÜBER DIE GATTUNG THEONINA SIMON UND MEIONETA HULL AUS MITTELEUROPA

F. MILLER und I. WEISS

Dem verdienten Zoologen Akademiemitglied Josef Kratochvíl zu seinem 70. Geburtstag gewidmet

Eingegangen am 9. März 1978

Abstract: A new species *Theonina kratochvili* sp. n. from Czechoslovakia and Romania is described and illustrated. Its affinities to *T. cornix* (Simon), the type-species of the genus, and to *Meioneta equestris* (L. Koch) are discussed. The untill unknown female of *M. equestris* (L. Koch) is described and illustrated.

Aus der Gattung *Theonina* Simon, 1929 war bis nun einzig *T. cornix* (Simon, 1881) bekannt. Saaristo (1974 b) hat diese Art als Typus-Art der Gattung neu beschrieben und anhand einer sehr genauen Analyse vor allem der Genitalstrukturen die Stellung innerhalb der Lepthyphantini (Saaristo, 1974 a) näher präzisiert. Er nahm an, dass *Theonina* innerhalb dieser Tribus der Gattung *Microneta* am nächsten steht. Nun wurde eine zweite Art dieser Gattung entdeckt und zwar zugleich in zwei entfernten Ländern: in der Tschechoslowakei und in Rumänien. Sie ist dergleichen wie die west- und mitteleuropäische *T. cornix* eine xerotherme Art, die jedoch scheint in Westeuropa zu fehlen.

Theonina kratochvili sp. n. (T. I, Abb. 1—10)

Weibchen (Holotyp):

Totallänge 1,3 mm, Prosoma 0.65 mm lang, 0,53 mm breit, flach und fast regelmässig gewölbt, glänzend dunkel olivengrau bis braun mit grossem schwärzlichen Rückenfleck, drei nach vorn gerichteten Linien und 2—3 Paar Radiärstreifen. Augenfeld schwärzlich. Brustpartie mit einem breiteren Marginalsaum. Bei manchen Weibchen ist das Prosoma heller gefärbt, mit nur wenig deutlicher dunkleren Zeichnung und statt des breiteren Marginalsaumes nur mit einer schwarzen Marginallinie. Hintere Augenreihe nimmt die ganze Stirnbreite ein. Sie ist recurv. Augen gross, Abstand der MA etwa 2/3 d, ihre Entfernung von den SA = d. Vordere Augenreihe schwach gebogen. Clypeus konkav, niedriger als die Länge des Augentrapezes. Cheliceren robust, vertikal, mehr als dreimal länger als der Clypeus (0,30 mm), mit 13—14 deutlichen Schrilleisten. Vorderer Klauenfurchenrand mit 6, hinterer mit 5 Zähnen. Sternum 0,37 × 0,35, zwischen den Coxen IV gerade abgestutzt und breiter als die Dicke dieser Glieder (0.11 mm), glänzend, dunkel olivenbraun mit rötlich violetem Glanz. Unterlippe mit Ausnahme des hellen Vorderwulstes, wie das Sternum gefärbt, Gnathocoxen wenig heller, mit blassen Spitzen.

Pedipalpus: 1,19 + 0,07 + 0,11 + 0,24 mm = 0,61 mm. Fe, pt hellgelb oder gelblich braun, ta dunkel olivenfarben.

Beine hellgelbraun, fe I vorn dunkler angehaucht; ti, mt und ta II (III) oft graulich getrübt, cx ventral ockergelb, distal mit dunklem Saum.

Bestachelung: Fe I prolateral distal mit 1 Stachel (Stellung 0,7), ti I, II dorsal 1.1, retrolateral distal 1, ti III, IV dorsal 1.1 Alle Stacheln kräftig und lang, der *profimale auf ti IV* = 2,5 d, *auf ti III fast 3d. Nur mt I-III* mit einer Bothriotrichie, ihre Stellung 8,18—0,19. Länge der einzelnen Glieder:

I	0,71	+ 0,18	+ 0,60	+ 0,48	+ 0,42	= 2,39	mm
II	0,60	+ 0,17	+ 0,47	+ 0,43	+ 0,28	= 2,05	„
III	0,48	+ 0,15	+ 0,40	+ 0,43	+ 0,28	= 1,64	„
IV	0,68	+ 0,17	+ 0,51	+ 0,45	+ 0,40	= 2,21	„

Hinterleib grauschwarz, Bauchseite hinter der Epigastraulfurche mit leuchtend blauem Metallglanz. Spinnwarzen schwärzlich.

Epigyne und Vulva ähnlich wie bei *T. cornix*. Die Unterschiede lassen sich aus den Abbildungen ersehen. Bei der neuen Art ist der Deckel (basaler Teil des eingefalteten Scapus) senkrecht von ventral gesehen breit vierecking, kurz und seine blassen, abgerundenten Seitenlappen füllen die beiden, stumpf dreieckigen Grübchen völlig aus.

Bei *T. cornix* ist der Deckel länger, vorn etwas breiter als hinten, die beiden grösseren Seitengruben sind nur zum Teil durch die Hinterlappen des Scapus ausgefüllt. Be der Seitenansicht ist der Epigynenhöcker bei *T. kratochvili* flacher, dem Bauch mehr anliegend.

Auch die Vulven der beiden Arten weisen verlässliche Unterscheidungsmerkmale auf, nicht nur in der Größe und Form der Receptakeln, sondern auch im Verlauf der Befruchtungsgänge.

Männchen:

Viel größer und meistens auch viel dunkler gefärbt als das Weibchen. Totallänge 1,8 mm. Prosoma 0,92×0,80 mm (rumänisches Exemplar 0,72×0,68 mm), niedrig und sehr flach gewölbt. Rückenlinie mit 3—4 langen Haaren. Färbung: dunkel olivenfarben bis braunschwarz, glänzend, der dunkle Rückenfleck und die 3—4 Paar Radiärstreifen heben sich meistens weniger deutlich ab. Augen viel kleiner als beim ♀, schwarz umrandet. Hintere Augenreihe recurv, kürzer als die Stirnbreite (0,37 mm); Abstand der MA nur wenig kleiner als ihr d. Seiteninterwalle etwa 1,5 d. Clypeus niedrig, procliv, unter den Augen ausgehölt. Cheliceren sehr eng (0,55 mm), schlank, mit 18—20 feinen, aber gut entwickelten Schrilleisten. Hinterrand auf dem Niveau der Klauenspitze mit einem kräftigen, plumpen, abgerundeten Zahn mit einer aufsitzender Spitze. Weiter distal eine Guppe von 5—6 spitzigen Zähnchen; die beiden mittleren (zuweilen zu einem Zwillingszahn verschmolzen) sind am grössten. Sternum stark gewölbt, dunkelbraun bis schwarz, stark glänzend, mit schwachem bläulichem Metallglanz.

Beine sehr lang, gelblich braun, vordere Seite der fe I, sowie die ti, mt und ta I-III dunkler getrübt. Länge der einzelnen Glieder ist wie folgt:

I	1,02	+ 0,24	+ 0,98	+ 0,74	+ 0,50	= 3,48	mm
II	0,80	+ 0,23	+ 0,70	+ 0,60	+ 0,48	= 2,81	„
III	0,68	+ 0,21	+ 0,50	+ 0,47	+ 0,36	= 2,22	„
IV	0,92	+ 0,24	+ 0,75	+ 0,70	+ 0,44	= 3,05	„

Bestachelung wie beim ♀, die Stacheln sind jedoch viel kürzer und dünner; die dorsalen auf ti I, II nur wenig länger als die der Glieder, auf ti III, IV um die Hälfte länger. Hinterleib dunkelgrau bis schwarz.

Pedipalpus: Pt mit einer kräftigen, langen Stachelborste. Cymbium basal mit zwei mächtigen ungleichen Ausbuchtungen, die durch einen schmalen, spitzwinkeligen Zwischenraum getrennt sind. Die vordere Ausbuchtung endet mit zwei ungleichen abgerundeten Höckern, von denen der hintere an der retrolateralen Fläche seicht ausgehölt ist. Der Embolus ist schlank, S-förmig gekrümmt, zu einer ziemlich langen Spitze verjüngt. Sein Endteil wird von der breiten, durchsichtigen, mit spitzigen Fransen versehenen membrana mediana (Conductor) begleitet. Fickertsche Drüse kugelig. Endapophyse und Radix von sehr komplizierter und eigenartiger Form.

Bei *T. cornix* laufen die beiden konischen Ausbuchtungen stark auseinander und sind daher durch einen stumpfwinkeligen Zwischenraum getrennt. Der Embolus ist flach, lamellös, breit mondförmig und an der konkaven Seite mit einem durchsichtigen Lappen versehen. Einen ähnlichen besitzen ausser *Microneta viaria* auch viele *Troglohyphantes*-Arten. Fickertsche Drüse spindelförmig. Die Endapophyse und Radix ebenfalls verwickelt und sehr spezifisch gebaut.

Beziehungen:

Theonina kratochvili steht *T. cornix* (T. 2, Abb. 1—4) verwandtschaflich sehr nahe, was sich nicht nur in dem Bau der Kopulationsorgane und in anderen morphologischen Merkmalen beider Geschlechter, sondern auch im äusseren Aussehen, besonders auch im bläulich violeten Metallglanz des Sternums und des Bauches offenbart. Auf die Verwandtschaft mit der Gattung *Microneta* hat, wie schon bemerkt, Saaristo aufmerksanm gemacht. Es sei hier jedoch auf einen gewichtigen Unterschied hingewiesen werden: bei *Microneta viaria*, der einzigen europäischen Art der Gattung, besitzen alle mt in der distalen Hälfte eine Bothriotrichie (mt I = 0,65). Bei *Theonina*-Arten fehlt die btr auf mt IV (Saaristo gibt sie irrtümlicherweise an), ihre Position auf mt I = 0,18—0,19. Auch in den ökologischen Ansprüchen gibt es Unterschiede: Die beiden *Theonina* Arten sind thermophil-xerophil, stenochron sommerreif, *Microneta viaria ist* hylobionhygrophil und diplochron.

Aus der taxonosmisch sehr einheitlichen Gruppe Micronetae hat besonders die Gattung *Meioneta*, und vor allem die Art *M. equestris* (L. Koch, 1881) (T. 2, Abb. 5—11), manche gemeinsame Merkmale mit *Theonina:* Alle Arten haben btr auf mt I-III (btr I = 0,20—0,25). Das Cymbium hat retrolateral basal einen Höcker, der bei *M. equestris* (T. 2, Abb. 10, 11) und *M. gulosa* (L. Koch), als ein sehr großer Fortsatz ausgebildet ist. Die Epigynen mit eingefaltetem Scapus sind von einfacher und einheitlicher Form, einigermassen ermahnend an die von *Theonina*-Arten. Die Vulva von *M. equestris* mit ihren komplizierten Receptakeln ähnelt sehr der von *T. kratochvili*.

Es gibt jedoch zwischen beiden Gattungen wesentliche genitalmorphologische Unterschiede, die gegen eine engere Verwandtschaft beider Genera sprechen. Im Bulbus der *Meioneta*-Arten ist mmer die sehr artspezifische Lamella characteristica vorhanden, die bei *Theonina*-Arten nicht entwickelt ist. Der Anschlußembolus ist sehr unansehnlich, schwer zu sehen, von ähnlicher Form wie bei den *Centromerus*-bzw. *Lepthyphantes*-Arten.

Fundorte:

Theonina kratochvili ist, der gleichen wie *T. cornix*, eine selten vorkommende, wärme- und trockenliebende Art. Sie lebt in schütteren Gras- und anderen Krautschichten sonniger Hecken und Waldränder. Die stenochronen Männchen erscheinen viel früher als die Weibchen (schon anfangs April) und verschwinden schon anfangs Mai. Die langlebigen Weibchen trifft man noch in der ersten Augusthälfte an.

Fundorte von *Theonina kratochvili* in der ČSSR: Bisher sind 4 Lokalitäten aus Mähren und eine aus der Slowakei bekannt.
Žebětín (Brno): Sonninger Rand eines lichten Waldes *(Querceto carpinetum)*.
Typische Lokalität: 20.–25. IV. 12 ♂♂, 15.–20. VI. ♀♀;
Pouzdřany: Grassteppe, 6. V. 1958 4 ♀♀, 1 j ♀;
Mohelno: Serpentinsteppe. 3. VIII. 1964 5 ♀♀;
Dolní Čepí: Am Eichenwaldrande eines nach Süden exponierten Hanges 15. VIII. 1968 3 ♀♀;
Krupina (Slowakei): 10 VI. 1 ♀.

Rumänischer Fundort: Südlich exponierter Hang im Serbuta-Tal in Siebenbürgen, zwischen den Ortschaften Sura Mare und Slimnic (Kreis Sibiu): am Waldsaum und am Rande der Hecken im Zwergmandelgebüsch *(Amygdaletum nanae)* und im Fierzwenkenrasen *(Brachypodietum pinati)* — 30. IV.–8 VII. 3 ♂♂, 4 ♀♀.

Fundorte von *Theonina cornix*
Böhmen: Radotín, Kalksteinsteppe (Miller & Valešová, 1964: Lovoš, Phonolith-Gipfel mit einer Waldsteppe (Buchar, 1972). Mähren: Grassteppe auf einem Kalkberg bei Brno — 10. IV. 1961 3 ♀♀, 2. VI. 1962 1 ♀, 6. V. 1968 8 ♂♂, 4 ♀♀; Čebínka: Grasiger Kalkberg bei Čebín — 4. VIII. 1 ♀; Mohelno: Serpentinsteppe, 4. VIII. 2 ♀♀.
Slowakei: Slovenské Nové Mesto, 1 ♀. unter *Bathyphantes*(?) *cyaneonitens* Kulczynski, 1898.

Aus Rumänien ist diese Art nicht bekannt. Roşca's Angabe (unter *Bathyphantes mastodon)* aus dem alten Friedhof inmitten der Stadt Sibiu dürfte auf Fehlbestimmung beruhen Es stimmt weder der ökologische Charakter des Standortes, noch die *Größenangaben bei Roşca (♂ 2 mm, ♀ 1,5 mm).*

Von *Meioneta equestris* (L. Koch, 1881) war bisher nur das Männchen bekannt. Im folgenden beschreiben wir das Weibchen.

Prosoma breit birnenförmig, 0,7 mm lang, 0,55 mm breit, gelblich olivenfarben, mit breitem unscharfem schwarzem Saum und schwarzem Augenfeld. Rückenfleck mit drei frontalwärts gerichteten Linien und drei Paar Radiärstreifen nur angedeutet. Hintere Augenreihe schwach recurv, Augen groß, fast equidistant, Zwischenräume kleiner als Halbmesser des MA.

Sternum 0,40 mm lang, 0,38 mm breit, zwischen den cx 4 breit abgestutzt und etwa so breit wie deren Dicke. dunkel olivenbraun mit spärlichen hellen Tüpfchen. Unterlippe dunkler als das Sternum, Gnathocoxen etwas heller. Clypeus niedrig (0.05 mm) senkrecht, ausgehölt.

Cheliceren 0,21 mm lang, gelbbraun mit rötlich gelber Kralle, ohne Schrilleisten. Pedipalpus gelblich. Länge der Glieder: 0,22 + 0,07 + 0,16 + 0,24 mm. Pt und ti vorn mit einer Stachelborste, ta dorsal vor der Mitte 2, retrolateral auf gleichem Niveau 1, ventral apical ein Paar und davor noch eine Sachelborste.

Beine graugelb, nur cx hellgelb. Länge der Glieder:

I	0,64	+	0,20	+	0,58	+	0,52	+	0,40	=	2,34	mm
II	0,62	+	0,18	+	0,53	+	0,45	+	0,39	=	2,17	„
III	0,50	+	0,16	+	0,40	+	0,40	+	0,31	=	1,17	„
IV	0,67	+	0,18	+	0,65	+	0,51	+	0,37	=	2,38	„

Bestachelung wie beim Männchen. Länge der Stachelborsten auf ti I = 1,5 d, Bothriotrichie auf mt I, II, III = 0,23, 0,24, 0,25.
Epigyne und Vulva T. II Abb.

Meioneta equestris ist eine sehr seltene, wärme- und trockenliebende Spinne. In der ČSSR wurde sie nur an zwei sehr warmen Standorten gefunden: Serpentinsteppe Mohelno, am 6. IV. 1 ♂, 1 ♀; Ein grasiger, nach Süden exponierter Hang von Babí lom unweit von Brno am 14. V. 1948. 2 ♂♂.

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Die Tafeln mit den Abbildungen sind am Ende des Heftes zu finden.

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Dr. I. Weiss, Muzeul Brukenthal, Sibiu, R. S. Romana.

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REDESCRIPTION OF THE NEMATODE SPINITECTUS INERMIS PARASITIC IN EELS, ANGUILLA ANGUILLA, OF EUROPE

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Dedicated to the Academician Josef Kratochvíl on the occasion of the 70th anniversary of his birthday

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Abstract: The nematode *Spinitectus inermis* (Zeder, 1800) (Spiruroidea) is redescribed and illustrated on specimens collected from eels, *Anguilla anguilla* (L.) of the Břehyně Brook near Mácha Lake, northern Bohemia, Czechoslovakia (R. Elbe drainage system). It distinctly differs from all hitherto known members of the genus in having eggs provided with polar caps which were observed in this species for the first time. The taxonomical value of some morphological features of *S. inermis* and the occurrence of this parasite in European eels are discussed. The paper is supplemented by a key for the identification of the members of *Spinitectus* parasitic in fishes of Europe.

The nematode *Spinitectus inermis* (Zeder, 1800) is a specific parasite of the stomach and, sometimes, of the intestine (juvenile forms) of the European eel, *Anguilla anguilla* (L.). Although it was described as early as at the beginning of the last century, its morphology has so far been only inadequately known and there is no description of *S. inermis* in the literature which would answer the purpose of the present taxonomy; the data concerning this species have ususally been taken over from the older literature including inaccuracies and errors, preventing thus any detailed comparison of *S. inermis* with other members of the genus *Spinitectus* Fourment, 1883.

This species had originally been described by Zeder (1800) as *Goezia inermis;* later Rudolphi (1819) added some data based on the specimens collected by Hübner; the latter were illustrated in the work of Bremser (1824). Dujardin (1845), like the two foregoing authors, dealt with the species under the name *Liorhynchus denticulatus* and noted that this helminth seemed to be rare. Schneider (1866), working with the materials of the Berlin Museum and other museums, gave a brief description and drawings of the anterior and posterior ends (male) of this nematode, reporting it as *Filaria denticulata;* later his description and drawings were taken over into several other monographs (Linstow, 1909; Skrjabin, 1923; Bychovskaja-Pavlovskaja et al., 1962; Skrjabin et al., 1937). The descriptions by these older authors have been rather poor and the origin of their specimens has not been mostly apparent from their works (it can be only supposed that they came largely from the territory of Germany). A more detailed description of *S. inermis* based on two specimens from *A. anguilla* from the eastern Pyrenees (France) was given only by Neveu — Lemaire

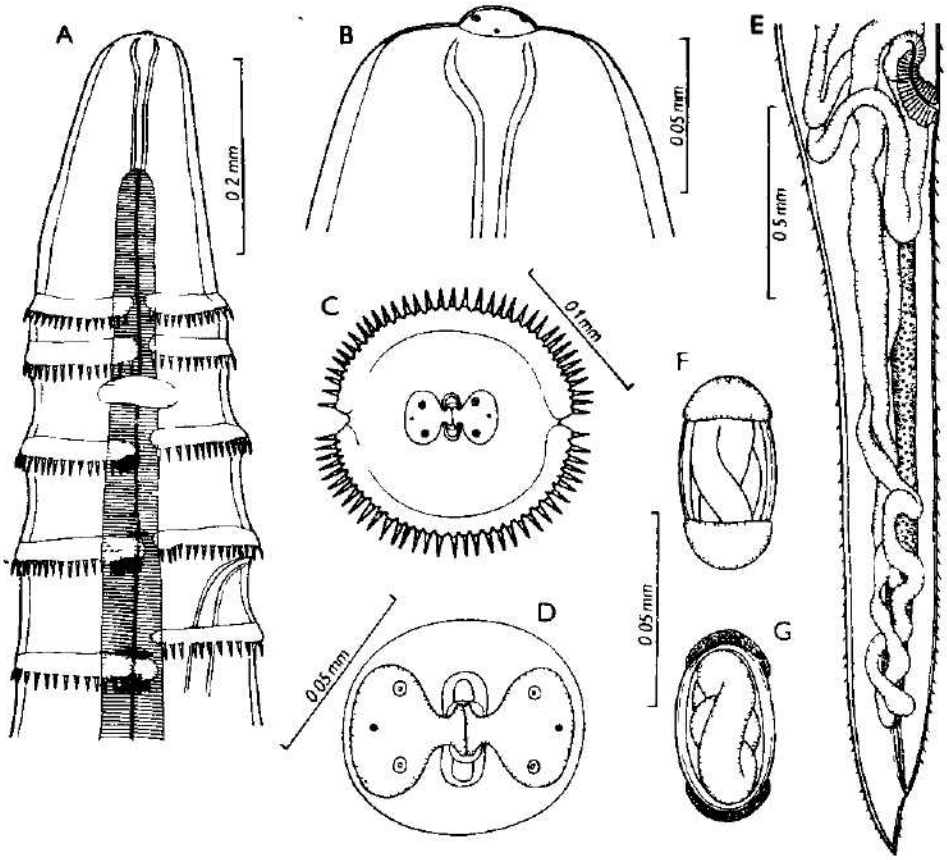

Fig. 1. *Spinitectus inermis* (Zeder, 1800). A — anterior part of gravid female's body (lateral view); B, C — anterior end of female body (lateral and apical views); D — mouth; E — posterior part of gravid female's body (lateral view); F, G — egg

(1927); these specimens were later revised by Campana-Rouget (1961). The female of this species was recorded from Poland by Markowski (1933) and Rasheed (1965) described the head end of *S. inermis* on specimens from the British Museum. In last years there were several records of this parasite from Great Britain (Chubb, 1962, 1963, 1964, 1970; Kennedy 1974); according to Cordero del Campillo and Alvarez—Pellitero (1976) some data concerning the morphology of this helminth are present in the unpublished thesis of Chubb (1961). In Germany, Schäperclaus (1954) reported *S. inermis* to cause inflamation of the pyloric caeca of young eels from the lower Elbe.

In Czechoslovakia this species was first recorded by Moravec (1977) who found theree juvenile specimens in eels of the Mácha Lake system, northern Bohemia. During subsequent investigations carried out at this locality in 1976 also adult specimens were obtained which made it possible to study up in detail the morphology of this hitherto little known parasite species.

Spinitectus inermis (Zeder, 1800) (Figs. 1, 2)

(Syn : *Goezia inermis* Zeder, 1800, *Liorhynchus denticulatus* Rudolphi, 1809, *Filaria* echinata Linstow, 1878).

Description : Whitish, medium sized nematodes with thick cuticle. Head end rounded, posterior end conical. Surface of body provided with transverse rings of small conical spines; rings interrupted at booth sides of body by lateral lines, several rings incomplete. First 5—6 rings somewhat raised, first two rings close to each other. Largest spines present in anterior 5—6 dings. spines gradually diminishing posteriorly, smallest spines being, on posterior end of body. Female body annulated up to posterior extremity, annulation of male ending just in front of precloacal cuticular ridges. First ring of female contained 70 spines (in apical view). Mouth aperture dorsoventrally elongated, with sclerotized rim. Two very small lateral lips present, each of them being continuous posteriorly into a thickened pulp provided with two mouth papillae and minute amphid. Cephalic end of body sometimes retracted due to considerable inflation of cuticle in region of first and second rings. Annulation of specimens with properly extended anterior end starting slightly in front of anterior end of muscular oesophagus. Vestibule straight, thin-walled, with anterior end distinctly distended to form funnel-shaped prostom in lateral view. Oesophagus divided into anterior muscular section and posterior, somewhat longer glandular one. Nerve ring encircling oesophagus approximately between second and third rings of cuticular spines, excretory pore situated below fourth ring: deirids not found.

Male (5 specimens): Length of body 5.81—14.00 mm, maximum width 0.136 to 0.340 mm. Maximum length of cuticular spines 0.015—0.018 mm. Length of overall vestibule including prostom 0.093—0.123 mm, length of prostom 0.018—0.021 mm, its width 0.027—0.030 mm. Muscular oesophagus measuring 0.296—0.489 mm, glandular oesophagus 0.884—2.258 mm. Nerve ring 0.180 to 0.303 mm from anterior extremity, distance of excretory pore 0.225—0.480 mm. Posterior end of body spirally coiled, provided with narrow subventral alae, these reaching posteriorly almost to end of tail. Tail conical, 0.120—0.195 mm long, ending in sharp point. Well developed longitudinal ventral cuticular ridges present in precloacal region, extending anteriorly approximately to level of proximal end of larger spicule. Caudal papillae: 4 pairs preanal and 6 pairs postanal pedunculate papillae present; last three pairs of postanal papillae close together; last but one pair of papillae shifted ventrally. Large spicule slender, 0.663—1.068 mm long, its conical distal tip slightly bent: length of its shaft 0.150—0.336 mm. Lenght ratio of spicular shaft and overall spicule 1 : 3.14—4.42. Small spicule wider, length 0.156—0.192 mm. Length ratio of spicules 1 : 4.17—5.72.

Female (specimen containing mature eggs in uterus; measurements of female without eggs given in parentheses): Length of body 21.95 (6.20) mm. maximum width 0.530 (0.177) mm. Maximum length of cuticular spines 0.018 (0.012) mm. Length of vestibule including prostom 0.150 (0.093) mm; prostom 0.024 mm long and 0.033 mm wide. Length of muscular oesophagus 0.571 (0.357) mm, of glandular oesophagus 2.054 (0.952) mm. Nerve ring 0.390 mm from anterior extremity, distance of excretory pore 0.612 (0.300) mm. Vulva situated in posterior part of body, 2.20 (0.91) mm from posterior extremity. Vagia muscular, pointing anteriorly. Uterus opposed; uterine loops reaching

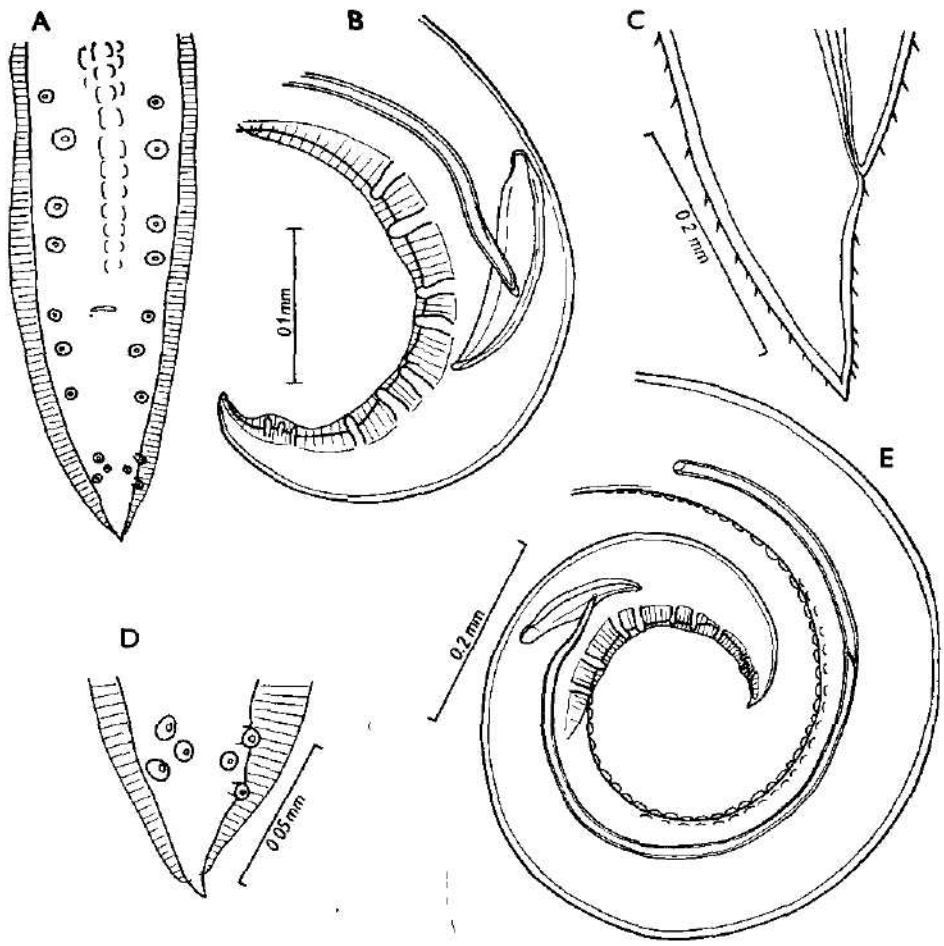

Fig. 2. *Spinitectus inermis* (Zeder, 1800). A. B — posterior end of male boly (ventral and lateral views); C — tail of gravid female (lateral view), D — tip of male tail (ventral view); E — posterior part of male body (lateral view).

anterioly to short distance below end of glandular eosophagus, posteriorly up to end of intestine; eggs present only in uterine loops anterior to vulva and completely absent from those below vulva. Mature eggs oval-shaped, thick-walled, embryonated, provided with thin gelatinous polar caps (0.003 mm thick); length of eggs excluding polar caps 0.048—0.051 mm, width 0.027 mm. Tail conical, 0.192 (0.108) mm long, bearing irregular rings of tiny cuticular spines.

Host: eel, *Anguilla anguilla* (L.).
Location: stomach.
Locality: Břehyně Brook in section between Mácha Lake and fishpond Břehyně near Doksy, northern Bohemia, Czechoslovakia (R. Elbe basin) (9 September 1976).
Deposition of specimens: Institute of Parasitology, Czechoslovak Academy of Sciences, Prague.

DISCUSSION

It is evident from our description of *S. inermis* that this nematode is characterized by some specific features which were given inaccurately or erroneously in the previous descriptions, or were not mentioned at all.

The most remarkable feature of *S. inermis* is the structure of its mature eggs; in having eggs provided with polar caps this species is unique among members of the genus *Spinitectus*. The older authors (Rudolphi, 1819; Dujardin, 1845; Schneider, 1866; Neveu-Lemaire, 1927; Markowski, 1933) indicated only that the eggs of this nematode were oval, embryonated, with a thick shell; Neveu-Lemaire (1927) illustrated the egg as being smooth, without polar filaments or other superficial formations. On the other hand, in the monograph by Bychovskaja-Pavlovskaja et al. (1962) the eggs of *S. inermis* were described to have long polar filaments and this feature was used for differentiation between *S. inermis* and other members of the genus distributed in the U.S.S.R. In this case it was evidently a mistake caused by the combination of the description of *S. inermis* and *S. echinatus* (Linstow, 1878) taken from the monograph of Skrjabin (1923) (*S. echinatus* is usually considered a synonym of *S. inermis*). Skrjabin (1923), however, took the data from Linstow (1909) who had incorporated into the description of *Spinitectus echinatus* also the description of the other species, *S. oviflagellis* Fourment, 1884, the parasite of marine fishes noted for the presence of thread-like polar filaments on the eggs; the latter species was apparently considered by Linstow (1909) to be a synonym of his species *S. echinatus*, described on the juvenile specimens from *Alburnus alburnus*. The morphology and the type of host (a freshwater fish) of *S. echinatus* inidicate, however, that this species is identical with *S. inermis* and not with *S. oviflagellis*. Inclusion of the data concerning *S. oviflagellis* into the description of *S. echinatus* (Linstow, 1909, Skrjabin, 1923) and later combination of the erroneous description of *S. echinatus* with that of *S. inermis* were accordingly the reasons why *S. inermis* was reported in the monograph by Bychovskaja-Pavlovskaja et al. (1962) to have eggs provided with polar filaments.

It follows from the present material that the mature eggs of *S. inermis* bear thin gelatinous polar caps resembling those of *Rhabdochona kisutchi* Margolis, Moravec et McDaniel, 1975 parasitic in North American salmons. This finding is noteworthy as it shows that, like in nematodes of the genus *Rhabdochona* (subgenus *Rhabdochona*) (see Moravec, 1975), the members of *Spinitectus* can be divided into three morphological groups according to their type of eggs: species with the surface of mature eggs smooth, without any superficial formations; species with eggs having polar filaments; and those with eggs having polar caps. The type of eggs in apparently associated with the ecology of the individual species because, for instance, the filaments have ever been found in species parasitizing marine fishes. The eggs of *S. inermis* from our material were somewhat larger than given by Neveu-Lemaire (1927) and Markowski (1933) ($0.033-0.036 \times 0.022$ mm); it can be explained so that not fully mature eggs were measured by the latter authors.

The number of spines in the anterior rings on the body is usually considered a significant feature of nematodes of this genus. It seems, however, that there are considerable differences in the numbers of these spines not only among individual specimens of the same species but also among various rings of the

same individual; it is probable that the cuticular spines in a ring increase in number with the age of the nematode. According to Schneider (1866) there are 56 spines per ring in *S. inermis* while Chubb (1961) reported 56—60 spines; the drawing given by Rasheed (1965) indicates the presence of 83 spines; in the medium sized female of *S. inermis* from our material 70 spines were found in the first rig.

Little attention has so far been paid, both in *S. inermis* and in members of *Spinitectus* generally, to the situation of the excretory pore in relation with the location of the anterior rings of cuticular spines. The situation of the excretory pore is specifically constant and, accordingly, can be considered a significant specific feature. In *S. inermis* it is located between the fourth and fifth rings like in several other species (e. g. *S allaeri, S. gordoni, S gracilis, S. plectroplites)*, whereas in others (e. g. *S. carolini, S. micracanthus*, and *S. tamari*) it is shifted more posteriorly.

The majority of authors (Schneider, 1866; Neveu-Lemaire, 1927, Chubb, 1961) described the male of *S. inermis* to have 4 pairs of preanal and 5 pairs of postanal papillae; all the males from our material possess, however, 6 pairs of postanal papillae, confirming thus the finding of Campana—Rouget (1961). The range of the large spicule lengths is greater in our specimens than given by Campana—Rouget (1961) and Chubb (1961) and the size of this spicule evidently depends on the body size of the male; in the smallest males the large spicule is considerably shorter than that of more advanced males, and its proximal end is only slightly sclerotized. In *S. inermis* there are also considerable differences as to the size of body of the mature specimens; the largest male of the present material is more than twice as long as the smallest one and the gravid female is almost 22 mm long, while Neveu-Lemaire (1927), Markowski (1933) and Chubb (1961) found gravid females only 12—13 mm long (Schneider (1866) gave the length of female 13—19 mm).

According to the present knowledge, *S. inermis* seems to be widely distributed in Europe (the North, Baltic and Mediterranean Seas basins) but occurs only locally, particularly in lakes, fishpond systems and in the lowland reaches of the rivers, being there a rather rare parasite of the eel Dujardin (1845) reported that *S. inermis* had been recorded in only 2 out of 43 eels examined from the museum in Vienna; he himself dissected 24 specimens of eel but this nematode was not found. Markowski (1933) in Poland recorded this species in 1 out of 27 (3.4 %) eels examined from the Baltic Sea coast. Chubb (1961) found *S. inermis* in 1.8 % of eels from Bala Lake in Britain. In the Břehyně Brook near Mácha Lake (fishpond) we recorded this parasite in 3 out of 32 (9 %) eels examined (intensity of infection 1—12 specimens); it confirms on the whole the observations by older authors on the rare occurrence of this nematode. From other localities in Czechoslovakia densely populated by eels (R. Lužnice in southern Bohemia, R. Teplá near Karlovy Vary, R. Želivka — all system of the R. Elbe) his parasite has not been recorded. It is possible that the infrequent occurrence of *S. inermis* is influenced partly by its seasonal dynamics. In the other European freshwater species, *S. gordoni*, the highest infections occur in the definitive hosts (trouts) during September and October (Cordero del Campillo and Avarez-Pellitero, 1976). The mature specimens of *S. inermis* from our material

as well as those found by Markowski (1933) were recorded in September too.

Key to the European members of *Spinitectus*:

1 Mature eggs provided with thread-like polar filaments. Larger spicule of male shorter than 0.3 mm. Excretory pore posterior to fifth ring of cuticular spines Parasitic in marine fishes 2

– Mature eggs without polar filaments. Larger spicule of male longer than 0.3 mm. Excretory pore located between fourth and fifth rings of cuticular spines Parasitic in freshwater fishes 3

2 Each pole of mature egg provided with a small plug and three long, thread-like filaments; size of eggs 0.055 × 0.035 mm Prevulva/postvulva ratio 1.7 : 1. Length of larger spicule 0.275 mm, of smaller spicule 0.075 mm. Parasitic in *Gadus merlangus* (Gadidae) (Western Scotland, English Channel) . . . . . *S. oviflagellis* Fourment, 1884

– Only one pole of mature egg provided with a plug and two short, thread-like filaments; size of eggs 0.040–0.043 × 0.025–0.028 mm Prevulva/postvulva ratio 3 : 1. Length of larger spicule 0.180 – 0.257 mm, of smaller spicule 0.078–0.087 mm. Parasitic in *Gobius batrachocephalus* (Gobiidae) and *Gaidropsarus mediterraneus* (Gaidropsaridae) (Black Sea) . . . . *S. tamari* Naidenova, 1966

3 Mature egg smooth, without any superficial formations, size of eggs 0.039–0.045 by 0.023–0.033 mm Number of spines in one ring 32–48. Prevulva/postvulva ratio 3.8 : 1 Length of larger spicule 0.37–0.45 mm, of smaller spicule 0.082–0.119 mm. Body length of males 2.7–4.7 mm, of gravid females 3.1–5.1 mm Parasitic in *Salmo trutta* m. *fario* and *S. gairdneri* (Salmonidae) (Spain) . . . . . *S. gordoni* Cordero del Campillo et Alvarez-Pellitero, 1976

– Mature egg provided with thin gelatinous polar caps; size of eggs 0.048–0.051 by 0.027 mm Number of spines in one ring 56–83. Prevulva/postvulva ratio 7.6–9.0 : 1 Length of larger spicule 0.66–1.07 mm. of smaller spicule 0.156–0.192 mm Body length of males 5.8–14 mm, of gravid females 12–22 mm. Parasitic in *Anguilla anguilla* (Anguillidae) (North, Baltic and Mediterranean Seas basins) . . . . . *S. inermis* (Zeder, 1800)

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Svazek XLIII — Číslo 1 — 1979 — Str. 43–47

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PRODUCTION OF PERCH AND ROACH FRY IN THE KLÍČAVA RESERVOIR

Karel PIVNIČKA

Dedicated to the Academician Josef Kratochvíl on the occassion of the 70th anniversary of his birthday

Received June 14. 1977

Abstract: The production of perch and roach fry has been estimated under the assumption of different extreme courses of mortality, and the relationship of fry production to the production of all age groups has been discussed.

INTRODUCTION

Although nowadays an estimate of fry production appears to be possible, the problem of considerable differences in results obtained for the individual fish species from various localities still remains to be solved (Chapman, 1967). A great variability in fry production should be expected from a long-term investigation of a single species from the same reservoir dependent mainly on a considerable difference in the abundance of the fry. An attempt has been made in this paper to estimate the production of perch and roach fry from the Klíčava reservoir.

MATERIAL AND METHODS

The course of mortality after three months of life of the fry was the same to that reported in an earlier paper (Černý and Pivnička, 1973), namely 0.66 %. For both 1967 and 1971, our estimate of the initial number of perch eggs has been made under these assumptions: a) percentage representation of females in 1967 — 12 % total average for 1967–1973 — 22.1 %. Therefore, total number of female perch in 1967 was 1,348 and 2,481 out of the total number of perch of age groups 2–8 (11,225); b) on May 5. 1967, the number of egg belts along 300 m of a shore line was 143, and 100 along 1 km of a shore line (May 6. 1967). Along the whole shore line, the number of egg belts attained the values of 6,197 and 1,300 respectively. Average fecundity for 1968 was 10.300 eggs (Rejnek, 1969). Having regard to the various possible combinations, we took 1,347 (minimum), 2.481 and 6,197 (maximum) of perch females and corresponding fecundity as a basis for further estimation of production. (Fecundity in 1967 is not known).

In 1971 the percentage representation of females perch was 41.7 (the total average for 1967–1973 22.1 %). Out of the total number of mature perch of age groups 2–8 (15,048), that of females reached gradully 6,275 and 3,326 respectively. The latter value was used for a basis of our production estimate. Direct counts of egg belts (May 5. 1971) resulted in 1,205 belts along the entire shore line of the reservoir. In 1971, average fecundity was estimated at 14,100 (Rejnek, unpublished data).

The course of mortality of roach fry in 1967 after the third month of life was reconstructed on the basis of data on perch fry mortality. The percentage representation of females was 44 (ie 44,614 females out of 101.396), average fecundity

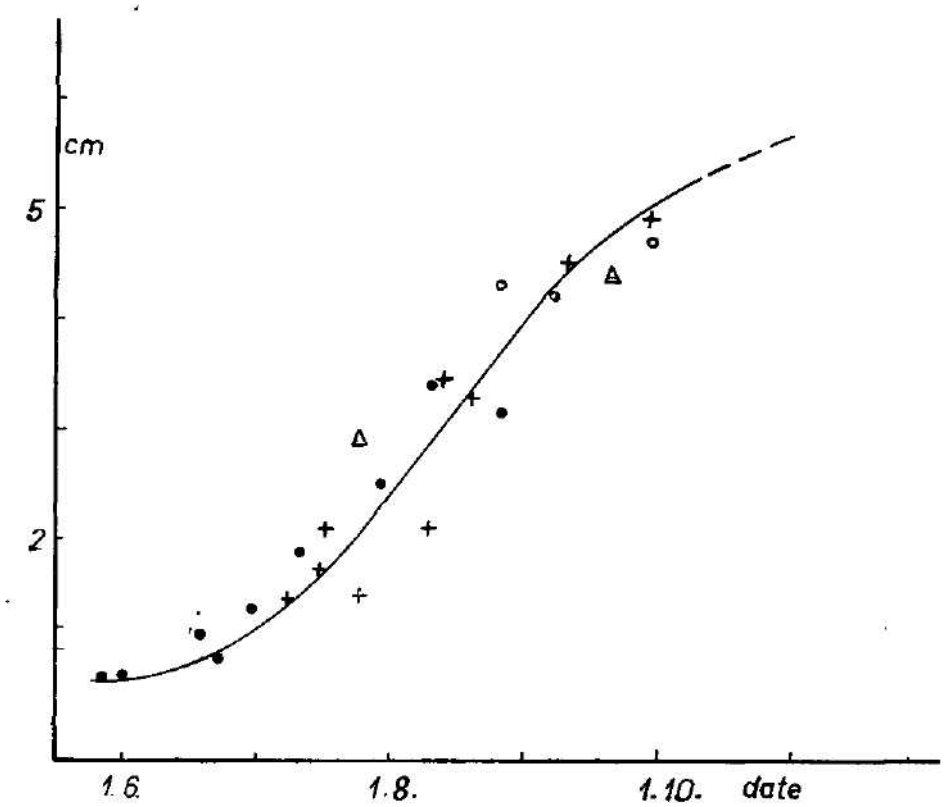

Fig. 1. Growth in length of the roach during the year (from various sources Frank, 1959, 1970 +, ○: Wilkomska and Žuromska, 1967 •; and own results △).

in 1968 was 36,800 eggs (Rejnek, 1969) An extreme case was a 100 % hatching of larvae, another a 5 % hatching of larvae (Žuromska, 1967). In the first case, the daily rate of mortality was 28 % during the first 13 days of life, in the second about 12 %. Both results are calculated from the papers of Žuromska (1967, 1967a), whereas 25.1 % for perch from Menšutkin et. al. (1968).

The growth in length of both species was read from the empirical curves (Fig 1). The corresponding weights were calculated from length-weight equations log w = = −4.254 +2.764 log L for perch fry, log w = −4.590 +2.946 log L for roach fry

For calculation of production of both species we first construced Allen's curves. The basic points were the number of eggs laid in one year, and the number of yearlings in the next year. From the latter number, we proceeded backwards to younger stages using a daily mortality of 0.66 % until August of the previous year (hatching of fry). Conversely, our next procedure started from the number of eggs with a mortality rate of 25 1 % (7 days) for perch, 28 and 12 % (13 days) for roach Part of the curve showing the transition from high to lower values of mortality was filled in graphically. The resulting curves were levelled out by equations $y = ae^{bx}$ and $y = ax^b$. An integration of the latter equation within the limits of the initial and the ultimate weight of the fry gives a numerical estimation of annual production (P_T).

$$P_T = \int_{w_0}^{w} ax^b \, dx = \left(\frac{w^{b+1} - w_0^{b+1}}{b + 1} \right) a$$

Weights (w and w_0) used were 6 g and 0.001 g respectively for roach in 1967; 9 g and 0.0019 g respectively for perch in 1967 and 12.5 and 0.0019 g respectively for perch in 1971. Calculation of roach fry production in 1967 (5 % hatching of larvae) is given as an example. Allen's curve is given by the equation $y = 692\,874\ x^{-0.6419}$,

$$P_T = \int_{0.046}^{2.25} ax^b\,dx\ 692874 \left(\frac{2.25^{-0.6419+1} - 0.046^{0.-6419+1}}{0.6419 + 1} \right) = 1{,}954 \text{ kg.}$$

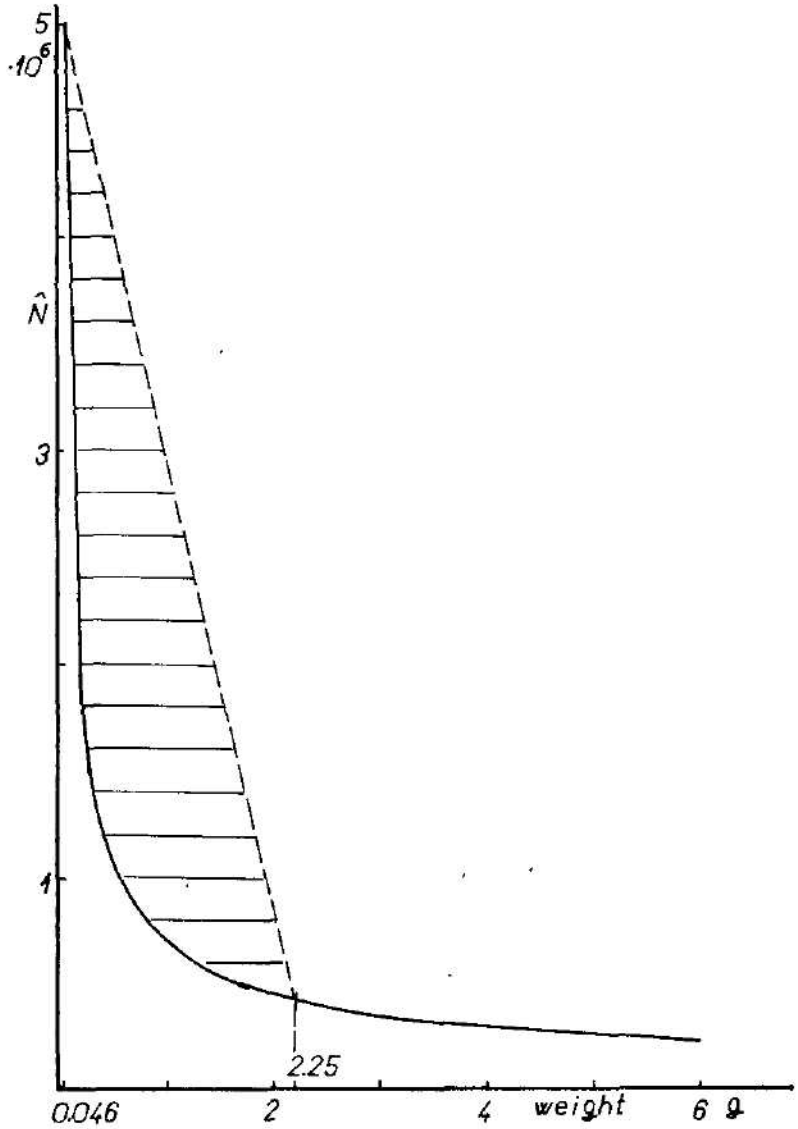

Fig. 2. Part of Allen's curve for roach (5 % of hatching), explanation see in text.

Graphical difference between the production values calculated numerically and those calculated graphically between July 5 and September 20 is shown in Fig. 2. In the first case, the production value was 1,954 kg, in the second case 5,966 kg! There was more than 100 % difference between these two values of production (shaded part = 5,966 – 1,954 kg). It is obvious that the more points between July 5 and September 20, the smaller difference could be expecter. However, each point requires a new estimation of abundance; that is nearly impossible.

RESULTS

All results are summarised in the following table:

species, year	1 $P_T$kg/kg ha 1st age g.	2 P_T kg 2—8 age g.	3 P_T kg total	4 1 as % of 3
perch 1967 1,347 females	1,573/25.8	483	2,056	76.5
perch 1967 2,481 females	1,690/27.7	483	2,173	77.8
perch 1967 6,197 females	1,953/32	483	2,436	80.2
perch 1971 3,326 females	1,528/25	268	1,796	85.1
roach 1967 44,614 females 5% of hatching	3,513/57.6	2,146	5,659	62.1
roach 1967 44,614 females 100% of hatching	5,523/90.5	2,146	7,668	72

DISCUSSION

One of the factors influencing estimates of production in the first age group is a considerable variability in mortality during the first month of life, and a considerable inaccuracy in the estimation of fry abundance. Menšutkin et al. (1968) demonstrated on perch fry that a succesful hatching may range from 1 to 100 % in dependence on various initial conditions (number of eggs, water temperature, quantity of food available). Taking into account the extremely high and low number of eggs in the Klíčava reservoir in 1967, production of perch ranged from 76.5 to 80 % (the share of the first age group production in that of all age groups). However, this relatively low variability increased to 85.1 % by adding to it one more result only from another year (1971). On the whole, first age group production of perch ranged from 25 to 32 kg/ha constituting 76.5—85.1 % of the production of all age groups. LeCren (1962, cit. Mathews, 1971) maintained that the production of the first age group of perch constituted about 70 % of the total production.

Clady (1977) estimated production of first age group of yellow perch in two relatively infertile Michigan lakes (16.4 and 3.0 kg) ha, or 61.8 and 15.4 percent of the total production of the four youngest age groups). Similar values of production of the same species were estimated in eutrophic Oneida Lake (Vashro, 1975 cited after Clady l.c). In this lake perch fry production varied from 8.3 to 61.2 kg/ha, or from 16.5 to 77.5 percent of the total production of the four youngest age classes. In all lakes, production was concentrated in

the four youngest age classes (an average of 73.5 percent of the total), therefore all relative values must be diminished of one quarter. Comparing these values with those from the Klíčava Reservoir, one can see that the percentage participation of the first age classes is much lower than that in the Klíčava Reservoir.

Mathews (l.c.) also observed that the production of the first age groups of four different species from the Thames river was 36—73 % with an average of 70 % in 1967, and 39—64 % of the production of all age groups with an average of 52 % in 1968.

Production of roach fry from the Klíčava reservoir ranged from 57.6—90.5 kg/ha in 1967 (5.8—9.1 g/m^2). Mathews (l.c.) reported values of 28.1 and 15.7 g/m^2 respectively for the years 1967 and 1968 for the same age group of roach, surpassing three times our values. In these years, the production of roach fry from the Thames river created 66 and 39 % respectively of the production of all age groups, whereas the percentage participation of roach fry from the Klíčava reservoir was 62.1—72 %.

CONCLUSIONS

In 1967 and 1971, the production of perch and roach fry from the Klíčava reservoir was estimated under the assumptions of an extreme rate of mortality and number of mature females. The production of perch fry fluctuated within the limits of 25—32 kg/ha, constituting 76.5—85.1 % of the production of all age groups. The production of roach fry ranged within the limits of 57.6—90.5 kg/ha in 1971 and constituted 62—72 % of the production in all age groups.

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NESTSTANDORTE UND GEDEIHEN DER BLÄSSRALLE (FULICA ATRA) AN DEN TEICHEN IN SÜDWESTBÖHMEN (AVES: RALLIFORMES)

Pavel ŘEPA

Herrn Prof. RNDr. Josef Kratochvíl, Mitglied der Akademie, zum 70. Geburtstag gewidmet

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Abstract: The author traced placing of nests of the Coot (*Fulica atra* L.) on ponds of southwestern Bohemia damaged in various ways through recultivation of planted banks. On less damaged ponds characteristic nests predominated placed on banks covered with muddy plants (93.3 % all cases), on severely damaged ponds *such nests presented only 49 % of the whole number* The *sites of remaining nests* were not characteristic for the Coot (in flooded shrubs, in open waters without plants, etc.). Breeding succes was also traced The losses were high (44.5 % of all clutches traced and 37.6 % of the whole number of carried eggs). The extent of losses was influenced by the placing of nests (in uncovered nests in open water 58 % of clutches, in nests situated in muddy plants 41.2 %). Between severely and lightly damaged ponds there was also a differrence in the average number of brood for a couple (2.0 and 2.3), respectively for a couple).

EINLEITUNG

Bei der Durchforschung der Wasservögelfauna im staatlichen Naturschutzgebiet „Anenské rybníky" bei Mariánské Lázně in den Jahren 1971—1974 (Řepa, 1975), und bei Beobachtunng der Nistpopulationen der Wasservögel an mehreren Teichen in der Tachover Senke (Kreis Tachov, Südwestböhmen) in den Jahren 1973—1976 wurden ziemlich viele Daten über Neststandorte und Gedeihen der Blässralle gesammelt. Die erwähnten Vorgange wurden bereits wiederholt in der ČSSR (Lelek, Havlín, 1956; Lelek, 1958; Havlín, 1967, 1970), sowie in anderen europäischen Landern (Alley, Boyd, 1947; Kornowski, 1957, Askaner, 1959, Bezzel, 1959; Wagner, 1962, Melde, 1962, 1968; Blum, 1963, 1973; Muntjan, 1970, Sage, 1969, Haase, Wobus, 1971; Robel, Paudtke, 1971) untersucht. Auch in der Tachover Senke habe ich selbst solche Beobachtung bereits in den Jahren 1967—1970 durchgeführt (Řepa, 1974). Die Teiche in diesem Gebiet erführen aber nach 1970 bedeutende Veränderungen. Infolge der ausgedehnten Rekultivation und des damit verbundenen Hinaufscharrens der Uferbanke durch Buldozzers, hat sich das Ausmaß der Uferpflanzenbestande an rekultivierten Teichen bedeutend verringert. Danach begann die Zahl der Blaßrallennester, die für diese Art untypisch, d. h. nicht in Sumpfpflanzenbestanden untergebracht sind, bedeutend zu steigen. Ich bemühe mich hier meine Erkenntnisse in dieser Richtung zusammenzufassen und den Anteil der untypischen Nester an den mehr oder weniger beschädigten Teichen zu ermitteln. Gleichzeitig

führe ich auch die Angaben über die Verluste der Gelege und Eier an, um festzustellen, inwieweit die Verluste durch untypische Neststandort beeinflusst werden. Zum Schluss bringe ich auch einige Daten über die Verluste der Jungen im Verlaufe ihrer Großziehung, zur Bewertung der Unterschiede zwischen den wenig und stark devastierten Teichen.

BESCHREIBUNG DES UNTERSUCHTEN GEBIETES

Die Tachover Senke ist eine flache Mulde mit Höhen von 490—510 m ü. M., die den östlichen Saum des Gebirges Český les zwischen Mariánské Lázně und Přimda bildet. Zwei Drittel ihrer Fläche nehmen landwirtschaftlich genutze Grundstücke ein, den Rest Kieferwalder und über 200 Teiche, von denen nur ungefähr 50 grosser als 5 ha sind. Es wurden 41 Teiche in verschiedenen Abschnitten der Senke verfolgt. Es sind durchwegs seichte, oft an Wassermangel und starker Schwankungen des Wasserspiegels leidende Teiche, mit schwachen Zuflussen oder völlig ohne diese. Praktisch an allen von ihnen wurden wenigstens einmal Rekultivationen durchgeführt, durch welche die Sumpfpflanzenbestände im verschiedenen Masse verringert wurde. Ich teile sie auf wenig und stark beschadigte. Als wenig beschadigt bezeichne ich die Teiche, auf welchen die Uferpflanzenbestande in verschiedener Breite, aber im Ganzen Umkreis erhalten sind. Als starkt beschadigt betrachte ich die Teiche, an welchen solche Bestände entweder vollig zerstört, oder nur stellenweise erhalten blieben, so dass zwischen ihnen nackte Uferabschnitte vorhanden sind. Hierher rechne ich auch Teiche mit mehr zusammenhangenden Pflanzenbeständen, welche aber wegen Wassermangel nicht überschwemmt wurden und daher für normale Blässrallennester unbrauchbar sind.

Nahere Beschreibung der Teiche in der Tachover Senke findet man in den Arbeiten von Tesař (1967, 1976) und jene der Teiche im Naturschutzgebiet „Anenske rybníky" in der Arbeit von Řepa (1975).

METHODIK

Ich habe vor allem die Daten uber Blässrallennester verwendet, welche ich bei der systematischen Durchforschung des Naturschutzgebietes „Anenske rybníky" angesammelt hatte. Hier habe ich in wöchentlichen Abständen alle Nester und Nistpaare an beiden Teichen der Reservation in eine Karte eingetragen, sodass ich imstande war erste und nachträgliche Gelege ziemlich verlasslich voneinander zu unterscheiden, und eine gute Vorstellung über den Verlauf des Brütens einzelner Paare zu gewinnen (siehe auch Řepa, 1976)

In den Jahren 1973—1976 ermittelte ich bei Anwendung der Methodik von Havlín (1967) den Bestand aller nistenden Wasservögel, darunter auch Blässrallen, an mehreren Teichen der Tachover Senke. Dabei wurde die Zahl der nistenden Blässrallen meistens nur nach der Zahl der Junge führenden Paare angegeben; dem Aufsuchen der Nester konnte ich mich nur an den Tagen widmen, in welchen ich mehr Zeit zur Verfügung hatte. Trotzdem habe ich auf diese Weise eine bestimmte Anzahl der Angaben über die Neststandorte und die Verluste an Gelegen und Eiern angesammelt. Die Beobachtungen wurden in diesem zweiten Fall in 10—14 tägigen Intervallen vorgenommen und daher war die Zahl der Nester, bei welchen ich die ersten und nachträglichen Gelege unterscheiden und überhaupt weitere ihre Schicksale erfahren konnte, kleiner als im Falle der Teiche im Naturschutzgebiet „Anenské rybníky".

Ich versuchte auch die durchschnittliche Grosse der Bruten gegen Ende des Aufziehens zu ermitteln. Die Zählung der Jungen der ausgeflogenen Brut ist bei der Blässralle ziemlich schwiering. Jüngere Familien bleiben fast ununterbrochen im Versteck der Sumpfpflanzen, so dass die ermittelten, Zahlen niemals verlasslich sein konnen. Ältere Jungen halten sich schon mehr am offenen Wasser auf, und nach Verscheuchen derselben aus den Verstecken kann man sie auf kleinen und gut übersichtlichen Teichen der Tachover Senke ziemlich vollständig abzählen. Die einzelnen Familien schlagen sich aber bald zu grösseren Scharen zusammen und sind schwer voneinander zu unterscheiden und getrennt nach Paaren abzuzahlen. Ich habe daher kurz vor dem Flüggewerden der Mehrzahl der Jungen (zweite Hälfte Juni oder Anfang August) die Gesamtzahl der Jungen ermitteln versucht,

Tab. 1: Neststandorte von Blässralle an den Teichen in Südwestböhmen

Art der Unterbringung	wenig beschädigte Teiche Zahl der Nester	%	stark beschädigte Teiche Zahl der Nester	%
I. Nester am Ufer	—	—	—	—
II. Feste Nester auf den Seichten (bis zur Tiefe 40 cm)				
a) auf Riegrasbülten	1	1,4	6	3,2
b) auf Ästenbündeln	—	—	5	2,7
c) an überschwemmten Strauchern	1	1,4	5	2,7
d) auf den aus Wasser heraustagenden Steinen	—	—	6	3,2
e) im offenen Wasser	2	2,6	9	10,0
Insgesamt	4	5,4	41	21,8
III. Schwimmende Nester auf den Seichten (bis zur Tiefe 40 cm)				
a) in sg. harten Beständen (Phragmites, Typha)	4	5,4	13	6,9
b) in sg. weichen Beständen (Carex, Juncus, Scirpus, Equisetum, Glyceria usw.)	26	35,3	33	17,5
c) an überschwemmten Landpflanzen	—	—	10	5,3
Insgesamt	30	40,7	56	29,7
IV. Schwimmende Nester am Tiefwasser (über 40 cm)				
a) in harten Beständen	13	17,6	11	6,1
b) in weichen Beständen	25	33,5	29	15,3
c) an überschwemmten Landpflanzen	1	1,4	5	2,7
d) auf schwimmenden Teppichen der Wasserpflanzen	—	-	5	2,7
e) auf herabhangenden Baumasten	1	1,4	25	13,2
Insgesamt	40	53,9	75	40,0
V. Feste Nester-frei im Teifwasser	—	—	9	4.8
Typisch untergebrachte Nester — (IIa + IIIa + IIIb + IVa + IVb)	68	93,3	92	49,0
Untypisch untergebrachte Nester (die übrigen Alternativen)	5	6,7	96	51,0
Summe	74	000,0	188	100,0

und die gewonnene Zahl dann durch Gesamtzahl der in der Brutperiode am Teiche festgestellten Paare dividiert. Der auf diese Weise ermittelte Wert — ich bezeichne ihn als Durchschnittszahl der Jungen auf 1 Paar — ist kleiner als durchschnittliche Grösse der aufgezogenen Brut, die durch direkte Abzählung der Familien festgestellt werden könnte (siehe z. B. Kornowski, 1957), weil in die obenerwähnte Gesamtzahl zwangweise auch nicht brütende oder erfolglos brütende Paare einbezogen werden. Den Vorteil dieser Methode kann man aber darin sehen, dass auch diese Einflüsse auf das Brutgeschäft einkalkuliert werden, und dass sie erlaubt die Gesamtproduktivität der Population auf dem erforschten Teiche besser zu erfassen.

EIGENE ERGEBNISSE

a) Neststandorte

Ich hatte insgesamt Angaben über 262 Nester zur Verfügung, davon 130 aus dem Naturschutzgebiet „Anenské rybníky" aus den Jahren 1971—1974, und 132 Angaben von den übrigen Teichen der Tachover Senke aus den Jahren 1973—1976.

In der Tab. 1 gebe ich Übersicht der bei einzelnen Unterbringungsalternativen vorgekommenen Fälle. Angaben überr stark und wenig beschädigte Teiche führe ich getrennt an. Es geht hervor, dass auf den als wenig beschadigt bezeichneten Teichen die Mehrzahl der Nester in überschwemmten Pflanzenständen untergebracht ist (Alternativen IIa, IIIa, b, IVa, b — 93,3 %). Dagegen auf den Teichen mit stark beschädigten Uferpflanzenbeständen kommt dieser typische Neststandort nur in 49 % der Fälle vor. Sehr oft findet man hier Nester, die in den überschwemmten Sträuchern aufgebaut wurden, namentlich in dichten Weidenästen, die den Wasserspiegel berühren (Alternativen IIc und IVe — 15,9 % Fälle). Mehrzahl der Autoren bezeichnet diese Bauweise der Nester als eine ganz vereinzelte Erscheinung (Dementěv und coauct., 1951; Tischler ex Niethammer, 1942; Wagner, 1962, Blum, 1963, 1973; Hudec, Černý und coauct., 1977). Gleiche Erfahrung habe ich selbst in früheren Jahren auch an den Teichen der Tachover Senke gemacht (Řepa, 1974). Bloss an den Teichen bei Ismaning kam diese Variante der Neststandort öfter vor (Bezzel, 1959).

Am Uferboden aufgebaute Nester bildeten selbst an den stark devastierten Teichen eine Ausnahme (3,7 %); genauso wie in anderen Gebieten Europas (Niethammer, 1942; Bezzel, 1959; Drijver, Oldham-zit. Wagner, 1962; Blum, 1963; Haase, Wobus, 1971).

Auf den Seichten fand ich einen ansehlichen Anteil der Nester, die an nackten Stellen ohne jeden Pflanzenwuchs untergebracht wurden — auf Steinhaufen, Ästenbündeln und anderen Erhöhungen. Man fand auch Nester am offenen Wasser, die vom Grund hinauf aufgebaut wurden, und zwar in Tiefen bis zu 50 cm. Von Zeit zu Zeit traf ich auch Nester, die an überschwemmten Resten der Landpflanzen (Knöterich, Ampfer, Zweizahn) gebaut wurden. Das geschah an den Teichen, die im vorigen Sommer einen niedrigen Wasserstand hatten, und wo sich die Seichten im Spätsommer mit Beständen dieser Pflanzen bedeckten. Als dann im nächsten Jahr diese Pflanzen überschwemmt wurden, benutzten die Blässrallen, bei Mangel an Seggen- und Schilfbeständen, ihre abgestorbenen, aus dem Wasser herausragenden Stengel zum Nestbau. Ausnahmsweise fand man auch offene Nester auf dichten, schwimmenden Teppichen von Wasserpflanzen. Alle offenen Nester bilden einen ansehlichen Anteil an stark beschädigten Teichen (38 % Fälle).

Es ist daher klar, dass die Blässralle bei der Wahl des Nistortes eine hohe Anpassungsfähigkeit besitzt, und bei Mangel an normalen Niststätten in Sumpfpflanzenbeständen häufig auch andere Stellen zum Nestbau aufsucht (Boden, Sträucher, Astgewirr der Bäume usw.), bzw. offene Nester auch an Seichten ohne Pflanzenwuchs baut, was alles normalerweise eine Ausnahme ist (Melde, 1963; Rabel, Paudtke, 1971).

b) Gedeihen des Brütens

Im NSG „Anenské rybníky" habe ich den Anteil der Ersatzgelege und Gesamtergebniss des Brütens einzelner Paare festgestellt. Insgesamt habe ich

Tab. 2: Anteil der Nachgelege und der erfolglosen Brutversuche der Paare, bei welchen das ganze Brutgeschäft bekannt war. (NS-Gebiet „Anenské rybníky")

Jahr der Beobachtung	Anzahl der Paare	Zahl der 1. Nachgelege		Zahl der 2. Nachgelege		Zahl der erfolglosen Brutversuche	
		n	%	n	%	n	%
1971	61	15	27,5	1	1,6	3	4,9
1972	19	4	24,5	—	—	8	42,0
1973	25	11	44,0	—	—	8	32,0
1974	29	15	52,1	2	8,0	7	24,0
Insgesamt	134	—	33,5	3	2,2	26	19,4

in vier Jahren der Beobachtungen Daten über das Brüten von 134 Paaren gewonnen. In der Tab. 2 bringe ich Angabe über die Anteil der ersten und nachträglichen Gelege, sowie den Anteil der Paarre, derren Brüten trotz der Ersatzgelege erfolglos war. Da auch im NSG „Anenské rybníky" kurz vor Beginn der Forschung die früher erwähnten Rekultivationen durchgeführt wurden, muss man die Angaben in der Tab. als die von stark beschädigten Teichen betrachten. Der Anteil der Ersatzgelege war hier kleiner als der von Lelek (1958) an den Teichen der Böhmisch-Mährischen Höhe festgestellte Prozentsatz, aber relativ hoch war hier Anteil der Paare, deren Brüten trotz den Ersatzgelegen erfolglos war. Das dürfte durch bedeutende Verspätung des Brutgeschäftes der Blässrallen im NSG „Anenské rybníky" im verfolgten Zeitraum verursacht sein. Gewöhnlich findet man den grössten Teil der angefangenen Gelege Ende April bis Anfang Mai, aber an den Teichen des NSG wurde

Tab.3: Gedeihen des Brutgeschäftes bei allen angefangenen Gelegen (ohne Rucksicht auf erste oder Nachgelege) in Abhängigkeit vom Datum des Ablagebeginns

Dekade des Ablagebeginns	Zahl aller verfolgten angefangenen Gelegen	Zahl aller zerströrten Gelege		Eierzahl in angefangenen Gelegen	Zahl der Eier in zerstörten Gelegen		Zahl der zerstörten Eier in ausgebrüteten Gelegen	
		n	%		n	%	n	%
2 Dek. IV.	5	4	80,0	32	27	83,3	—	—
3 Dek. IV	24	8	33,0	156	36	23,0	10	6,4
1 Dek. V.	37	12	32,5	248	66	26,5	5	2,0
2 Dek. V.	61	29	47,5	339	133	36,0	6	1,8
3 Dek. V.	50	27	54,0	258	103	38,8	2	0,8
1 Dek. VI.	26	10	38,5	132	47	35,6	6	4,5
2. Dek. VI.	7	3	43,0	30	10	33,3	—	—
Insgesamt	209	93	44,5	1195	419	35,2	29	2,4

n = Zahl der Fälle % = Prozentsatz aus der Gesamtzahl

in den meisten Nestern mit Eiablage erst in der zweiten und driten Dekade des Monats Mai angefangen. Es handelt sich hier offensichtlich um Einflüsse der ungünstigen Nistbedingungen nach der Devastation der Teiche, denn an den übrigen Teichen der Tachover Senke wurde in früheren Jahren der Höhepunkt der Eiablage etwas früher verzeichnet (Řepa, 1974). Auf Verspätung des Brutgeschäftsbeginns bei Blässralle infolge des Mangels an geeigneten Pflanzenbeständen hat bereits Havlín (1967, 1970) aufmerksam gemacht.

In der Tab. 3 findet man Angaben über den Anteil der zerstörten Gelege und Eier, ohne Rücksicht darauf ob es sich um erste oder Ersatzgelege handelt. Ausser den Daten vom NSG „Anenské rybníky" wurden hierher auch zufällig gevonnene Angaben von anderen Teichen der Tachover Senke einbezogen. Prozentsatz der Verluste an Gelegen erscheint immer grösser als der der verlorengegangenen einzelnen Eier. Das dürfte dadurch verursacht sein, dass bei längeren Kontrollintervalen manche später zerstörte Gelege noch als unvollständig investiert wurden, was den wirklichen Anteil der Verluste an Eiern verringen muss.

Vereinzelt wurden Verluste an Eiern auch in den sonst erfolgreich ausbrüteten Gelegen verzeichnet (nur 2,4 % der Gesamtzahl). Vorwiegend handelte es sich um Eier, die beim Betreten oder Verlassen des Nestes herausrollten. Oft wurden einzelne Eier auch in das Nest eingebaut. Nur in 3 Fällen blieben die Eier unausgebrütet (taub), und ebenso in 3 Fällen verschwanden sie aus dem Nest aus unbekannten Gründen.

Gesamtverluste an Gelegen betrugen 44,5 % und an Eiern 35,2 %. Meistens werden bei der Blässralle bedeutend niedrigere Abgänge verzeichnet (Bezzel, 1959; Blum, 1963, 1973; Havlín, 1970). Nur Askaner (1959) hat bei Verfolgung einiger weniger Paare ähnlich grosse Verluste festgestellt, und Alley, Boyd (1947) und Sage (1969) in England sogar noch höhere. Ich stimmte mit der Ansicht von Havlín (1970) und Blum (1973), dass die 25 % übersteigenden Verluste aussergewöhnlich und vom Durchschnitt bedeutend abweichend sind. Im unseren Fall sind abnormal hohe Verluste offensichtlich durch Mangel an geeigneten Niststätten und durch Nestbau an wenig passenden Stellen verursacht (siehe weiter die Tab. 4).

Wenn wir die Höhe der Verluste bei den in verschiedenen Zeiträumen angefangenen Nestern bewerten, so sehen wir, dass zwischen den einzelnen Monatdekaden kein wesentlicher Unterschied besteht. Nur bei den frühesten Gelegen vom Ende April und Anfang Mai verzeichnet man einen ein wenig niedrigeren Prozentsatz der Verluste — offensichtlich deswegen, weil die Blässrallen am frühesten an den geeignetesten Stellen zu bauen beginnen.

Die Unterschiede der Verluste zwischen den an verschiedenen Stellen untergebrachten Nestern sind dagegen gross. Die niedrigsten habe ich in solchen verzeichnet, die im Gewirr der zum Wasserspiegel herabhängenden Äste gebaut wurden — 30,5 %, was sogar weniger ist als in den normalen, in Sumpfpflanzenbeständen untergebrachten Bauen (41,2 %). Die grössten Verluste wurden an den im Offenen gebauten Nestern verzeichnet — 58 %.

Über die Ursachen der Zerstörung der Gelege wird in der Tab. 5 referiert. Entgegen den Angaben von Blum (1973) von den Seen in Lettland wurde bei uns ein höherer Anteil der durch Wasserwellen, und kleiner Prozentsatz der von Vögeln verursachten Schäden verzeichnet. Auch Havlín (1970) hat an den Teichen bei Náměšť n. Osl. in Mähren festgestellt, dass die Verluste durch Wellen, bedeutend höher waren als die von Vögeln verursachten. Es

Tab 4: Gedeihen des Brutgeschäftes bei allen angefangenen Gelegen (ohne Rücksicht auf erste oder Nachgelege) in Abhängigkeit von dem Neststandort

Neststandort	Zahl aller angefangenen Gelege	Zahl der zerstörten Gelege		Eierzahl in angefangenen Gelegen	Eierzahl in zerstörten Gelegen		Zahl der zerst. Eier in ausgebrüteten Gelegen	
		n	%		n	%	n	%
I.	8	5	62,5	40	17	42,5	—	—
IIa.	7	2	28,5	46	13	28,0	4	8,9
IIb.	7	3	42,8	34	9	38,0	1	2,9
IIc.	5	1	20,0	37	10	27,0	—	—
IIe.	5	3	60,0	29	16	55,0	4	13,8
IIe.	24	16	66,3	136	74	54,2	—	—
IIIa.	15	6	40,0	92	29	31,7	2	2,1
IIIb.	50	22	40,0	276	81	29,3	4	1,4
IIIc	10	6	60,0	55	28	51,0	—	—
IVa.	15	4	26,8	94	12	12,8	12	4,2
IVb.	22	11	50,0	127	61	48,0	6	4,7
IVc	5	1	20,0	32	5	15,6	1	3,1
IVd.	2	1	10,0	18	8	44,3	—	—
IVe.	31	10	32,2	163	45	27,6	3	1,8
Typische Unterbringung	109	45	41,2	635	196	31,0	20	3,1
Unterbringung in Sträuchern und auf Baumästen	36	11	30,5	20	55	27,2	3	5,4
Offene Nester aller Type	64	36	58,0	360	169	47,2	6	1,7

Bemerkung. Erläuterungen zu numerischen Bezeichnungen einzelner Type der Neststandort siehe in der Tab 1

Tab 5 Ursachen der Verluste an Gelegen

Neststandort	Zahl aller Gelege	Zahl der zerst. Gelege		durch Uber schwemmung		davon in Mowennest eingebaut		durch Raubvogel		von anderen Blassrallen vernichtet		Grund der Zerstorung unbekannt	
		n	%	n	%	n	%	n	%	n	%	n	%
In Sumpfpflazenbestanden	109	45	41,2	21	19,4	19	16,3	1	0,9	1	0,9	4	3,7
Strauchern und Baumasten	36	11	30,5	4	11,1	6	16,6	—	—	—	—	1	2,8
Offene Nester aller Type	64	36	58,0	17	26,7	16	21,8	1	1,6	2	3,2	3	4,7
Insgesamt	209	93	44,5	43	20,7	41	18,1	2	0,9	3	1,4	8	3,7

scheint, dass die Ursache der Gelegezerstörung eng von den konkreten Bedingungen des betreffenden Gebiets abhangig sei (siehe auch Alley, Boyd, 1947; Sage, 1969; Muntjan, 1970).

Wenn wir Verluste in einzelnen Typen der Neststandorte vergleichen, sehen wir, dass sie bei den im Offenen gebauten Nestern am grossten sind, und zwar wie durch Überschwemmung, so auch durch Raubvögel. Die letzteren bleiben bei den übrigen zwei Gruppen der Neststandorte annahernd gleich, dagegen sind die Verluste durch Überschwemmung bei den in Weidenstrauchern und in herabhängenden Ästen aufgebauten Nestern bedeutend kleiner, sogar auch im Vergleich mit normalen, in Sumpfpflanzenbestanden untergebrachten Nestern. Das Nisten in Sträuchern und Ästen erscheint daher als der erfolgreichste Typ, und man kann den Jägern empfehlen, falls die devastierten Uferpflanzenbestande an den Teichen nicht mehr erneuerungsfähig sind, dieselbe durch Anpflanzung von Weidensträuchern am Rande der Inundationszone zu ersetzen.

Als eine ugewöhnliche und in der Literatur bisher unerwahnte Ursache der Gelegeverluste habe ich in 3 Fällen die offenbar unabsichtliche Zerstörung des Geleges bei den Kämpfen der Blassrallepaare um Nistreviere festgestellt. Zweimal wurde das ganze Nest umgestossen und in einem Fall die Eier zerschlagen, als der verfolgte Vogel auf sein Nest zurückwich und der Verfolger auch dort den Kampf fortsetzte. Unter ähnlichen Umstanden beobachtete ich auch die Zerstörung des Nestes von einem Zwergtaucher. Alle diese Kämpfe fanden in einem kleinen Feldteich statt, wo äusserster Mangel an Nistgelegenheiten herrschte, und wo die Kämpfe einzelner Paare um Nistreviere weit heftiger und unerbittlicher als sonst verliefen.

c) Durchschnittszahl der Jungen auf 1 Paar

Die Zahlen der Jungen auf 1 Paar, die auf einzelnen Teichen festgestellt wurden, sind in der Tab. 6 einerseits nach den Jahren der Beobachtung, anderseits nach dem Typ der Teiche zusammengestellt. Ausser den wenig und stark beschädigten Teichen habe ich noch die kleinsten Teiche bis 0,5 ha abgetrennt, auf welchen die Zahlen der Jungen auf 1 Paar ausgepragt höher waren. Zum Teil kann dieser Unterschied auch auf die Methode der Abzählung zurückgeführt werden, weil auf diesen leicht übersichtlichen Teichen etwaige Fehler in der Erfassung aller Jungen kaum vorkommen können. Aber zum Teil haben die höheren Zahlen hier auch einen realen Grund, denn es bruten hier höchstens 1—2 Paare, die die besten Nistorte auswählen können. Auch die Abwesenheit der nicht brütenden Paare, die das Brutgeschäft zweifellos stören, spielt hier eine gewisse Rolle.

Zwischen den einzelnen Jahren der Beobachtung gab es auch bedeutende Unterschiede. Die niedrigste Durchschnittzahl der Jungen auf 1 Paar wurde 1976 festgestellt, wo infolge katastrophaler Trockenheit eine ganze Reihe der Teiche teilweise oder völlig ohne Wasser war, und die Zahl der erfolglos brütenden Paare bedeutend anstieg. Verhältnismassig niedrige Zahlen der Jungen auf 1 Paar in 1974 können zweifellos auf starke Regenfälle gegen Ende April und Anfang Mai zurückgeführt werden, wo viele Nester durch Hochwasser vernichtet wurden.

Die wenig beschädigten Teiche wiesen im Vergleich mit den stark beschadigten immer höhere Durchschnittzahlen der Jungen auf 1 Paar auf. Ausnahme bildete nur das Jahr 1976, wo auch auf den wenig beschädigten Tei-

Tab. 6: Durchschnittszahl der Jungen auf 1 Paar am Ende des Aufziehens

Jahr der Beobachtungen	stark beschädigte Teiche n	stark beschädigte Teiche Juv./Paar	wenig beschädigte Teiche n	wenig beschädigte Teiche Juv./Paar	kleine Teiche (bis 0,5 ha) n	kleine Teiche (bis 0,5 ha) Juv./Paar	Ingesamt n	Ingesamt Juv./Paar
1971	4	2,5	1	3,5	—	—	5	2,5
1972	3	2,6	1	8,0	1	4,0	5	2,8
1973	12	1,6	9	2,5	2	3,8	23	2,1
1974	14	2,0	9	2,2	8	4,0	31	2,3
1975	17	2,2	9	2,8	7	4,6	33	2,6
1976	7	1,9	5	1,7	5	2,6	17	2,0
Insgesamt	57	2,0	34	2,3	23	4,4	114	2,3

Bemerkungen n — Zahl der verfolgten Teiche
Juv./Paar = Durchschnittszahl der Jungen am Ende des Aufziehens auf 1 der Paare, die sich während der Brutperiode am Teiche aufhielten

chen die Produktivität der Nester enorm niedrig war sogar um ein wenig niedriger als an den stark devastierten Teichen.

ZUSAMMENFASSUNG

1. In den Jahren 1971—1976 wurde an den Teichen der Senke von Tachov (Südwestböhmen) das Brutgeschäft der Blässrallen *(Fulica atra)* verfolgt und Daten über die Unterbringung der Nester und Verluste an Gelegen und Eiern gesammelt. Besondere Aufmerksamkeit wurde 1971—1974 den Teichen im Naturschutzgebiet „Anenské rybníky" bei Mariánské Lázně gewidmet.

2. Es wurden insgesamt 262 Angaben über Unterbringung des Nestes gewonnen, weiter Daten über den Verlauf des Brütens von 134 Paaren und über Verluste an Gelegen und Eiern bei 209 Nestern, und schließlich wurde in 114 Fällen durch Abzählung aller juvenilen Individuen am Teiche die Durchschnittszahl der Jungen auf 1 Paar ermittelt.

3. An den Teichen, wo die Uferbestände der Sumpfpflanzen besser erhalten waren, wurden 93,3 % Nester in diesen Beständen untergebracht. An stark beschädigten Teichen mit lückenhaften und armen Pflanzenbeständen betrug die Zahl der in ihnen unterbrachten Nester nur 49 % der Gesamtzahl; die übrigen Nester wurden an wenig üblichen Stellen gebaut (in überschwemmten Sträuchern, an herabhängenden Ästen, oder im offenen Wasser ohne jede Deckung).

4. Anteil der 1. Nachgelege betrug bei 134 Paaren 33,5 % aller Fälle, der 2. Nachgelege 2,2 %. In 19,4 % der Fälle blieb das Brüten trotz der Ersatzgelege erfolglos.

Was das Gedeihen aller Gelege betrifft, ohne Rücksicht darauf ob es sich um erste Ablage oder Nachgelege handelt, so betrugen die Verluste 44,5 % der Gesamtzahl der Gelege und 37,6 % der Eier. Die größten Verluste wurden bei den ungedeckten Nestern im offenen Wasser festgestellt (58 %), und die niedrigsten bei den Nestern, die an herabhängenden Ästen und überschwemmten Sträuchern gebaut wurden (30,5 %). In typischen, in den Sumpfpflanzenbeständen untergebrachter Nestern, betrug der Anteil der vernichteten 41,2 %

5. Die Durchschnittszahl der Jungen auf 1 Paar schwankte von Jahr zu Jahr. Am höchsten war sie an kleinen Teichen unter 0,5 ha Größe — 4,4 auf 1 Paar. An stark beschädigten Teichen betrug sie 2,0 Jungen auf 1 Paar, an weniger beschädigten 2,3 Jungen auf 1 Paar.

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NEW OPILIONIDS FROM THE SUBFAMILY PHALANGODINAE FROM CUBA (ARACHN.: OPILIONIDEA)

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Dedicated to the Academician Josef Kratochvíl on the occasion of the 70th anniversary of his birthday

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Abstract: A morphological description of five new genera and eight new species of opilionids from the subfamily Phalangodinae from Cuba: *Anamota custodiens* gen. n., sp. n., *Caribula longimana* gen n, sp. n., *Cersa kratochvili* gen. n., sp. n., *Turquinia montana* gen. n., sp. n., *Valifema blanda* gen. n., sp. n., *Brimma castanea* sp. n., *Hewus cubensis* sp. n. and *Kalina zebroides* sp. n. is given. Dorsal view of body, chelicerae, pedipalps, genitalia and other details of all species are figured.

In this paper I describe, as continuation of my studies on the opilionids fauna from Antilles, other genera and species of the subfamily Phalangodinae from Cuba.

Anamota gen. n.

Eyemound in the form of sharp pointed cone situated at the anterior margin of carapace. Dorsal scute without distinct areas, area 1 without median line. Areas, free tergites and anal plate unarmed. Basal segment of chelicerae without distinct elevation, pedipalpi short, robust, pedipalpus-femur at the apicomedial portion with one spinebearing tubercle. Tarsal segments of legs: 3.4,4,4, distitarsi of second legs with three segments.

This genus is related to the genus *Turquinia* gen. n.; it differs by the first segment of chelicerae.

Generotype: *A. custodiens* sp. n.
Derivatio nominis: free combination, femininum.

In 1951 and 1953, Goodnight and Goodnight criticized the taxonomical classification of Gonyleptomorphid opilionids and pointed at the enormous number of genera, of which most are monotypic Those authors, appealing to natural system, tried to simplify the existing one and they supposed many genera to be synonymous; unfortunately, they set up their conception only upon the material from Mexico and, moreower, without studying the genital morphology.

Although the idea of restriction of monotypical genera is plausible, it is, to my mind, somevheat premature. From the subfamily Phalangodinae, for instance, about 200 genera has been described: it requires, among other things, to revise all species (the genital morphology of most formerly described species remains unknown). We must take into account that our knowledge of all opilionids is relatively scant: the descriptions of new representatives from hitherto monotypic genera as well as their geographical occurence prove their existence. And there remains always time to a justified synonymization.

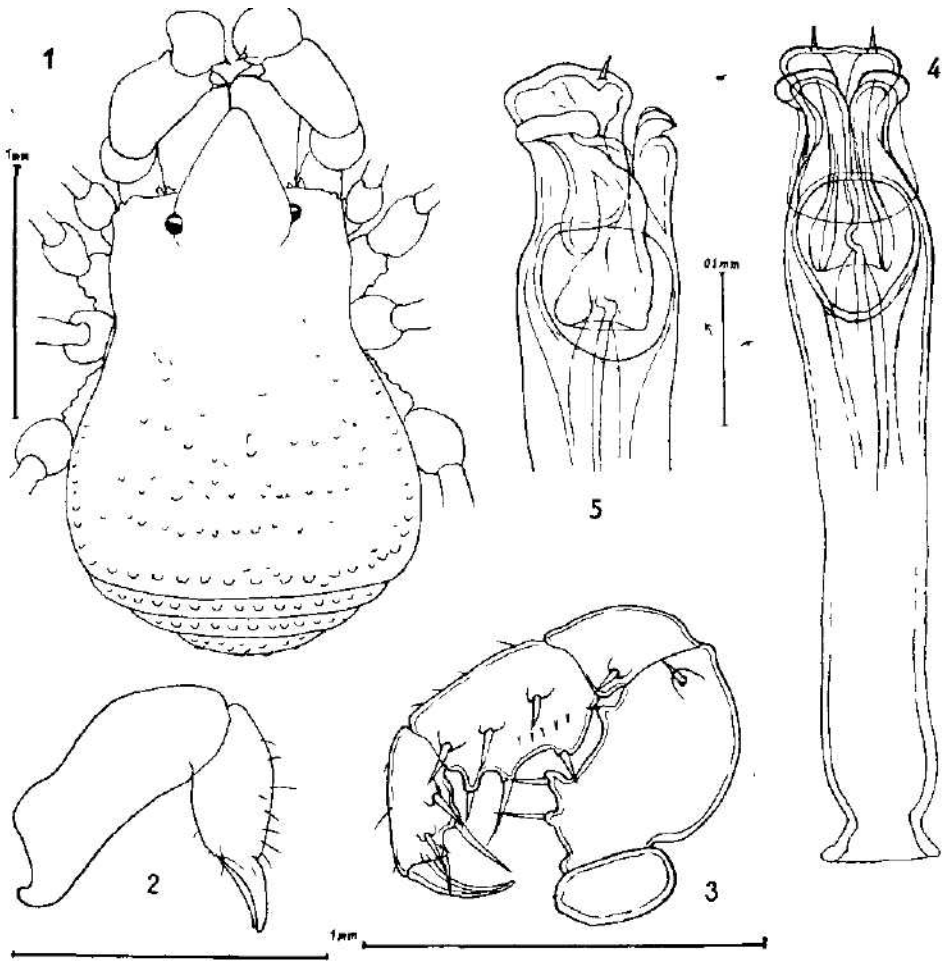

Fig. 1–5. *Anamota custodiens* gen. n., sp. n, male holotype. 1 – dorsal view of body, – chelicera, medial aspect, 3 – pedipalpus, medial aspect, 4 – penis, dorsal aspect, 5 – distal part of penis, lateral aspect.

Anamota custodiens sp. n. (Figs. 1–5)

Male holotype:

Body length 1,9 mm. Carapace finely granulate, without spines or tubercles. Eyemound in the form of sharp pointed cone, situated at the anterior margin of carapace. Dorsal scute without distinct areas, finely granulate. with some low tubercles. Fifth area with a row of low tubercles joining at the lateral boundaries on the lateral margins of scute which are provided with one row of very small tubercles. Free tergites with one row of tubercles, anal plate unregularly tuberculate.

Coxae 1–4 with tubercles, coxae 3 with one anterior and one posterior

row of tubercles, coxae 4 laterally not very widened, dorsal portion with low tubercles. Free sternites with one row of distinct tubercles.

Chelicerae: basal segment enlarged but without distinct dorsal elevation, unarmed, second segment small, only with some hairs.

Pedipalps 1,9 mm long, robust, dorsally unarmed. Femora lateromedially flatened, ventrally with three hair pointed spines and at the apical portion with one medial hair pointed tubercle. Patellae medially with one spine, tibiae ventrolaterally and ventromedially with three spines, tarsi ventrolaterally and ventromedially with two spines. Tarsal claws long and curved

Legs 2,2 — 3,2 — 2,4 — 3,1 mm long, all segments cylindrical, only with hairs. Tarsal segments: 3,4,4,4, second distitarsi with three segments.

Penis of the form shown in Figs. 4, 5.

Colour (in alcohol) reddish brown with distinct pattern of darker brown shading on the dorsal scute

Holotype locality: Cuba, Cienfuegos, Berlesa Funnel, N A Weber coll

Variability. There are in the collection another 4 males of a body length from 1,6 mm (subadult) to 1,8 mm from Cuba, Soledad, under legs. 12 Aug. 1931, Wosley coll.; morphologically not differ from the male holotype

No female of this species is in the collection.

Caribula gen. n.

Eyemound round, situated nearly at the anterior margin of carapace. First area without median line, areae 1—5 and free tergites without spines. Basal segment of chelicerae with distinct dorsal elevation, pedipalpus-femora at the apicomedial portion with one spinebearing tubercle. Tarsal segments, 4.6 or more than 6 (♂), 5,5; distitarsi of legs 2 with three segments. Sexual dimorphism: distinctly prolonged legs 2 of males.

Generotype: *C. longimana* sp. n.

This genus is related to *Texella* Goodnight et Goodnight, 1942; differs in the form of eyemound and in the tarsal segments formula.

Derivatio nominis: occurence in the Caribbean territory

Caribula longimana sp. n (Figs. 6—9)

Male holotype:

Body length 2,0 mm. Carapace finely granulate, without spines, only with some low tubercles. Eyemound situated nearly at the anterior margin of carapace, rounded, with some round granulations. Dorsal areae distinct, their margins not curved, parallel Area 1 without median line, areae 1—4 with two rows of regularly disposed hair pointed tubercles. Area 5 joining at the lateral boundaries the lateral margins of scute with one row of similar tubercles. Free tergites with one row of tubercles, anal plate tuberculate.

Coxae 1—4 finely granulate with very low tubercles, coxae 3 with one row of small tubercles on the anterior and posterior margins, coxae 4 not widened laterally. Dorsal portion of coxae 4 tuberculate. Free sternites only with one row of hairs.

Chelicerae: basal segment with distinct dorsal elevation and as well as the second segment unarmed, only with some hairs.

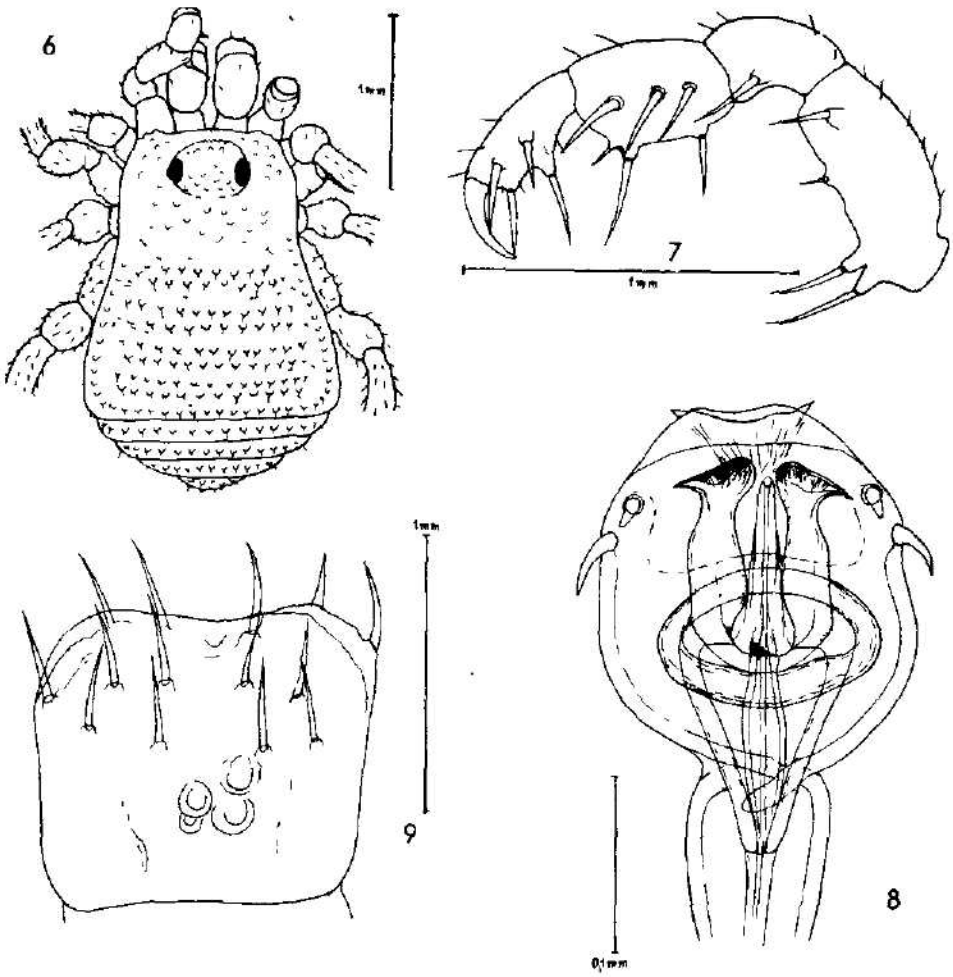

Fig. 6–9. *Carbula longimana gen. n.*, sp n, 6 — dorsal view of body, male holotype, 7 — pedipalpus, medial aspect, 8 — distal part of penis, dorsal aspect, male holotype, 9 — ovipositor, female allotype

Pedipalps 1.8 mm long, dorsally unarmed. Femora ventrally with two greater basal spines and one small spine situated in the middle. Apicomedial portion with one spine. Patellae ventromedially with one spine, tibiae ventrolaterally with two spines, ventromedially with three spines, tarsi ventrolaterally as well as ventromedially with two spines. Tarsal claws relatively short.

Legs 3,0 — 7,0 — 3,5 — 4,3 mm long, all segments cylindrical and only with hairs. Tarsal segments 4,7,5.5, distitarsi of legs 2 with three segments.

Penis of the form shown in Fig. 8.

Colour (in alcohol): Carapace, coxae, chelicerae, pedipalps and legs yellowish brown, femora and tibiae of legs at the basis darker, areae and free tergitest brown.

Holotype locality: Cuba, Soledad, Cienfuegos, Darlington coll 1936.

Female allotype:

Body length 1,9 mm. Body and extremities in the armature not very different from those of male holotype. Legs relatively short: 2,5 — 4,2 — 3.0 — 3,7 mm.
Ovipositor of the form shown in Fig. 9.

Allotype locality: Soledad, Cienfuegos, I-II-III 1936, Darlington coll.

Variability: There are in the collection 9 males, 13 females and 3 juvenile specimens differing in the length of body (from 1,8 mm to 2,5 mm) Only 1 ♂ has one distitarsus of leg 2 with 5 segments, in remaining adult specimens is the number of tarsal segments the same as in male holotype

Cersa gen. n.

Eyemound round, standing at the anterior margin of carapace. with a pair of tubercles. Areae distinctly visible, first area without medan line. Areae 1—3 and area 5 without spines, area 4 with a pair of median spines. Free tergites unarmed. anal plate with one median spine. Chelicerae not enlarged basal segments with a distinct dorsal projection and as well as the second segments only with hairs. Pedipalpus-femora at the apicomedial portion with one spinebearing tubercle. Tarsal segments: 3,5,5,5, distitarsi of legs 2 with three segments.

Generotype: *C. kratochvili* sp. n.

This genus is related to the genus *Sevianus* Roewer, 1949 living in Peru
Main differences are in the armature of areae and free tergites.

Derivatio nominis: free combination, feminnum.

Cersa kratochvili sp. n. (Figs. 10—15)

Male holotype:

Main differences are in the armature of areae and free tergites.
Body length 1,7 mm. Carapace granulate without greater spines or tubercles Eyemound round, hemisperical, situated on the anterior margin of carapace with a pair of low tubercles. Dorsal areae distinct, recurved, granulate, area 4 with a pair of small, pointed and medianly situated spines. Area 5 with a row of low hair pointed tubercles, joining at the lateral boundaries with the lateral margins of dorsal scute, which are provided also with one row of dense tubercles.

Coxae 1—4 with low tubercles, coxae 3 with a row of tubercles on the anterior and posterior margins. Coxae 4 widened laterally, dorsal portion with some hair pointed tubercles. Free sternites only with one row of hairs anal plate with one median spine.

Pedipalps 1,4 mm long, dorsally unarmed. Femora ventrally at the basis with two spines, apically with one hair pointed tubercle. Apicomedial portion of femora with one spinebearing tubercle. Patellae medially with one spine tibiae ventromedially with two spines and one smaller hair pointed tubercle ventromedially with two spines, tarsi, tipped with a long curved claw, with two ventrolateral and two ventromedial spines.

Chelicerae not enlarged, unarmed, basal segments with a distinct dorsal projection.

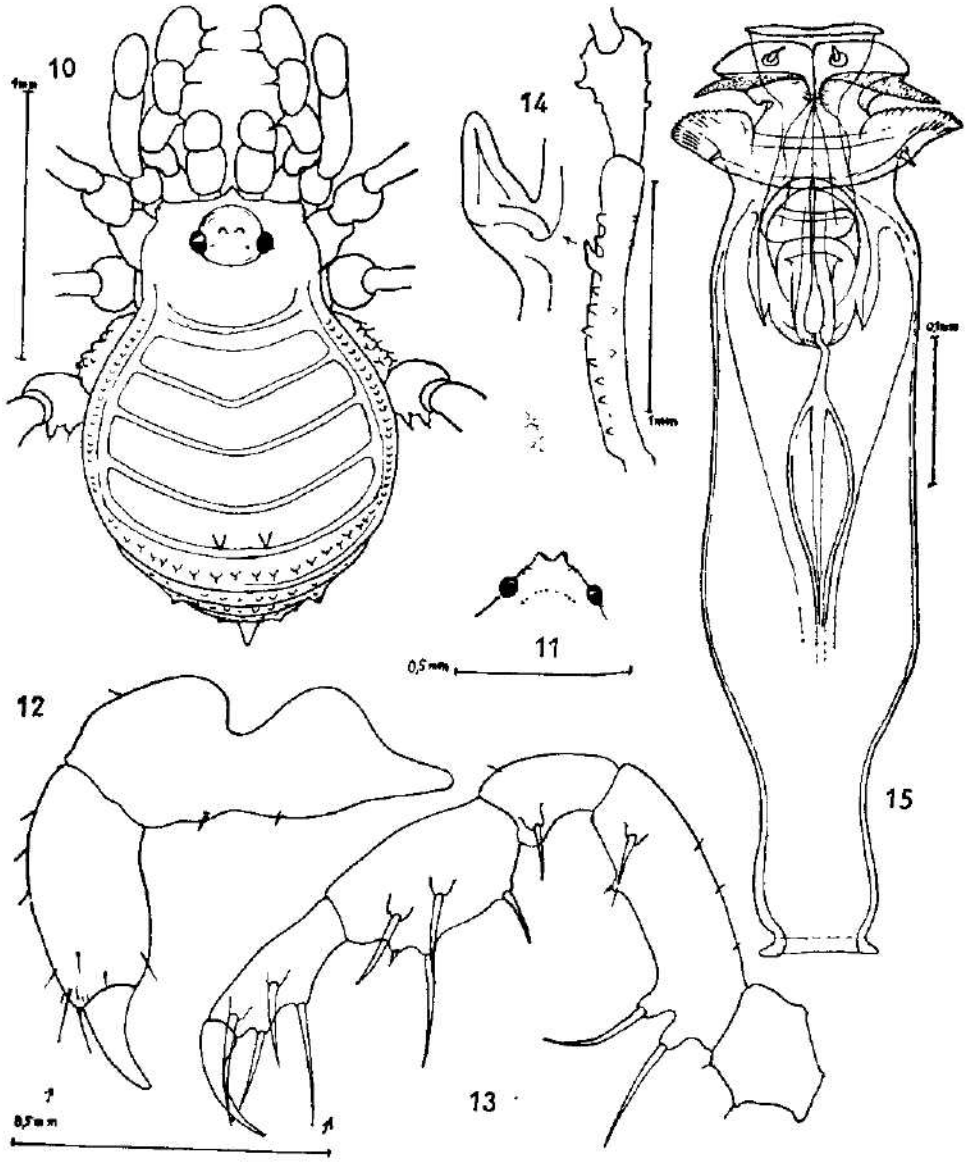

Fig. 10–15. *Cersa kratochvili* gen. n., sp. n., male holotype. 10 — dorsal view of body, 11 — eyemound, posterior aspect, 12 — chelicera, lateral aspect, 13 — pedipalpus, medial aspect, 14 — femur and patella, 4, 15 — penis, dorsal aspect.

Legs 2,6 — 3,5 — 2,8 — 3,9 mm long. Femora 1–3 with one row of hair pointed tubercles or small spines. Trochanters 4 ventrally posteriorly with two spines, femora 4 dorsally and laterally with hair pointed tubercles, ventrally

with one row of low spines, protoapically with one greater procurved spine Patellae and tibiae 1—4 with pointed tubercles, other segments only with hairs. Tarsal segments: 3,5,5,5, distitarsi of legs 2 with 3 segments.

Penis of the form shown in Fig. 15.

Colour (in alcohol) reddish yellow.

Holotype locality: Cuba, Trinidad, N. A Weber coll. (no other information).

In the same vial occurs one male paratype not different from male holotype.

Turquinia gen. n.

Eyemound in the form of sharp pointed cone, situated at the anterior margin of carapace. Dorsal scute with 5 distinct areas: first area without median line. All areas, free tergites and anal plate unarmed. Basal segment of chelicerae with a distinct dorsal elevation, pedipalpus-femora at the apicomedial portion with one spinebearing tubercle. Tarsal segments: 3,4,4,4, distitarsi of legs 2 with three segments.

This genus is related morphologically to the genus *Pegulius* Roewer, 1949 from Burma; differs by the sharp pointed eyemound.

Generotype: *Turquinia montana* sp. n.

Derivatio nominis: named after the locality of the holotype.

Turquinia montana sp. n. (Figs. 16—21)

Female holotype:

Body length 3,0 mm. Carapace finely granulate, without spines and tubercles. Eyemound in the form of relatively long, sharp and procurved cone situated on the anterior margin of carapace. Dorsal areae distinct, unarmed, area 1 without median line. Dorsal scute and free tergites with small hairpointed tubercles. Free tergites as well as anal plate unarmed.

Coxae 1—4 with low, hair pointed tubercle, coxae 3 with one anterior and posterior row of tubercles, coxae 4 not widened laterally. Dorsal portion of coxae 4 with low tubercles. Free sternites with two rows of very small hairs.

Chelicerae not enlarged, from normal size, basal segment with a distinct dorsal elevation. All segments unarmed.

Pedipalps 2,4 mm long, dorsally unarmed. Femora with one medioapical spine and with two hair pointed tubercles situated nearly in the middle of segment. Patellae medially with one spine, tibae ventrolaterally with three, ventromedially with two, tarsi ventrolaterally as well as ventromedially with two spines, tipped by a long curved claw.

Legs 3,3 — 6,0 — 3,9 — 5,3 mm long. Femora 4 with one ventral row of tubercles and spines, metatarsi 4 apically with one spinebearing tubercle, other segments of legs only with hairs. Tarsal segments: 3,4,4,4, distitarsi of legs 2 with three segments.

Colour (in alcohol): body and extremities reddish brown. Carapace and eyemound darkerly reticulated, areae 1—5, lateral margins of dorsal scute, free tergites and last free sternite with one reddish brown streak.

Holotype locality: Cuba, Pico Turquino (Sierra Maestra), south side 1000—1700 m, June 1946, Darlington coll.

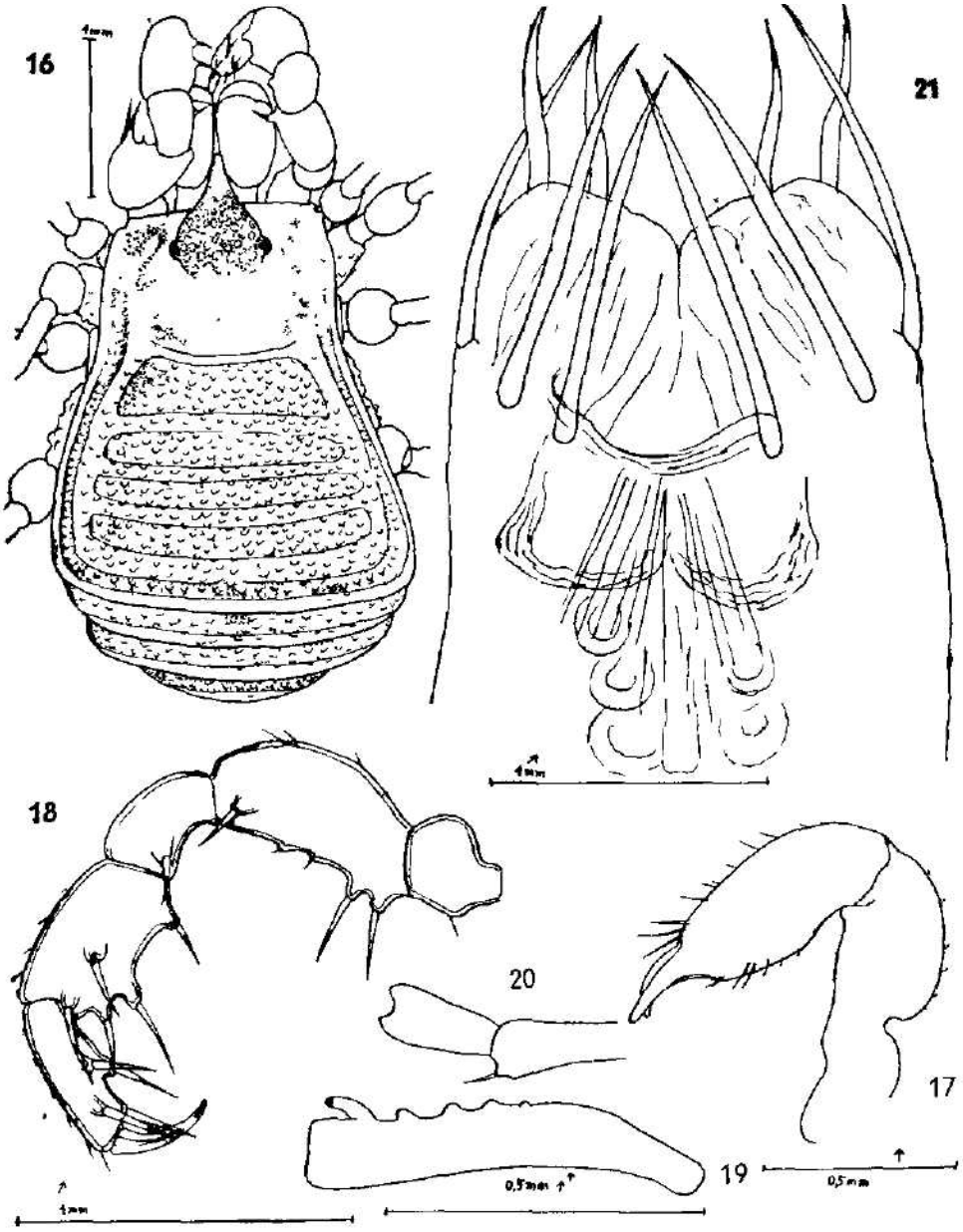

Fig. 16–21 *Turquinia montana* gen n, sp. n, female holotype, 16 – dorsal view of body, 17 – chelicera, medial aspect, 18 – pedipalpus, medial aspect, 19 – femur 4, lateral aspect, 20 – distal part of metatarsus nad basal segment of tarsus 4, lateral aspect, 21 – ovipositor.

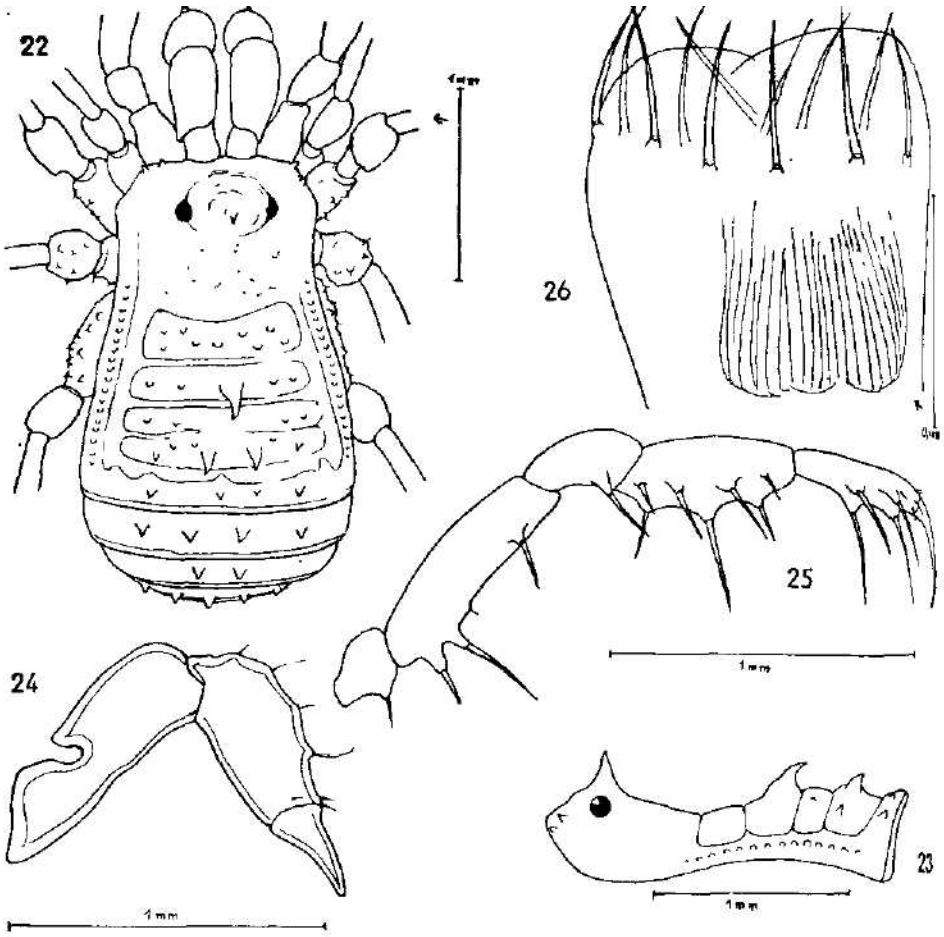

Fig. 22–26. *Valifema blanda* gen. n., sp. n., female holotype, 22 — dorsal view of body, 23 — lateral view of dorsal scutum, 24 — chelicera, lateral aspect, 25 — pedipalpus, medial aspect, 26 — ovipositor.

V a r i a b i l i t y : There are in the collection two further females from Cienfuegos (Viches Care Soledad, Bates and Fairchild coll). of body length 1,5 and 1,6 mm which resemble morphologically the holotype, the reddish brown streaks of scute and free tergites are only more distinct. These two specimens are demaged, legs, chelicerae and pedipalps of one are missing.

No males are in the collection.

V a l i f e m a gen. n.

Eyemound in the form of low tubercle tipped by sharp spine situated at the anterior margin of carapace. Areae distinct. First area without median line, areae 1 and 3 without spines. Area 2 with one median spine, area 4 with a pair of median spines and two lateral pointed tubercles. Fifth area and

free tergites unarmed. Basal segments of chelicerae with a distinct dorsal elevation, pedipalpus femora at the apicomedial portion with one spinebearing tubercle. Tarsal segments: 4, more than 6, 5, 6, distitarsi of legs 2 with three segments.

Generotype: *V. blanda* sp. n.

Relations: This genus is related to *Panoplia* Roewer, 1949, *Paralus* Roewer, 1949 and *Tolus* Goodnight and Goodnight, 1942 from Central and Northern America. Differs by the armature of tergites.

Derivatio nominis: free combination, femininum.

Valifema blanda sp. n. (Figs. 22—26)

Holotype female:

Body length 2,3 mm. Carapace granulate, without spines or tubercles. Eyemound situated at the anterior margin of carapace in the form of rounded tubercle pointed by a sharp spine. Dorsal areae distinct, boundaries not curved, parallel, area 1 without median line. Area 1 and 3 with some tubercles, area 2 with one recurved median spine, area 4 with a pair of median spines, two lateral pointed tubercles and some rounded tubercles. Area 5 with four rounded tubercles, joining at the lateral boundaries on the lateral margins of scute which are provided with one row of tubercles. Free tergites 1 and 3 with a row of four greater pointed tubercles, free tergite 2 only with two pointed tubercles. Anal plate with one row of five tubercles.

Coxae 1—4 granulate, with greater hair pointed tubercles, coxae 3 with a row of small tubercles on the posterior and anterior margin, coxate 4 somewhat widened laterally, dorsal portion of coxae 4 with greater tubercles. Free sternites with a row of hair pointed tubercles which are laterally greater.

Chelicerae not enlarged, basal segments with distinct dorsal elevation which is dorsally laterally prolonged in a slight, posteriorly directed cone.

Pedipalps 2,2 mm long, dorsally unarmed. Femora at the apicomedial portion with one hair pointed tubercle, ventrolaterally with two spines. Patellae medially with one spine, tibiae ventrolaterally with three spines. ventromedially with two spines situated in the midlle and one basal as well one apical spinebearing tubercle. Tarsi ventrolaterally and ventromedially with two spines.

Legs 4,8 — 8,8 — 5,3 — 7,1 mm long. All segments unarmed, only with hairs. Tarsal segments: 4, 7, 5, 6, distitarsi 2 with three segments.

Ovipositor of the form shown in Fig. 26, receptacula seminis indistinct.

Colour (in alcohol): Body reddish brown, carapace and eyemound with brown reticulations, areae and free tergites brown granulated. Chelicerae, pedipalps and legs yellowish brown.

Holotype locality: Cuba, Trinidad, N. A. Weber coll (without other data).

No paratypes are in the collection.

Brimma Roewer, 1949

From this genus only the species *B. hirsuta* Roewer from Costa Rica has been described.

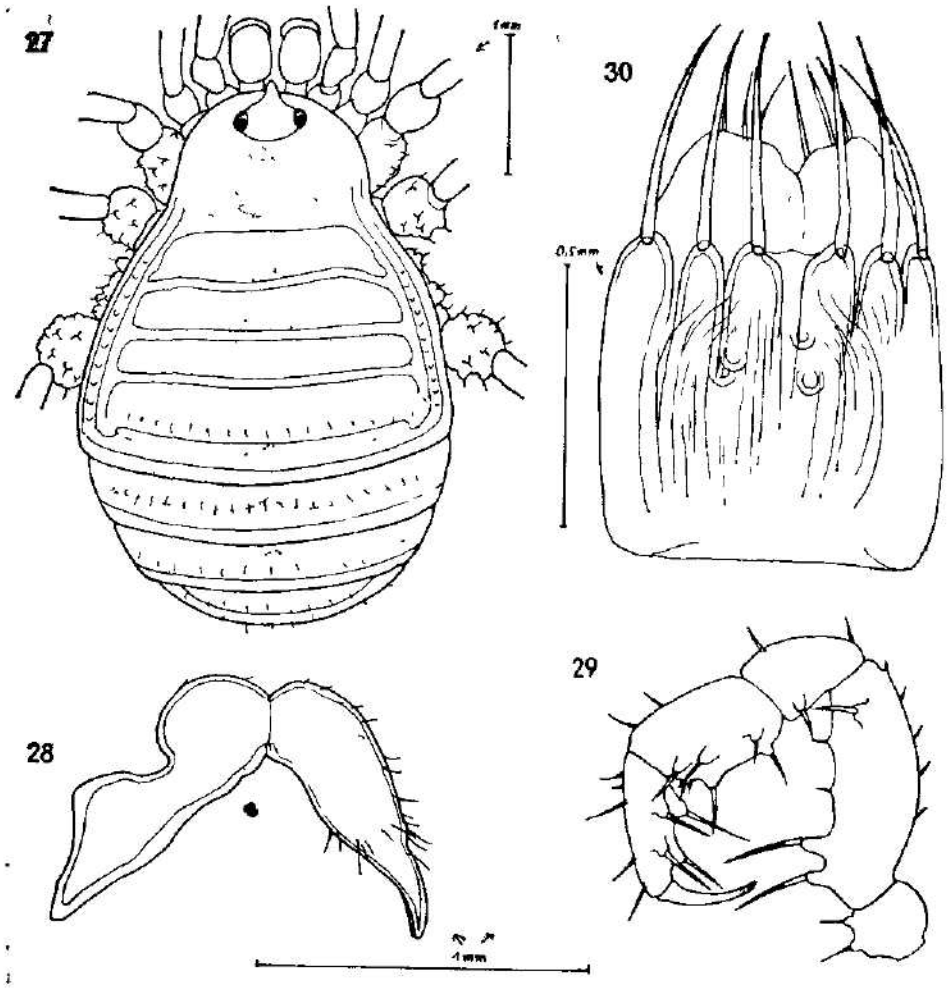

Fig. 27—30. *Brimma castanea* sp n., female holotype, 27 — dorsal view of body, 28 — chelicera, medial aspect, 29 — pedipalpus, medial aspect, 30 — ovipositor.

Brimma castanea sp. n. (Figs. 27—30)

Holotype female:

Body length 3,7 mm, robust, pyriform. Carapace finely granulate without greater tubercles or spines. Eyemound situated at the anterior margin of carapace, ovoidal and tipped with a sharp tooth. Dorsal areae distinct, first area without median line. Areae 1—4 smoth, greasy glossy with transversal rows of small hairs, area 5 joining at the lateral boundaries the lateral margins of carapace and of scute, which are provided with one row of tubercles. Free tergites unarmed too, provided only with one row of hairs, anal plate with unregularly disposed hairs.

Coxa 1—4 with hair pointed tubercles; coxae 3 with one posterior row of

tubercles, coxae 4 not widened laterally and as well as dorsal portion of coxae 2 with hair pointed tubercles.

Chelicerae not enlarged, unarmed, only with hairs, basal segments with a distinct dorsal elevation.

Pedipalps 2,1 mm long, robust, dorsally unarmed. Femora ventrally basally with two spines, at the apicomedial portion with one spinebearing tubercle. Patellae medially with one spinebearing tubercle. tibiae ventrolaterally with two spinebearing tubercles, ventromedially with three spinebearing tubercles, tarsi ventrolaterally as well as ventromedially with two spinebearing tubercles, tipped by long curved claw.

Legs 3,7 — 5,8 — 5,0 — 6,2 mm long. Femora, patellae and tibiae 1—4 and metatarsi 4 with some rows of hair pointed tubercles which are on the ventral side greater, metatarsi 1—3 and tarsi 1—4 with hairs. Tarsal segments: 3, 6, 5, 5, distitarsi of legs 2 with three segments.

Ovipositor of the form shown in Fig. 30.

Colour (in alcohol) of body reddish brown, extremities are yellowish brown.

Holotype locality: Cuba, Trinidad, N. A. Weber col. (without other data).

No allotypes or paratypes are in the collection.

Relations. *B. castanea sp. n.* is the second described species from the genus. It differs from the generotype *B. hirsuta* distinctly by the armature of scute.

Hewus Goodnight and Goodnight, 1942

This genus has been described as monotypical from Panama by Goodnight and Goodnight. Generotype *H. gertschi* G. and G., related to *Heteroscotolemon* Roewer, differs from this genus by not havig a pair of spines over the eyemound.

Hewus cubensis sp. n. (Figs. 31—36)

Male holotype:

Body length 4,2 mm. The form of abdomen is ovoidal. Carapace relatively small. Surface of carapace finely granulate without greater spines or tubercles. Eyemound not situated directly at the anterior margin of carapace, rounded, hemispherical, with distinct blunt tubercles. Dorsal areae distinct. their posterior margins recurved, strongly broken in the middle, area 1 without median line. Areae 1—4 with not well arranged rows of relatively great tubercles, area 5 with one row of tubercles, lateral margins of scute without tubercles. Free tergites with one row of greater pointed tubercles, similar to these ones situated unregularly on the anal plate.

Coxae 1—4 with similar tubercles, coxae 3 with one anterior and posterior row of smaller tubercles, coxae 4 widened laterally and their dorsal portion is provided with hair pointed tubercles. Free sternites with one row of small tubercles.

Chelicerae not enlarged, relativelly small. Basal segments with distinct dorsal elevation and as well as other segments of chelicerae only with hairs.

Pedipalps 2,6 mm long, robust, dorsally unarmed. Femora ventrobasally with two spines, at the apicomedial portion with one spinebearing tubercle. Patellae medially with one spine, tibiae ventrolaterally with two spines and one sub-

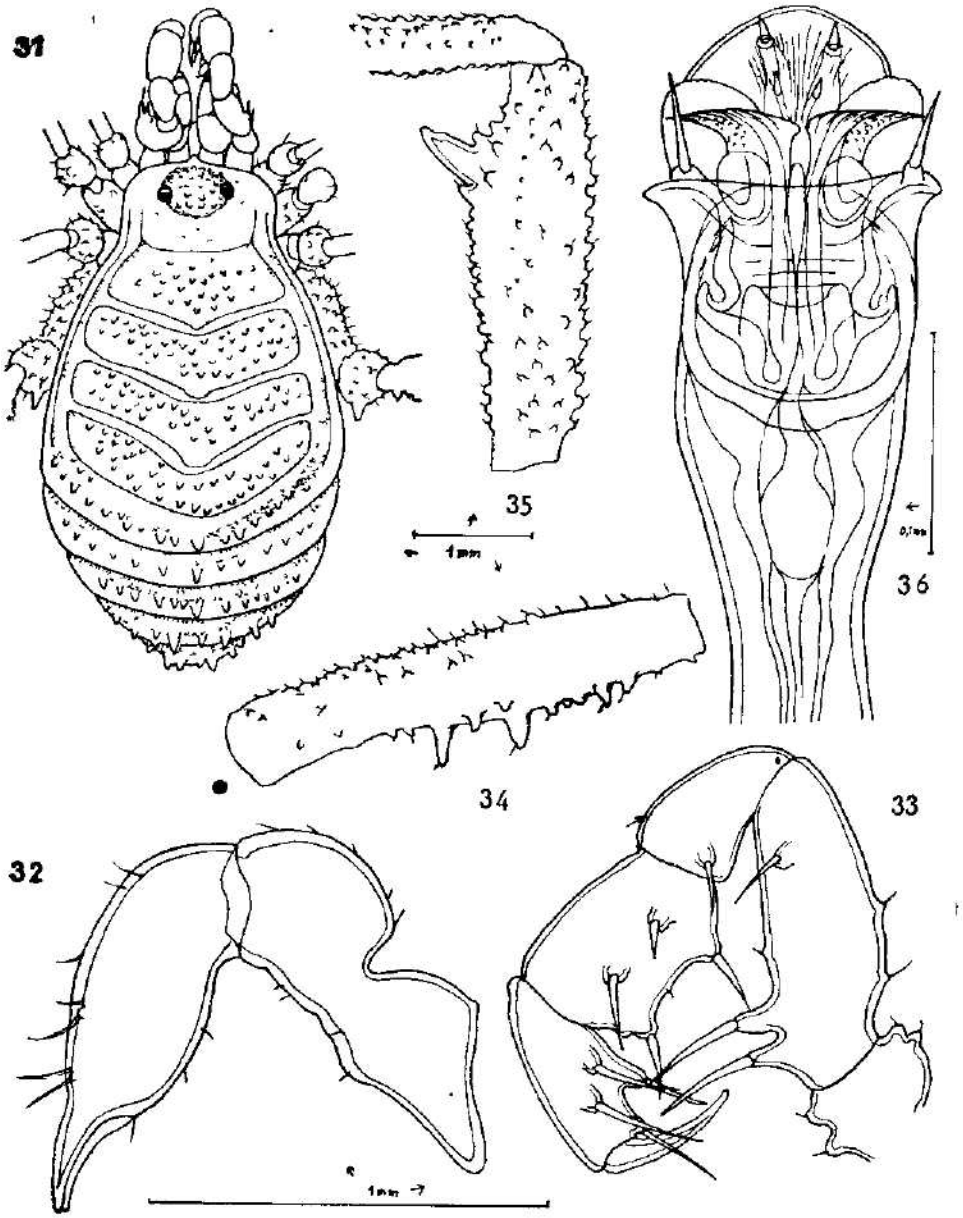

Fig. 31–36. *Hewus cubensis* sp. n., male holotype, 31 — dorsal view of body, 32 — chelicera, medial aspect, 33 — pedipalpus, medial aspect, 34 — femur 4, lateral view, 35 — tibia and basal portion of metatarsus 4, lateral view, 36 — distal part of penis, dorsal aspect .

apical hair pointed tubercle, ventromedially with two spines. Tarsi ventrolaterally and ventromedially with two spines. Tipped by long curved claw.

Legs 4,2 — 6,5 — 4,6 — 7,5 m long. Femora, patellae and tibiae 1—3 with hair pointed tubercles (greater on the ventral side), metatarsi and tarsi 1—4 with hairs. Femora 4 ventrally with 2—3 spines, tibiae 4 with one ventroapical tooth; remaining segments only with hairs. Tarsal segments: 3, 6, 5, 6, distitarsi of legs 2 with three segments.

Penis of the form shown in Fig. 36.

Colour (in alcohol): body reddish brown, distal segments of legs yellowish.

Holotype locality: Cuba, Cienfuegos, Soledad, Thomas Barbour coll. 1917 to 1918

No other specimens of this species are in the collection.

Relations. *H. cubensis* sp. n. is related to *H. gertschi* from Panama. It differs mainly by the armature of pedipalps, legs 4 and dorsal side of body.

Kalina Goodnight and Goodnight, 1942

This genus has been described similarly as monotypical with the generotype *K. parallela* G. and G., 1942 from Costa Rica. It is related to *Dapessus* Roewer, 1933 Differs in hawing the boundaries of the areae parallel and in having no spines ower the eyemound.

Kalina zebroides sp. n. (Figs. 37—42)

Male holotype:

Body length 2,6 mm, pyriform. Carapace smooth, unarmed. Eyemound rounded, hemispherical, without spines or tubercles, distinctly removed from the frontal margin of carapace. One very low hump is situated at the anterior margin of carapace before the eyemound. Dorsal areae distinct mainly by their patern. First area without median line. All areae as well as free tergites with a row of low hair pointed tubercles growing on the distal segments greater. Anal plate with some hairs.

Coxae 1—4 very finely granulate, with short hairs. coxae 3 with one posterior row of tubercles. Free sternites only with one row of hairs.

Chelicerae not enlarged, basal segments with a distinct dorsal elevation, unarmed, second segments small, with some dorsal and ventral hairs.

Pedipalps 1,5 mm long, relatively slim, dorsally unarmed. Femora ventrally basally with two spines, apicomedial portion with one spine. Patellae ventromedially with one spine, tibiae ventrolaterally and ventromedially with two low spines, tarsi ventrolaterally and ventromedially with two spinebearing tubercles. Tipped by one long curved claw.

Legs relatively long and slim: 5,0 — 8,5 — 5,8 — 10,0 mm long. All segments cylindrical, without tubercles, only with some rows of fine hairs. Tarsal segments: 3, 7, 6, 6, distitarsi of legs 2 with three segments.

Penis of the form shown in Figs. 40 and 41.

Colour (in alcohol) of body and extremities yeollowish brown light Scute darker brown with contrasting lighter areas and lateral margins

Holotype locality · Cuba, Trinidad, N A. Weber coll (no more information).

Female allotype:

Differs from the male holotype by the length of body — 3,2 mm and extremities — legs 4,0 — 7,0 — 4,8 — 7,5 mm long. Pedipalps are more robust,

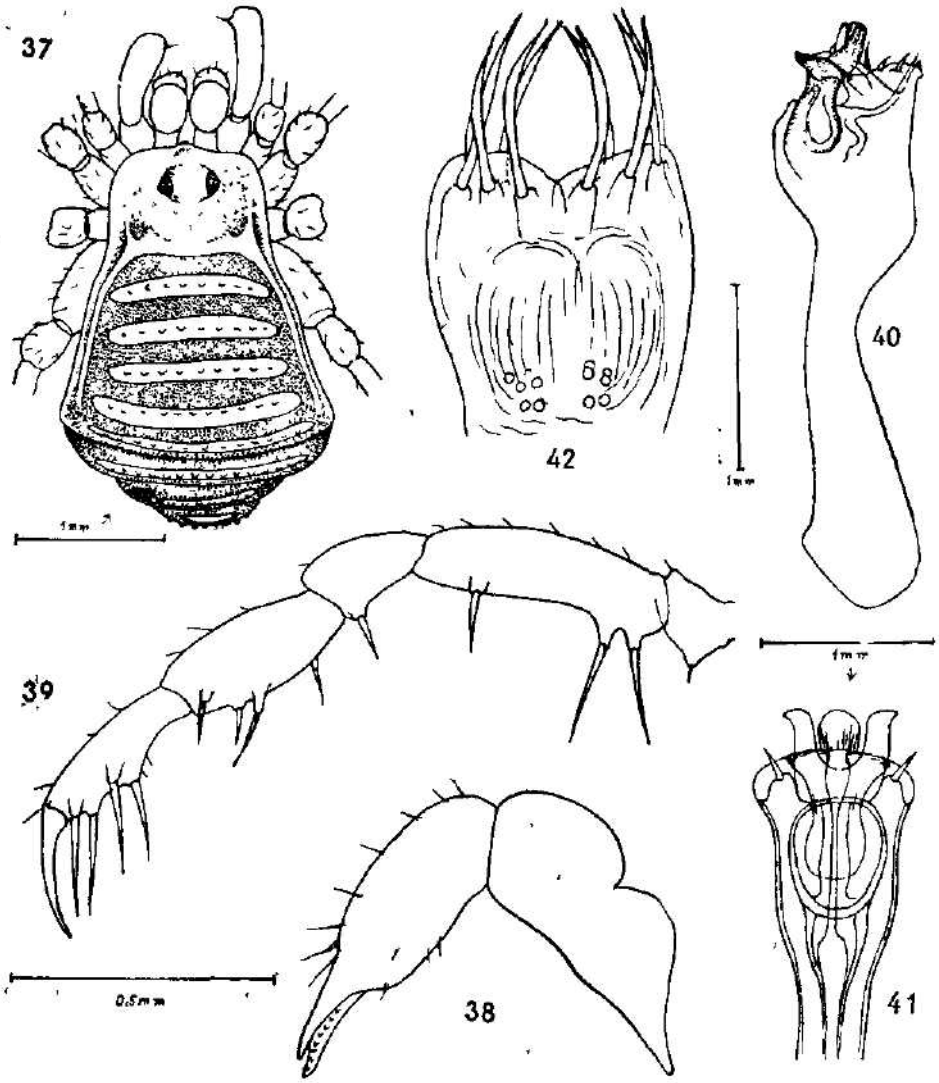

Fig. 37–42. *Kalina zebroides* sp n. 37 — dorsal view of body, male holotype, 38 - chelicera, medial aspect, 39 — pedipalpus, medial aspect, male holotype, 40 — penis, lateral aspect, male holotype, 41 — penis, distal portion from dorsal, male holotype, 42 — ovipositor, female allotype.

all spines and tubercles are bigger than those of male holotype. Ovipositor of the form shown in Fig. 42. The specimen occurs in the same vial as the male holotype (Cuba, Trinidad, N. A. Weber coll.).

Paratypes (2 ♂, 1 ♀, 10 juv.) are of the same provenance (Cuba, Trinidad), tarsal segments formula is the same as in holotype and allotype.

Relations. *K. zebroides* sp. n. is the third representative of the genus *Kalina*. From the *K. parallela* G. and G. as well as *K. tuberculata* G. and G

from Trinidad island differs in the dorsal armature, relative length of legs, length of body and ostentatious pattern of dorsal scute.

Acknowledgements

I wish to thank Prof. Dr. Herbert W Levi, Curator in Arachnida, Museum of comparative Zoology (Cambridge, U S A) for offering a very interesting material of opilionids from Antilles at my disposal for determination, as well as helping me to get all necessary literature.

The holotypes, allotypes and paratypes are deposited in the collections of MCZ--Harvard university Cambridge, U S.A., some paratypes are in my collection.

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Svazek XLIII — Číslo 1 — 1979 — Str. 76—80

Department of Systematic Zoology, Charles University, Praha

STRANDTMANNIIDAE — A NEW FAMILY OF EUPODOIDEA (ACARINA: PROSTIGMATA)

Miloslav ZACHARDA

Dedicated to the Academician Josef Kratochvíl on the occasion of the 70th anniversary of his birthday

Received September 29, 1978

Abstract: A contemporary state of systematics of Eupodoidea is outlined. Brief differential diagnoses of the families belonging to Eupodoidea are keyed. A new family Strandtmanniidae is presented and defined on the basis of phylogenetic evaluation of prodorsal chaetotaxy.

Soil mites belonging to the superfamily Eupodoidea are one of the most unknown group among the prostigmatic mites. Though their first descriptions were published demonstrably already in the 1st half of the 19th century and maybe even earlier (Thor, Willmann, 1941), only a few genuine diagnostic decsriptions have existed up to the present. It has been caused by the fact that true specific diagnostic morphological characters have not been usually distinguished in these mites.

Professor R. W. Strandtmann, Texas Tech University, Lubbock, is undoubtedly a pioneer of the contemporary systematics of Eupodoidea. His papers (Womersley & Strandtmann, 1963; Strandtmann, 1964, 1967, 1970, 1971, 1972) present detailed and standardized diagnostic descriptions of many species. Strandtmann (1967, 1971, 1972) published also good determination keys, but their applicability is limited to faunas of Subantarctic, Antarctic region and Arctic part of Neartic region. Unfortunately, some diagnostic characters incorporated into these keys were gleaned from the literature and, in fact, they are not diagnostic. Moreover, I must stress that a number of species described up to the present is evidently only a small part of existing specific richness. Consequently, revisions of particular families of Eupodoidea are quite necessary as a prerequisite of further work. Mites belonging to the superfamily Eupodoidea Banks, 1894 are characterized with the prodorsal epivertex (naso) usually bearing one pair of setae, the chelicerae are chelate and raptorial or with malformed shears and probably piercing. The pedipalps are 4-segmented, the terminal segment is simple. Special sensory rhagidial organs are located on the trasi of the first two (exceptionally three) pairs of legs. Two claws and a middle empodium are on the tarsi of the all legs. Epimeres I, II and III, IV are separated with the sejugal interval. Two pairs of the progenital knobs are in the progenital atrium under the progenital lips.

According to Krantz (1970), the superfamily Eupodoidea consists of four families: Eupodidae, Penthalodidae, Penthaleidae and Rhagidiidae. I add a new

family Strandtmanniidae which is distinguished and defined on the basis of phylogenetic evaluation of the prodorsal chaetotaxy. The differential diagnoses of the five families are keyed as follows:

1a Chelicerae large, robust, with well developed raptorial shears, digitus mobilis strong ...2
1b Chelicerae slender with malformed shears, digitus mobilis weak, claw-like ...3
2a Without polytrichy on dorsum of opisthosoma, prodorsum with 4 pairs of ciliated setae including trichobothria ...Rhagidiidae Oudemans
2b Dorsum of opisthosoma with polytrichy, prodorsum with 5 (!) pairs of ciliated setae including trichobothria ...Strandtmanniidae fam. n.
3a Tegument heavily sclerotized, often with tubercles and ornamentation, gnathosoma with epirostral plate, polytrichy on opisthosomal dorsum absent ...Penthalodidae Sig Thor
3b Tegument fine, weakly sclerotized, epirostral plate absent, sometimes with polytrichy on opisthosomal dorsum ...4
4a Anal orifice on dorsal side of opisthosoma, frequently with polytrichy on dorsum of opisthosoma ...Penthaleidae Sig Thor
4b Anal orifice either terminal or subterminal on ventral side of opisthosoma which is always without polytrichy ...Eupodidae C. L. Koch

Strandtmanniidae fam. n.

Genotype: *Strandtmannia* gen. n.

Diagnosis: Predatory soil inhabiting prostigmatic mites. Body soft and distinctly divided into gnathosoma, stethosoma and opisthosoma. Disjugal furrow clearly visible, epimeres I, II and III, IV separated with sejugal interval into two groups. Opisthosoma with terminal anal orifice and subterminal ventral genital orifice. Prodorsum bearing 5 (!) pairs of ciliated setae: one pair of internal vertical setae on distinct epivertex, one pair of external vertical setae, one pair of trichobothria, one pair of internal and one pair of external scapular seate. Large number of small nude (?) seate on opisthosomal dorsum. Hypostome longitudinally split from apex to middle with broad terminal membraneous malae. Chelicerae slender with well developed raptorial shears. Pedipalps consist of 4 segments, terminal pedipalpal segment simple and conic. Tarsus I with usual rhagidial organ including stellate seta, rhagidial organ with spiniform seta on tarsus II. Tibia I with dorsodistal rhagidial seta, tibia II with sensorious lancetform seta in depression with terminal pore. Spiniform solenidia on legs. Apotele with two claws and middle ciliated empodium. Two pairs of progenital disks in progenital atrium in adult.

Only one species is known.

Distribution: So far only a unique finding in Czechoslovakia.

Differential diagnosis: The family Strandtmanniidae is resembling the family Rhagidiidae to which it is undoubtedly closed in phylogenetic viewpoint. The principal differences from Rhagidiidae are: five pairs of prodorsal setae including trichobothria, polytrichy on opisthosomal dorsum.

The family Strandtmanniidae differs from the other families of Eupodoidea in the unique prodorsal chaetotaxy and in the morphology of chelicera with strong, raptorial shears.

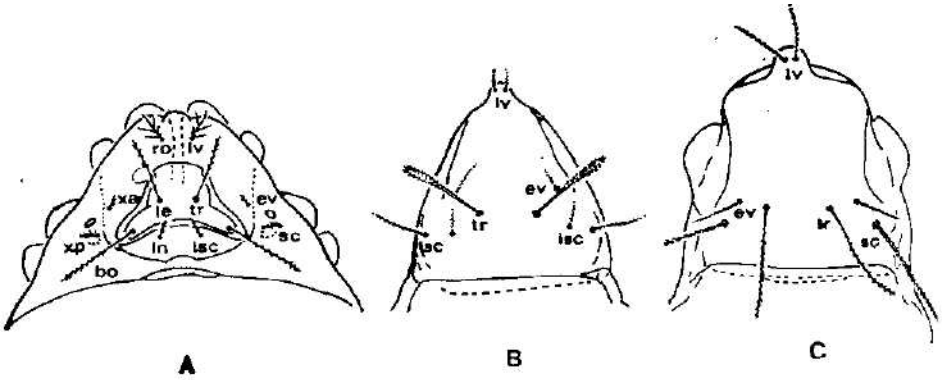

Fig. 1. Prodorsal chaetotaxy in: A-*Alycus roseus* (taken over from Van der Hammen, 1969), B — *Strandtmannia celtarum*, C — *Rhagidia gigas*. Abbreviations of chaetotaxy designation: Van der Hammen, 1969: bo-bothridial seta, in-interbothridial seta, le-anterior bothridial seta, ro-rostral seta, xa-anterior exobothridial seta, xp-posterior exobothridial seta; Strandtmann, 1971: ev-external vertical seta, isc-internal scapular seta (a new name), iv-internal vertical seta, sc-(external) scapular seta, tr-trichobothrium.

Discussion: The principal reason for the distinguishing and the definition of the new family Strandtmanniidae is the unique prodorsal chaetotaxy. As to my present knowledge, the five pairs of prodorsal setae have not been so far described in any species belonging to the superfamily Eupodoidea. According to contemporary opinion on phylogenetic evaluation of the morphological characters in Actinotrichida (Van der Hammen, 1969), six pairs of prodorsal setae, including trichobothria, are the primitive, plesiomorphic state of prodorsal chaetotaxy (Fig. 1-A). Consequently, five pairs of prodorsal setae in Strandtmanniidae (Fig. 1-B) and four pairs of prodorsal setae in other families (Fig. 1-C) of Eupodoidea are the derivative numbers. Though the prodorsal chaetotaxy is more primitive in Strandtmanniidae, it does not seem that this family is generally more primitive than other families of Eupodoidea. I have not been able to distinguish a greater number of primitive plesiomorphic characters in this family.

The family Strandtmanniidae is named in honour of Professor Dr. R. W. Strandtmann, Texas Tech University, Lubbock, the acarologist who has laid the foundations of the new contemporary systematics of Eupodoidea. I wish to express my thanks for and my appreciation of his uncommon interest in my work and his goodwill to help me in many respects.

Strandtmannia gen. n.

Type species: *Strandtmannia celtarum* sp. n.
Feminine gender.

Strandtmannia celtarum sp. n.
(Figs. 2, 3)

Description: Female, length of body 355 μm.

Dorsum: Tegument fine, striated in longitudinal lines forming ringlets arround insertions of setae. Internal vertical setae 12 μm long, external

verticals 20 μm, trichobothria slenderly clavate and 48 μm long, external scapular setae 31 μm, internal scapulars 14 μm. Setae on opisthosomal dorsum 12—14 μm long. Internal sacral setae 34 μm, external sacrals 17 μm. All prodorsal setae finely ciliated, small opisthosomal setae nude or very shortly ciliated(?) I have not been able to distinguish it employing a standard light microscope — 2000×). Eyes absent. Venter: Epimeral formula 3—1—5—4, trochanteral formula 1—1—2—2. Five pairs of progenital and five pairs of paragenital setae. Progenital lips 58 μm long.

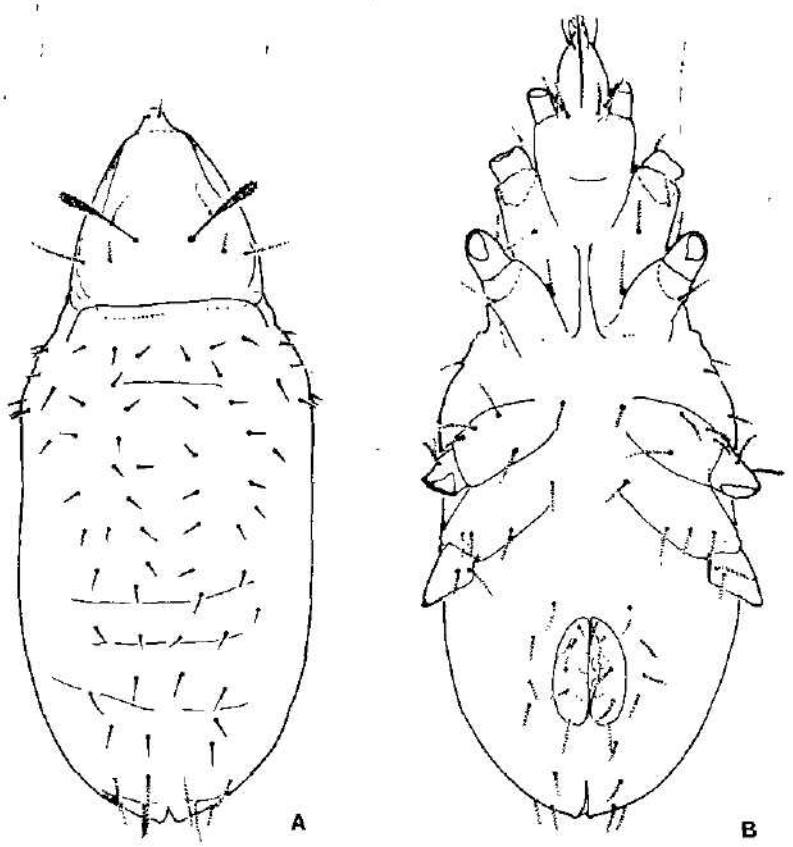

Fig. 2. *Strandtmannia celtarum* sp. n.: A-dorsum, B-venter.

Gnathosoma. Hypostome longitudinally oval, ratio of its length to breadth: 2.12, terminal malae membraneous and broad. Hypostome with two pairs of basal ciliated setae and with two pairs of nude subterminal setae. Chelicerae slender with strong raptorial shears. Digitus fixus with broad inner margine (see in profile) and bearing two nude setae. Proximal cheliceral seta inserted dorsally, distal seta inserted partly laterally and overlapping apex of digitus fixus. One large tooth is placed subapically on inner margin of digitus fixus. Inner margin of digitus mobilis serrate. Length of chelicera 89 μm, breadth 31 μm, length of digitus mobilis 24 μm, length of proximal cheliceral seta 7 μm, distal seta 10 μm, distance between their bases 7 μm.

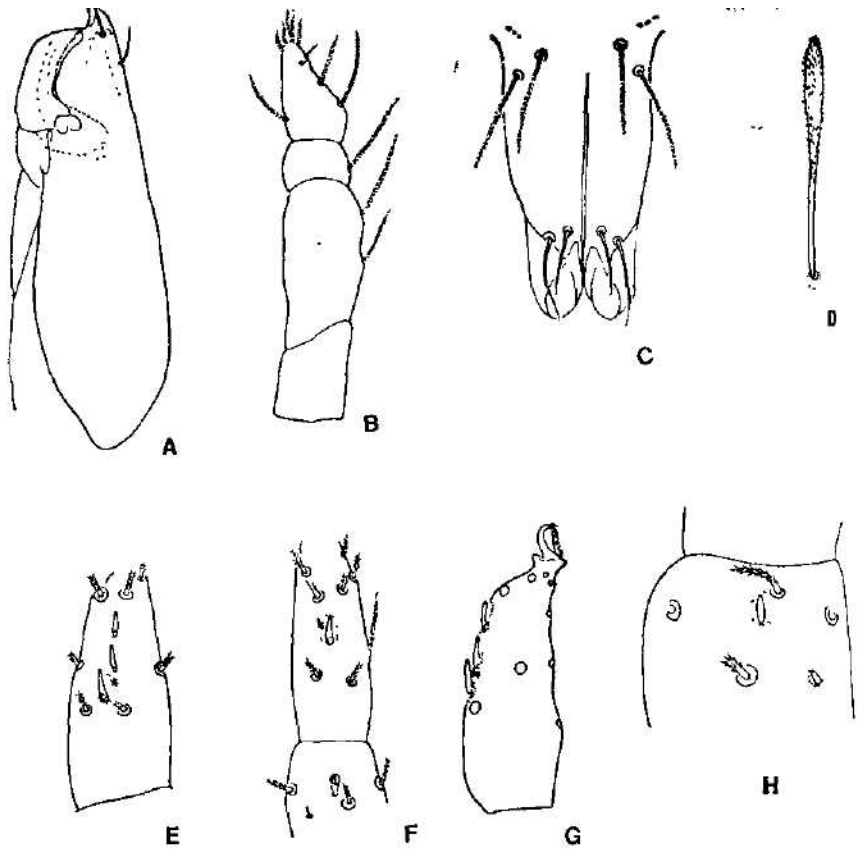

Fig. 3. *Strandtmannia celtarum* sp. n.: A — chelicera, B — pedipalpus. C — hypostome, D — trichobothrium, E — rhagidial organ I, F — rhagidial organ II, G — tarsus I (in profile), H — dorsodistal part of tibia I.

Ratio of length to breadth of chelicera: 2.88, ratio of length of digitus mobilis to that of chelicera: 0.27, ratio of length of digitus mobilis to breadth of chelicera: 0.77.

Pedipalps consist of 4 segments. Terminal pedipalpal segment is simple and conic to its tip. Numbers of ciliated setae on segments I, II, III, IV are 0—2—1—9, respectively. One small nude spiniform solenidion on terminal segment.

Tarsus I relatively short, forward suddenly rounded, ratio of its length to breadth: 2.80. Slender empodium not overlapping arch of claws without clawlets.

Rhagidial organ I consists of three rhagidial setae in separate fields arranged almost tandem, stellate seta laterally between 1st and 2nd proximal rhagidial setae. Rhagidial organ II consists of one rhagidial seta and one small lateral spiniform nude seta.

Solenidia on legs: Tibia I with small laterodorsal, distal solenidion and dorsodistal rhagidial seta in open pit. Tibia II with one small dorsolateral mediodistal solenidion and sensory lancetform seta in deep dorsodistal pit

with terminal pore, tibia III with one laterodorsal, distal solenidion, genu III with one distilateral solenidion and tibia IV with one laterodorsal, distal solenidion. Other solenidia have not been observed.

Material examined: 1 ♀, ČSSR, Bohemia centr., Závist-knoll near Zbraslav, Prague, oak forest litter, 13 9. 1972, M. Zacharda leg. et coll., fragments in permanent preparation, holotype.

Because the species was found near to ruins of Celtic oppidum on Závist--knoll, it was named "celtarum".

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Die Tierwelt Deutschlands. 64. Teil. Spinnentiere, Arachnida: Weberknechte, Opiliones. Von J. Martens. – Jena: VEB Gustav Fischer 1978. 464 S., 815 Abb., L 6, Br., DDR 110,– M: Ausland 125,– M.

Šedesátý čtvrtý svazek knižnice „Die Tierwelt Deutschlands", založené v roce 1925 F. Dahlem, je pozoruhodný z několika hledisek. Mimo jiné již proto, že jde poprvé o opětovné zpracování skupiny živočichů, která v této knižnici již vyšla. Sekáči zde byli poprve opublikováni v roce 1928 jako součást 8. svazku, autorem byl A. Kästner. Dnešní dílo pojednává o 110 druzích, z nichž 27 bylo popsáno po roce 1928 (6 přímo v této knize). Autor sám je profesorem na universitě J. Gutenberga v Mohanu, má široký přehled po zoologii. V evropské zoologické veřejnosti je znám především svými mnohaměsíčními expedicemi do Himálaje (na zpracovávání pozoruhodných materiálů se podílejí i českoslovenští badatelé).

Druhá pozoruhodnost nové knihy o středoevropských sekáčích spočívá ve významném rozhojnění ekologických a obecně biologických poznatků, a to i za situace, kdy mnohé údaje nebyly dosud publikovány. Podchytit tato data umožnila profesoru Martensovi přátelská spolupráce s řadou významných znalců středoevropské zvířeny sekáčů. Šest z nich je vyjmenováno spolu s autorem na titulní stránce knihy. Patří mezi ně např. náš přední znalec této skupiny Dr. V. Šilhavý, CSc., z Polska Dr. W. Starega a další.

Třetím progresívním rysem je veliké množství map znázorňujících dnešní znalosti o rozšíření většiny probíraných druhů, dále to jsou velice instruktivní vyobrazení kopulačních orgánů, kladélek a dalších znaků používaných v moderní taxonomii této skupiny.

Kniha je rozdělena na 4 hlavní části. Prvá (str. 13–57) pojednává o obecné problematice. Zvlášť pozoruhodné informace se týkají bizarních žlaznatých chloupků, lyrovitých smyslových orgánů poněkud odlišného uspořádání než u pavouků, histologie očních tkání, nejnovějších údajů o zápašných žlázách. Za významnou možno považovat podkapitolu o srovnávací morfologii samčích kopulačních orgánů, jejichž typologie (zejména pokud jde o uspořádání svaloviny) má velice úzké vztahy k systematice vyšších taxónů. Totéž lze říci i o kladélku samic. Shrnuty jsou i dosavadní údaje o stridulačních orgánech, které vznikly nezávisle u různých skupin sekáčů. Dále je upozorněno na všudypřítomnost této druhově poměrně chudé skupiny, na výběr potravy, sociální chování atp. V oddílu věnovaném rozmnožování jsou uváděny poměrně časté případy partenogeneze. Jsou popsány jednoletý, dvouletý i víceletý životní cykly. Pokud jde o zoogeografické údaje možno upozornit na informace o vysokém endemismu alpského masivu (26 % ze všech přítomných druhů), na disjunkce postglaciálního a interglaciálního charakteru i na sekundární zvětšení areálů vlivem člověka (11 případů). Z podkapitoly zabývající se systémem sekáčů je zvlášť pozoruhodné, že dosavadní členění podřádu Palpatores (kam náleží většina našich druhů) na Eupnoi a Dyspnoi, je nahraženo členěním na 4 nadčeledi: Caddoidea, Phalangioidea, Ischyropsalidoidea a Troguloidea.

Druhá část knihy (str. 59–429) obsahuje dokonalé determinační klíče na všechny taxóny žijící na daném území podřády počínaje a poddruhy konče. U každého taxónu je vedle morfologických charakteristik uváděno zoogeografické rozšíření, u každého druhu nadto bohaté údaje ekologické (vždy však vhodným způsobem zobecněné).

Třetí část je věnována seznamu literatury (19 stran) a poslední část seznamu názvů včetně všech synonym (14 stran).

Nutno pouze litovat, že některá z vyobrazení nejsou dosti zřetelně vytištěna. Vcelku kniha představuje významnou vzorně a všestranně zpracovanou monografii, která zejména svým mapovým vybavením dalekosáhle přesahuje rámec daného zoologického oboru, neboť v těchto mapách je zobecněno mnoho zákonitostí informujících o vývoji středoevropských přírodních podmínek.

J. Buchar

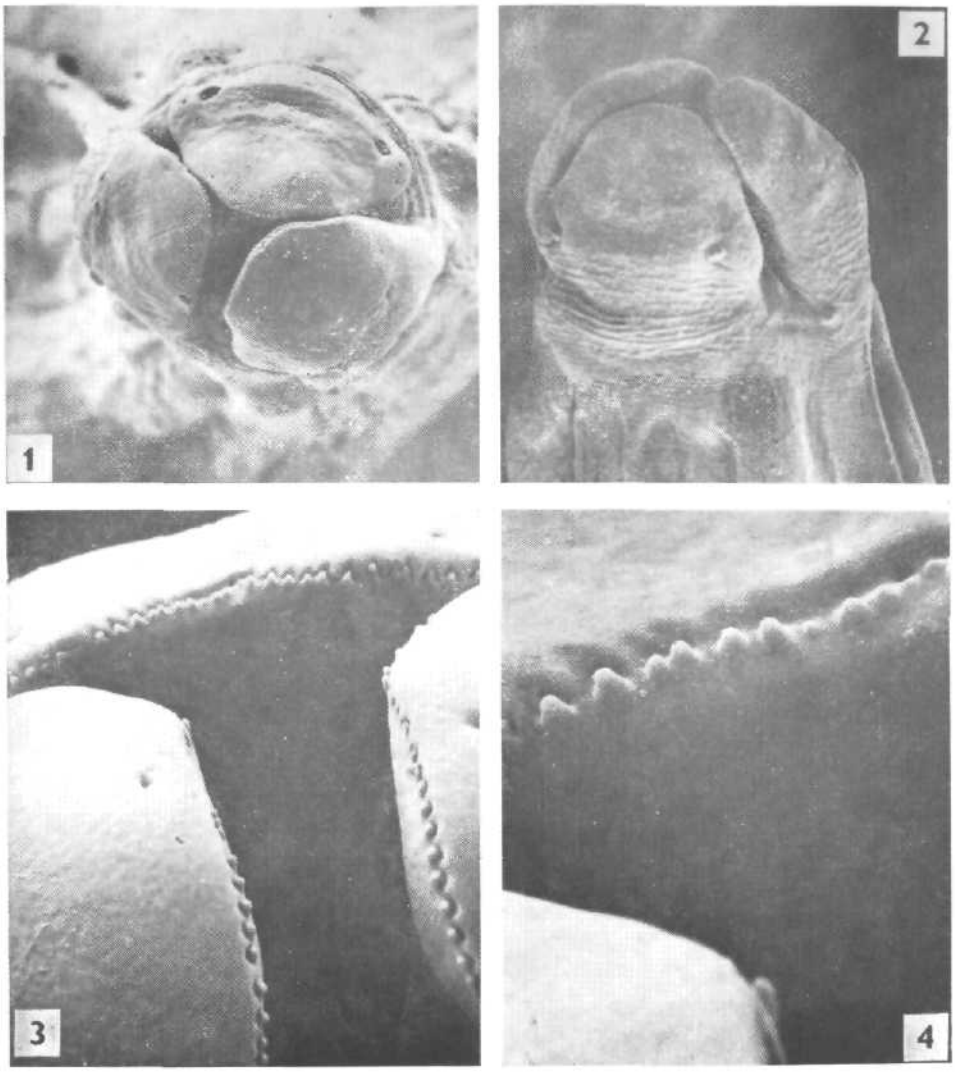


Plate I.
Figs. 1—4. Scanning electron micrographs of *Toxascaris leonina*.
Fig. 1. Group of 3 lips — apical view. (× 300); Fig. 2. Head end of body — dorsal view. (× 300); Fig. 3. Denticles on the lips — middle groups of denticles in a line near the top of lips. (× 1,000); Fig. 4. Middle group of denticles near the top of dorsal lip — detail (× 3,000).

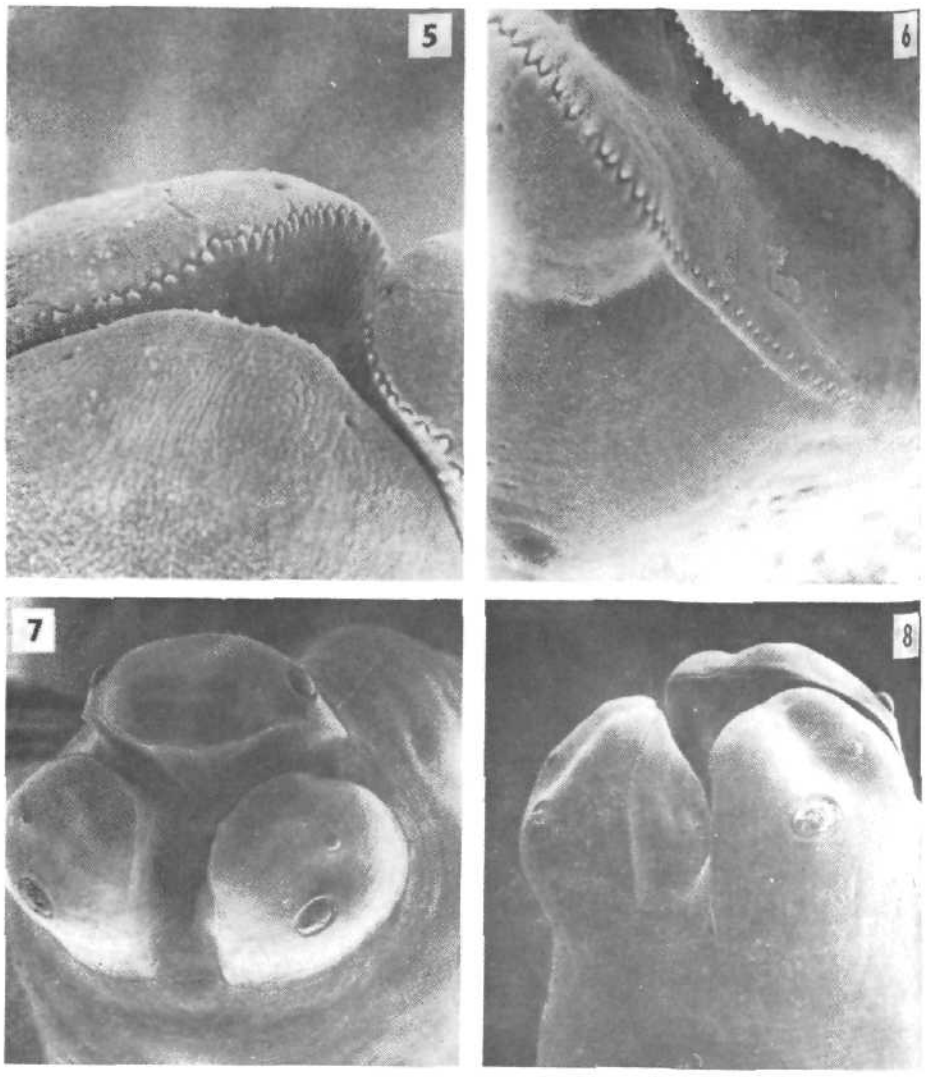


Plate II.
Figs. 5–6. Scanning electron micrographs of *Toxascaris leonina*, and Figs. 7–8 of *Toxocara canis*. Fig. 5. Denticles on the lips – middle group in a line on the top of lips. (× 1,000); Fig. 6. Denticles in lateral line, gradually becoming smaller caudally. (× 1,000); Fig. 7. Group of 3 lips (apical view). (× 300); Fig. 8. Head end of body – ventral view. (× 300).

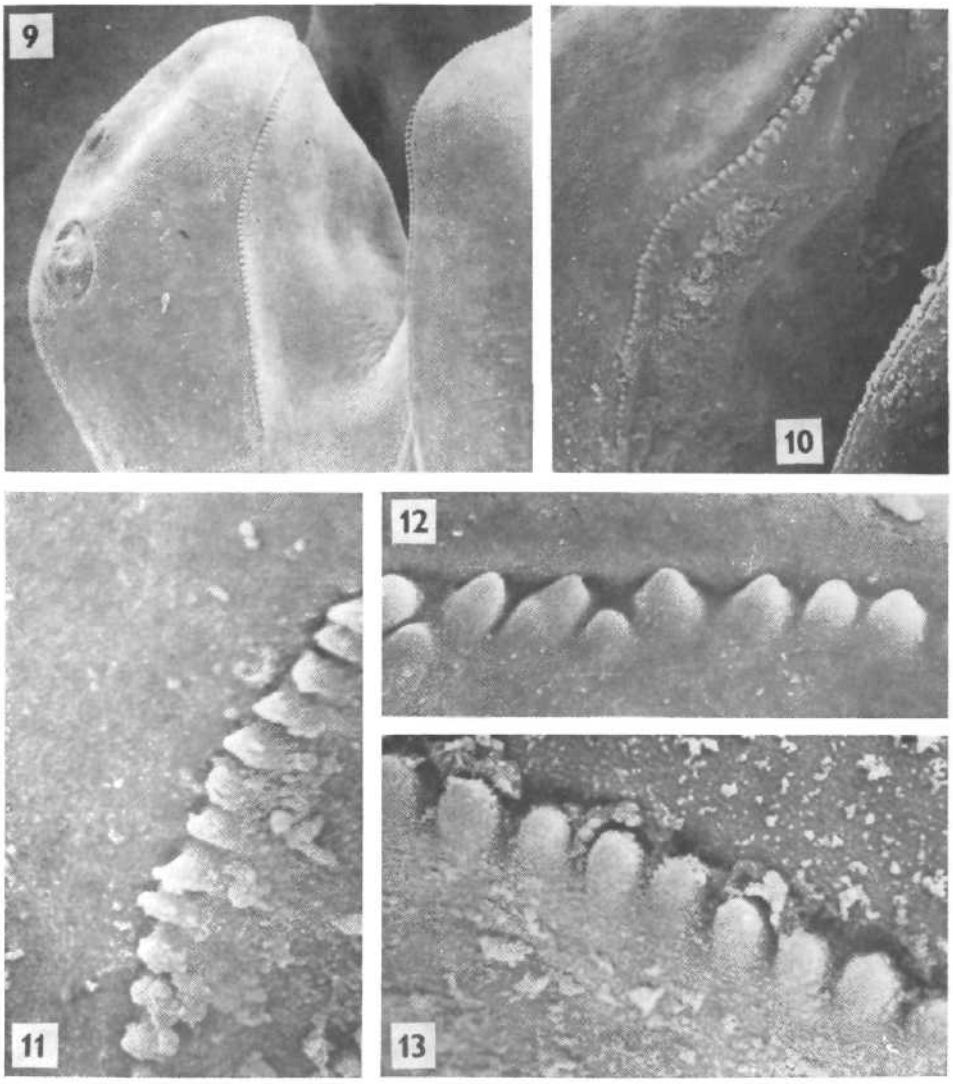


Plate III.
Figs. 9–13. Scanning electron micrographs of *Toxocara canis*. Fig. 9. Margins of latero-ventral lips with denticles. (× 550); Fig. 10. Denticles in lateral line, gradually becoming smaller caudally. (× 1,000); Fig. 11. Shape of denticles (detail) in lateral line. (× 5,000); Figs. 12–13. Shape of denticles (detail) in middle group near upper margin of lips. (× 6,00).

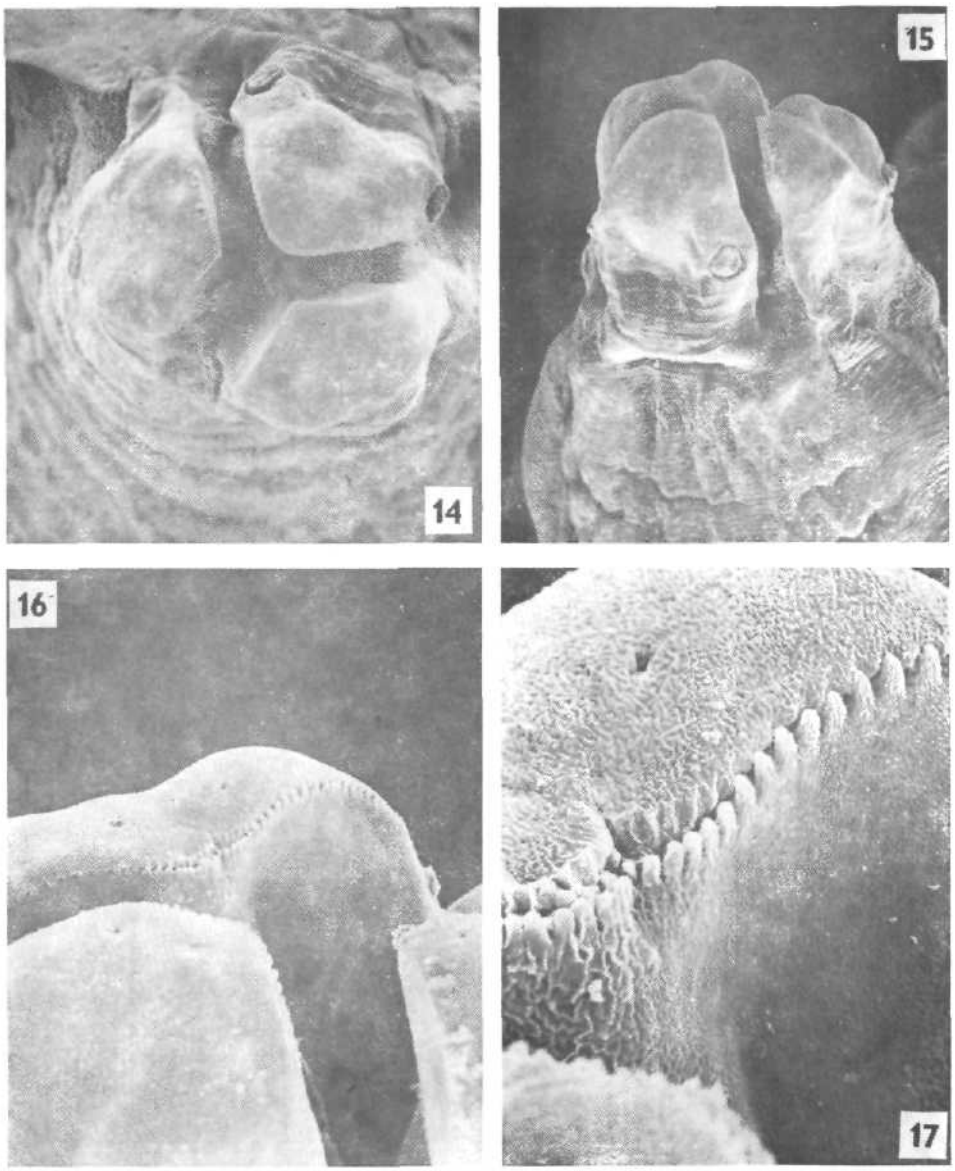
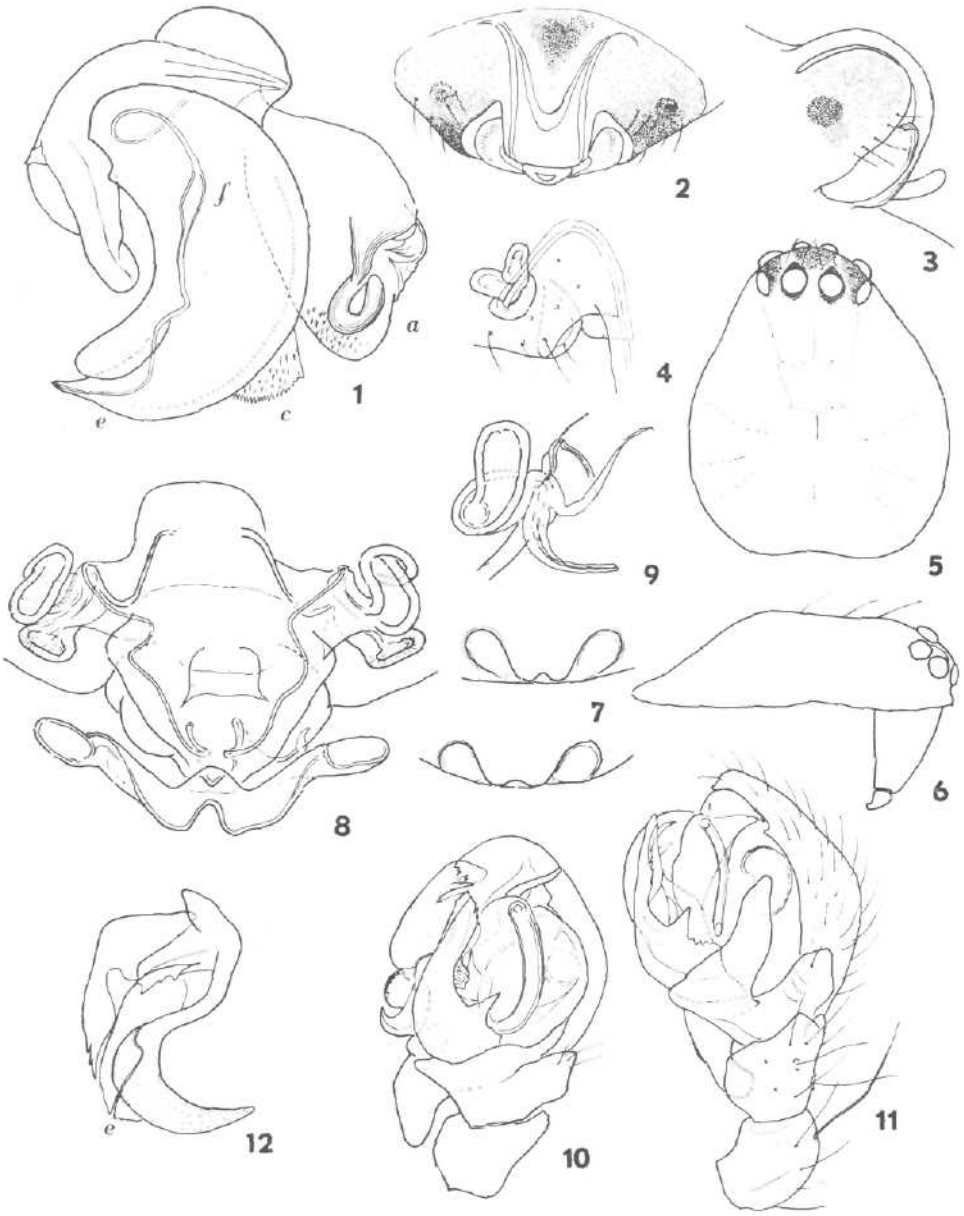


Plate IV.
Figs. 14—17. Scanning electron micrographs of *Toxocara cati*. Fig. 14. Group of 3 lips — apical view. (× 400); Fig. 15. Head end of body, dorso-lateral view. (× 300); Fig. 16. Denticles on the lips — middle group in a line near top of lips. (× 1,000); Fig. 17. Shape of denticles (detail) in middle group near upper margin of lip. (× 3,000).

T. 1. Abb. 1–10: *Theonina kratochvili* sp. n. 1 – ♀; 2 – ♀ 3, 4 ♂ Pedipalpus pro- und retroloteral; 5 – Endapparat ("embolic division"): Embolus (e), Terminal Apophysis und Radix (a); Membrana mediana ("Conductor") (c), Fickertsche Drüse (f); 6 – ♀ Chelicere; 7 – ♂ Chelicere; 8, 9 – Epigyne von ventral und lateral; 10 – Vulva.



T. 2. Abb. 1–4 – *Theonia cornix* (Simon, 1881); – Endapparat ("embolic division"): Embolus (e) Terminal Apophysis und Radix (a), Membrana mediana (Conductor") (c), Fickertsche Drüse (f); 2, 3 – Epigyne von ventral und lateral; 4 – Receptakeln von dorsal (innen). Abb. 5–11 – *Meioneta equestris* (L. Koch, 1881). 5, 6 – ♀; 7 – Epigyne senkrecht von ventral und mehr von hinten; 8 – Vulva; 9 – Receptakeln von dorsal (innen), 10, 11 – ♂ Pedipalpus von ventral und retrolateral; 12 – Endapparat ("embolic division"): Embolus (e).

POKYNY PRO AUTORY

Věstník Československé společnosti zoologické uveřejňuje původní vědecké práce členů společnosti v rozsahu nejvýše 30 stran rukopisů, napsané v některé z kongresových řečí, a dále články, hodnotící životní dílo našich zoologů, vyžádané redakcí. Práce autorů, kteří nejsou členy společnosti, budou přijímány jen výjimečně.

Formální úprava prací:

Rukopis (originál a 1 kopie) musí být psán na stroji s většími typy obřádek, na stránce 30 řádek, řádky po 60 úhozech, bez větších oprav. Rukopisy, které by neodpovídaly těmto formálním požadavkům, budou vráceny k přepsání.

Hlavička práce: 1. Název pracoviště. 2. Název práce (u prací taxonomických v závorce za názvem systematické zařazení druhu nebo skupiny — např. Ostracoda: Cypridinidae), obojí v řeči, v níž je práce psána. 3. Jméno a příjmení autora.

Vlastní práce: 1. Velmi stručný abstrakt, v rozsahu nejvýše 15 řádek, v angličtině. 2. Úvod do problematiky (stručně). 3. Materiál a metodika (u známých metod pouze odkaz). 4. Vlastní část experimentální nebo popisná. 5. Diskuse. 6. Závěr. 7. Seznam citované literatury (nikoliv bibliografie!). 8. Adresa autora. 9. Tabulky, texty k obrázkům a grafům. Celý rukopis je průběžně stránkován.

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Přepis cyrilice proveďte podle mezinárodních pravidel vědecké transliterace (nikoliv fonetické transkripce) — viz ISO Recommendation R 9. International System for the transliteration of cyrillic characters 1. Ed. October 1955 nebo Zekalle R., 1964: *Pedobiologia,* 4 : 88—91, Jena.

Obrázky a grafy kreslete černou tuší na kladívkový nebo pausovací papír v poměru 1 : 1 až maximálně 1 : 3, u taxonomických prací musí mít obrázky měřítko. Obrázky kreslete pokud možno tak, aby mohly být všechny stejným způsobem zmenšeny. Fotografie musí být ostré, kontrastní, na lesklém papíře. Obrázky sestavte do tabulí, které by bylo možno reprodukovat na šíři strany (126 mm), nebo s textem na celé zrcadlo (126 × 188 mm). Obrázky nebo obrazové tabule průběžně očíslujte a v rukopise vyznačte místo, kam mají být zalomeny.

Tabulky jsou tištěny jako otevřené, tj. bez svislých linek. V tabulkách oddělte vodorovnými linkami jen záhlaví tabulky a dolní okraj. Tabulky protokolárního charakteru nebo opakující údaje z textu, případně tak velké, že by je nebylo možné vytisknout na dvě protilehlé strany, nebudou přijímány.

V taxonomických pracích dodržujte zásady, ustanovení a doporučení mezinárodních pravidel zoologické nomenklatury.

V rukopisu nepředpisujte zásadně žádne typy písma, označte pouze tužkou po straně části, které mají být vysazeny petitem.

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