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LABORATORY CULTURE OF CYCLOPOID COPEPODS ON A DEFINITE FOOD

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Abstract: Carnivorous cyclopoid copepods are reared on a mixed diet consisting of large Protozoa and unicellular green algae. Protozoa and algae are cultivated in separate non-sterile (not axenic) cultures. If large numbers of uniform copepod specimens are desired special care is made to separate the newly hatched nauplii from the female, and later, to keep the cohort in a narrow size range.

The feeding of freshwater cyclopoid copepods on a wide spectrum of food is well known from the classic study of Fryer (1957). This feeding habit together with their adaptability makes their cultivation in the laboratory a simple procedure. Despite this fact reports about the succesful breeding of cyclopoids are relatively scarce (Lowndes 1929, Coker 1933, Ewers 1936, Price 1958, Yeatman 1959, Parker 1960, Smyly 1970). Recently, Lewis, Luff and Whitehouse (1971) described the culture of *Cyclops abyssorum* Sars. Neither physiological and ecological experiments nor modern taxonomic studies can be done without well established laboratory cultures which can cupply live specimens of a relatively constant character, as well as provide the student with the possibility of keeping the specimen and its progeny alive. The following paragraphs describe the method of cultivation which was gradually developed during the laboratory study of cyclopoid taxonomy and ecology (Department of Hydrobiology, Charles University, and Hydrobiological Laboratory, Czech. Acad. Sci., Prague) and during the study of their carnivorous feeding (Department of Biology, University of Waterloo, Ontario, Canada).

MATERIAL AND METHODS

Distilled water: Only glass distilled water should be used. However, even the glass distilled water from continuous apparatus may contain volatile substances from tap water which may cause an apparently inexplicable harm to the animals. Heating to the boiling point in an open beaker removes this effect satisfactorily.

Lake water: Lake water was immediately prefiltered through a 0.04 mm net. In the laboratory, the water was heated to 90—95 °C and filtered through dense filter paper. The filtered water was placed in 5 or 10 l jars and bubbled with air for at least a week. Then it may be stored in sealed jars in less than 10 °C for many months.

Glassware: Any kind of wide-mouth glass bottle was found suitable for cyclopoid cultures regardless of the quality of the glass. The size of container depends on the purpose of the culture (see below) but generally the depth of water should be not more than 10—15 cm. However, for protozoan and algal cultures chemical glassware must be used, and conical flasks are the most convenient. More important than the choice of glassware is its washing: chromic-sulphuric acid

mixture never should be used. Washing in hot water solution of sodium carbonate or phosphate is usually sufficient. The glassware is then dipped in approximately 3% nitric acid and thoroughly rinsed in tap water and distilled water.

Compressed air The air supplied for bubbling must have any oil droplets from the compressor, or other pollutants, removed by means of a cotton filter and a gas-washing cylinder.

Metal sieves· A set of sieves screened with metal nets of various meshes has proved to be almost an indispensable tool for quick and easy handling of cultures The densest sieve should have 0.05 mm mesh and successive ones should be coarser by 0 05 mm, up to the coarsest sieve with openings of about 1 mm.

Culture of algae

The purpose of the algal component in a mixed diet is to serve as a food for nauplıar stages. Any species of unicellular alga which does not settle quickly to the bottom and is easy to cultivate is suitable. The author succesfully used both *Chlorella* sp. and *Scenedesmus* ssp. but the species of *Chlamydomonas*, namely *Ch. reinhardti* and *Ch. moewusi*, were found to settle much less than the former genera

Culture medium: For media, see the extensive algological literature (referred e g in Starr, 1964, or Chu 1942). L-C Standard Medium (Bourrelly, 1948) or Bristol's Solution (Bold, 1949) can be recommended, the last one with addition of 5 ml of soil extract per litre.

Maintenance of algal cultures: Very dense cultures are achieved by using air bubbling through the culture medium. 500 ml or 1 litre conical flasks half filled with medium are inoculated and kept at 18—20 °C, in artificial light or indirect day-ligt (near a window) and with continuous bubbling (5—10 small bubbles per second). When the culture grows dark green part of the culture is regularly removed and replaced by a fresh medium The turn over rate is such that the entire volume is replaced once about every ten days.

Culture of Protozoa

Cultivation of protozoans is the most laborious part of the cyclopoid culture system since the cultures need to be re-inoculated twice a week. However, their treatment is very simple and easy. Any of the following species can be used: *Paramecium caudatum* (Ehrenberg), *P. aurelia* (Ehrenberg), and *P. bursaria* (Ehrenberg et Focke) The first species is the largest of all three (length about 0 2 mm), the last one is by one third smaller but is easily visible due to its green colour

Culture medium: Two media were examined and succesfully used each having some adventage over the other Barley grains boiled in water can be prepared quickly and simply. The extract of a scotch grass can be stored in a refrigerator for at least a few weeks

1. Barley medium: 100 barley grains per litre A conical flask is half-filled by volume with distilled water, stopped with a soft cotton or foam plastic plug, and heated to the boiling point. After ten minutes of gentle boiling, the flask is removed from the heater to prevent a steam explosion after the addition of grains. Barley grains are added and the stopped flask is boiled for a further 5 minutes After cooling to room temperature the medium is ready for inoculation.

2. Scotch grass medium 3 *g* of dry matter per litre. "Scotch grass" is finely ground powder commercially prepared from dry grass. The extract is prepared similarly to the method of Pasternak (1967) 3 *g* of the grass powder are boiled with 500 ml of distilled water for one hour. The hot extract is filtered through a dense filter paper and made to one litre with distilled water. To adjust the pH of the medium between 6 6 and 7 0, 0 4 g of Na_2HPO_4 is added per litre. Before the inoculation, the medium is poured into flasks, and plugged flasks are sterilized either in a sterilizer or by 10 minutes of boiling If the plugs and necks of the flasks are covered by an aluminium foil the flasks containing sterilized medium can be stored in a refrigerator ready for use in a few days

Maintenance of Paramecium cultures: All the cultures are kept in darkness at 27 °C. According to the purpose, three types of cultures may be distinguished. Each of them requires a special treatment

A. Transferring cultures: Temporary cultures in an exponential growth phase from which is transferred the supplied or isolated strain to the new medium The best way to do this is to mix equal volumes of the new medium and the culture obtained from the supplier in a small conical flask When the culture has grown to the same density as was that of the supplied culture the procedure is repeated until the desired volume is obtained Only dense culture may be used to inoculate the first set of current feeding cultures (C).

B. Sterile stock cultures: Slowly growing cultures for replacement of a contaminated strain. Ordinary long test-tubes are used containing about 10 ml of sterile barley medium (1—2 barley

grains). The cultures should be treated as sterile, e g. using sterile pipette etc. When inoculated with 0 5 ml of the old culture they do not need re-inoculation for 3—4 weeks

C Current cultures for production of cyclopoid food: Although these cultures are non-sterile, sterile medium and glassware are used. The simplicity of treatment is based on a balance between the bacterial and protozoan components which is reached using large amount of protozoans to inoculate new cultures The cultivation is made in triads: the best of three parallel cultures is used to establish a new triad, the two others constitute a yield.

Conical flasks (from 150 up to 1000 ml) are suitable but the author also succesfully used wide-mouth bottles having the mouth closed by opaque wrapping paper and sterilized in a dry sterilizer. Three sterile flasks filled with sterile medium up to 1/4 of their height are adjusted to 27 °C and inoculated simply by pouring one old culture into them Care must be taken to avoid the pouring of barley grains, slime coating of the surface, or any sediment from the old culture The cultures placed in 27 °C become turbid due to bacterial growth during 20—30 hours Then the turbidity gradually disappears as the number of protozoans increases After 3—4 days (Scotch grass medium) or sometimes later (Barley medium) the same density is achieved as it was in the previous culture and the medium has become transparent. Then the best culture, having the greatest density of protozoans, the most transparent medium, and the least amount of sediments is chosen for inoculation of a fresh medium as above The remainning two cultures are prefiltered through a 0 15 mm sieve into a beaker and left open, at room temperature, for a few hours, e g. overnight. Then the content of the beaker without a bottom sediment is poured into a large funnel with dense filter paper. When the protozoans are concentrated in the last 20—25 ml of medium, 250 ml of lake water (see above) is gradually added to replace the medium When concentrated again, the filter paper above the concentrated culture is washed by gentle water current and the protozoans in lake water are ready for use.

MAINTENANCE OF CYCLOPOID CULTURES

If no special temperature is required the cultures may be placed anywhere in the laboratory except in direct sun light. The containers may be either open or covered with wrapping paper. There are two quite different purposes of cultivation: either to keep the collected material and its descendants alive for a long time, usually at the same density and with less care, or to produce great number of specimens for experimental use at once. The latter culture needs some special care, so the former will be described first.

A. Simple culture to keep the live material

One half to one litre wide-mouth bottles are suitable. One to five females with egg sacs can be placed into one bottle three quarters filled with lake water. If it evaporates by more than one tenth, the loss is replaced by distilled water. Food is added twice a week in the form of a few drops of algal culture to give a very slight greenish tint, and a fair amount of Paramecium. No control of sufficient feeding is made other than visual checking that both protozoans and nauplii are still present prior to the next addition of food. If there is not the case, the amount of Paramecium should be increased. No other care is necessary. Provided numerous nauplii are present the adult specimens may be taken away for any purpose whenever they have appeared. The green algal sediment need not be removed from the bottom. On the contrary, it can serve as a complementary food especially in cultures of bottom-dwelling species.

B. Highly productive culture

The principle difficulty to be overcome in mass production of carnivorous cyclopoids is the cannibalistic feeding of adults and larger copepodits on the smaller, especially naupliar stages. To prevent cannibalism, two measures must be followed· the separation of the female from its offspring,

and the maintenance of the cohort in a narrow size range. The most effective way is as follows: 30—50 females are placed in one litre bottle and well fed. A large white dissection plate is used for quick separation of the egg-carrying females. Using a metal sieve of a convenient density, all the females are concentrated in a few ml of water which is poured onto the plate. If the water makes just a thin film the animals cannot move and the females with egg sacs may be picked up quickly. Each of them is transferred into one wide, 20 ml glass vial. The vials (20 to 25) are checked twice daily. All the vials containing nauplii born in one day are poured through a metal sieve into one common bottle. The females caught at the sieve are returned into the bottle with the other females where they are kept till they produce egg sacs again. One bottle containing the nauplii of the same age is obtained a day by the described procedure which needs but twenty minutes of time. Algal food is added to sustain the concentration of one million cells/ml. From the fourth or fifth day, Paramecium is also added in increasing doses which should reach as much as one million of protozoans per one litre cultivation bottle. Visual checking is advisable to ensure that abundant protozoans are still present even before the next addition of food. After the copepodid stage was achieved, the animals must be sorted according their size. Usually the animals hatched in the three days following may be mixed together. Then they are sorted using the set of sieves so that one cohort is formed from animals which passed through one sieve but did not pass through the next denser by 0.05 mm. The sorting of cultures reared at room temperature should be repeated twice weekly till the animals reach maturity. However, the concentration of protozoans must be visually checked every day and more food added whenever necessary.

Another less effective but also less time-consuming method is to place about 20—25 egg-carrying females and lake water into a small bottle the mouth of which is tightly covered with coarse bolting cloth. The bottle is fastened with the bottom up into a larger bottle containing also the lake water, so that the hatched nauplii can fall down through the cloth but the females are closed inside the smaller bottle.

C. Special cultures

The protozoan food can be used for any other kind of cyclopoid cultures including dense cultures in a small volume of water or cultures of individual specimens in volumes as small as 1 ml. Such cultures need an exchange of water: the smaller the container the shorter must be the intervals in which water is replaced, up to daily exchange. The only strict condition for small containers is that they must be well protected against dust.

DISCUSSION

A method of laboratory feeding of animals should be discussed from two points of view: the adequacy of food, and the simplicity of the procedure. However, the only criterion verifying the suitability of a method is its use in rearing a number of cultures for many generations.

The following species were examined all of them breeding well on the *Paramecium* diet: *Acanthocyclops vernalis* (Fischer), *A. americanus* (Marsh), *A. robustus* (Sars), *A. viridis* (Jurine), *Cyclops vicinus* Uljanin, *C. strenuus* Fischer, *C. tatricus* Kozminski, *Diacyclops bicuspidatus* (Claus), *Mesocyclops*

leuckarti (Claus), *Eucyclops serrulatus* (Fischer), *Macrocyclops albidus* (Jurine), *Paracyclops poppei* (Rehberg), *P. affinis* (Sars). At least ten of these species are supposed to be carnivorous. Fryer (1957) confirmed this way of feeding for five of them; the present author (unpublished data) for three others. The cultivation of the enumerated species included about seven hundred cultures of *Acanthocyclops* (*A. vernalis*, *A. robustus*, *A. americanus*), each cultivated usually for more than ten generations. Mass cultures of *Cyclops vicinus* Uljanin producing about a thousand adult specimen at once for experimental use were maintained following the described procedure.

Due to their absence in limnetic region, ciliate protozoans are unlikely to be a natural diet for at least the limnetic carnivorous cyclopoids. In nature, these species feed mostly on planktonic Crustacea including young stages of their own or related species, as was shown by Fryer (1957) for *Cyclops abyssorum* Sars, *C. strenuus* Fischer, and *Mesocyclops leuckarti* (Claus), McQueen (1969) for *Diacyclops bicuspidatus thomasi* (Forbes), Anderson (1970) for *Acanthocyclops vernalis* (Fischer) and *D. b. thomasi* (Forbes), and by the present author (unpublished data) for *C. vicinus* Uljanin. However, the breeding of laboratory cultures of cyclopoids on the crustacean diet brings many problems. If collected from a lake, such food may contain specimens of the cultivated cyclopoid species or, alternatively, the species preying upon the cultivated species. Moreover such food can hardly be separated from the cultivated animals simply using a difference in size.

As a result, the laboratory cultivation of food is inevitable if a definite and reproducible diet has to be used. Eight reports about the cultivation of cyclopoids were quoted above. Out of these reports, three authors used an indefinite protozoan mixture raised from manure (Coker, 1933; Ewers, 1936) or from the infusion of plant leaves (Lowndes, 1929). Both Coker (1933) and Lowndes (1929) mentioned that the diet is not fully adequate especially in respect to the number and fertility of reared adults. The former author improved this food by addition of finely chopped bits of filamentous algae. Two other authors used *Paramecium* for feeding of *Acanthocyclops*: Price (1958) fed his cultures of *Acanthocyclops* of the *vernalis*-group on *Paramecium* sp. (details not given) and Yeatman (1959) reared the closely related *A. carolinianus* (Yeatman) on a diet mixture of unicellular green algae and *Paramecium multimicronucleatum*. Parker (1960) cultivating *A. viridis* (Jurine) used only algal food, namely *Chlamydomonas moewusii*. The adult specimens in his experiments obviously preyed upon their own progeny or, in the case of experiments containing *Simocephalus*, also on young cladocerans. Lewis, Luff and Whitehouse (1971) achieved good results using an axenic culture of *Euglena gracilis* as food for carnivorous *Cyclops abyssorum* Sars. However, they added fresh nauplii of the brine-shrimp, *Artemia salina* (L.) as a complementary food. The same kind of animal food was used by Smyly (1970) who thoroughly compared various diets as regard to the development and fecundity of *Acanthocyclops viridis* (Jurine). His results are very instructive for evaluation of the suitability of the protozoan diet. He grew the copepodit stages on any of the following kinds of food or their mixture: algae, protozoans raised from infusion, small and large cladocerans, and nauplii of *Artemia*. The animals reared on *Artemia* nauplii first reached maturity but had also the shortest life-span.

Protozoan diet was the second as regard to the fast development of cyclopoids, being better than the diet consisting of cladocerans or algae. However, both the number of broods and the number of eggs per brood were much higher on Artemia nauplii diet or daphnid cladoceran diet than in animals fed on protozoans. It seems that a protozoan diet is well suitable for cyclopoids to reach maturity and to reproduce but they need some essential amount of crustacean food to produce high number of progeny. Smyly (l.c.) made his experiments on individual cultures of one specimen per one vial. It must be emphasized here that in collective cultures, the adult females can and certainly do feed on smaller stages including adult males. This habit may provide them with necessary amount of crustacean food. However, another hypothesis explaining such effect is also possible : the substance necessary for the succesful reproduction may be produced by bacteria or yeast cells growing on the clumps of algae. In the collective culture, cyclopoids can eat these clumps from the bottom algal sediment directly while, in the case of the individual cultures, they can obtain such substance only through the feeding on herbivorous crustaceans.

Predation on the many kinds of food available in nature can be experimentally proved when each kind of prey is offered to cyclopoids separately. Despite the wide range of possible food, carnivorous cyclopoids usually prefer a single component even if a mixture is suplied. McQueen (1969) studied the predatory feeding of *Diacyclops bicuspidatus thomasi* (Forbes) on the natural lake zooplankton. Both in a lake and under laboratory conditions, diaptomid and the predator's own nauplii were preyed much more than cladocerans. Protozoans also belong to the preferred kinds of food: the present author (unpublished data) found *Acanthocyclops vernalis* (Fischer) preferring *Paramecium* to young *Ceriodaphnia* when a mixed diet was supplied to the laboratory culture of this predator collected from the biotope where *Ceriodaphnia* predominated. Even when transferred to a pure cladoceran diet the animals fed previously on *Paramecium* ate less number of cladocerans than the animals reared always on the cladoceran diet. When only cladocerans are offerred the animals prefer young specimens to the large ones. Similarly Smyly (1970) states that the smaller specimens of *Simocephalus* are invariably eaten first, when the adult females of *Acanthocyclops viridis* (Jurine) have a choice of prey specimens differing in size. The mechanism of prey selection can shift the size and age composition of filtrators in mixed cultures to the prevalence of large specimens, which are more efficient in the consumption of algal food. Competition for algae between *Simocephalus* and nauplii of *Acanthocyclops viridis* (Jurine) very likely is responsible for lower number of *Acanthocyclops* in mixed cultures than in pure cultures as observed by Parker (1960) who supplied the algal food once a week. Smyly (1970) using a daily addition of algal food did not observe any negative effect of *Simocephalus*' presence on mortality or fertility of *Acanthocyclops viridis* (Jurine). Nevertheless it is better to remove all older uneaten specimens of prey if filtrators are used as a food. Lewis, Luff and Whitehouse (1971) did so with nauplii of *Artemia* every day. On the other hand, no undesirable change can happen to the surplus of *Paramecium* in cyclopoid culture.

Although the protozoan cultures need some care and their treatment may seem complicated to the reader, they are very simple in fact. It is advisable

to keep a few sterile cultures (type B) besides the current cultures (type C) but the contamination by an undesirable species of Protozoa was encountered only twice during six years of cultivation. The contamination was caused by small protozoans (*Tetrahymena* sp.) growing better than *Paramecium*. The small protozoans are also eaten by cyclopoids but they can pass through a filter paper. The great adventage of *Paramecium* is the possibility of concentration using a filter paper, with following replacement of the medium by lake water which diminishes the chance of bacterial growth in cyclopoid cultures. The density of concentrated culture can be counted and adjusted as desired. However, it must not be forgotten that the protozoans will divide in cyclopoid cultures, too.

SUMMARY

Both littoral and limnetic carnivorous cyclopoids were succesfully reared on mixed diet for several years. The diet consists of *Paramecium* and unicellular green algae (e.g. *Chlamydomonas*). *Paramecium* is grown in non-sterile cultures on either barley or "Scotch grass" medium. The cultivation of protozoans as well as the maintenance of cyclopoid cultures is described.

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ON THE SYSTEMATICS OF THE EUROPEAN PIKE-PERCH, STIZOSTEDION LUCIOPERCA (LINNAEUS, 1758)

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Received August 21, 1972

Abstract: The morphometric and meristic characters of the European pike-perch, *Stizostedion lucioperca* (Linnaeus, 1758) were studied using material chiefly from the river Labe drainage in Czechoslovakia, leading to a partial redescription. The morphometric and meristic characters are very stable, compared to the specimens from other localities within the area of distribution. There is a tendency for an increase in the number of gill rakers with the size of the specimens.

MATERIAL AND METHOD

Thirty-five specimens from the Slapy Valley Water Reservoir near the village Živohošť, 10 specimens from the ponds of Třeboň and Blatná pond area, 4 large specimens from the largest Bohemian pond, Rožmberk (about 500 ha of surface area) in southern Bohemia, 3 specimens from the Czechoslovak part of the river Danube in the southern Slovakia were used in the study of morphometric characters. All fish were collected during 1948—1958, deposited in the Laboratory of Ichthyology and partially used for the study of meristic characters by Oliva and Šafránek (1962). The data from the localites drainage of Labe, drainage of Danube and Bulgaria are cited according to Oliva and Šafránek (1962). The data from the localites drainage of Dniepr, Dniepr and western Dwina are from Žukov (1965).

The measurements were made by use of dividers with ± 0.5 mm accuracy and the proportions expressed as % of standard length, head length, length of caudal peduncle and V-A, to the first decimal place (table 1). The standard length was measured from the tip of snout (most prominent part of the lower jaw) to the end of body (urostyle length, insertion of caudal fin rays). The forked last ray in second dorsal and anal fin is counted as one ray.

RESULTS

The variability of different morphometric characters is evident from table 1. The larger specimens have larger preanal distance, longer dorsal fin base, lower depth of first dorsal and second dorsal, lower depth of anal fin, smaller preorbital distance, maxillary length, apparently smaller eye diameter, apparently larger postorbital distance, larger head depth, larger depth of caudal peduncle, smaller length of pectoral fin and apparently smaller length of ventral fin when expressed in V-A distance. Generally there is no apparent variability of morphometric characters even when the specimens of various sizes are taken into consideration. The number of gill rakers increases with the size of fish.

DISCUSSION

When we compare both morphometric and meristic characters of pike-perch (tables 2—6 and for further details see Oliva & Šafránek, 1962)

Table 1. Morphometric and meristic characters

Locality No. of specimens	Živohošť 35		Třeboňsko 10	
	Ranges	Ave.	Ranges	Ave.
Standard length in mm	52—285	119.4	79—126	99.8
As % of standard length:				
length of head	30—33	32.1	29—32	30.7
predorsal distance	33—36	34.8	33—35	33.9
preventral distance	33—36	34.7	33—36	34.3
preanal distance	60—69	64.9	61—66	63.8
body depth	16—22	19.2	16—20	18.0
length of caudal peduncle	23—27	24.6	23—25	24.5
length of D_1	19—27	22.8	20—25	22.3
length of D_2	19—26	23.8	22—26	24.2
length of A	10—13	12.1	11—14	12.5
length of C	19—25	22.3	22—25	23.7
length of P	14—18	16.4	17—19	18.2
length of V	16—19	17.2	18—21	19.3
depth of D_1	12—17	14.0	13—16	14.5
depth of D_2	12—17	14.9	14—17	15.3
depth of A	12—19	15.9	15—17	15.5
As % of head length:				
preorbital length	25—31	28.2	25—30	26.5
maxillary length	44—56	47.0	43—48	45.6
interocular distance	14—21	17.4	15—19	16.5
diameter of eye	16—24	20.4	23—26	24.0
postorbital distance	44—59	51.3	46—54	50.0
head depth	48—57	51.1	46—52	50.0
As % of caudal peduncle				
depth of caudal peduncle	40—57	47.1	40—52	43.7
minimum body depth	27—41	35.7	28—38	34.3
As % of V—A				
length of P	46—60	53.3	56—67	60.4
length of V	49—67	56.0	61—68	64.0
No. of gill rakers (first arch)	12—14	12.8	11—13	12.2

* Žukov (1965), ** Vladykov (1931), *** Banarescu (1964)

there are no apparent differences between the specimens from the territory bordered in west by the river Labe and on the east by the river Dniepr and the river Western Dwina. Comparing the meristic data with those published by Berg (1949) who has given the ranges of spines in the first dorsal as XIII—XVII, we can see in Bohemian specimens from the river Elbe the tendency to reduce the number of spines. The highest number of dorsal spines can be seen in specimens from Western Dwina, which is geographically about 6° shifted to the north than the locality drainage of Labe in Czechoslovakia. We can observe the same but less evident situation in the table 3, where the number of soft 2nd dorsal fin rays is highest in specimens from the river Western Dwina in White Russian Soviet Republic. The highest number of anal soft rays in specimens from Dniepr could possibly be due to

of *Stizostedion lucioperca* (Linnaeus, 1758)

Danube 3		Rožmberk 4		Dniepr drainage* L8		Tisza** 3	Rumania***
Ranges	Ave.	Ranges	Ave.	Ranges	Ave.	Ranges	Ranges
247—339	300.3	379—500	436.7	125—435	226.0	255—390	
30—34	31.3	29—30	29.5	28—31	29.4	28—30	27—35
33—35	34.0	31—34	32.5	31—34	33.0	—	30—35
32—34	33.3	31—34	32.5	30—35	32.8	—	—
64—66	65.0	65—69	67.2	60—67	63.6	—	—
19—21	20.0	19—21	20.2	18—23	20.3	19—21	17—24
24—25	24.7	23—25	23.7	22—27	24.1	23—25	22—27
23—28	26.0	24—27	25.7	21—28	23.7	—	—
22—24	23.3	24	24.0	21—27	24.0	—	—
11—12	11.3	12—13	12.5	10—14	12.8	—	—
19—20	19.5	18	18.0	15—22	18.8	—	—
15—17	16.0	15—17	16.0	15—18	16.3	—	14.5—18.5
16—17	16.3	15—17	15.5	16—19	17.1	—	16—19
10—12	11.0	10—11	10.7	10—15	12.6	—	—
12—13	12.7	11—12	11.2	11—16	13.9	—	—
13	13.0	11—14	12.2	12—17	14.0	—	—
24—26	25.0	24—25	24.5	25—29	26.3	26—28	23—28
41—45	43.3	43—46	44.5	—	—	—	—
15—16	15.7	15	15.0	14—21	16.9	—	—
16—17	16.3	12—15	13.5	14—21	17.7	16—22	11—18
59—60	59.7	59—64	62.0	51—63	56.0	—	—
49—52	51.0	53—54	53.5	43—57	50.6	—	—
48—52	49.7	50—55	52.2	—	—	—	—
34—35	34.7	31—36	34.2	—	—	31—38	—
45—50	47.7	41—51	47.0	—	—	—	—
46—49	47.7	39—52	46.5	—	—	—	—
13—15	14.0	13—16	15.0	—	—	—	—

the fact that the material is from White Russian part of the river Dniepr, which is more northern than the localities in Czechoslovakia (river Labe drainage). This could be accepted if we admit the common theory concerning the diminishing of the number of rays and lateral line scales in more southern subspecies of the species under consideration (table 5). From five known species of the genus *Stizostedion*, *S. lucioperca* has the largest number of lateral line scales (see Svetovidov and Dorofejeva, 1963).

The number of gill rakers depends also on the size of the specimens; the largest specimens from the pond Rožmberk have the larger number of gill rakers also in comparison with the smaller specimens from the same territory within the river Labe drainage. Therefore when we do not compare the fish

Table 2. Rays of first dorsal

Locality	No. of specimens	XII	XIII	XIV	XV	Average
Drainage of Labe*	117	1	40	65	11	13.73
Drainage of Danube*	5	—	1	3	1	14.00
Bulgaria*	4	—	2	2	—	13.50
Drainage of Dniepr**	18		(XII) XIII upto XIV			13.28
Dniepr**	40		XIII upto XV			13.25
Western Dwina**	36		(XII) (XIII) XIV upto XV (XVI)			14.25

* Oliva & Šafránek (1962), ** Žukov (1965)

Table 3. Rays of second dorsal

Locality	No. of specimens	I	II	III	Ave.	19	20	21	22	23	Ave.
Drainage of Labe*	117	23	88	6	2.2	8	45	46	14	2	20.28
Drainage of Danube*	4	2	2	—	1.5	1	—	2	—	1	21.00
Bulgaria*	4	2	2	—	1.5	—	2	1	1	—	20.75
Drainage of Dniepr**	18	—	—	—	—	(18—19)	20 upto 23 (24)				21.50
Dniepr**	40	—	—	—	—	(19)	20 upto 23 (24)				21.65
Western Dwina**	43	—	—	—	—	(19)	20 upto 22 (23)				20.68

* Oliva & Šafránek (1962), ** Žukov (1965)

Table 4. Anal fin rays

Locality	No. of specimens	I	II	III	Ave.	9	10	LL	12	Ave.
Drainage of Labe*	114	1	112	1	2.0	1	19	68	26	11.04
Drainage of Danube*	5	—	5	—	2.0	—	—	3	2	11.40
Bulgaria*	4	—	4	—	2.0	—	1	1	2	11.25
Drainage of Dniepr**	17	—	—	—	—	from 10 to 12				11.33
Dniepr**	40	—	—	—	—	from 10 to 13				11.92
W. Dwina**	42	—	—	—	—	from 10 to 13				10.86

* Oliva & Šafránek (1962), ** Žukov (1965)

of the same or similar size this phenomenon is not of significant taxonomic value.

Banarescu (1964) pointed out that in the smaller specimens from 150 to 300 mm of body length the depth of body represents 17—22% of the length; in larger ones, 300—450 mm, the body depth is higher — 24%. Banarescu (l.c.) has found in the first dorsal exceptionally XVII rays, in the second dorsal exceptionally 24 rays and in the anal rarely 10 rays but 9 not at all. In the anal of our material 10 rays occur in 17% (table 4); 13 and 14 do not

Table 5. Number of lateral line scales

Locality	No. of specimens	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	Ave.
Drainage of Labe*	118	4	1	7	7	8	10	15	7	4	7	11	11	8	5	8	3	1	1	87.97
Drainage of Danube*	5	—	—	—	—	—	—	1	1	—	1	1	1	—	—	—	1	—	—	90.60
Bulgaria*	5	—	—	—	—	—	—	—	1	1	1	2	—	—	—	—	1	—	—	90.80
Dniepr**	36								from 89	to 96										92.62
W. Dwina**	40								from 86	to 96 (100)										91.81

* Oliva & Šafránek (1962), ** Žukov (1965)

occur — a deviation from the data of Banarescu (1964). Similarly, 80 and 81 scales of lateral line do not occur in our material. In the material of Banarescu (l.c.) there are no specimens with number of scales higher than 95 wheras in 10% of the specimens investigated by us the number of lateral line scales is higher than 95. The ranges of the number of gill rakers 10—16 in the material of Banarescu (1964) is also broader than in our material.

SUMMARY

The morphometric characters of 52 pike-/perch ranging from 52 to 500 mm standard (body) length were studied and the data on the meristic characters were obtained from 117 specimens from the drainage of the river Labe, 5 specimens from the Danube, and 4 specimens from Bulgaria. The averages and ranges in values of morphometric and meristic characters are summerised. While the morphometric and meristic characters are generally stable, a tendency for an increase in the number of gill rakers with the size of the specimens has become apparent.

Table 6. Number of gill rakers

Locality	No. of specimens	ranges	average
Živohošť*	35	12—14	12.8
Třeboňsko*	10	11—13	12.2
Rožmberk*	4	13—16	15.0
Danube*	3	13—15	14.0
Drainage of Dniepr**	8	13	13.0
Dniepr**	40	13—15	13.9
W. Dwina**	8	13—14	13.5

* Authors, ** Žukov (1965)

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DIAPAUSE OF CHRYSOPA CARNEA (CHRYSOPIDAE: NEUROPTERA) FEMALES IN THE FIELD

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Abstract: Diapausing *Chrysopa carnea* females can be activated at any time by transfer from the field to long day (L 18, D 6) and constant temperature of 25—27 °C. An exposure to low temperatures is not a prerequisite for the resumption of reproduction. The duration of the pre-oviposition period after the transfer increases in late summer, is maintained on its highest level in autumn, and begins to decrease in December.

It is discussed why the duration of the pre-oviposition period alone cannot be a safe criterion of the intensity of diapause, although it may serve as a good preliminary indication of relative changes.

It is usually stated for the insects of the mild zone, hibernating as adults, that the essential part of inhibition of reproductive processes dissapears already in the first half of hibernation, i.e. in northern latitudes as early as at the end of year or in January. This process has not been studied in *Chrysopa carnea* yet.

Several laboratory studies on diapause in *C. carnea* have been undertaken recently (Tauber and Tauber, 1969, 1970a, b, 1972, Tauber et al., 1970a, b). As for termination, these authors have studied only the termination of artificial diapause, induced in the laboratory by different photoperiods at a constant temperature. In Massachusetts, U.S.A., MacLeod (1967) transferred lace-wings from the field to the laboratory, but on only one date (late October). He attained reproductive activity by the transfer of adults to 25°C and long-day conditions (L 16, D 8). He failed, however, to obtain reproduction under 25°C and short day (L 10, D 14) or after an exposure to 3°C for 55 days and a subsequent 5 days rearing under 25°C.

The aim of this paper has been to study in detail the development of diapause in *C. carnea* in the open. An analogous study has been carried out on *Pyrrhocoris apterus* (Pyrrhocoridae, Heteroptera) (Hodek, 1971). It is advantageous to compare these two species which appear to have a similar type of diapause.

MATERIALS AND METHODS

The insect studied were sampled in part in central Bohemia (Praha — July to October 1970, August to November 1971), partly in eastern and northern Moravia (surroundings of Vsetín and Ostrava: November 1970 to April 1971, December 1971 to February 1972). The Prague specimens were swept from vegetation, the Moravian ones were collected at hibernation sites. After they had been collected, the specimens were kept in field isolators until the beginning of experiment. The

activation proceeded under constant temperatures of 25 ± 1 °C (1970—1971) and 27 ± 1 °C (1971—1972) and at a photoperiod with 18 hr photophase and 6 hr scotophase (long day). The adults were held in pairs in transparent plastic boxes (cont. 80 ccm) covered with nylon nets. Water was supplied by a moist wick pulled through a hole in the bottom of each box and reaching into a container with water. Artificial food (a mixture of 30 % dried yeast autolysate, 30 % glucose or fructose, and 40% of water) was provided in drops on slips of wax paper. The pollen of *Corylus avellana* was supplied in addition. Food was exchanged every 2—4 days (1970—1971) or after 3—7 days (1971—1972).

The intensity of diapause was estimated according to the interval between the transfer to the activating conditions and the onset of egg laying. The length of this „pre-oviposition" period varies considerably. It was necessary to find an indicator of the mean intensity of diapause within the population. The distribution of data for the duration of the pre-oviposition period within the sample is of such a type that the average and standard deviation does not provide a proper information about the population. A large proportion of females begin to oviposit within 7—12 days after the egg laying of the first female, in 3—10% of females (mainly in autumn samples) the pre-oviposition period is substantially longer, and this fact shifts the average value. With the size of our samples, a median (i.e. the time after which 50% of females begin to lay eggs) serves as a better indicator. Also the minimum and maximum values of the pre-oviposition period, and the time after which 25% and 75% of females began to oviposit, are given.

RESULTS

The reactivation during hibernation 1970—1971 and 1971—1972 (Fig. 1) have the same trend in both seasons. A somewhat faster activation of the samples of September—November 1971 was obtained apparently due to activation temperatur being 2° higher.

The samples of late July and early August had the pre-oviposition period shorter than the samples of the late summer. Judging by the length of the pre-oviposition period, diapause (although of low intensity so far) started in about 50% of females in late July and in 75% in early August; the remaining females oviposited so early after the transfer that they cannot be considered as diapausing. Moreover, the proportion of nondiapausing females, ascertained in this way, conforms roughly to the percentage of females sampled in the open at that time of year, which were found by dissection to have mature or intermediate ovarioles (Honěk, unpubl.).

In both seasons the longest pre-oviposition period was found in the specimens transferred to the laboratory in autumn (September-November). In the samples of late December — late February the pre-oviposition period was shorter in both seasons. These differences appeared in medians which fluctuated between 17—22 days and 17—19 days respectively from September to November, whereas in January and February they were only 10—11 and 10—13 days resp. A similar difference appeared also in the minimum values of the pre-oviposition period: 9—15 and 11—13 days resp. in the autumn, 6—8 and 8—10 days resp. in January and February, and it was still more striking in the maximum values (26—56 and 32—44 days resp.) in the autumn, and 13—15 and 13—25 days resp. in the winter.

The results of early spring (late March or April) differ little from the data of February. Not before May did all the females of the sample oviposit within a week after transfer, and the majority of them began to lay eggs virtually immediately after transfer.

In general, the onset of diapause in the populations of *C. carnea* in central Bohemia can be estimated quite well from the changes in the length of the pre-oviposition period; it is much worse, however, with its termination. Diapause is induced within the period of late July and the first half of August. The whole population entered diapause apparently as late as in September.

During December the inhibition of diapause greatly diminishes but it does not disappear completely before spring.

In contrast, under short day (L 12, D 12) and 27°C, oviposition in females sampled in late summer (24 Aug., 14 Sept. 1972) was not achieved even after 40 days' exposure. Also in earlier (1968) preliminary experiments it

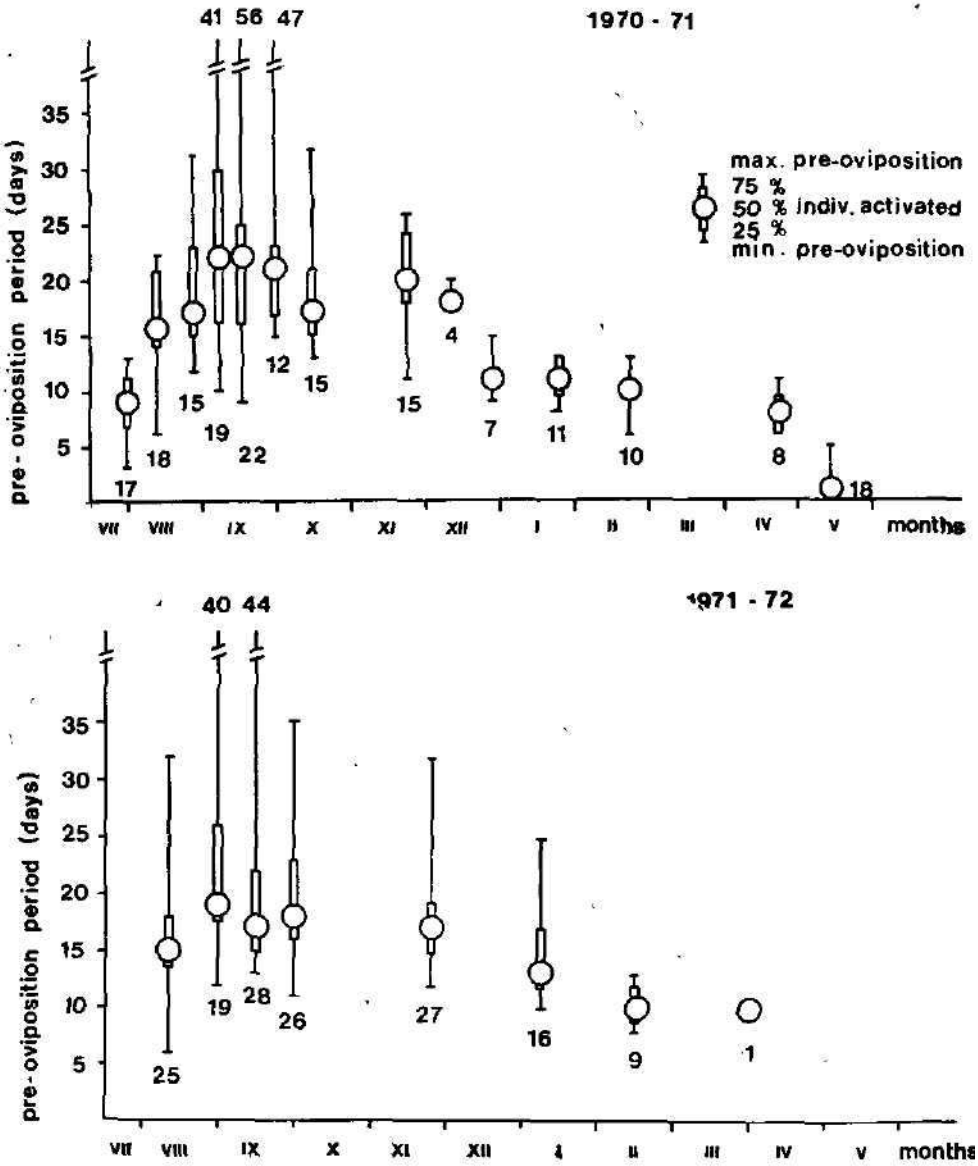

Fig. 1. Duration of the pre-oviposition period (the time from the transfer to the laboratory to the first oviposition) in *Chrysopa carnea* females when activated under long day (L 18, D 6) and 25°C (1970—71) or 27°C (1971—72). The circles denote medians, the numbers below indicate the number of females the in sample.

was revealed by dissection that all females, collected in late September or late October, remained with unripe ovaries (the vast majority had mere germaria and 10—15% had 1 oocyte) after having been reared for two months under short day (L 12, D 12) and 25°C.

DISCUSSION

The length of the pre-oviposition period in diapause eliminating conditions is sometimes used as the methodically easiest criterion for determining the level of the reproductive inhibition. It has been adopted as a measure of diapause intensity e.g. by Tauber et al. (1970). This criterion is suitable only for comparing the relative changes within a population (as it has proved also in the present experiment). A more accurate idea of the changes of the physiological condition of dormant insects can be provided by taking also other characteristics into consideration, as the percentage of females ovipositing even under diapause inducing conditions, fecundity, duration of the post-oviposition period, etc. (Hodek, in prep). The level of inhibition which underlies the diapause (or the degree at which this inhibition has already been overcome) cannot adequately be evaluated from the pre-oviposition period alone, as the duration of this period is a result of several processes of different character and exigencies. Moreover the processes may overlap to a varying degree: 1) continuation of the processes of the Andrewartha's "diapause development" leading to the elimination of the inhibition apparently at the level of "memory" in the brain; they started in the pre-treatment period in the open before the transfer to laboratory and need both elapsing of a certain period of time and, in some species, specific environmental conditions (e.g. low temperature); 2) a stimulation by signals acting against diapause (photoperiod, temperature, humidity, food); 3) post-diapause processes in the neuroendocrine system which govern 4) the maturation of ovaries. The same length of the pre-oviposition period need not be a sign of the same level of the inhibition in diapausing insects (Hodek, in prep).

In *C. carnea*, the average values of the length of the pre-oviposition period are a rather reliable criterion for determining the rate of inhibition in the middle period of hibernation (from late September to early March). By contrast, by the end of hibernation the processes (1) have been terminated in a great part of individuals, and after a short stimulation by favourable conditions (2), processes (3) and (4) may start. From later spring on, not only the processes (2), but partly even the processes (3) and (4) proceed in the field during warmer periods so that the pre-oviposition period in the laboratory is then very short. The opposite situation holds at the start of hibernation when the samples contain besides diapausing individuals also immature but non-diapausing adults and adults in which "secondary" diapause is induced (after a period of maturation of ovaries or even after egg laying) and the resorption of ovaries is advanced to a different degree. The average values are then calculated from the values for diapausing, non-diapausing and intermediate adults.

The activation of *C. carnea* females in both seasons resembles the results in *Pyrrhocoris apterus* (Hodek, 1971). The analogy is especially close in the first season (1966—67) when a shorter pre-oviposition period was recorded in 3 samples of *P. apterus* in late August and early September than later in

autumn; also its shortening in January was similar. In 1967—68 season the results in *P. apterus* were somewhat different. It can be explained by the dependence of the incidence of diapause in the population and its intensity on the developmental stage at which the insects experience the change from non-diapause to diapause conditions, both in *C. carnea* (Tauber and Tauber, 1970) and *P. apterus* (Hodek, 1971). And thus an acceleration or retardation of the life-cycle of a certain population, caused by weather, obviously changes the intensity of the inhibition of reproduction in its individuals. The life-cycle in *P. apterus* is delayed much longer to autumn (larvae completing their development during each suitable increase of temperature can be found as long as January), whereas in *C. carnea* it is finished as early as in September (Zelený, 1965). Therefore, the weather differences of individual years apparently change the variability of the inhibition of reproduction far more in P. apterus, which has in autumn a more varied age structure in the samples, than *C. carnea*.

CONCLUSION

1. Reproduction can be achieved in practically all adults at any period of hibernation by transferring them from the open to diapause eliminating conditions (long day L 18, D 6, 25—27°C). In contrast, the transfer to short day (L 12, D 12) does not enable reproduction in autumn.
2. Intensity of diapause was evaluated by the length of the preoviposition period after the transfer to the laboratory. On the average, the intensity of diapause increases in the population from late July to mid-August, in autumn it is then maintained at a constant level till late November (median 17 to 22 days), during December it decreases substantially and later on it keeps at a steady level again (median 10 to 13 days) or slightly decreases. Inside individual samples there is a great variability — particularly in late summer and in autumn.
3. Similarly to *P. apterus*, diapause in *C. carnea* can be relatively quickly terminated by the change of photoperiod. The exposure to low temperatures is not a prerequisite for further development.
4. Reasons are stated why the length of the pre-oviposition period cannot be a safe criterion of the degree of the inhibition of reproduction, i.e. the intensity of diapause.

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ERSTER FUND EINES CUPEDIDEN IM NEOGEN EUROPAS (COLEOPTERA: CUPEDIDAE)

A. G. PONOMARENKO

Eingegangen am 28. Juli 1972

Abstrakt. Es wird eine neue Gattung und Art *Miocupes* gen. n. *rihai* sp. n. aus den miozänen Cyprisschiefern des Egerer Tertiärbeckens in Böhmen beschrieben. Das Fossil ist besonders dadurch bemerkenswert, dass es den ersten Fund eines Cupediden im Neogen Europas darstellt.

Die Familie Cupedidae ist die ursprünglichste aller in der Jetztzeit lebenden Käferfamilien. Die Cupediden waren im Mesozoikum aller Kontinente weitverbreitet und in der Trias sowie im Jura durch zahlreiche und mannigfaltige Gattungen und Arten vertreten (Ponomarenko, 1969). Am Ende des Mesozoikums ist ihre Anzahl wesentlich gesunken, so dass sie im Känozoikum nur sehr selten vorkommen. Heutzutage gehören dieser Familie nur 6 Gattungen mit 26 Arten an.

In Europa waren die Cupediden im Jura häufig, aus dem Paläogen sind jedoch nur zwei Arten bekannt. In dem Oligozän der Insel Wight wurde ein als *Tetraphalerites oligocenicus* Crowson, 1962 beschriebener Käferrest gefunden, welcher der heute in Südamerika lebenden und im Mesozoikum Eurasiens weitverbreiteten Gattung *Tetraphalerus* nahe steht. Höchstwahrscheinlich handelt es sich um einen Vertreter der genannten Gattung, was man jedoch wegen Unvollständigkeit des Käferrestes nicht eindeutig beweisen kann. Im baltischen Bernstein wurde mindestens zweimal *Cupes tesselatus* Motschulsky, 1856 gefunden, der mit dem rezenten nordamerikanischen *Cupes capitatus* F. am nächsten verwandt ist. Aus dem Neogen sind bisher überhaupt keine Cupediden bekannt. Umso mehr interessant ist der Fund eines aus dieser geologischen Periode stammenden Käferrestes, der zweifelsohne der Familie Cupedidae angehört.

Den in deiser Arbeit beschriebenen Kafer habe ich von Herrn Dr. P. Říha, der schon fruher diesen fossilen Käferrest als einen Vertreter der Familie Cupedidae identifizierte, zur Untersuchung erhalten. Das Exemplar stammt aus den miozanen Ablagerungen von Pochlovice in Westböhmen, aus denen Říha (1961) einen Schwimmkäfer der Gattung *Agabus* beschrieben hat. An dieser Stelle mochte ich Herrn Dr. P. Říha fur die Ermoglichung der Untersuchung des interessanten Fossils meinen aufrichtigsten Dank aussprechen; zugleich halte ich es fur meine angenehme Pflicht ihm zu Ehren die neue Art zu benennen.

Eine nähere Untersuchung des fossilen Käfers ergab, dass es sich um eine neue Gattung der Unterfamilie Cupedinae handelt. Die Zugehörigkeit zu dieser Unterfamilie beweisen die durch den Prosternalfortsatz getrennten

Vorderhüften. Leider ist der Käferrest nicht so vollständig erhalten, um eindeutig entscheiden zu können, welcher der drei Tribus dieser Unterfamilie er angehört. In die ausgestorbene mesozoische Tribus Mesocupedini kann man ihn wegen der Gestaltung der Abdominalsterna keinesfalls eingliedern, es kommen also nur die Tribus Cupedini und Priacmini in Betracht. Für die Unterscheidung dieser beiden Tribus sind besonders die folgenden drei Merkmale wichtig: die Stelle der Fühlereinlenkung, die Skulptur der Oberseite des Kopfes und die Form des Prosternalfortsatzes. Die erwähnten Merkmale sind aber auf dem Fossil leider nicht eindeutig zu erkennen. Die Spitze des Prosternalfortsatzes fehlt, zwischen den Vorderhüften ist der Prosternalfortsatz jedoch nicht verschmälert, so dass man voraussetzen kann, dass er länger war als die Vorderhüften. Aus diesem sowie auch aus weiteren indirekten Merkmalen (der kurze und breite, hinten stark halsförmig verengte Kopf, die Form des Halsschildes sowie die kurze Hinterbrust) lässt sich höchstwahrscheinlich auf die Zugehörigkeit zu der Tribus Cupedini schliessen.

Miocupes gen. n.

Kopf mit langen Schläfen, die bedeutend länger sind als die Augen, und kurzen Wangen. Vorderhüften durch den Prosternalfortsatz getrennt. Flügeldecken mit vier Hauptadern, wobei *R* vereinigt sich mit *M* und *Cu* noch vor der Vereinigung mit A_1.

Typus der Gattung: *Miocupes rihai* sp. n.

Miocupes rihai sp. n.

Holotypus: Sammlungen der Lehrstuhl für Paläontologie, Naturwissenschaftliche Fakultät der Karls-Universität in Prag.

Typische Schicht: Cyprisschiefer des Egerer Tertiärbeckens, Mittleres Miozän.

Typischer Fundort: der verlassene Abraum „Boží požehnání" unweit von Pochlovice bei Kynšperk n. O., Westböhmen.

Beschreibung: Kopf kaum kürzer als breit, nach vorn schwach verengt. Die Wangen sind kürzer als die Länge der Augen, die Schläfen eineinhalbmal so lang wie die Augen. Hinten ist der Kopf sehr deutlich halsförmig verengt, wobei die Breite dieser Verengung die halbe Kopfbreite nicht überschreitet. Die Skulptur der Oberseite ist unbekannt, das Relief war jedoch höchstwahrscheinlich schwach entwickelt, denn auf dem Abdruck ist es nicht wahrnehmbar.

Der Halsschild ist wesentlich kürzer als der Kopf, er ist zweimal breiter als lang, mit einem sanft bogenförmig nach vorn gezogenen Vorderrand. Seine Vorderecken sind vorn seicht ausgebuchtet, ohne einen zahnförmigen Vorsprung. Die Oberseite des Halsschildes zeigt einen medianen Längseindruck und beiderseits dieses Eindrucks eine erhabene Längswulst. Der Prosternalfortsatz ist zwischen den Vorderhüften nicht nach hinten verengt. Die zur Aufnahme der Vorderbeine dienende Furchen der Vorderbrust sind schwach ausgeprägt, sie reichen nur bis zu den Pleuren und konvergieren nach vorn kaum.

Die Mittelhüften sind länglich und berühren sich untereinander. Die Hinterbrust ist quer, nach vorn bogenförmig verengt, am Hinterrand mehr als doppelt so breit wie vorn. Die Entfernung zwischen den Mittel- und Hinter-

hüften ist nur halb so gross wie die grösste Breite der Hinterbrust. Das letzte Abdominalsternum fast zweimal länger als das vorhergehende.

Die Vorderschenkel sind auffalend verdickt, etwa dreimal länger als breit. Die Flügeldecken hatten wahrscheinlich vier unverkürzte Hauptadern und alle zehn Längsreihen von Grübchen. Zwei Reihen längs der Epipleure sind nicht erhalten, aber die darauffolgende Ader (*R*) unterscheidet sich keineswegs von den übrigen Hauptadern. Die zweite (*M*) und dritte (*Cu*) Hauptader mündet in die erste, die sich mit der letzten (A_1) vor der Flügeldeckenspitze vereinigt.

Abmessungen: Länge des Käfers — 12,5 mm, Breite — 4,5 mm; Länge der Flügeldecke — 8,5 mm.

Beziehungen: Die neubeschriebene Gattung unterscheidet sich von allen Gattungen der Tribus Cupedini und Priacmini besonders durch die langen Schläfen, die bedeutend länger sind als die Augen. Von den Gattungen *Priacma* und *Prolixocupes*, bei denen die Schläfen gleich lang sind wie die Augen, unterscheidet sich die neue Gattung durch kurze Wangen und durch die stark quere Vorderbrust. Von allen Gattungen unterscheidet sie sich auch durch die Nervatur der Flügeldecken, u. zw. durch das Vorhandensein von *R* als einer Hauptader und durch ihre Vereinigung mit *M* und *Cu* noch vor der Vereinigung mit A_1. *R* ist auf den Flügeldecken von *Priacma* und *Paracupes* zwar auch vorhanden, aber bei diesen Gattungen verenigt sich *Cu* mit A_1 noch vor der Vereinigung mit den übrigen Adern. Durch die Gestaltung der Vorderbrust steht die neue Gattung den ursprünglichen Cupedini (*Paracupes* und *Prolixocupes*) nahe, bei denen die zur Aufnahme der Beine dienenden Furchen schwach ausgeprägt und nach vorn nicht konvergierend sind.

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Die Tafel ist am Ende des Heftes zu finden.

Anschrift des Verfassers: Dr. A. G. Ponomarenko, Paläontologisches Institut, Akademie der Wissenschaften der UdSSR, Leninski Prospekt 33, Moskva V-71.

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CONTRIBUTION TO THE GROWTH OF THE BREAM, ABRAMIS BRAMA (LINNAEUS, 1758) (OSTEICHTHYES, CYPRINIDAE) IN THE SLAPY WATER RESERVOIR, BETWEEN 1957 AND 1965

JAROSLAV POUPĚ

Received March 15, 1972

Abstract: The author evaluates the growth of the Bream, *Abramis brama* (Linnaeus, 1758) in the Slapy valley water reservoir in Bohemia, south of Prague. The growth was evaluated according to there samples collected in the years *1957—1958 and 1963—1965*. A total of 707 specimens were examined. Those factors which could influence the growth not only in the years 1957—1965, but up to the year 1970, are taken into account in the report. In the course of the period under review the growth has been retarding.

INTRODUCTION

In the Slapy valley water reservoir the growth of certain species of fish was followed up from the date of filling up of the reservoir to the year 1965 when the Nižbor State Fishery stopped the industrial fishing.

The growth of the Bream was studied by the following authors: Čihař and Oliva (1960), Oliva and Frank (1959 a), Oliva and Frank (1959 b) and Poupě (1971).

From the point of view of fishing the reservoir of Slapy appeared to be a *highly profitable one, with large biomass of plankton and benthos present* over the whole area (Hruška, 1966).

In 1971 the author obtained for investigation a sample of the Bream caught in the Slapy reservoir in the 1965 year. The growth of this sample is compared by the author with the growth of fish caught in 1957—1958 and 1963.

For valuable assistance and co-operation the author is indebted to RNDr V. Hruška CSc from the Hydrobiological laboratory of the Czechoslovak Academy of Sciences, to RNDr O. Oliva CSc and to the staff of the Laboratory of Ichthyology Natural Science Faculty, Charles University, Prague.

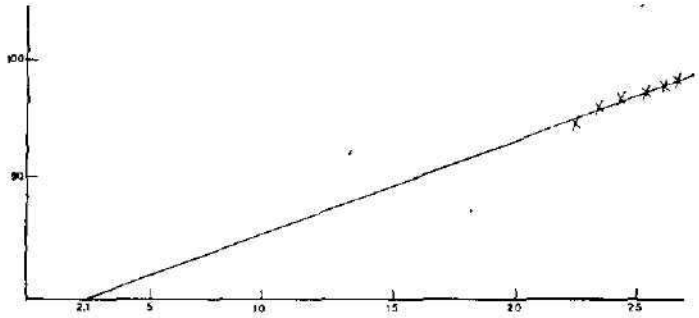
MATERIAL AND METHODS

The sample was caught by fishermen of the Nižbor State Fishery for the Hydrobiological Laboratory of the Czechoslovak Academy of Sciences, preserved in ethanol and kept *till 1971* in the laboratory. The material contained a total of 51 specimens caught on July 13th and 14th 1965 in the reservoir off the Živohošť hotel (19 specimens; 37%) and on July 8th, 1965 in the vicinity of Cholín at shore km 116—117 (32 specimens; 63%). The material was measured, weighed and the growth evaluated by the conventional metod. (Poupě, 1971). After the investigation, *all the materials were handed over to the Zoological Institute of the Natural Sciene* Faculty, Charles University, Prague. The sample was lacking in specimens of the oldest age groups.

Table 1. The growth of the Bream in Slapy reservoir 1965

Age group	Annual group	Number of specimens	Weight at the time of capture		Body lenght at the time of capture		Average back calculated standard lengths in mm, with ranges indicated below								
			average	ranges	average	ranges	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9
III	1962	2	177	84—270	188	150—227	85 78—92	146 123—170	184 148—220						
IV	1961	4	267	196—332	222	208—245	84 77—91	128 120—134	165 141—182	208 180—235					
V	1960	11	386	328—440	251	235—263	78 72—86	124 116—141	161 147—185	201 178—209	238 223—251				
VI	1959	13	387	340—480	257	248—270	73 49—90	112 86—133	152 133—173	186 165—203	218 206—226	248 236—263			
VII	1958	12	414	378—468	265	256—280	80 71—91	123 108—137	158 147—174	193 178—207	216 208—230	237 227—247	261 252—276		
VIII	1957	5	415	376—446	268	257—271	80 71—87	117 102—130	140 131—149	168 154—181	196 179—213	224 210—240	246 233—260	260 253—271	
IX	1956	4	433	358—398	285	280—295	77 70—90	120 115—122	147 132—155	172 167—174	199 196—206	215 206—221	232 230—236	252 247—256	276 272—282
Total		51	383	196—498	257	150—295	78 49—92	121 86—170	156 131—220	190 154—235	218 179—251	236 206—263	252 230—276	257 247—271	276 272—282

In addition to an evaluation of growth, the values of growth increments for the different age categories and the growth increment values for the different calender years vere calculated. The body length at the time of scale development and of the "Banks' start" were determined from the graphs. The coefficient of condition was calculated by are of the Fultons' formula.



Graph No. 1: Relation between the standart length and the radius of scale according the data from sample caught in 1965.
Axis y = scale radius in milimeter divisions. Observed under 17.5 × magnification. Axis x = = length of body in cm.

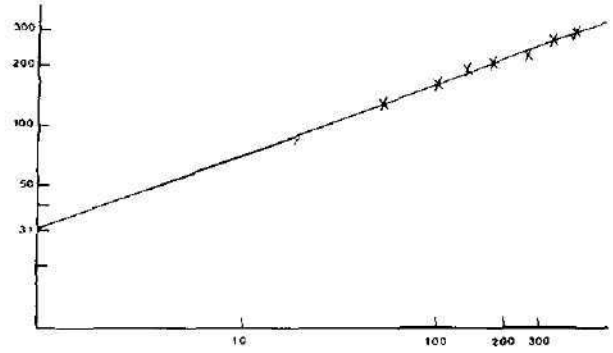
BREAM GROWTH

The body lenghth at the time of scale development was established at 21 mm, the coefficient of condition was found to be 2.29, and the Banks' start was 31 mm. The back calculated growth tempo follows from the Table 1.

DISCUSSION

A comparison of the growth of the Bream according to the sample caught in the years of 1957—1958 (No. 1, Čihař and Oliva, 1960), 1963 (No. 2, Poupě, 1971), and 1965 (No. 3) is shown in the following table:

Sample No.	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	l_{10}	l_{11}
1	81	126	165	196	216	242	303	340	383	412	
2	85	135	179	219	249	289	320	370	404	425	445
3	78	121	156	190	218	236	252	257	276		



Graph No. 2: The relationship between the standart length and body of samples caught in 1965.
Axis y=body length in mm. Axis x = weight in grams.

The growth of the Bream in Slapy reservoir at the time of investigation between 1957 and 1965 was influenced by the following factors: a) Commercial Fishing by the State Fishery, b) decrease of the benthic biomass as a result of cold water inflow from the Orlík valley water reservoir and of water level fluctuation, c) winter killing (suffocation of a large number of fish under ice) during the 1962—1963 winter season (see Brátka, Řeháčková, 1964), d) angling.

Table 2. The absolute increments of standart lengths in the different age categories

Age group	Number of specimens	1956	1957	1958	1959	1960	1961	1962	1963	1964
III	2							85	61	38
IV	4						84	44	37	43
V	11					78	46	37	40	37
VI	13				73	39	40	34	32	30
VII	12			80	43	35	35	23	21	24
VIII	5		80	37	23	28	28	28	22	14
IX	4	77	43	27	25	27	16	17	20	24
Total	51	77	63	59	49	45	41	33	31	29

Factor a) caused a more rapid removal of the most rapidly growing fish of all age groups and should cause a relative speeding up of the growth. On the other hand, fishing may prevent the overpopulation and this aspects is the predominating one. Factor b), i.e. cold water flowing in from the Orlík reservoir, manifested itself most markedly in the upper section of the reservoir, less in the midway section, while in the lowermost section the hydrobiological conditions remained practically unchanged. (Hrušká, 1966). Factor c) caused considerable loss particularly as regards the cyprinid fish and it should manifest itself in the growth particularly in the years 1963 and 1964. Factor d), the removal of fish by angling, should be divided into two periods. The first one up to 1965, with this year included and the second one from 1966 to 1970. The average catch of all species of fish (by fishermen using both nets and angling rods) amounted in total to 449 tons or 33.8 kg/ha, a year in the period between 1960—1965. Maximum yield corresponds to the 1962 year; it amounted in total to 69.5 tons or 52.3 kg/ha of fish, prior to a subsequent suffocation of a large quantity of fish. The minimum yield was recorded in 1965, that is, in total 24.7 tons or 18.6 kg/ha of fish. During the same time anglers caught an average of 21.5 tons, i.e. 16.1 kg/ha of fish. Between 1966 and 1970 fish were caught only by anglers and the average annual catch of all fish species amounted to 22.7 tons, i.e. 17.1 kg/ha of fish; in this total catch, breams accounted on the average to 9.928 tons, i.e. 44.2%. The State Fisheries did not make available any exact statements as to the percentages of the different species of fish caught. The Bream made up approximately 70% of the total catch according to the data submitted by Mr M. Vacek, the superindentendt of the Nižbor State Fishery, and, consequently, fishing by nets had been by far most efficient means of control of the number of breams in the reservoir. A rapid decline of the catch yield

began in 1963, when also the increment data of the third sample showed a marked downward trend (see table 2).

The second sample caught in 1963 showed the best growth among all samples reviewed. These optimum growth condition are interpreted by the author to be the result of exploitation of fish by the State Fishery. In this way an excessive reproduction of fish was prevented and the growth of fish could be better because of the abundance of food. Besides 81% of the total yield of fish were caught in the lowest part of the reservoir where, according to all authors, optimum condition of development existed and where no apparent decrease of the benthic biomass had taken place, that is, not even after the Orlík valley water reservoir had been filled.

The third sample amounting to about 63% came from the midway section of the basin, was exposed throughout practically its entire life to adverse effects of cold water and to limited amount of food. The two former samples showed substantially better growth. No apparent improvement in growth could be recorded in the third sample even in 1963 and 1964 when large number of fish died in the winter season. This is an evidence of the fact that not even the industrial fishing of the bream by the State Fisheries could control the overpopulation of the bream.

CONCLUSION

In the present report results obtained by Čihař, Oliva, 1960; Oliva, Frank, 1959a, b and the author from an investigation of the growth of the bream in the Slapy reservoir during the 1958—1965 period are summarized. The conclusions were drawn from the growth data of 3 samples in which 707 specimens had been investigated. During the period under review the growth decreased due to overfishing caused by insufficient catch chiefly by nets. The present-day catch practised exclusively by angling cannot adequately control the number of the breams in the reservoir and thus prevent overpopulation resulting in retardion of the growth.

The cold water coming in from the Orlík reservoir and the decrease in the biomass of benthos and plankton, which is incidental, affects the growth of the bream only in the upper and partially also in the midway section of the reservoir.

The growth of bream as seen from scale structure is slow due to overpopulation. It is also evident from the circumstance that not even during the years which followed the suffocation of fish during the winter season, that made available large amounts of the existing food supply to the remaining ones, better growth tempo could be recorded. With the present day system of fishing only by anglers, which means that only about one half of the fish is caught with respect to the catches corresponding to the years 1960—1965, and with the bream accounting for 44.2% of the total catch, i.e. for about 20% of the catches recorded in 1960—1965, there is bound to be its excessive reproduction and, consequently, the fish become stunted. The only measure that might prevent its future overpopulation would be a resumption of its planned exploitation by commercial fishing.

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Czechoslovak Entomological Society, Praha

TWO NEW SYSTEMATIC GROUPS OF GONYLEPTOMORPHID PHALANGIDS FROM THE ANTILLEAN-CARIBBEAN REGION, AGORISTENIDAE FAM. N. AND CARIBBIANTINAE SUBFAM. N. (ARACHN.: OPILIONIDEA)

VLADIMÍR ŠILHAVÝ

Received June 20, 1972

Abstract: A new family of Opilionids: *Agoristenidae* (two subfamilies: *Agoristeninae* and *Leiosteninae*) and a new subfamily of *Biantidae (Caribbiantinae)* are described. There are given descriptions of fifteen new genera and eighteen new species from these groups found in Antillean-Caribbean region.

Classifying the Antillean material of phalangids from the collection of the Museum of Comparative Zoology, Cambridge (U.S.A.) sent to me for determination and the material collected during my short stay in Cuba (1963), I found already some years ago a number of specimens from the suborder Gonyleptomorphi which I had not been able to range in any of till this time described subfamilies. Before concluding that they were unknown and not yet described groups, it was necessary to examine the representatives of all families of Gonyleptomorphi, not only their external, but also genital morphology, which has not been studied in several groups.

These studies have been made possible (besides the named collection from Antilles) by using the material from Central and South America. Further I had at my disposal phalangids from Africa, Australia and Japan. I wish to express my appreciation and thanks for kindness in enabling me these studies in the first place to Prof. Dr. Herbert W. Levi, furthermore to Prof. Dr. Clarence J. Goodnight, Prof. Dr. B. A. Soares and Dr. H. E. M. Soares, Prof. Dr. R. F. Lawrence, Prof. Dr. V. V. Hickman, Prof. Dr. S. Suzki and Dr. R. Capocasale. I was enabled the stay at the Senckenberg Museum (Frankfurt) to study Roewer's collection trough courtesy of Prof. Dr. O. Kraus; Prof. Dr. M. Vachon, Prof. Dr. S. L. Tuxen, Dr. J. Gruber and Dr. W. Staręga kindly allowed me, to examine some specimens of phalangids from their institutions.

Holotypes and allotypes and most of paratypes are deposited in collections of MCZ, Cambridge, some paratypes in my collection, holotypes of *Galibrotus riedeli* and *Manahunca bielawskii* in the collections of the Zool. institute, PAN, in Warsaw.

Although the phalangids of the American continent have been in general well explored, they have not been studied systematicly in the Antillean-Caribbean region. Nevertheless some older papers from Antillean phalangids have been published by Banks, Simon, and Roewer; phalangids of Antilles were further dealt with by Goodnight and Goodnicht and recently — beside the writer — by Avram, Jaume, Rambla, Staręga etc. Several

of the recent publications brought to light some very surprising results: not only decribing new systematical forms (genera and species) but also discovering some representatives of the groups known up to this time only from the farther regions *(Ibaloniinae)*.

The phalangid fauna from the Antillean-Caribbean region, according to recent explorations, seems to be very motley. It depends on more than one factor: complicated historical geology of the Antilles in the first plane, each of the greater islans having been an evolutionary center. Phalangids are further from the phylogenetical point of view a very old order with small ecological valence, conforming with difficulty to changing life conditions and being very sensitive to the shortage of water and not very mobile. Phalangids cannot move by the "balloning" as some spiders can and their possibility of migration among the islands has been minimal even if we admit the possibility of their passive transfer by hurricanes (either as living specimens or as eggs).

General life conditions of the Antilles are for the phalangids of a high favour: mountainous, moist, tropical-insular territory with abundance of plants and isolation for long geological periods creates the best conditions for quicker phylogenetical evolution. The persistence of some greater systematical groups of phalangids, which died out in other regions, is not surprising in this territory.

First of these groups, a new family *Agoristenidae*, is quite differing from all known families of opilionids. We can recognise nearly macroscopically all representatives by first legs which are strikingly fine, short and thin. These extremities possess several characters of degeneration, the tarsal claw for instance is in some species stunted. Unfortunately, we have no observations of living specimens of this group and that is why we can hardly infer the function of first legs. We cannot prove the supposition of their tactile function, I have not found any corresponding organs on them. Some groups of the subordre Gonyleptomorphi *(Stygninae, Prostygninae, Heterostygninae, Stygnicranainae, Biantinae)* have also thin legs of the first pairs, but in no of these subfamilies is stunting so advanced as in the family *Agoristenidae*.

All other legs of representatives of family *Agoristenidae* are longer, but also fine and only slinghtly armed. The longest are in the subfamily *Leiosteninae*, subfam. n.

Second special characteristic of the family *Agoristenidae* is advanced segmentation of distitarsi. All found species have first distitarsus from 3 (mostly) to 4 segments, the second one from 4 (mostly) to 6 segments, exceptionally of 3 segments.

Third important characteristic of the family *Agoristenidae* is the morphology from the frontal portion of cephalothorax. Under the frontal margin of carapace there are projections as in the African families *Assamiidae* and *Trionyxellidae*, but not so developed: the lateral growths are short and obtuse, mostly covered by the lateral corner of carapace. The median spine and two paralateral ones are always distinct, obtuse or pointed.

Eyemound in this family is low with a wide basis, mostly provided with a median furrow, unarmed. In the subfamily *Leiosteninae* is this furrow so wide that the eyes seem to be separated.

In the subfamily *Agoristeninae* there are five distinct areas. The first area is with a median line in the form of biscuit. Areas, free tergites and anal plate

are provided with spines, tubercles or granulated In the subfamily *Leiosteninae* all five areas are grown together.

In the subfamily *Agoristeninae* the chelicerae are of the usual form, not enlarged in males. In the subfamily *Leiosteninae* are chelicerae in males enlarged (genus *Leiostenus*)

Pedipalps are relatively robust, in the subfamily Leiosteninae longer All segments are armed with spines, femora provided at the distal portion medially with a spine.

The representatives of the family *Agoristenidae* have a special genital morphology, mainly in the males penis is without musculature, with a tiny corpus, enlarged on the distal portion in a glans His ventral apophysis is thin, in the form of a groove Stilus is long, flat and mobile. There are three pairs of special threefold spines on the side of glans The members of the family *Agoristenidae* were found in the Great Antilles (Cuba, Haiti, Portorico-subfamily *Agoristeninae*) and in Trinidad (subfamily *Leiosteninae*. We can suppose that the representatives of the last subfamily live also in the northern territories of Southern America.

Second group of new Antillean phalangids, *Caribbiantinae* subfam n rank among the subfamilies of family *Biantidae* This family, according to Mello Leitao, included three subfamilies *Biantinae* from Africa, Indian ocean-islands and southeast Asia, *Stygnommatinae* from Central America and Antilles, and *Dibuninae* from the south-east Asian islands Last two subfamilies which live in the same territory (distribution of *Dibuninae* is smaller) are closely related, differ only by the number of areas and presence *(Biantinae)* or absence *(Dibuninae)* of scopula. The subfamily *Stygnommatinae* is from the morphological point of view more differing and has some relations to the subfamily *Phalangodinae.*

The subfamily *Caribbiantinae* is related to the subfamily *Biantinae* although we could rather suppose the relations to the American subfamily *Stygnommatinae*

As in the family *Agoristenidae* the members of subfamily *Caribbiantinae* possess an advanced segmentation of tarsi: first distitarsi are composed from three, second distitarsi from four segments We can judge from this interesting circumstance that both groups are phyllogenetically very young. Eyes — as in all representatives of the family *Biantidae* — are placed apart on the lateral side of carapace near its distal margin Each eye is situated on a separate tubercle.

Scute consists of five distinct areas, first area is mostly with a median line Some areas as well as the free tergites are armed with various spines or tubercles

Chelicerae are of usual form and without greater armature, mostly considerably enlarged in males Pedipalps are long, with thin and long, unarmed femora, patellae in the form of a club, tibiae and tarsi short, dorsally unarmed, laterally and medially with long curved spines Tarsal claw long and thin, curved Legs are fine and mostly unarmed. Third and fourth tarsi with a thick scopula, without pseudonychium, with simple, stout and transverse claws Third metatarsi of males enlarged in a form of spindle On the ventral side of this spindle there is an eliptical court of short and dense hairs. The function of this organ is unknown.

Genital morphology of all known representatives of the subfamily *Carib-*

biantinae is very similar to this of *Biantinae* Secondary sexual characteristics of males are in the enlarged chelicerae and spindle third metatarsi

All to this time known members of new subfamily are relatively small. They were found in Cuba, Haiti and the Virgin Islands Their relationships to the subfamilies *Biantinae* and *Dibuninae*, living in the Ethiopian and Oriental region, are very interesting. Like the representatives of the subfamily *Ibaloniinae (Ibantilla cubana)*, found in the Antilles, the subfamily *Caribbiantinae* represents a missing link in the geographical distribution of further tropical family of Gonyleptomorphi

The position of both new groups of phalangids in the system of superfamily Gonyleptoidea is shown in the following key (the system is only slightly modified according to the division of Mello-Leitao-Ringuelet).

Suborder Gonyleptomorphi
Superfamily Gonyleptoidea

1	Eyes raised on one distinct tubercle or lying laterally at a heavy central elevation near the anterior margin of carapace (in some cave phalangids eyemound or eyes absent) Pedipalps robust, armed	2
—	Eyes separated, placed on the lateral margin of carapace, next its posterior margin Pedipalps long	9
2.	Eyes lying on a separate tubercle at the central elevation, jointed by a bridge with the anterior margin of carapace Femora of first legs with a dorsal and ventral row of spines	*Podoctidae* (Rwr.) M L , 1938
—	Eyes on the distinct madian tubercle, exceptionally absent	3
3.	Inferior frontal margin of carapace with 3,5 or 7 forward directed teeth Pedipalps robust, armed with spines	4
—	Inferior frontal margin of carapace without teeth	6
4	Tarsi III—IV with pseudonychium	*Triaenyxellidae* (Rwr) M L , 1938
—	Tarsi III—IV without pseudonychium	5
5	First legs considerably stout, very fine and mostly short	*Agoristenidae* fam n
—	First legs normal	*Assamiidae* Sr , 1884
6	Pedipalps short, applied to the chelicere, pressed, with slight regular teeth	*Cosmetidae* Simon, 1889
—	Pedipalps long, armed with strong spines	7
7	Tarsi III—IV with pseudonychium	*Gonyleptidae* Sund , 1833
—	Tarsi III—IV without pseudonychium	8
8	Dorsal scute formed only by 5 areas	*Phalangodidae* Simon, 1879
—	Dorsal scute formed by 5 areas and I—II free tergite	*Paralolidae* Krat , 1958
9	Tarsi III -IV with pseudonychium	*Stygnidae* (Sim), M L 1930
—	Tarsi III—IV without pseudonychium	*Biantidae* Thor , 1884 . 10
10.	Tarsi III—IV with scopula	11
—	Tarsi III—IV without scopula	12
11	Distitarsus I of 3 segments, distitarsus II of 4 segments	*Caribbiantinae* subfam n
—	Distitarsus I of 2 segments, distitarsus II of 3 segments	*Biantinae* Rwr , 1912
12	Five areas	*Stygnommatinae* Rwr , 1923
—	Four areas	*Dibuninae* Rwr , 1912

Agoristenidae fam n

Under the frontal margin of carapace three forward directed spines. Eyemound unarmed, mostly with a median furrow Five areas either distinct or forming a scute without distinct boundaries, first area with or without median line Chelicerae unarmed, basal segment with dorsal projection Pedipalps dorsally unarmed, all segments with spines. Maxillary lobe of second coxae mostly with very low ventral projection. First coxae with a row

of hair pointed tubercles, third coxae with a row of bridges at the lateral margins. Spiracles visible. Legs fines, cylindrical, metatarsi with distinct astragali and calcanei, tarsi without scopula and pseudonychium, tarsal claws simple. First distitarsi with 3, second with 3—6 segments.

Key to the subfamilies

Areas distinct, first area with a median line. Pedipalps robust, with short spines ..... *Agoristeninae* subfam. n.
Area 1—5 forming a scute without distinct boundaries. Pedipalps fine with very long spines ..... *Leiosteninae* subfam. n.

Agoristeninae subfam. n.

With the main characters of family. First area always with median line, first legs very short. Chelicerae ♂ normal.

Typus subfamiliae: *Agoristenus* gen. n.

Key to the genera

1. Coxae IV ventrally with an apical-medial spine 2
— Coxae IV ventrally without apical-medial spine 4
2. Femora IV with apical medial spine, distitarsi II with 3 segments 3
— Femora IV without apical medial spine, distitarsi II with 4 segments ..... *Ahotta* gen. n.
3. Free tergites II—III with a pair of spines, tarsi III—IV with 5—6 segments ..... *Piratrinus* gen. n.
— Free tergites unarmed, tarsi III—IV with 6 segments ..... *Calmotrinus* gen. n.
4. Distitarsi II with 3 segments ..... *Haitimera* gen. n.
— Distitarsi II with 4—6 segments 5
5. Legs very long, tarsi III with 8 segments, areas distinct only by very narrow furrows ..... *Lichirtes* gen. n.
— Legs short, tarsi III with 6—7 segments, areas very distinct 6
6. Both areas III and IV with a pair of spines ..... *Yunquenus* gen. n.
— Area III or IV with a pair of spines 7
7. Operculum anale with a median tooth ..... *Meriosfera* gen. n.
— Operculum anale without tooth ..... *Agoristenus* gen. n.

Agoristenus gen. n.

With the characters of subfamily. Area III or IV armed with a pair of spines, free tergites and operculum anale unarmed. Tarsal formula: 6,n,6—n,n. First distitarsi with 3, second of 4—5 segments; fourth femora ventrally without apical — medial spine. Two species from Cuba and Haiti.

Typus generis: *Agoristenus cubanus* sp. n.

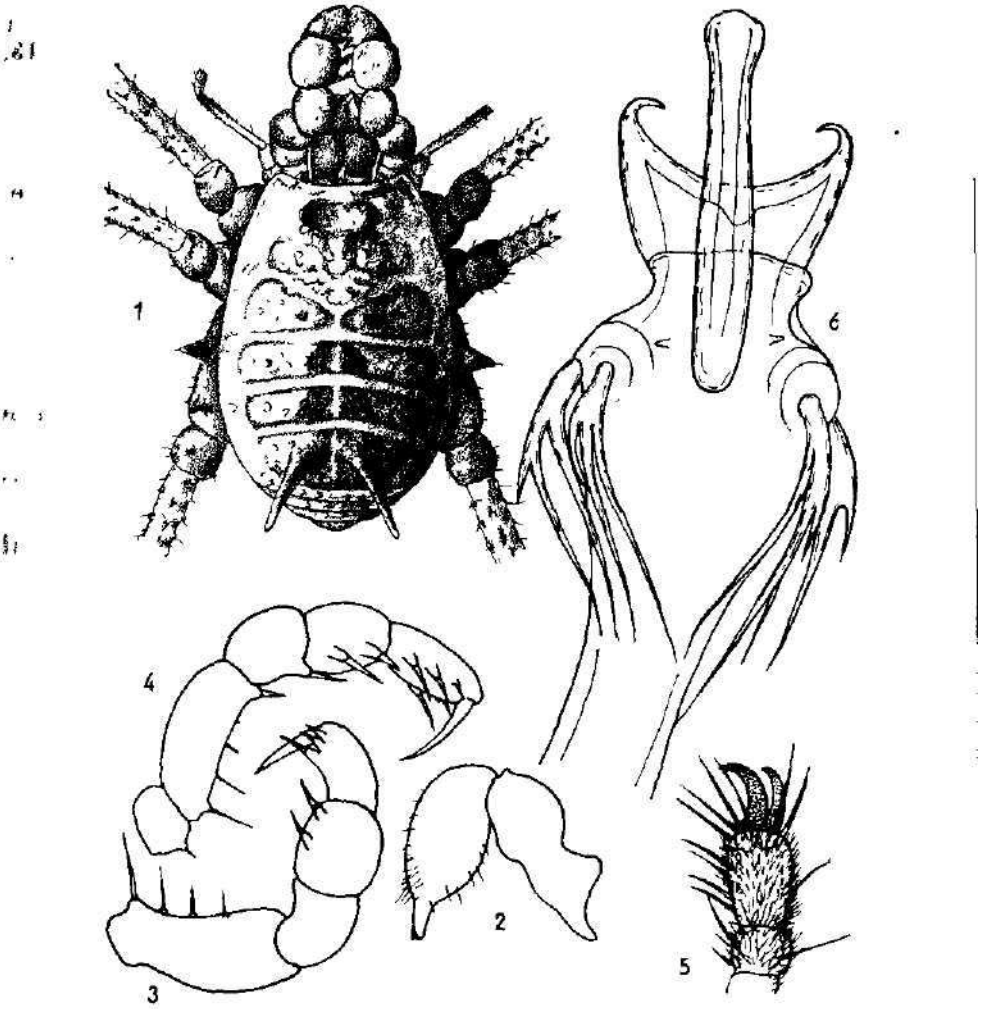
Area IV with a pair of spines ..... *A. cubanus* sp. n.
Area III with a pair of spines ..... *A. lutensis* sp. n.

Agoristenus cubanus sp. n. (Figs 1—8)

Male, holotype:

Body length 4.0 mm. Carapace behind the eyemound roughly granulate. Under the frontal margin of carapace three teeth, the lateral ones small and obtuse. Eyemound situated near the anterior margin of carapace, broad, with a deep median furrow, roughly granulated. Dorsum with five distinct areas, all areas with greater granulations. First area with two tubercles

which are situated near the median line, second area with a pair of tubercles situated laterally, third area with a pair of not so separated tubercles. Fourth area with a pair of long, abtuse and divergent spines, fifth area as well as three tergites with a row of granulations. Lateral margins of scute very lowly granulated.



Figs 1—6. *Agoristenus cubanus* sp. n. 1 — dorsal view of male, holotype; 2 — lateral view of chelicera, male, holotype; 3 — lateral view of pedipalpus, male, holotype; 4 — medial view of pedipalpus, male, holotype, 5 — tarsal claws of leg IV, male, holotype; 6 — dorsal view of distal part of penis, holotype.

Anal operculum, sternites and coxae finely granulate, lateral margins of third coxa joined with the second and fourth coxa by a row of small bridges, fourth coxae dorsally with a lateral and an apical tooth. Maxillary lobe of the second coxa without ventral projection, spiracles visible.

Chelicerae of normal form, unarmed, basal segment with a dorsal projection Pedipalps 3.1 mm long, robust. Trochanters ventrally with a low hair pointed tubercle, femora ventrally with an oblique row of four very low hair pointed tubercles and an apical medial spine. Patellae with an apical medial spine, tibiae with two lateral and two medial spines, tarsi with three lateral and three medial spines. Tarsal claws long.

Legs. 5.0; 12.0; 9.0; 13.0 mm long, fine, irregularly clothed with low hair pointed tubercles. Metatarsi with distinct calcanei. Tarsal segments: 6, 13, 6, 7. Second distitarsi with 4 segments.

Genitals: Penis of the form shown in Fig. 6.

Secondary sexual characters absent.

Colour (in alcohol). Body and legs yellowish brown. Carapace brown reticulated, each area brown marginate. Pedipalps lighter yellowish, chelicerae, trochanters, metatarsi and tersi of legs yellowish.

Holotype locality: Cuba, Pico Turquino (Sierra Maestra), 6000 ft, 10. VI. 1936, Darlington coll.

Female, allotype:

Body length 4.5 mm, legs 5.0; 12.5; 9.5; 12.5 mm.

Genitals: Ovipositor of the form shown in Fig. 8. In general appearance and characteristics resembles the male holotype.

Allotype locality: In the same vial as male holotype; Cuba, Pico Turquino, Darlington coll.

Variations. One male paratype differs in slighter granulations on the dorsal scute.

Agoristenus haitensis sp. n. (Figs 9—12)

Male, holotype·

Body length 5 0 mm. Carapace, eyemound, areas and tergites granulated. Eyemound situated near the anterior margin of carapace, broad, with a shallow median furrow. First area with a pair of low tubercles near the median line. Second area with a low median convexity, third area with a pair of spines. Other areas, free tergites and anal operculum unarmed. Sternites and coxae smooth, lateral margins of the third coxae jointed with the second and fourth coxa by a row of bridges on the distal portion only. Maxillary lobe of the second coxae with a low ventral projection, spiracles visible.

Chelicerae of normal form, basal segment with a granulated dorsal projection, second segment smooth, shiny.

Pedipalps long Trochanters ventrally with a low hair pointed tubercle, *femora ventrally with a row of four spines and one apical medial spine.* Patellae with one apical medial spine, tibiae with two lateral and two medial spines, tarsi with three lateral and three medial spines. Tarsal claws long All spines of pedipalp are in this species greater as these of *A. cubanus.*

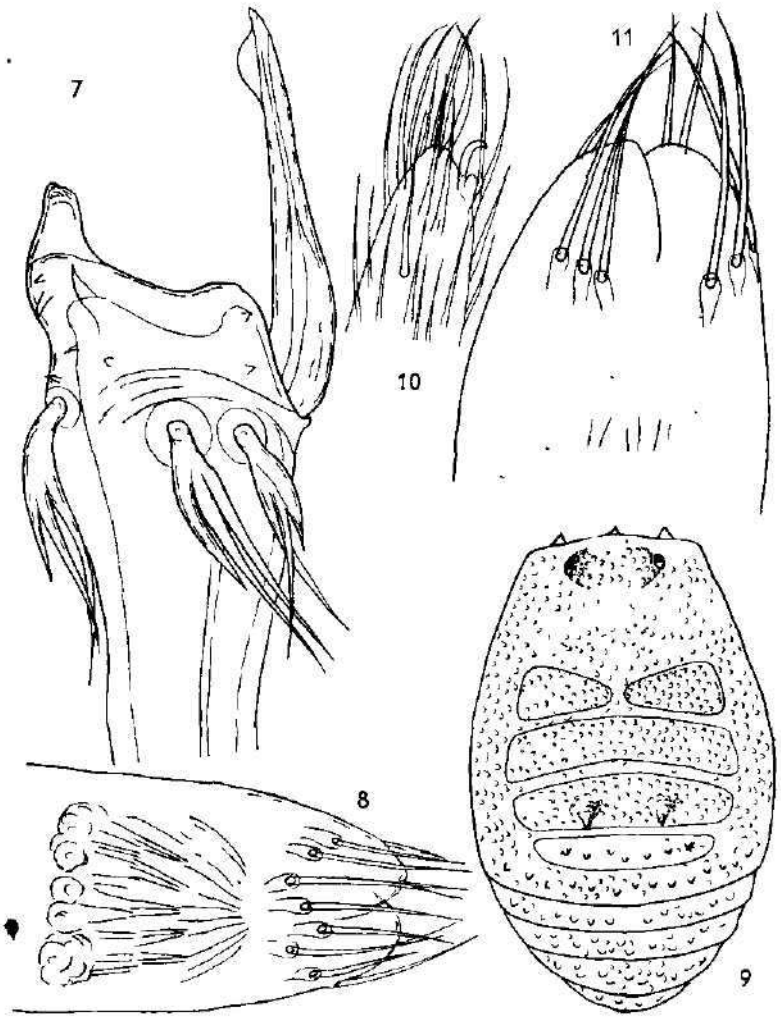
Legs 8 2; 20.5; 14.5; 19.5 mm long, fine and unarmed, only II—IV trochanters, femora, patellae and tibiae with very low hair-pointed tubercles, first legs and other segments only with hairs. Tarsal segments: 6, 14, 6—7, 7—8, second distitarsi with 4 segments.

Genitals: Penis of the form shown in Fig. 12.

Secondary sexual characters· fourth astragali apically slightly enlarged.

Colour in alcohol· yellowisch brown. The median line of dorsum from the anterior margin of carapace to the anal operculum, boundaries between areas, chelicerae, pedipalps and legs lighter Pedipalps and the dorsal projection of the basal segment of chelicera with darker fine reticulations.

Holotype locality. Haiti, Dominican republic, Loma Vieja, Cord. centr , S. of Constanza, ± 6000 ft, Aug. 1938, Darlington coll



Figs 7—8. *Agoristenus cubanus* sp n. 7 — lateral view of distal part of penis, holotype; 8 — ovipositor, allotype.
Figs 9—11. *Agoristenus haitensis* sp. n. 9 — dorsal view of male, holotype; 10 — distal part of tarsus I, male, holotype; 11 — ovipositor, allotype.

Female, allotype:

Lenght 5.5 mm, legs 8.3; 19.0; 14.6; 24.0 mm long, tarsal segments: 6, 16—19, 7, 8, second distitarsi with 4—5 segments. Colour darker as in male

holotype. Ovipositor of the form shown in Fig. 11. Other characters as in male holotype.

Allotype locality: Haiti, Dominican republic, Loma Rucilla, Cord. centr., 5—8000 ft, june 1938, Darlington coll.

Ahotta gen. nov.

Areas III—V with a pair of spines, free tergites and anal operculum unarmed. Tarsal segments formula: 5, n, 5, 6. Second distitarsi with 4 segments. Fourth coxae ventrally with an apical medial spine and one dorsal apical spine.

Typus Generis: *Ahotta hispaniolica* sp. n.

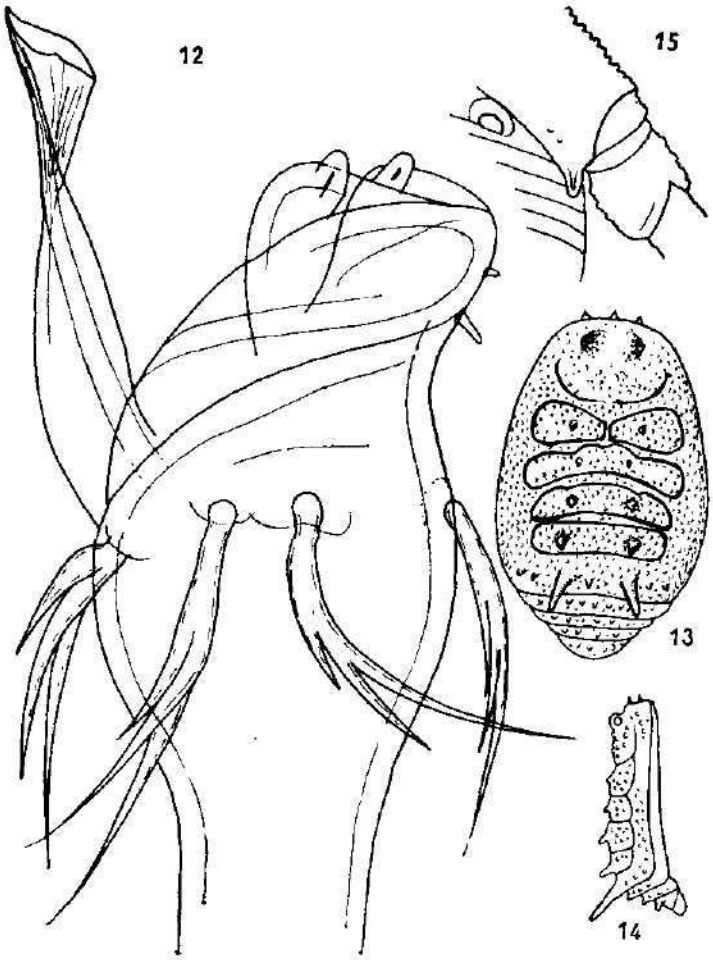


Fig. 12. *Agoristenus haitensis* sp. n. — lateral view of distal part of penis.
Figs 13—15. *Ahotta hispaniolica* sp. n. 13. dorsal view of male, holotype; 14 — lateral view of dorsal part of body, male, holotype; 15 — ventral view of coxa and trochanter IV, male, holotype

Ahotta hispaniolica sp. n. (Figs. 13—16)

Male, holotype:

Body length 3.8 mm. Carapace, eyemound and areas granulated. Under the frontal margin of carapace three obtuse teeth. Eyemound near the anterior margin of carapace, with a median furrow. First and second area with four tubercles, third area with two short median spines and a pair of lateral tubercles, fourth area with a pair of long spines, fifth area with a pair of even greater spines and a row of irregularly situated tubercles. Three free tergites with a row of tubercles, anal operculum granulate.

Sternites and coxae smooth with dispersed very low tubercles. First coxae with a row of obtuse tubercles, maxillary lobe of second coxae with a low ventral projection. Fourth coxae apically with a ventral medial tooth, dorsally granulate.

Chelicerae normal, unarmed, basal segment with a granulate dorsal projection, distal segment smooth and shiny.

Pedipalps 4.6 mm long, robust, smooth and shiny. Trochanters ventrally with a spinebearing tubercle, femora dorsally unarmed, ventrally with four spinebearing tubercles and with a medial apical spine, patellae with a medial spine, tibiae laterally and medially with two spines, tarsi laterally and medially with three spines.

Legs 4.5; 12.0; 9.5; 12.5 mm long, fine. Trochanters, femora, patellae and tibiae with low hair-pointed granules, remaining segments only with hairs. Tarsal segments: 5, 10, 5, 6. Second distitarsi with four segments.

Genitals: Penis of the from shown in Fig. 16.

Secondary sexual characters absent.

Colour (in alcohol) of chelicerae and pedipalps yellowish. Carapace yellowish with brown reticulations, eyemound laterally brown. Area I—IV brown, marginated by yellowish brown boundary; each area in the middle lighter, pair tubercles and spines dark brown with lighter points. Fifth area yellowish with light-yellow spines and tubercles, boundaries of scute brown reticulated. Free tergites with one median, lateral dark brown flecks, trochanters, femora, patellae and tibiae of legs brown marbled.

Holotype locality: Haiti, foothills NE of La Hotte, 3—4000 ft, oct. 1934, Darlington coll.

No female either male paratypes are in the collection.

Haitimera gen. nov.

Fourth area with a pair of spines, other areas and free tergites without greater spines. Tarsal segments formula: 4, n, 5, 5—6, second distitarsi with 3—4 segments. Fourth coxae and fourth femora without apical spines.

Typus generis: *Haitimera paeninsularis* sp. n.

Haitimera paeninsularis sp. n. (Figs 22—23)

Female, holotype:

Body length 4.5 mm. Carapace, eyemound and dorsal scute granulate, eyemound situated near the anterior margin of carapace, relatively high, with a deep and narrow median furrow. First, second and third area with s pair of very low median tubercles, fourth area with a pair of reclined conical

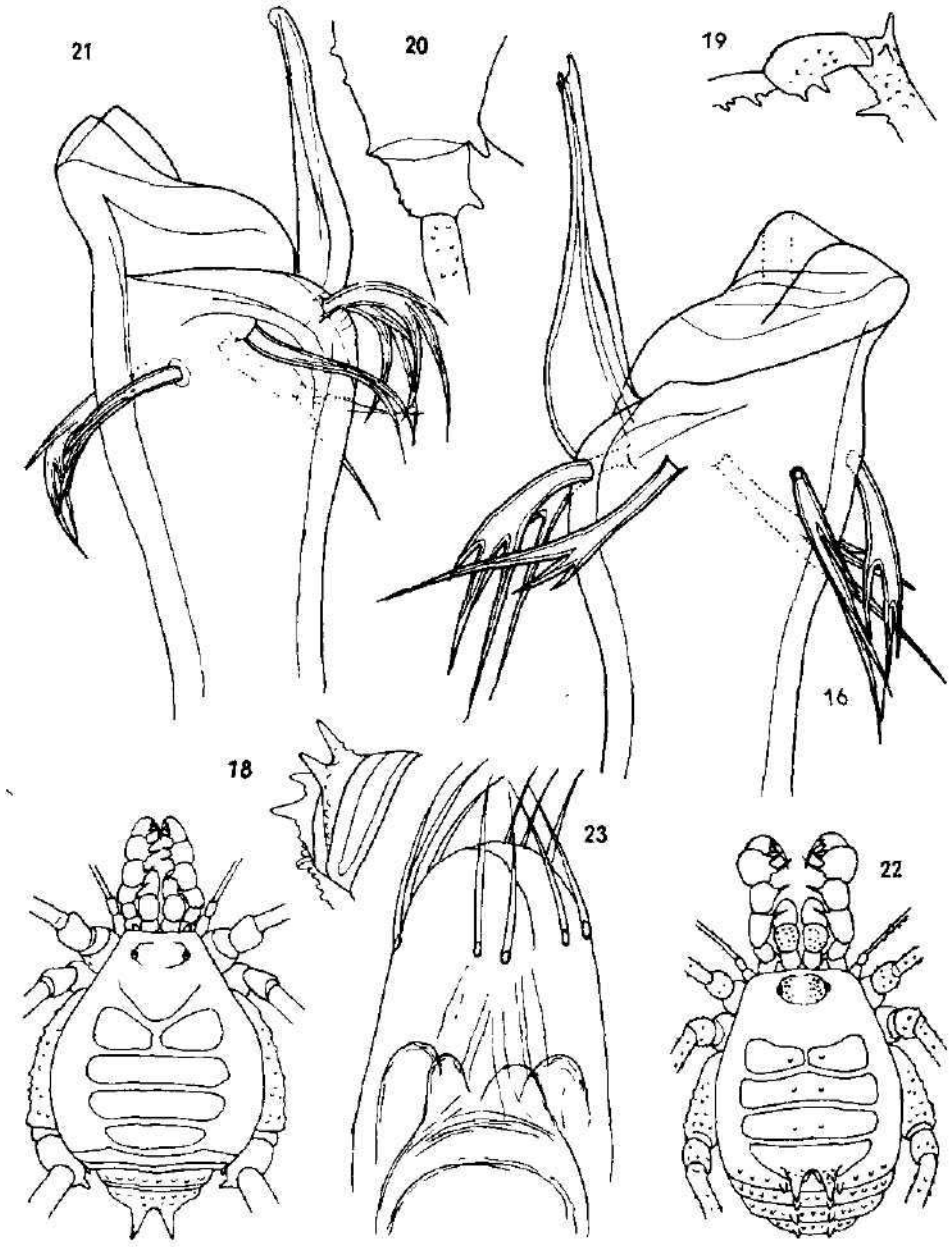


Fig. 16. *Ahotta hispaniolica* sp. n. — lateral view of distal part of penis, holotype.
Figs 17—21. *Piratrinus calcaratus* sp. n. 17 — dorsal view of male, holotype; 18 — dorsolateral view of distal part of body, male, holotype; 19 — view of distal part of femur, patella and tibia IV, male, holotype; 20 — ventral view of coxa and trochanter IV, male, holotype; 21 — lateral view of distal part of penis, holotype.
Figs 22—23. *Haitimera paeninsularis* sp. n. 22 — dorsal view of female, holotype; 23 — ovipositor of holotype.

spines. Fifth area and free tergites with a pair of greater pointed tubercles situated among a row of smaller ones. Anal plate granulate.

Starnites and coxae finely granulate, maxillary lobe of second coxae with very low ventral projection. Spiracles visible.

Chelicerae of usual form, unarmed, basal segment with dorsal projection.

Pedipalps 2.7 mm long, robust, smooth and dorsally unarmed. Trochanters with one low hair pointed tubercle, femora ventrally with 3—4 hair pointed tubercles and one apical medial spine. Patellae with one medial spine, tibiae with two lateral and two medial spines, tarsi with three lateral and three medial spines.

Legs 4.5; 11.0; 8.0; 11.5 mm long, fine. Trochanters, femora, patellae and tibiae with very low hair pointed tubercles, other segments smooth, with hairs only. Tarsal segments: 4, 8, 5, 6. Second distitarsi of 4 segments. Tarsal claws on first tarsi stunted.

Genitals: Ovipositor has the form shown in Fig. 23.

Colour in alcohol yellowish brown. Carapace brown marbled, I—IV area brown with lighter spots, spines brown dark. Fifth area, boundaries of scute and free tergites with greater brwon flecks. Chelicerae and pedipalps laterally and ventrally black-brownish, legs light brown with lighter spots. Fourth coxae dorsally and sternites brown.

Holotype locality: Haiti, La Vestite, 6—7000 ft, 16—23 sept. 1936, Darlington coll.

Females, paratypes:

Two specimens from the same vial differing from the holotype: body length 4 mm, tarsal segments 4, 7, 5, 5—6, second distitarsi with 3 segments; body length 4.4 mm tarsal segments 4, 7, 5, 5, second distitarsi with 3 segments.

Piratrinus gen. n.

All areas and first free tergite without spines, second and third free tergite with a pair of median spines. Fourth coxae with dorsal and ventral apical teeth, fourth femora with apical spines. Tarsal segments' formula: 4, n, 5, 6, second distitarsi with 3 segmets.

Typus generis: *Piratrinus calcaratus* sp. n.

Piratrinus calcaratus sp. n. (Figs 17—21)

Male, holotype:

Body length 4.7 mm. Carapace, eyemound and dorsal scute finely granulate; eyemound situated near the frontal margin of carapace, with the median furrow. Four anterior areas with a pair of very low median tubercles, fifth area and first free tergite with a pair of low teeth. Second and third free tergite with a pair of median spines, fifth area, all free tergites and anal plate with a row of greater granulations. Coxae ventrally smooth, with dispersed low tubercles, maxillary lobe of second coxae with a little ventral projection. Fourth coxae apically with a ventral medial tooth. Sternites with a row of greater tubercles which are greatest in the last sternite.

Chelicerae mormal, unarmed, basal segment with a granulate dorsal projection, distal segment smooth.

Pedipalps 2.8 mm long, robust, smooth and shiny, dorsally unarmed. Trochanters ventrally with a spinebearing tubercle, femora ventrally with four spines and with one apical median spine. Patellae with one medial spine, tibiae with two lateral and two medial spines, tarsi with three lateral and three medial spines (these lying at the tarsal claw are very small).

Legs 5.2; 16.0; 11.2; 15.0 mm long. First legs unarmed. Femora of second legs dorsally with an irregular row of teeth, apically with long spines. Patellae of second legs with one ventral tooth. Femora of third legs only apically with spines, patellae with 1—2 ventral teeth, tibiae ventrally with a row of several teeth. Trochanters of fourth legs medially with one spine, fourth femora ventrally with a row of small teeth and a greater subapical-lateral and apical-medial spine. Patellae ventrally with two teeth, tibiae and proximal portion of metatarsi with irregularly disposed teeth. Tarsal segments: 4, 9—10, 5, 6. Booth first and second distitarsi with three segments.

Genitals: Penis of the form shown in Fig. 21.

Secondary sexual characters absent.

Colour (in alcohol). Chelicerae and pedipalps yellowish white. Legs and body yellowish brown, carapace brown marbled, areas brown with lighter spots, boundaries between areas lighter. Lateral boundaries of scute with brown flecks in the level of first, second and third area, free tergites brown. A lighter strip begins in the middle of the frontal margin and stretches to the anal plate. Coxae and sternites brown marbled, a dark brown line lies between fourth coxae. Legs yellowish brown.

Holotype locality: Cuba, Trinidad mountains, Buenos Aires, 2—3500 ft, 8—14 may 1936, Darlington coll.

Male, differing from the holotype only by the body length 4.4 mm was found in the foothills of Trinidad mountains, Cuba, near Trinidad city (V. Šilhavý coll. 17. V. 1963) under stone.

Calmotrinus gen. n.

Four anterior areas and free tergites without spines, fifth area with a pair of median spines. Fourth coxae with ventral apical teeth, fourth femora with apical spines. Tarsal segments' formula: 4, n, 6, 6, second distitarsi with three segments.

Typus generis: *Calmotrinus turquinensis* sp. n.

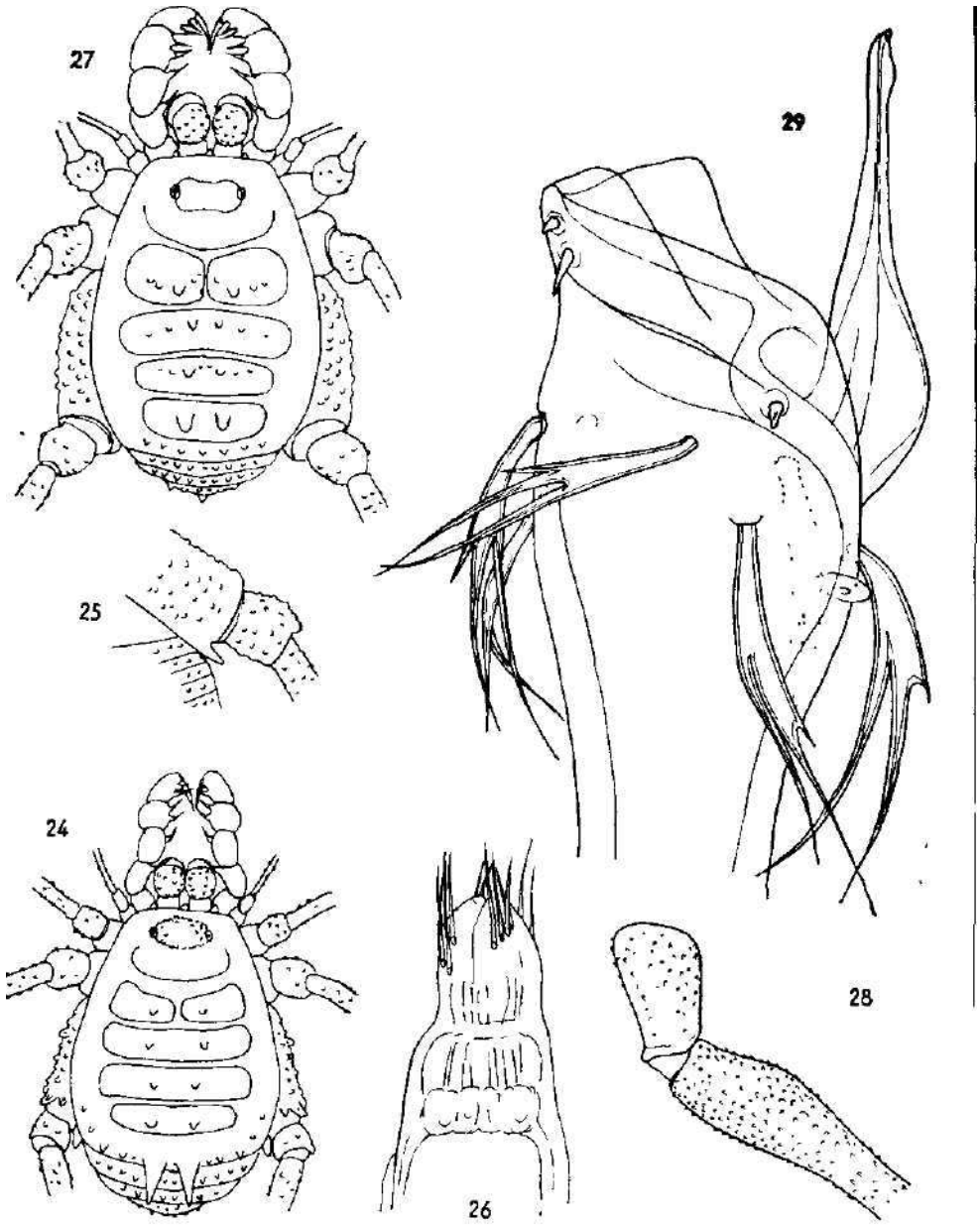
Calmotrinus turquinensis sp. n. (Figs 24—26)

Female, holotype:

Body length 3.2 mm. Carapace, eyemound and dorsal scute granulate. Eyemound situated near the frontal margin of carapace, with the very low median furrow. Four anterior areas with a pair of median tubercles, fifth area with two median spines and five greater pointed tubercles. Free tergites with a row of greater tubercles, anal operculum granulated. First coxae with tubercles, maxillary lobe of second coxae without ventral projection, spiracles visible. Free sternites with a row of rough tubercles, fourth coxae dorsally with great obtuse tubercles and one ventral apical medial tooth.

Chelicerae of normal form, unarmed, basal segment with dorsal projection.

Pedipalps 2.0 mm long. Trochanters with one low hair pointed tubercle, femora ventrally with 3—4 hair-pointed tubercles and one apical medial



Figs 24—26. *Calmotrinus turquinensis* sp. n. 24 — Dorsal view of female, holotype; 25 — view of distal part of coxa and trochanter IV; 26 — ovipositor, holotype.
Figs 27—29. *Meriosfera gertschi* sp. n. — 27 — dorsal view of male, holotype; 28 — distal part of femur and patella IV, male, holotype; 29 — lateral view of distal part of penis, holotype.

spine. Patellae with one medial spine, tibiae with two lateral and two medial spines, tarsi with three lateral and three medial spines.

Legs 4.0; 9.8; 7.3; 8.9 mm long, fine. Trochanters, femora, patellae and tibiae very finely dentate, third and fourth femora apically with spine. Other segments smooth, clothed with hairs. Tarsal segments: 4, 8, 6, 6. Distitarsi of booth first and second tarsi with 3 segments.

Genitals: Ovipositor of form shown in Fig. 26.

Colour (in alcohol). Chelicerae and pedipalps yellowish white, legs yellowish brown light. Carapace brown marbled, areas and boundaries of carapace brown, areas I—III with lighter spots. Area IV with a pair of lighter flecks bearing tubercles, area V with lighter spines and tubercles. Free tergites brown, pointed tubercles light yellowish. Bording lines among areas lighter, scute bordered by very fine white line. Fourth coxae dorsally brown, venter yellowisch brown with darker spots.

Holotype locality: Cuba, Sierra Maestra, south side of Pico Turquino, 3—5000 ft, june 1936, Darlington coll.

No other specimens of this species.

Meriosfera gen. n.

Some areas or free tergites with a pair of spines, anal operculum with one tooth. Fourth coxae dorsally apically with spine, fourth femora without apical spines. Tarsal segments formula: 6—n, n, n, n, second distitarsi with 4—6 segments. Legs relatively long. Secondary sexual characteristics on fourth femur (?).

Typus generis: *Meriosfera gertschi* sp. n.

Two species from Haiti:

Fourth femora apically enlarged, first and third area with a pair of pointed tubercles ..... *M. gertschi* sp. n.
Fourth femora apically not enlarged, first and third area with a pair of short spines ..... *M. lineata* sp. n.

Meriosfera gertschi sp. n. (Figs 27—29)

Male, holotype:

Body length 5.7 mm. Carapace, eyemound and dorsal scute finely granulate. Three spines under the frontal margin of carapace obtuse. Eyemound situated near the frontal margin, with very narrow and broad furrow. First area with six tubercles, median ones being the grestest, second area with low tubercles, third area with six tubercles, from which the paramedian are the greatest, fourth area with two median tubercles and a pair of paramedian short and obtuse spines. Fifth area and free tergites with a row of pointed tubercles, anal operculum granulated with a low median tooth. Coxae smooth, first coxae with greater tubercles, maxillary lobe of second coxae without ventral projection. Fourth coxae dorsally with a little tooth and apically with 1—2 teeth. Spiracles visible. Free sternites with a row of greater granules.

Chelicerae of usual form, basal segment with granulated dorsal projection.

Pedipalps 3.8 mm long, robust, trochanters with one spine, femora with four ventral and one apical medial spine, patellae with one medial spine,

tibiae with two lateral and two medial spines. tars with three medial and three lateral spines.

Legs: 8.0; 19.0; 15.5; 20.0 mm long, femora of first legs and all segments of resting legs with exception of calcanei and tarsi which are only with hairs, finely dentate. Femora and tibiae of fourth legs apically enlarged. Tarsal segments: 6—7, 17, 6, 7, first distitarsi with three, second with 6 segments.

Genitals: Penis of the form shown in Fig. 29.

Secondary sexual characters: enlarged fourth femora and tibiae(?).

Colour (in alcohol). Chelicerae and pedipalps brown, reticulated; legs brown, apical portions of segments darker. Dorsum brown with a yellowish white median strip from the eyemound to the anal operculum and with black brown patterns: carapace reticulate, area I—IV marginated, all tubercles and spines dark brown, only on the third free tergite and anal plate lighter. Venter brown reticulated with greater darker flecks.

Holotype locality: Haiti, Mt. La Vestite, 6 — 7000 ft, 16—23 sept. 1936, Darlington coll

Males, paratypes (2) from the same vial as holotype, differing: body length 5. 7, tarsal segments: 7, 16—17, 6, 8, distitarsi of second legs 5—6; body length 4.7 mm, tarsal segmenta: 7, 18, 6, 7, second distitarsi with 6 segments.

Fourth specimen, not diferring from the described ones (damaged), was found in the same locality: Haiti, La Vestite, 28 march (19??) Folk coll.

Meriosfera lineata sp. n. (Figs 30—33)

Male, holotype:

Body length 4.0 mm. Carapace, eyemound and dorsal scute finely granulated. Under the frontal margin of carapace three spines, the lateral ones obtuse. Eyemound situated near the frontal margin, with very broad furrow. First, third and fourth area with a pair of spines, first area moreower with two lateral tubercles, second area with two greater medial tubercles. Fifth area and free tergites with four little teeth, anal operculum granulated, with a median tooth. Coxae smooth, maxillary lobe of second coxae without ventral projection. Fourth coxae dorsally with low tubercles and apically with 1—2 teeth. Spiracles visible, free sternites with a row of greater granules.

Chelicerae of usual form, basal segment with granulated dorsal projection.

Pedipalps 3.2 mm long, robust. Trochanters with one hair pointed tubercle, femora ventrally with four spines and one apical medial spine, patellae with one medial spine, tibiae with two lateral and two medial spines, tarsi with three lateral and three madial spines.

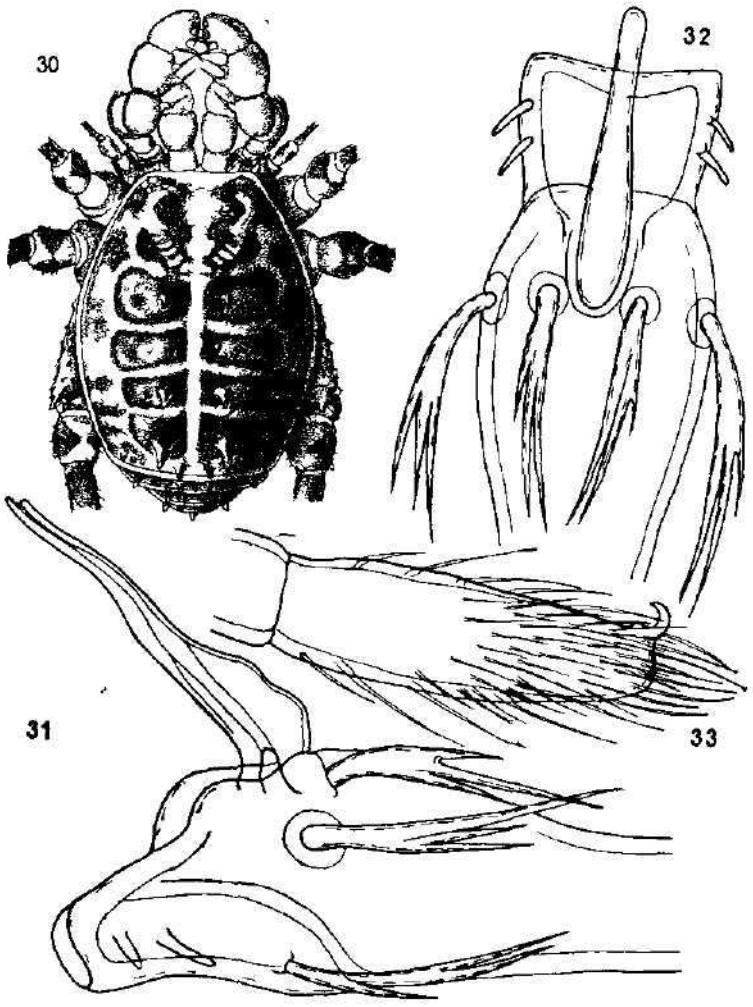
Legs 6.3; 17.0; 12.0; 16.2 mm long, fine. Femora of first legs, femora, patellae and tibiae of second and third legs, femora, patellae, tibiae and metatarsi of fourth legs finely dentate, other segments clothed only with hairs. Tarsal segments: 6, 14—16, 6, 7. Second distitarsi with five segments.

Genitals: Penis of the form shown in Fig. 32.

Colour (in alcohol). Basal segments of chelicerae yellowish red light, distal segments ventrally brownish. Trochanters and basal portion of pedipalps-femora brownich, other segments yellowish red light. Dorsum of body yellowish red with brown patterns and with a yellowish white medial strip from the frontal margin of carapace to the anal plate. Lateral boundaries of carapace,

scute and boundaries between free tergites yellowish white Fourth coxae dorsally brown, trochanters with brown flecks in the form of sand glass, femora brown merbled. Other segments of legs brown. Venter reddish brown marbled.

Holotype locality. Haiti, La Hotte, 5 — 7000 ft, sept 1936, Darlington coll.



Figs 30—33 *Meriosfera lineata* sp n 30 — dorsal view of male, holotype, 31 — lateral view of distal part of penis, holotype, 32 — dorsal view of distal part of penis, holotype; 33 — distal part of tarsus I, male, holotype

In the collection there is one male of 4.5 mm body length and of lighter colour, otherwise not differing from the holotype.

Paratype locality· Haiti, Diguini, W. M. Mann coll.

Lichirtes gen n.

Eyemound broad with very deep furrow. Areas poorly distinct, only by very low furrows, first area with a median low wrinkle. Third and fourth area with a pair of spines, free sternites and anal operculum unarmed. Legs very long, fourth femora without spines Tarsal segments' formula· n, n, n, n, first distitarsi with 3—4 segments, second with 5 segments Secondary sexual characteristics on fourth tarsi of males (false pseudonychium)

Typus generis: *Lichirtes hexapodoides* sp n

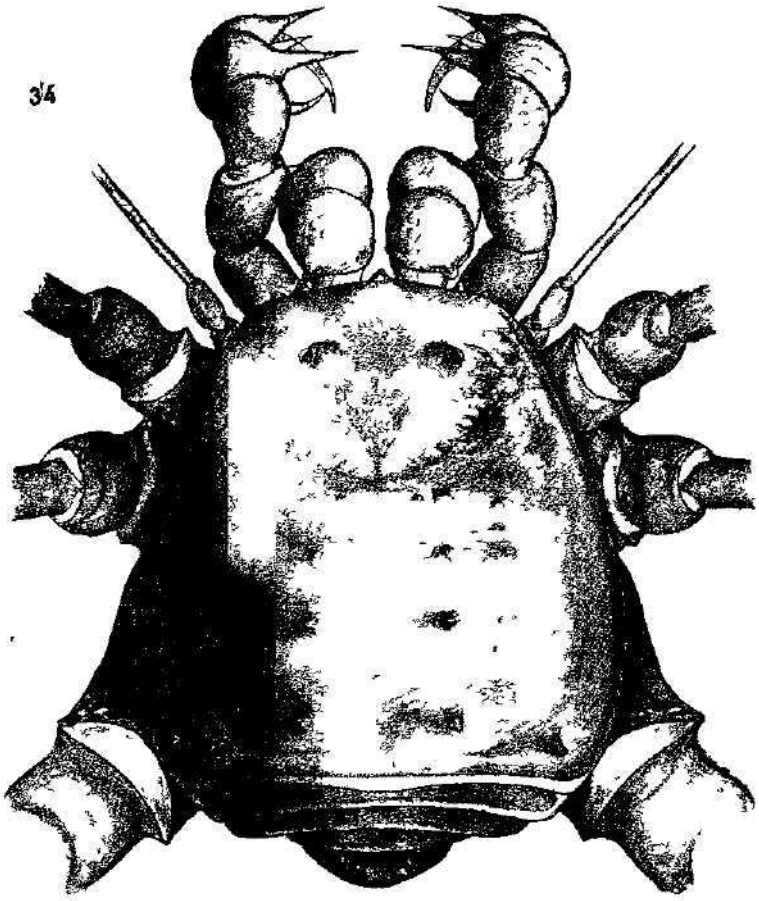


Fig 34. *Lichirtes hexapodoides* sp n — dorsal view of male, holotype.

Lichirtes hexapodoides sp n (Figs 34—38)

Male, holotype

Body length 6 2 mm Carapace, eyemound and dorsal scute finely granulate. Three spines under the frontal mergin of carapace pointed. Eyemound separated from the frontal margin, broad, with a deep furrow so that the

eyes seem to be separated. First and second area with a row of greater granules and a pair of pointed tubercles, third area with a pair of short median spines, fourth area with a pair of longer medial spines, fifth area with a pair of lateral spines and row of greater granules. Free tergites and anal operculum with a row of some granules. Coxae very finely granulated, with short dispersed hairs, maxillary lobes of second coxae with a low ventral projection, fourth coxae dorsally apically with two short spines.
Spirales visible.

Chelicerae of usual form, unarmed, basal segments with smooth dorsal projection.

Pedipalps 7.0 mm long, robust. Trochanters with one ventral hair pointed tubercle, femora ventrally in the basal portion with two hair pointed tubercles and a small apical medial spine. Patellae with one medial spine, tibiae with one lateral and two medial spines, tersi with two medial and two lateral spines.

Legs very long: 16.5; 49.0; 34.5; 44.0 mm, fourth femora, patellae, tibiae and metatarsi with small teeth, all other segments of legs only with hairs. Tarsal segments: 8—9, 28, 8, 8. First distitarsi with 3—4, second with 5 segments.

Genitals: Penis in this specimen has been prostruded and its ventral apophysis is unfortunately spoiled, other details shown in Fig. 35.

Secondary sexual characters very unusual: on the fourth distal tarsal segment there is between the claws one direct spurious pseudonychium.

Colour (in alcohol). Chelicerae, pedipalps and first legs yellowish white. Carapace yellowish with reddish brown merbled paterns, eyemound lighter. Areas yellowish, signed by unsharp light brown boundaries, spines on third, fourth and fifth area dark brown, lateral boundaries of scute brown reticulated. Coxae reddish yellow, free sternites reddish brown. Femora II—IV of the samo colour as coxae and trochanters, patellae II—III dorsally brown reticulated, tibiae, metatarsi and tarsi of legs II—IV dark brown. Distal articulations of femora and distal portions of tibiae II—IV yellowish white.

Holotype locality: Cuba, Sierra Maestra, Pico Turquino, 3—5000 ft, june 1936, Darlington coll.

Female, allotype:

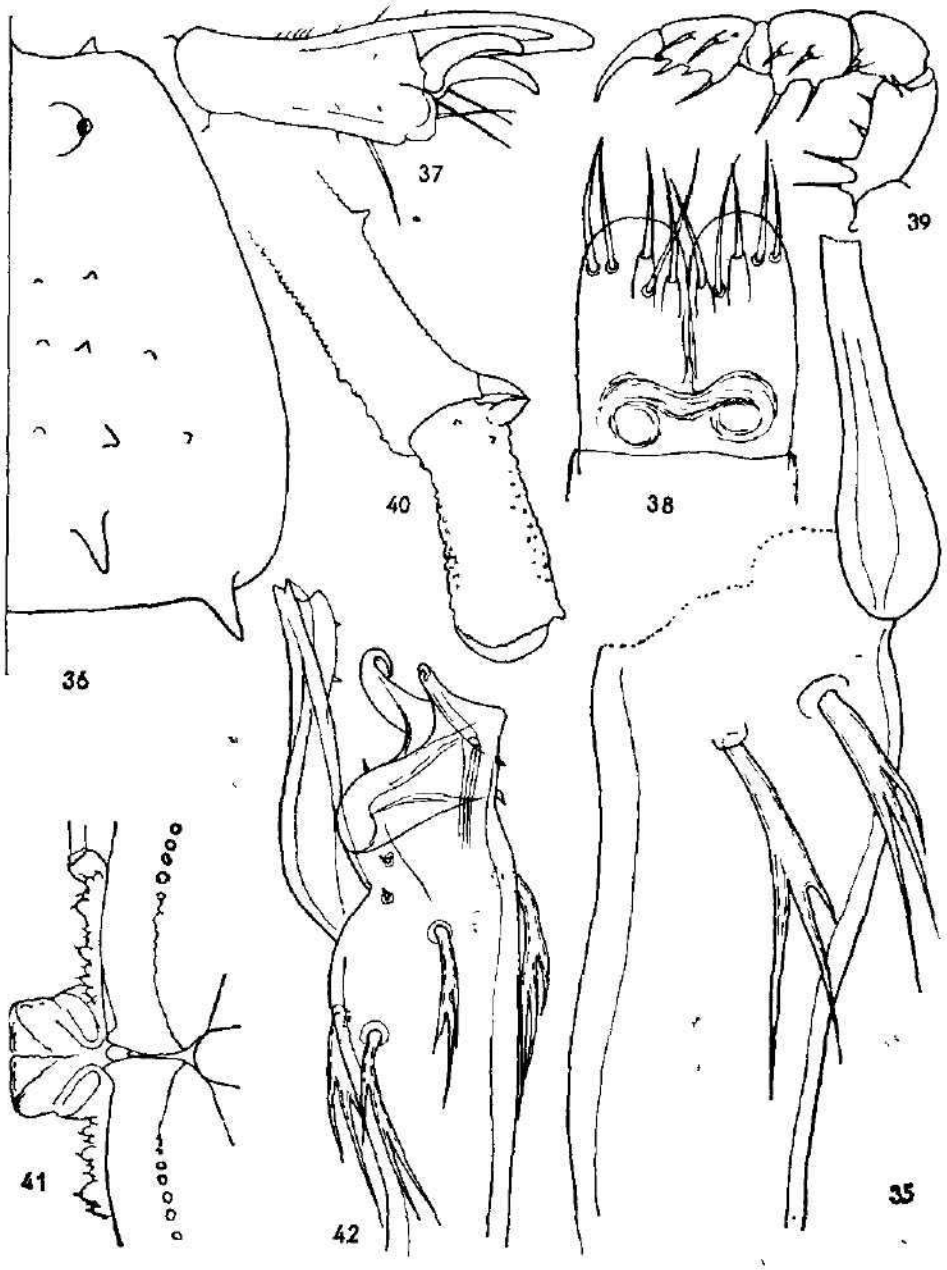
Body length 8.7 mm. Legs 15.0; 58.0; 38.0; 47.0 mm long, tarsal segments 9, 27, 8, 9. First distitarsi with 3, second with 5 segments. The colour of dorsum is darker, lateral spines of fifth area longer as those of male holotype.

Allotype locality: the same as of male holotype, from the same vial. No other males or females in the collection.

Yunquenus gen. n.

Eyemound with deep furrow, areas poorly distinct, first area with a low median wrinkle. Fourth area and second free tergite with a pair of spines, second and third free tergite and anal operculum with a median tooth. Legs very long. Tarsal segments' formula: 5, n, n, n, second distitarsus with 5—6 segments. Secondary sexual characters unknown.

Typus generis: *Yunquenus portoricanus* sp. n.

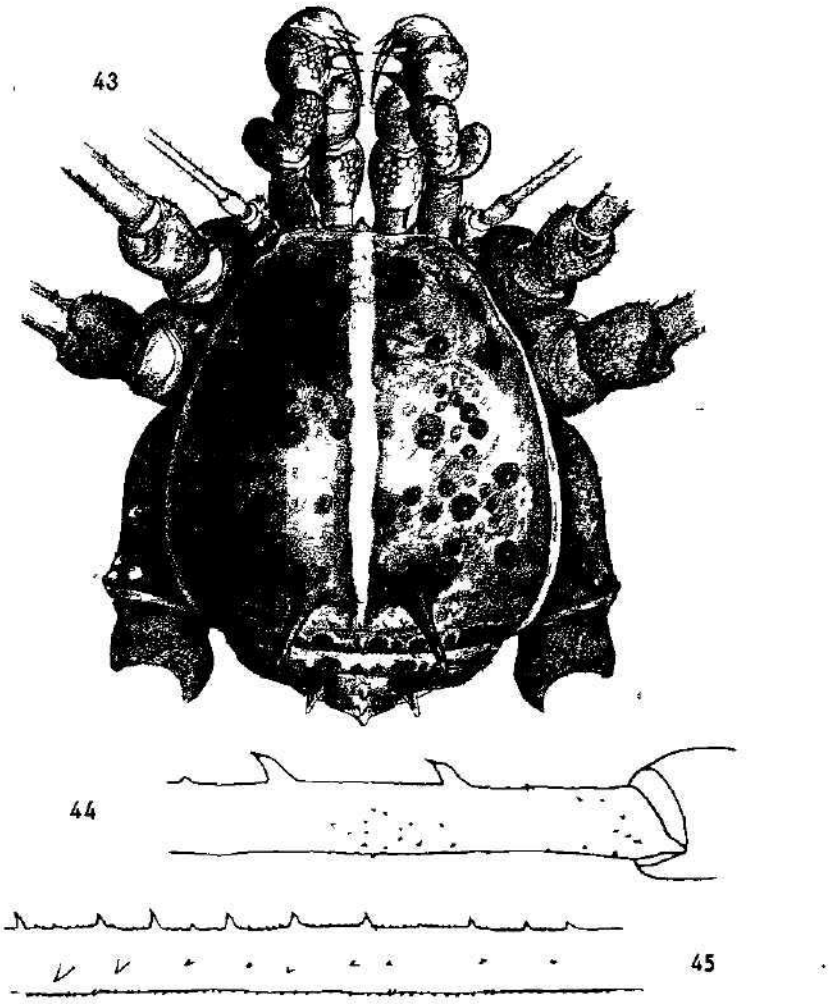


Figs 35–38. *Lichirtes hexapodoides* sp. n. 35 — lateral view of distal part of penis, holotype; 36 — scutum dorsale of female, allotype; 37 — distal segment of tarsus IV, male, holotype; 38 — ovipositor allotype.
Figs 39–42. *Yunquenus portoricanus* sp. n. 39 — medial view of pedipalpus, male, holotype; 40 — distal part of femur and patella IV; male, holotype; 41 — ventral view of sternum, male, holotype; 42 — lateral view of distal part of penis, male, holotype.

Yunquenus portoricanus sp. n. (Figs 39—45)

Male, holotype:

Body length 5.5 mm. Carapace, eyemound and dorsal scute finely granulated, spines under the frontal margin pointed. Eyemound near the frontal margin, with deep furrow. First area with median pair of pointed tubercles



Figs 43—45. *Yunquenus portoricanus* sp. n. 43 — dorsal view of male, holotype; 44 — basal part of femur IV, male, holotype; 45 — distal part of femur IV, male, holotype.

and a pair of paramedian situated teeth. Second area with four pointed tubercles, third area with a pair of long pointed spines. Fourth, fifth area and first free tergite with a row of pointed tubercles, second free tergite with a pair of low spines and a median tooth, third free tergite and anal operculum with a median tooth. Coxae and free sternites smooth. Maxillary lobe

of second coxae with a low ventral projection, fourth coxae dorsally with some pointed tubercles and dorsally apically with an obtuse tooth. Spiracles visible, free sternites unarmed.

Chelicerae of usual form, small. Basal segment with a smooth dorsal projection, distal segment medially with some hair pointed low tubercles.

Pedipalps 6.8 mm long. Trochanters unarmed, femora ventrally with four short spines, apically medially with one spine. Patellae medially with one spine, tibiae laterally and medially with two spines and apically with one lateral one and one medial spinebearing tubercle.

Legs very long: 11.0; 44.0; 28.0; 39.0 mm. Fourth femora dorsomedially and ventromedially with a row of unequal spines and a greater apical ventromedial spine, fourth patellae with one proximal medial spine. All segments of fourth legs with exception of tarsi with small denticules. Other legs unarmed, provided only with small dispersed hairs. Tarsal segmens: 5, 21, 8, 9—10, second distitarsi with 5—6 segments.

Genitals: Penis has the form shown in Fig. 42.

Secondary sexual characters unvisible.

Colour (in alcohol) yellowish brown. Chelicerae and pedipalps brown reticulated. A brownish white, brown darker marginated strip is lying from the frontal margin over the eyemound to the fourth area. Frontal portion of carapace dark brown, remaining part of dorsum yellowish brown with blackish brown spines and tubercles. Tops of spines on the third area as well as the median teeth on the second and third free tergite and on the anal plate lighter. On the I—III area there are lighter round rings. Venter brown marbled. Legs yellowish brown with darker unsharp reticulated rings.

Holotype locality: Portorico, El Yunque, 3000 ft, May 1938, Darlington coll.

No other specimens of this species in the collection.

Leiosteninae subfam. n.

With the characters of family. Scute without distinct areas. Legs very long and fine, third femora more longer than body. Pedipalps relatively long, armed, secondary sexual characteristics in enlarged chelicerae of males.

Typus subfamiliae: *Leiostenus* gen. n.

Leiostenus gen. n.

Eyemound broad, unarmed, near the anterior margin of carapace. All areas forming a scute, without distinct boundaries, unarmed as well as all free tergite and anal plate. Fourth coxae without apical spines. legs very long and fine.

Tarsal segments' formula: n, n, 6, n, second distitarsi with 3—4 segments. Secondary sexual characteristics in enlarged chelicerae of males.

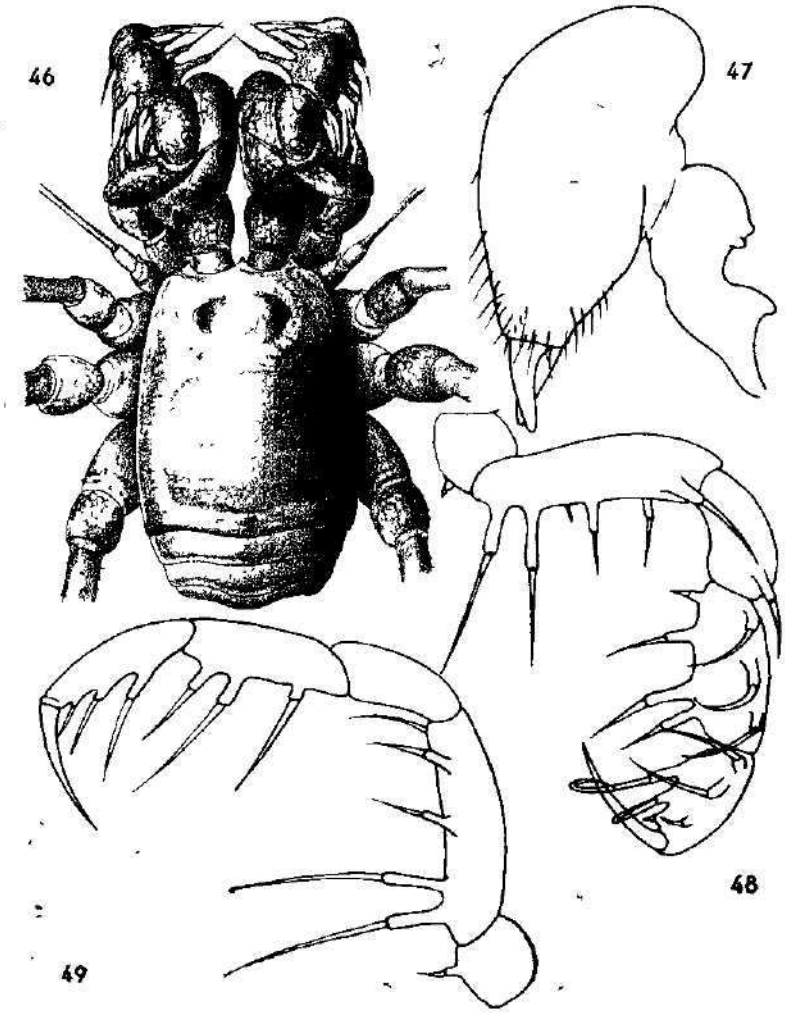
Typus generis: *Leiostenus leiobuniformis* sp. n.

Leiostenus leiobuniformis sp. n. (Figs 46—50)

Male, holotype:

Body length 4 mm. Frontal margin of carapace with two incisures for chelicerae, three spines jointed to the inferior margin. Eyemound without

median furrow, broad and low, elevated between the eyes. Scute without boundaries limiting areas, dorsum entire unarmed and smooth. First coxae with great hair pointed tubercles, maxillary lobes of second coxae with distinct ventral projektion, third coxae jointed by bridges with the second and fourth coxae only on the distal portion. Coxae II—IV and free starnites with a row of low tubercles. Spiracles visible.



Figs 46—49. *Leiostenus leiobuniformis* sp. n. 46 — dorsal view of **male, holotype. 47 — lateral** view of chelicera, male, holotype; 48 — medial view of pedipalpus, **male, holotype; 49 — lateral** view of pedipalpus, male, holotype.

Chelicerae of usual form but very enlarged. Basal segments with dorsal projection, which is provided at both lateral and medial posterior corners with small obtuse tooth, granulated and with several pointed tubercles. Second segments 2.8 mm long.

Pedipalps 7.6 mm long, dorsally unarmed. Trochanters ventrally with one hair pointed tubercle, femora ventrally with four long spines (the longest is 1 mm) and one apical medial spine, patellae with one medial spine, tibiae and tarsi with three lateral and three medial spines.

Legs 22.8; 55.0; 34.0; 48.0 mm long, very fine. Femora II—IV with the slightest denticuli, all other segments and legs I only with fine hairs. Tarsal segments: 8, 23, 6, 8, second distitarsi with 3—4 segments.

Genitals: Penis of the form shown in Fig. 50.

Secondary sexual characters in enlarged chelicerae.

Colour (in alcohol) yellowish brown. Dorsal portion of basal segment of chelicerae brownish, all padipalp-segments dorsally light brownish reticulated. Eyemound and anterior portion of carapce brown marbled, scute and free tergites yellowish brown with darker later boundaries. Coxae light brown reticulated, boundaries of free sternites brown. Legs yellowish brown, distal portions of femora, patellae and tarsi darker.

Holotype locality: Trinidad, N. A. Weber coll. (without other information).
Male, paratype in the same vial.

Female, allotype:

Body length 4.2 mm, exsicated. Only first left tarsus with 8 segments and right third tarsus with 7 segments resting. It was not possible to prepare the ovipositor. Body morphologically resembling male holotype.

Allotype locality: Trinidad, Guacharo caves, 23. IV. 1916 (without other information).

Biantidae Thor., 1884

Caribbiantinae subfam. n.

With the main characters of the family: Frontal margin broad, carapace and scute rectangular. Without common eyemound, eyes lying on the lateral boundaries of carapace. Five areas, first area mostly with median line. Pedipalps long, dorsally unarmed, apical portion of their coxae conically prolonged. Femora mostly unarmed, long and fine, patellae in the form of club, tibiae and tarsi short and broad, with long lateral and medial spines. Tarsal claws long, fine and curved. Chelicerae of usual form, unarmed. Legs thin, cylindrical and unarmed, tarsi III and IV with scopulae, tarsal claws double, simple, lying in a level transverse to the axis of the leg. First distitarsi with 3, second with 4 segments. First coxae with a row of rough granules, maxillary lobe of second coxae with or without ventral projection, spirales visible. Secondary sexual characteristics in enlarged chelicerae and spindled third metatarsi of males.

Typus subfamiliae: *Caribbiantes* gen. n.

Key to the genera

1. First area with a median line 2
– First area without median line ..... *Bidoma* gen. n.
2. Area IV with two median arising and jointed spines. ..... *Vestitecola* gen. n.
– Area IV without jointed spines 3
3. All areas and free tergites only with tubercles ..... *Manahunca* gen. n.
– Some areas or free tergites with a pair of spines 4
4. Third free tergite with one median spine..... *Martibianta* gen. n.
– Third free tergite with a pair of spines 5
5. On the areas III and IV a pair of spines of the same length ..... *Caribbiantes* gen. n.
– On the area III a pair of tubercles and on the area IV a pair of spines ..... *Galibrotus* gen. n.

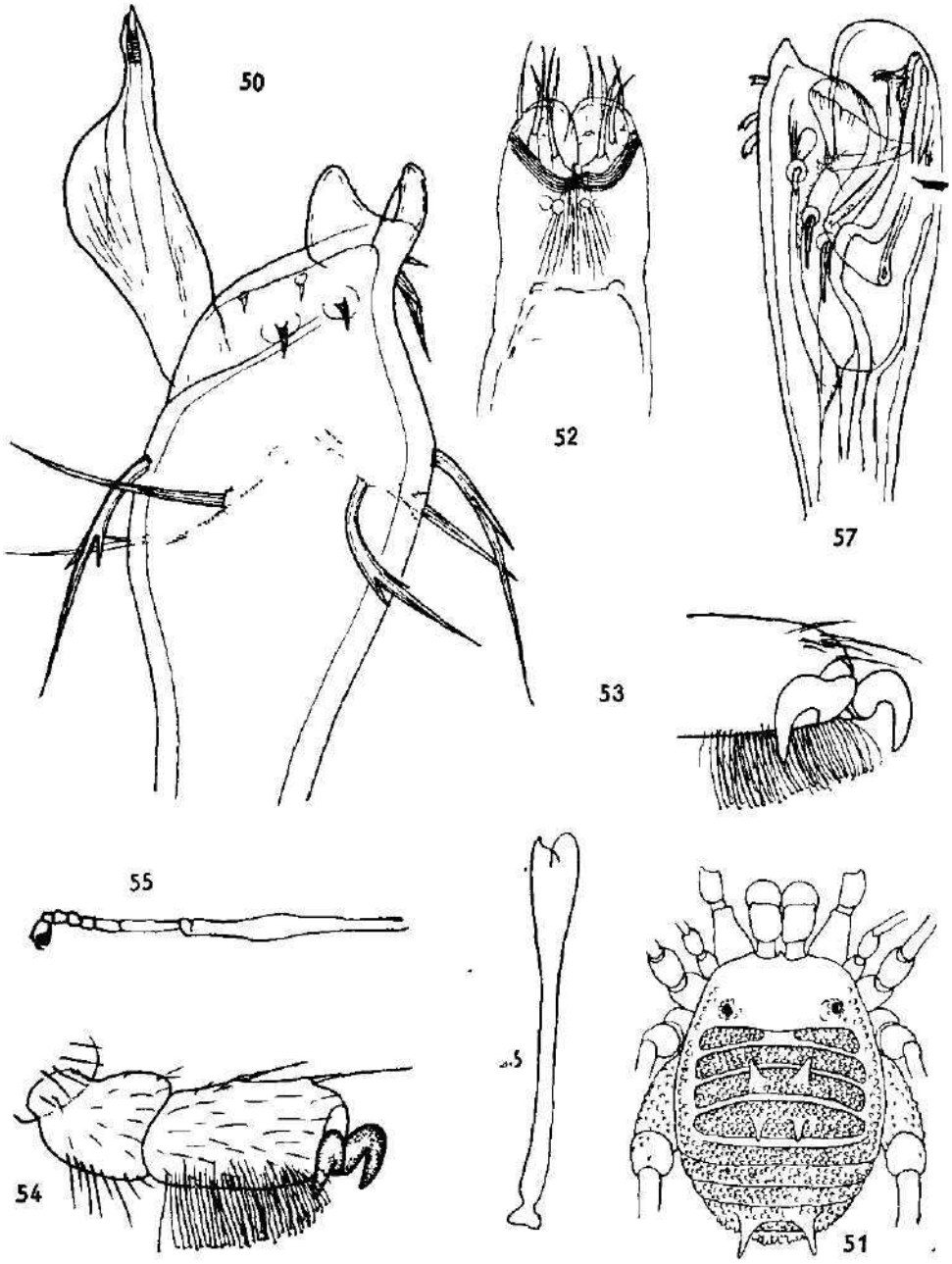


Fig. 50. Leiostenus leiobuniformis sp. n. — lateral view of distal part of penis, holotype.
Figs 51—57. *Carabbiantes cubanus* sp. n. 51 — dorsal view of female, allotype; 52 — Ovipositor, allotype; 53, 54 — distal part of tarsus IV, male, holotype; 55 — distal part of metatarsus and tarsus IV, male, holotype; 56 — total view of penis, holotype; 57 — view of distal part of penis, holotype.

First area with a median spine, third and fourth area as well as third free tergite with a pair of median spines. Patellae of pedipalps with one medial spine, tibiae with four lateral and four medial spines. Tarsal segments' formula: n, n, n, n.

Typus generis: *Caribbiantes cubanus* sp. n.

Caribbiantes cubanus sp. n (Figs 51—58)

Male, holotype:

Body length 2.2 mm. Carapace granulate, two eyemounds separated and situated near the deep furrow at the posterior margin of carapace. Areas distinct, first area with a median line roughly granulated as well as the second area. Third and fourth area with a pair of obtuse median spines, laterally with rough granules, fifth area as well as the boundaries of scute with two rows of granules. First and second free tergite with a row of rough granules, third free tergite with a pair of divergent median spines, anal operculum granulate. Coxae roughly granulate, maxillary lobe of second coxae without ventral projection, third coxae at the distal portion with a row of bridges joining its boundaries with second and fourth coxa. Free sternites with a row of tubercles.

Chelicerae enlarged, unarmed, basal segment with a smooth dorsal projection.

Pedipalps 3.8 mm long, dorsally unarmed. Trochanters ventrally with a small spine, femora ventrally with some pointed tubercles, patellae in the form of club, medially with one spine, tibiae with four medial and four lateral spines, tarsi with three lateral and two medial spines.

Legs 5.9; 12.0; 8.0; 11.0 mm long, fine, cylindrical and unarmed. Trochanters, femora, patellae and tibiae of legs II—IV granulate, first lags and remaining segments only with hairs. Calcanei indistinct. Distal portion of third metatarsi in the form of spindle. Tarsal segments: 7, 12, 7, 7.

Genitals: Penis of the form shown in Figs 56, 57.

Secondary sexual characters in enlarged chelicerae and spindled third metatarsi.

Colour (in alcohol). Carapace yellowish red, distal portion brown marbled. Areas and free tergites brown, spines brown with lighter points. Boundaries of areas lighter, yellowish brown. Chelicerae yellowish red, distal segments darker. Pedipalps yellowish white, distal portion of femora and proximal portion of patellae blackish brown. Legs yellowish, brown reticulated, distal portion of femora and middle portion of tibiae with lighter mottling. Venter yellowish red, free tergites brown.

Holotype locality: Cuba, Cienfuegos, Soledad, I—II—VII 1936, Darlington coll.

Female, allotype:

Body length 2.8 mm Colour lighter, in other details resembling to male holotype. From the same vial.

Male, paratype from the same locality, body length 2.2 mm. Differing from male holotype by not so enlarged chelicerae.

Other specimens: one male and one female from Cuba, Cienfuegos, Soledad, aug. 12—13 1931, Waxley coll.

First area with a median line, fourth area and third free tergite with a pair of median spines. Tibiae of pedipalps laterally with four, medially with three spines. tarsal segments' formula: 6—n, n, n, n.

Typus generis: *Galibrotus carlotanus* sp. n.

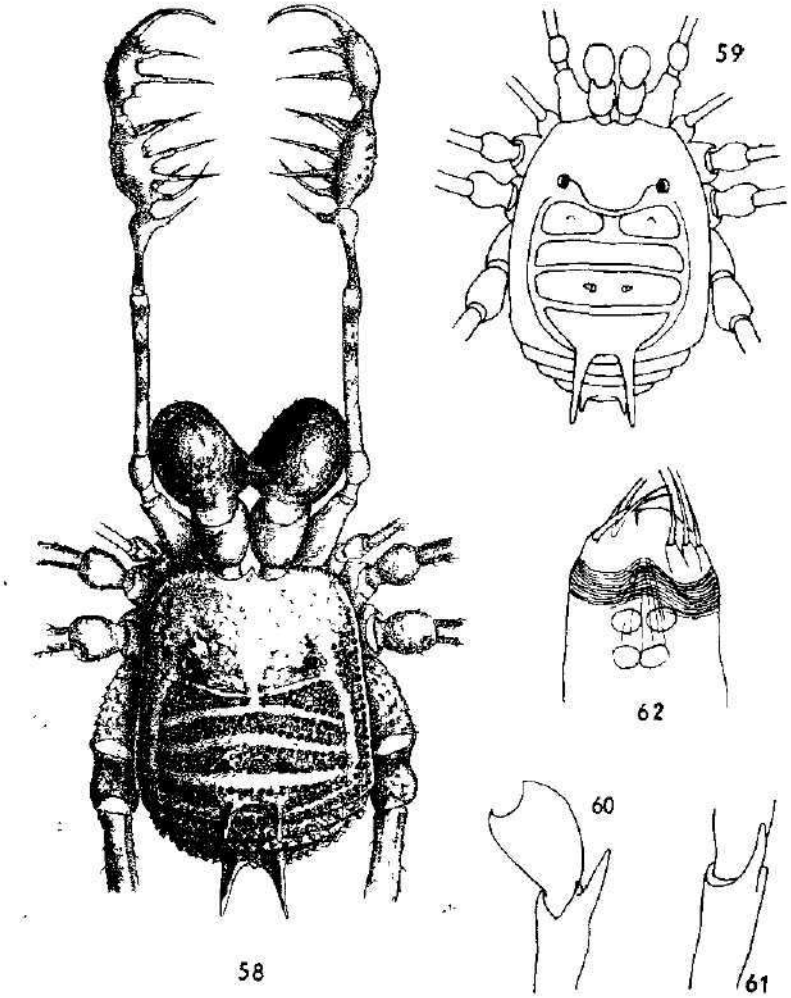


Fig. 58. — *Caribbiantes cubanus* sp. n. — dorsal view of male holotype.
Figs. 59—62. *Galibrotus carlotanus* sp. n. 59 — dorsal view of female, holotype; 60 — distal part of femur and patella III, female, holotype; 61 — distal part of femur and patella IV, female, holotype; 62 — ovipositor, holotype.

Two species from Cuba:

Femora II—IV dorsally apically with long spine. Spines on the third free tergite shorter than these of fourth area ..... *G. carlotanus* sp. n.
Femora II—IV without apical spines, spines on the third free tergite of the same length as these of fourth area ..... *G. riedeli* sp. n.

Galibrotus carlotanus sp. n. (Figs 59—62)

Female, holotype:

Body length 2.0 mm. Carapace finely granulated. Areas distinct, first area with a median line. Boundaries of scute with two rows of tubercles. All areas granulated, third area with a pair of short median spines, fourth area with a pair of long and thin pointed spines. Fifth area and free tergites I—II with a row of greater granules. Third free tergite with a pair of short median spines, anal operculum granulated. Coxae slightly granulate, maxillary lobe of second coxae with a small ventral projection, third coxae at the distal portion with a row of bridges joing its boundaries with second and fourth coxa. Free sternites with a row of low tubercles. Spiracles visible.

Chelicerae not enlarged, basal segment with a finely granulated dorsal projection.

Pedipalps 3.0 mm long, dorsally unarmed. Trochanters ventrally with a spinebearing tubercle, femora ventrally at the basal portion with some hair pointed tubercles, patellae in the form of club, medially with one spine, tibiae laterally with four, medially with three spines, tarsi with three lateral and two medial spines.

Legs: 4.5; 10.5; 7.0; 9.5 mm long. Femora II—IV dorsally apically with long spine, other segments and first legs unarmed, only with hairs. Third metatarsi not enlarged. Tarsal segments: 6, 11, 8, 8.

Genitals: ovipositor of the form shown in Fig. 62.

Colour in alcohol yellowish brown. Carapace brown bordered and brown marbled. Areas and free tergites brown marbled, spines on the third area dark brown, other spines lighter. Venter light brown reticulated. Chelicerae yellowish, pedipalps yelowish too with two brown mottlings on femora, distal portion of patellae and tarsi brownish. Legs yellowish with brown mottlings.

Holotype locality: Cuba, Mina Carlota, Trinidad mts, 10.–15. VII. (19??), Parsons coll.

No other specimens in the collection.

Galibrotus riedeli sp. n. (Fig. 63)

Male, holotype:

Body length 2.2 mm. Carapace finely granulated, with some tubercles on lateral portion of frontal margin. Areas granulated, first area with a median line. First area with a pair of lateral tubercles, third area with a pair of median, but separated short spines, fourth area with a pair of long spines, fifth area with a pair of short median obtuse spines and a row of greater tubercles. Boundaries of scute with two rows of tubercles. Free tergites with a row of tubercles, first free tergite with a short and obtuse median spine, third free tergite with a pair of spines. Anal operculum granulated. Coxae with low tubercles, maxillary lobe of second coxae without ventral projection. Free sternites with a row of low tubercles.

Chelicerae not enlarged and unarmed, basal segment with finely granulate dorsal projection.

Pedipalps 4.4 mm long, dorsally unarmed. Trochanters ventrally with two hair pointed tubercles, femora ventrally with some very small and low hair pointed tubercles, patellae medially with one spine, tibiae laterally with four,

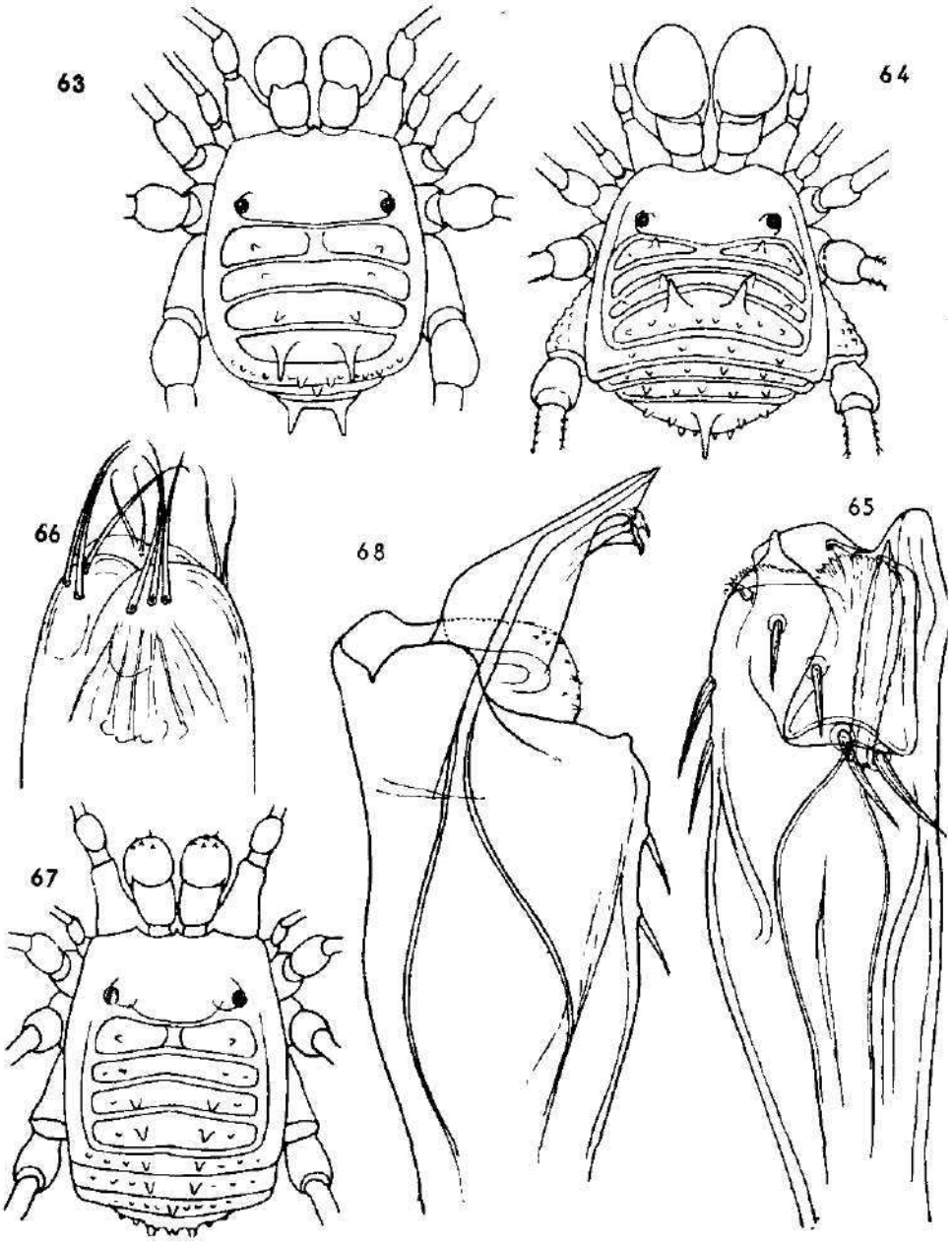


Fig. 63. *Galibrotus riedeli* sp. n. — dorsal view of male, holotype.
Figs. 64—66. *Martibianta virginsulana* sp. n. 64 — dorsal view of male, holotype; 65 — dorsal view of distal part of penis, holotype; 66 — ovipositor, allotype.
Figs 67—68. *Manahunca bielawskii* sp. n. 67 — dorsal view of male, holotype; 68 — lateral view of distal part of penis, holotype.

medially with three spines, tarsi laterally with four, medially with four spines.

Legs 6.0; 16.8; 9.8; 15.5 mm long, unarmed, clothed only with hairs. Third metatarsi enlarged in the form of spindle. Tarsal segments: 7, 12—13, 8, 8.

Genitals: Penis not net developed.

Secondary genital characters in the third metatarsi.

Colour (in alcohol). The specimen — holotype is young, with not very chitinised cuticula and not yet very pigmented. Colour of body and extermities yellowish with brown pattern. Areas and free tergites with lateral brown flecks, spines and tubercles white. Venter yellowish, free sternites brownich. Chelicerae yellowish, pedipalps and legs with undistinct brownish mottlings.

Holotype locality: Cuba, prov. Oriente, Sierra de Nipe, Rio Piloto, 4. II. 1967, R. Bielawski et A. Riedel coll.

No other specimens of this species.

Martibianta gen. n.

First area with median line, fourth area with a pair of long spines, third free tergite with one long median spine. Pedipalps with tibiae armed laterally with five, medially with three spines. Tarsal segments' formula: 5—n, n, n, n

Typus generis: *Martibianta virginsulana* sp. n.

Martibianta virginsulana sp. n. (Figs 64—66)

Male, holotype:

Body length 2.2 mm. Carapace finely granulated. Eyemounds with greater granules, as well as areas. First area with median line and two lateral hair pointed tubercles, third area with two median tubercles, fourth area with a pair of median spines and a posterior row of pointed tubercles. Fifth area with a row of pointed tubercles, boundaries of scute with two rows of small tubercles. First and second free tergites with a row of pointed tubercles, third free tergite with one modian spine and four pointed tubercles, the lateral are greater. Anal operculum with two high obtuse tubercles, granulated. Coxae with low tubercles which are on the first coxae greater. Maxillary lobe of second coxae without ventral projection, third coxae with lateral rows of bridges, free sternites with a row of tubercles which are on the distal sternites long and obtuse. Spiracles not very distinct.

Chelicerae of usual form, very enlarged, basal segment with smooth dorsal projection.

Pedipalps 3.5 mm long, dorsally unarmed. Trochanters ventrally with two hair pointed tubercles, femora with one basal ventral hair pointed tubercle, othervise only with some hairs. Patellae medially with one spine, tibiae laterally with five spines, medially with three spines, tarsi laterally with four, medially with four different spines.

Legs 5.0; 10.4; 7.4; 10.6 mm long. Femora, patellae and tibiae of legs II—IV with irregular rows of hair pointed tubercles, first legs and metatarsi and tarsi of legs II—IV only with hairs. Femora II—IV dorsally apically with one spine, metatarsi III enlarged in the form of spindle. Tarsal segments: 5, 9—11, 8, 8.

Genitals: Penis of the form shown in Fig. 65.

Secondary sexual characters in enlarged chalicerae and third metatarsi.

Colour (in alcohol). Dorsum yellowish with dark brown patterns. Carapace brown marbled, areas brown with lighter flecks and lighter boundaries between single areas and boundaries of scute, tubercles yellowish. Free tergites brown with lighter boundaries and tubercles. Venter dark brown, coxae with lighter spots. Chelicerae yellowish with blackish brown lateral and medial reticulations. Pedipalps yellowish light with basal and apical mottling on femora and patellae. Legs brown with lighter mottlings in the distal portion of femora, basal and middle portion of tibiae and patellae brown reticulated.

Holotype locality: Virgin Islands, St. John, Cruz Bay. Feb.-Mar. 1964, Chickering coll.

Female, allotype:

Body length 2.4 mm, tarsal segments: 7, 11—12, 8, 8, first distitarsi with three, second with four segements, othervise not differing from the male holotype.

Allotype locality the same as of holotype, from the same vial.

Other two specimens from the same locality and collector. Male of body length 2.5 mm, tarsal segments: 6, 12, 8, 8. Differing from male holotype in not enlarged chalicerae. Female of body length 2.5 mm with tarsal segments 6, 11, 8, 8. In other characteristics not differing from types.

Manahunca gen. n.

First area with median line. Areas and free tergites without spines, only with tubercles. Tibiae of padipalps laterally with four, medially with three spines. Tarsal segments' formula: 6, n, n, n.

Typus generis: *Manahunca bielawskii* sp. n.

Manahunca bielawskii sp. n. (Figs 67, 68)

Male, holotype:

Body length 2.2 mm, carapace finely granulated with several low tubercles on the anterior portion. Areas roughly granulated, first area with a median line and a pair of low lateral tubercles. Third, fourth and fifth area with a median pair of pointed tubercles (the greatest on the fourth area). Boundaries of scute granulated. Free tergites with a row of granulations. First and third with two median pointed tubercles (on the third free tergite greater), second tergite with one median pointed tubercle. Anal operculum granulated.

Coxae with low tubercles, first coxae with greater ones. Maxillary lobe of second coxae without ventral projection, free sternites with a row of tubercles.

Chelicerae of usual form, basal segment with low dorsal projection, smooth.

Pedipalps 4.7 mm long, dorsally unarmed. Trochanters ventrally with two hair pointer tubercles, femora ventrally at the basal portion with some low hair pointed tubercles, patellae medially with one spine, tibiae laterally with four, medially with three spines, tarsi medially and laterally with four unequal spines.

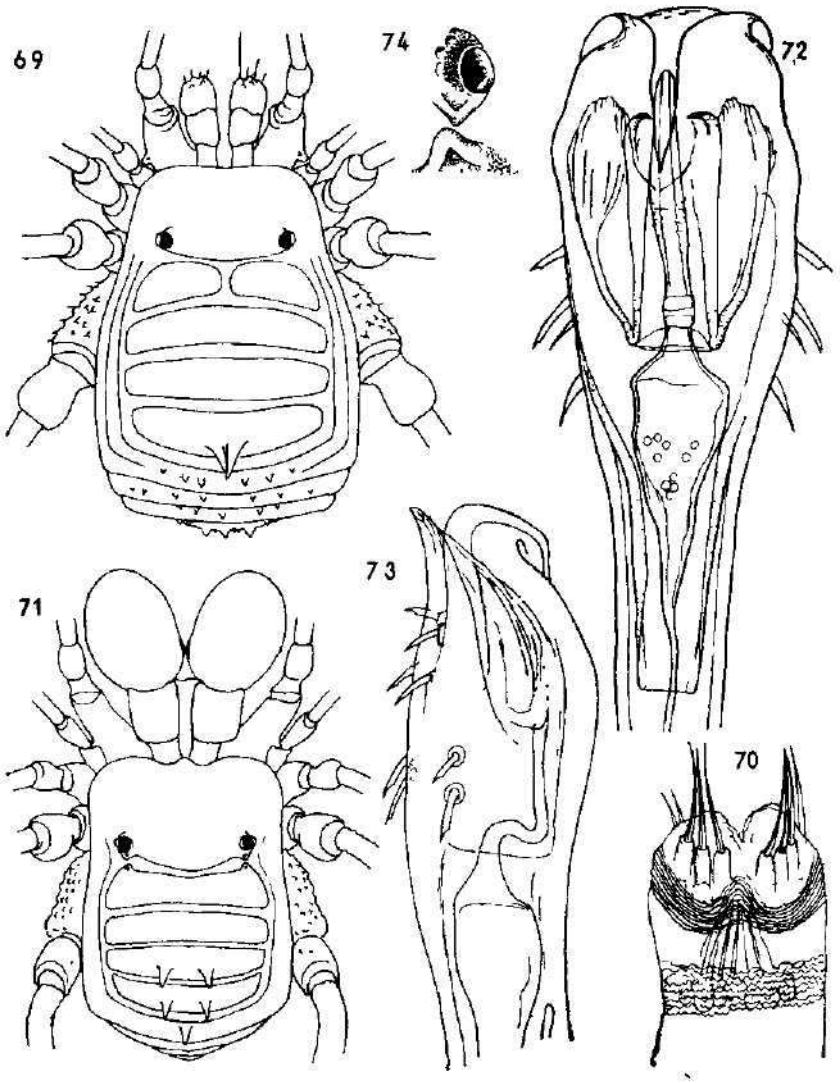
Legs 6.5; 13.6; 9.0; 12.8 mm long, unarmed, all segments only with hairs. Third metatarsi enlarged in the form of spindle. Tarsal segments: 6, 13—14, 8, 9.

Genitals: Penis of the form shown in Fig. 68.

Secondary genital characters in enlarged third metatarsi.

Colour (in alcohol) yellowish with brown patterns. Carapace laterally brown merbled, median portion light yellowish. Areas I—IV brown, in the middle lighter and with a pair of lateral light brown round flecks, fifth area only with one median spot. Boundaries of scute and free tergites brown.

Coxae on the anterior and distal portion brown with light spot, free ster-



Figs 69—70. *Vestitecola hautensis* sp. n. 69 — dorsal view of female, holotype; 70 — ovipositor holotype.

Figs 71—74. *Bidoma indivisa* sp. n. 71 — dorsal view of male, holotype; 72 — dorsal view of distal part of penis, holotype; 73 — lateral view of distal part of penis, holotype; 74 — right eye with adjacent tooth on area I, male, holotype.

nites brown. Chelicerae brown reticulate, pedipalps brown, its tibiae in the middle lighter. Legs brown with yellowish rings at the distal portion of femora and tibiae.

Holotype locality: Cuba, Prov. Oriente, Mts. La Gran Piedra, 1100—1200 m, under stones. 7. II. 1967. R. Bielawski et A. Riedel coll.

In the collection one paratype specimen, unadult, and another specimen from the same locality, which is damaged (missing distal portion of abdomen and some legs). Tarsal segments: ?, 13—14. 8, 8.

Vestitecola gen. n.

First area with median line, fourth area with two median touching spines jointed in one formation. All other areas and free tergites without spines. Tibiae of pedipalps laterally with four, medially with three spines. Tarsal segments' formula: 6, n, n, n.

Typus generis: *Vestitecola haitensis* sp. n.

Vestitecola haitensis sp. n. (Figs 69, 70)

Female, holotype:

Body length 2.8 mm. Carapace granulated as well as areas. Third area with a pair of low median tubercles, fourth area with median spine composed from two. Boundaries of scute with two rows of granules, fifth area with two rows of granules and some greater pointed tubercles. Free tergites with a row of granules and some greater pointed tubercles, anal operculum with low tubercles. Coxae with small tubercles, maxillary lobe of second coxae with low ventral projection, free sternites with a row of low tubercles.

Chelicerae of normal form, basal segment with smooth dorsal projection, distal segment dorsally with some very low hair pointed tubercles.

Pedipalps 3.5 mm long, dorsally unarmed. Trochanters ventrally with two hair pointed tubercles, femora only with hairs. Patellae medially with one spine, tibiae laterally with four, medially with three spines, tarsi laterally and medially with two spines.

Legs 4.3; 8.0; 5.9; 7.8 mm long, femora, patellae and tibiae with small hair pointed tubercles. Other segments only with hairs. Third and fourth femora curved in the form of S. Tarsal segments: 6, 9, 7, 8.

Genitals. Ovipositor of the form shown in Fig. 70.

Colour (in alcohol) yellowish brown. Carapace marbled, area I—IV dark brown, on the middle lighter, fifth area, boundaries of scute and free tergites brown, spine-formation on the fourth area dark brown, coxae with lighter spots. Chelicerae yellowish brown. Femora of padipalps brown, their distal portion lighter. Patellae, tibiae and tarsi light yellowish. Legs: trochanters with brown rings, femora brown, on the distal portion darker, patellae dark brown, tibiae light brown with three darker rings.

Holotype locality: Haiti, La Vestite, 16—23. IX. 1936, Darlington coll.
No other specimens of thus species in the collection.

Bidoma gen. n.

First area without median line. Third and fourth area with a pair of median spines, fifth area with one median spine. Tibiae of pedipalps laterally with five spines, medially with three spines. Tarsal segments' formula: 6, n, n, n.

Typus generis: *Bidoma indivisa* sp. n.

Bidoma indivisa sp. n. (Figs 71—74)

Male, holotype:

Body length 2.5 mm. Carapace granulate. Eyemounds situated at the posterior margin of carapace and each provided with a posterior tooth corresponding to similar tooth situated opposite at the anterior margin of first area. Areas granulated, third and fourth area with a pair of median obtuse spines, which are on the third area longer and on their lateral sides is situated a pair of short spines. Fifth area with rows of tubercles and one median spine. Free tergites with row of tubercles, from which the median is greater. Anal operculum tuberculated. Coxae with tubercles, first coxa with a row of small teeth. Maxillary lobe of second coxae with distinct ventral projection, third coxae on distal portion with a lateral row of bridges, fourth coxae with a posterior row of tubercles. Free tergites with tubercles.

Chelicerae of usual form, very enlarged. Basal segments with smooth dorsal projection.

Pedipalps 4.7 mm long, dorsally unarmed. Trochanters with two short teeth, femora with one short tooth on the basal portion. Patellae medially with one spine, tibiae dorsally granulated, laterally with five spines, medially with three spines. Tarsi laterally with four unequal spines, medially with two.

Legs 6.0; 11.2; 7.7; 11.2 mm long. Femora, patellae and tibiae granulated, other segments only with hairs. Third metatarsi enlarged in the form of spindle. Tarsal segments: 6, 10, 7, 7.

Genitals: Penis of the form shown in Fig. 72—73.

Secondary sexual characters in enlarged chalicerae and third metatarsi.

Colour (in alcohol) yellowish red. Boundaries of scute, free tergites and free sternites darker. Chelicerae yellowish red, padipalps light yellowish.

Femora, patellae and tibiae with darker rings.

Holotype locality: Haiti, Grand Riviere, January 1913, W. M. Mann coll.
No other specimens in the collection.

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LA STRUCTURE ET LA FONCTION DU NERF ALLATE CHEZ GRYLLUS DOMESTICUS LATR. (ORTHOPTERA)

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Abstract: The structure of the nervus allatus in the criquet *Gryllus domesticus* and the effects of its unilateral interruption were studied by general histological techniques including staining with paraldehyd-fuchsine (modification Gabe). For this reason, the nervus allatus has been subdivided into four sections: A and B, corresponding to the earlier indication n.a. I and C and D corresponding to n.a. II. The disposition of the neurosecretory granules in the individual sections in various periods after moulting and the operation has been registred. Special attention has been paied to the enlargement of the nervus allatus C, which has been viewd as a secondary neurohaemal organ specific for the family Gryllidae. Its agreement in many structural characters with the segmentary neurohaemal organs described in most insects has been suggested. The experimental breaking of the nervus allatus D results in a temporary disappearing of the neurosecretion from all three anterior sections of the nerve. No neurosecretion was ever observed in the section D.

Le nerf allate reliant le corps cardiaque avec le corps allate et le ganglion sous-oesophagien est signalé dans plusieurs travaux, mais on n'a pas encore precisé sa structure et son rôle. Bounhiol (1957), Nayar (1958), Schultz (1960), et des autres remarquent une hypertrophie du corps allate à la suite de l'interromption du nerf cardiaque chez Leucophaea maderae, tandis que chez *Calliphora*, la mème cause détermine son atrophie (Scharrer, 1952, Thomsen, 1952). Strong (1965) au contraire a montré chez *Schistocerca gregaria*, au'après le mème traitment, c'est le corps allate opposé, qui s'atrophie. La glande correspondante reste normale, donnant ainsi l'impression fausse d'être hypertrophié en comparaison avec la symmetrique.

Les immages de microscope éléctronique montrent, que parmi les cellules du corps allate de *Leucophaea* pénètrent des terminaisons nerveuses neurosécrétrices (B. Scharrer, 1961, 1962). On soutient encore chez Gryllus domesticus, que le nerve allate transporte de la neurosécrétion vers le ganglion sous-oesophagien ou dans la direction contraire (Belyaeva, 1964). La mème autrice a décrit un épaississement du nerf allate entre le nerf allate et le ganglion sous-oesophagien. La même structure a été observée par Awasthi (1968) chez Grillodes sigillatus, dans sa description détaillée du nerf allate chez cette espece. Il nous semble qu'on peut attribuer à cette épaississement une fonction d'un organe neurohémal sécondaire, tandisque le nerve maintient son rôle neurovégétative initiale.

Il reste encore baucoup à expliquer dans ce problème, par example la structure détaillée de l'épaississement et sa fonction dans des périodes et

conditions différentes; est-ce qu'une neurosécrétion passe entre cet épaississement et le ganglion sous-oesophagien; est-ce aussii de cet ganglion d'où provient la neurosécrétion ou du cerveau seulement. C'est à apporter de la lumière dans ces questions ce qui est le bût de ce travail.

MATÉRIEL ET TECHNIQUE

Pour les expériments, les adultes, males et femelles, de *Gryllus domesticus* Latr. ont été utilisés. Les complexes rétrocérébraux ont été dissectés dans la solution physiologique de Ringer (Insect-Ringer, comp. Novák, 1966) et c'était dans cette solution, que le liquide fixateur (Bouin ou Helly) a été apliqué par une pipette et seulement apres ça lés complexes ont été transmis dans le fixateur pure pour le temps necessaire. Pour la coloration des coupes de paraffine, les méthodes suivantes ont été utilisées: hémalaun-éosine, azan, paraldehide-fuesine (modification Gabe, 1952).

Pour les expériences, nous avons coupé le segment terminal du nerf allate (n.a. D) en séparant, par une incision dans la régione cervical dorsal, le ganglion sous-oesophagien du reste de la voie neuroendocrinienne rétrocérébrale. Les insectes anesthésiés par immersion dans l'eau ont été opérés rapidement dans une solution physiologique. Apres l'opération, les animaux ont repris peu à peu leur vie normale et ont été dissectés et fixés aux intervalles suivants: 6, 12, 18, 24, 72 heures et à 9 jours après l'opération. Pendant ce temps, ils ont été maintenus dans les conditions habituelles de temperature et d'humidité.

LA STRUCTURE DU NERF ALLATE

Les corpora cardiaca et allata de *Gryllus domesticus* sont réunis avec le ganglion sous-oesophagien par le nerf allate. La partie anterière de ce nerf sortant du corps cardiaque jusque à son sorti du corps allate a été connue sous la dénomination de nervus allatus I et le rest jusque an ganglion sous-oesophagien comme nervus allatus II. Pour facilité une description plus détaillée de ce nerf, nous avons partagé chaque de ces deux parties encore en deux sections. Ainsi, nous avons maintenu les quatre segments suivants: n.a. I A et B et n.a. II C et D, d'après la dénomination quelle suive.

Nervus allatus I A est la section du nerf de son sorti du corps cardiaque jusque au point où il touche le corps allate. Chez Gryllus il est assez court et, auprès de fibres nerveuses, il contient deux sortes d'éléments névrogliques: des gliocytes aplatis, situés le long des neurites et rapellant des cellules de Schwann et des gliocytes arrondis, formants une couche épitheliale péripherique, ressemblante aux cellules cromophiles du corps cardiaque. Cette ressemblance est tellement frappante, qu'il est difficile de distinguer ces deux sortes de cellules à l'émergence du nerf du corps cardiaque (Pl. I, fig. 2 a). Dans le cytoplasme de ces cellules, ainsi que dans le cytoplasme des cellules gliales périphériques, on remarque le même produit paraldehide-fucsine positive, qui paraît se diriger vers l'hémolymphe (Pl. 1, fig. 3, 4). Les grains de cette sécrétion présents dans les neurite du nerf allate sont petits, isolés, quelquefois agglutinés (Pl. 1, fig. 4 b). Parmi eux, on trouve aussi des grains faiblement colorés.

Nervus allatus I B se continue en semicircle sûr la surface du corps allate avant de se prolonger par le troisième segment du nerf allate. À cause de son trajet le long le surface ovoïde de cette glande, on ne le rencontre pas que très rarement dans les coups histologiques longitudinales. Il est moin épais que le premièr segment (n.a. I A), car quelques unes de ses fibres restent dans le corps allate ramifiés entre ses cellules. En connection avec cela, nulle gaine gliale du nerf a été observée sur la face interieure, au contact avec des cellules de la glande. Les cellules gliales de la face externes de cette

section contiennent quelques graines paraldehide-fucsine positive, mais moins nombreues que les autres cellules gliales du nerf. La présence de la neurosécrétion dans les fibres nerveuses du nerf allate permet de localiser leur trajets, soit entre les cellules du corps allate, soit le long du nerf, ou ils continuent vers son troisième segment.

Nervus allatus II C est presque sept fois plus long que le suivant, dernier segment. Il représente la plus longue et la plus large partie du nerf allate. Son épaississement s'accroît lentement vers la moitié de cette section et puis il décroit de nouveau quand il approche la section terminal du nerf. Dans l'épaississement, les fibres nerveuses sont groupées le long de l'axe longitudinale du nerf. Les granules neurosécrétrices forment des trajets moniliformes ou bien des ammas paraldehide-fucsine positifs entre les cellules gliales arrondies; quelques grains se concentrent dans la gaine périphérique (Pl. 1, fig. 5, 6, 7). Les gliocytes forment deux a trois assises cellulaires surposées. C'est la disposition de ces cellules qui détermine pour la pluparte l'épaississement de ce segment du nerf allate. Dans les autres régions, le revêtement gliale du nerf est simple, réduit à une seule assise cellulaire. Fréquement, quelques vacuoles apparaissent dans les graines de neurosécrétion qu'on peut voir quelquefois fondre dans le contenu de ces vacuoles. D'autres grains arrivent jusque'à la périphérie du nerf semblant traverser la gaine superficiale et passer dans l'hémolymphe.

Il semble bien possible, que les gliocytes jouent un rôle complexe dans le passage de la sécrétion à travers la périleme: 1 — de faire soluble la neurosécrétion accumulée en reserve dans l'épaississement; 2 — de faire passer cette neurosécrétion ou la plupart des neurohormones liberées dans l'hémolymphe; 3 — d'expulser en même temps dans l'hémolymphe leur propre sécrétion.

Nervus allatus II D, la dernière section du nerf allate n'a pas encore réçue beaucoup de l'attention d'autres chercheurs, peut-être à cause de sa minceur et la difficulté de la préserver pendant la dissection. Elle penètre dans le ganglion sous-oesophagien au niveau de sa face antérolatérale dorsale. Dans la plupart des cas, le n.a.D est de six à huit fois plus court que le segment précédent. Dans des rares occasions, quand on rencontre cette section coupé longitudinallement, il parraît d'être formé de quelques neurites. La plupart des fibres observées dans n.a.C ne continue pas là. N.a. D montre une gaine gliale tout à fait applatie, dont les cellules semblent moins actives en comparison avec les gliocytes du segment précédent (Pl. I, fig. 8).

La présence de la neurosécrétion au long des segments A, B, C du nerf allate montre le rôle essentiel joué par ce nerf dans le transport du produit élaboré par la pars intercerebralis et, possiblement, par corpora cardiaca Une part de la neurosécrétion traverse la gaine gliale du nerf et passe dans l'hémolymphe, l'autre part se repande dans le corpus allatum, tandis que la troisième part passe dans l'épaississement du n.a. C, où elle s'accumule souvant. L'évacuation de ce produit dans l'hémolymphe est probablement intermitente, parsque la quantité des granules rencontrée dans l'épaississement est variable. On peut conclure, que cet épaississement du nerf allate C. qui est caracteristique pour la famille *Gryllidae*, est très probablement un organe neurohémale secondaire, accesoire à ce du corps cardiaque.

On peut observer souvant dans cet organ, que les granules de la neurosécrétion, atteignant la gaine superficiale, perdent peu à peu leur affinité

pour le paraldehide-fucsine, peut-être grâce à la decomposition chimique de leur component protéinique (neurophysine) par l'activité des gliocytes. Par sa structure, le troisième segment du nerf allate, n.a. C, rapelle les organes neurohémaux segmentaires décrites par Raabe (1965) chez les Phasmides pour la première fois et découverts de ce temps là dans la plupart des ordres des insectes par ses collaborateurs (Raabe et col., 1971).

L'INTERROMPTION EXPERIMENTALE DU NERF ALLATE D

Les opérations ont été éffectuées unilaterallement sur un grand nombre d'individus. Nous avons cherché d'expliquer si la sécrétion accumulée dans le nerf allate dérive exclusivement du cerveau (ou le corps cardiaque) ou si quelque part d'elle provient aussi du ganglion sous-oesophagien. Les grillons opérés ont été sacrifiés après 6 12 18 24 72 heures et après 9 jours. Le matériel expérimental a subi le même traitement histologique que le témoins qui ont été opéré sans romper le nerf allate.

6 heures après l'opération la quantité de la neurosécrétion diminue dans le corps cardiaque et dans les deux premièrs segments (A et B) du nerf (Pl. II, fig. 9). Les granules persistent au voisinage de la gaine gliale du n.a. C (Pl. II, fig. 11). Au commencement du segment C on peut voir une accumulation de la neurosécrétion représentant des ammas paraldehide--fucsine positives (Pl. II, fig. 10). Les grains sont en train de disparaitre au centre du segment et de se concentrer dans la gaine gliale, dont la membrane externe forme quelques protubérances (Pl. III, fig. 13).

12 heures après l'interromption, l'effet est plus accentué: la quantité de sécrétion diminue dans le corps cardiaque et les deux premiers segments du nerf allate (A et B). Le troisième segment (C) montre seulement quelques grains de sécrétion au voisinage de la gaine gliale (Pl. III, fig. 14).

24 heures après l'interromption, l'accumulation de neurosécrétion semble partiellement rétablie dans le nerf allate, dont les fibres se remplissent de nouveau, peu a peu, d'un produit paraldehide positif; des grains pareils peuvent être vus s'accumuler dans la gaine gliale.

18 heures après l'opération, on voit de la neurosécrétion dans les neurites centrales du n.a. C. En outre, on observe des vacuoles accumulées au niveau du pôle basal des gliocytes et parmi ces vacuoles des grains paraldehide-fucsine positifs. Mais on ne peut pas distinguer si ces grains sont intra- ou extracellulaires.

72 heures et 9 jours après l'interromption, les corpora cardiaca montrent une quantité de la neuros écrétion plus grande que de habitude et on remarque que cette sécrétion se concentre vers l'assise cellulaire périphérique formée de cellules cromophiles du corps cardiaque. Une grande quantité de la sécrétion s'écoule le long des neurites centrales et pénetre dans la gaine gliale.

DISCUSSION

On peut conclure de ces observations que la fonction de l'épaississement du nerf allate C est auprès d'autres celle d'un réservoir de la neurosécrétion, d'où elle peuve passer aux certain periodes dans l'hémolymphe par l'intermédière de la gaine gliale. On peut supposer, que cette fonction est dépendente de l'activité des cellules neurosécrétrices de la pars intercerebralis et des corpora cardiaca, en raport avec le besoin physiologique de l'organisme.

Ils restent encore deux questions: L'identité de la neurosécretion dans l'épaississement du n. a. C avec celle des corps cardiaques et si quelque part de cette neurosecretion arrive par n.a. D jusque dans le ganglion sous-oesophagien, ou si au contraire, les axons de la section D allant dans la direction opposé proviennent des pericaryons du ganglion sous-oesophagien. Jusqu' ici nous n'avons jamais observé la neurosécrétion dans le n.a. D ou d'autres faits, dont on pourrait conclure sur son passage du ganglion ver le corps allate, comme en parle Belyajeva (1964).

Le manque de neurosécrétion dans le nerf pendant les premiers heures après l'opération peut être interpreté comme un processus physiologique compensateur temporaire, qui accompagne le trouble de l'opération. Après 18 heures, le produit de la pars intercerebralis recommence à remplir les neurites de ces cellules.

RÉSUMÉ

1. Le nerf allate de *Gryllus domesticus* a été décrit en détaile. Pour ce but, il a été partagé en quatre section: n.a. A — la partie entre le corps cardiaque et corps allate, n.a. B — la partie en contact avec le corps allate n.a. C — la partie entre le corps allate et le ganglion sous-oesophagien, sauf sa dernière section mince, après l'épaississement qui a été indiqué comme n.a. D. La section A et B ensemble correspondent à la dénomination plus ancienne n.a. I, la section C et D à n. a. II.

2. Attention spéciale a été accordée à l'épaississement de n.a. C qui est un caractère spécial de la famille *Gryllidae*. Il est formé par un tronc axial des fibres nerveuses entouré par plusieures cellules gliales arrondies. En plusieurs cas, il a été rempli par les graines de neurosécrétion paraldehide-fucsine positive.

3. La même neurosécrétion pouvait être observée dans les sections A et B de nervus allatus, mais pas dans la section D. On en a conclu que l'épaississement serve comme un organ neurohémal sécondaire pour la neurosécrétion provenant de pars intercerebralis via nervi corporum cardiacarum.

4. L'interromption expérimental de n.a. D resulte dans une disparition temporaire des graines de neurosécrétion du nerf pendant les premières 18 heure après l'opération; après ce temps le nerf, et specialement l'épaississement recommence à se remplir.

5. Il-y-a deux questions qui restent à répondre: l'identité de la neurosécrétion dans l'épaississement avec celle du corps cardiaque et la question de provenience des axons constituants la dernière section du nerf allate (n.a. D).

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TARDIGRADA IN HIGH TATRA LOCALITIES BARE OF SNOW WITH A DESCRIPTION OF ITAQUASCON PAWLOWSKII SP. N.

BARBARA WĘGLARSKA

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Abstract: In the material collected, 25 species of Tardigrada were found. Three species viz. *Echiniscus (E.) spitzbergensis* Scourfield, 1889, *Echiniscus (E.) wendi* Richters, 1903 and *Hypsibius (Isohypsibius) undulatus* (Thulin, 1928) have not hitherto been reported in Poland, a new species *Itaquascon pawlowskii* sp. n. has been described.

In February 1971 students from the Institute of Biology in the Jagiellonian University of Cracow on field work in the High Tatra Mountains collected 34 samples of mosses and lichens from localities which are prevented by the action of the wind from being covered with snow in winter.

In this material, 25 species of Tardigrada were found, 5 belonging to the order Heterotardigrada, and 25 to the order Eutardigrada. Three species from these orders have not been reported in Poland. After careful analysis of the relevant characters, a new species has been proved belonging to the genus *Itaquascon*. Taking these data into consideration, 70 species from Poland are now known and have been described by Węglarska (1959a and 1959b) and Dastych, 1969, 1970 i.e. about a fifth of all the forms and species found up to the present time.

I offer my cordial thanks to all those who took part in the camp for collecting material in difficult winter conditions.

LOCALITIES AND MATERIAL

Mosses and lichens were collected from several localities in the Eastern and Western Tatras. All these localities had such an exposure that winds or mountain air currents prevented them from being covered with snow even in very snowy periods. Biotypes of this kind are difficult to populate, as small animals are constantly exposed to being blown away or washed away during thaws by the water flowing down from melting snowflakes, and also to great variations in temperature — from about −20°C at night up to +5°C in the daytime if the sun is shining. In these circumstances, moss does not grow densely over the rocks, but forms larger or smaller tufts from 0.5 to 5 cm thick. Ramazzotti (1958) described these tufts as islands, as they are usually separated by bare rock.

Six samples, averaging 200 g in weight, came from Głodówka in the Eastern Tatras, 1150 m above sea level. One sample was collected from rocks above the Wodogrzmoty Mickiewicza, a waterfall 1100 m above sea level. Twelve samples, from 50 g to 1 kg, were collected on Polana pod Wołoszynem, a glade where mosses and lichens were also gathered from tree-trunks and old deserted mountaineers' huts. Eight samples were collected from the rocks above Polana pod Wołoszynem, c. 1600 m above sea level.

In the Kościelisko Valley in the Western Tatras, 4 samples were taken from the borders of Jaskina Zimna (1120 m above sea level), 2 from the vicinity of Staw Smreczyński (a lake 1226 m above sea level), and one from Hala Pisana (an alp 1030 m above sea level).

Not all the samples were inhabited by Tardigrada, which were found in only 20. No correlation was found between the size of the sample and the number of Tardigrada found in it. A small sample often contained a much richer material than a large one, both as regards the number of specimens and the variety of species. Since the tufts of moss grew practically under the same conditions, the population seems to be merely a question of chance. Rotifers and nematodes were richly represented in all samples.

Ramazzotti's keys (1962, 1965) have been used in determining the material. In doubtful cases I have referred to the original reports. The names of species are given according to Pilato's classification (1969).

REVIEW OF THE SPECIES FOUND IN THE LOCALITIES INVESTIGATED

1. Głodówka

Macrobiotus hufelandii Schultze, 1833
Macrobiotus intermedius Plate, 1888
Hypsibius pallidus Thulin, 1911
Hypsibius dujardini (Doyère, 1840)

2. Wodogrzmoty Mickiewicza

Macrobiotus ambiguus Murray, 1907
Macrobiotus echinogenitus Richters, 1904
Macrobiotus intermedius Plate, 1888
Macrobiotus hufelandii Schultze, 1833
Hypsibius dujardini (Doyère, 1840)
Isohypsibius sp. (stadium *simplex*)

3. Wołoszyn region (Polana pod Wołoszynem and the rocks above)

Echiniscus (E.) spitsbergensis Scourfield, 1897
Macrobiotus hufelandii Schultze, 1833
Macrobiotus intermedius Plate, 1888
Macrobiotus echinogenitus Richters, 1904
Macrobiotus richtersi Murray, 1911
Hypsibius pallidus Thulin, 1911
Hypsibius dujardini (Doyère, 1840)
Hypsibius convergens (Urbanowicz, 1925)
Diphascon oculatus (Murray, 1906)
Diphascon angustatus (Murray, 1905)
Diphascon prorsirostris (Thulin, 1928)
Diphascon scoticus (Murray, 1905)
Diphascon spitsbergensis (Richters, 1903)
Calohypsibius ornatus (Richters, 1900), forma *carpaticus* Bartoš, 1940
Itaquascon bartoši, Węglarska, 1959
Itaquascon pawlowskii spec. nov.
Milnesium tardigradum Doyère, 1840

4. Dolina Kościeliska

Echiniscus (Bryodelphax) parvulus (Thulin, 1928)
Echiniscus (E.) blumi Richters, 1903
Echiniscus (E.) wendti Richters, 1903
Pseudechiniscus suillus (Ehrenberg, 1853)
Macrobiotus coronifer Richters, 1903
Macrobiotus hufelandii Schultze, 1833
Macrobiotus intermedius Plate, 1888
Macrobiotus richtersi Murray, 1911
Isohypsibius undulatus (Thulin, 1928)
Isohypsibius sattleri (Richters, 1902)
Hypsibius dujardini (Doyère, 1840)
Hypsibius convergens (Urbanowicz, 1925)
Diphascon scoticus (Murray, 1905)

The comparatively large number of species (25) shows that mosses exposed in winter form a biotope in which small animals such as rotifers, nematodes and tardigrades may live. *Macrobiotus hufelandii*, *M. intermedius* and *Hypsibius dujardini* occurred in all localities. Both adult and young specimens were found, as well as eggs. In the region of Wołoszyn, a large population of *Echiniscus (E.) spitsbergensis* was found in moss collected from the rocks above Polana. The specimens in this population are characterized by a very marked development of the lateral cirri, which certainly constitutes an adaptation to life in these exceptional conditions.

REMARKS ON SPECIES NEW TO THE FAUNA OF POLAND

Echiniscus (E.) spitsbergensis Scourfield, 1897

Ramazzotti (1962) reports that specimens may reach 300 μm in length; the Tatra specimens reach up to 367 μm. The length of the hairs at Plate C is 200 μm, at Plate D 250 μm. At C^d there are long formed hairs, and at D^d short spines. There is a discussion as to the merging of *Echiniscus (E.) spitsbergensis* with *Echiniscus (E.) spinuloides* Murray, 1907, into one species under the name of *Echiniscus (E.) spinuloides*, but until this merge has been accomplished, the name introduced by Scourfield, 1897, will be kept, since the population found in the region of Wołoszyn, rich in specimens, is characterized by the formation of appendages typical of *Echiniscus (E.) spitsbergensis*.

Echiniscus (E.) wendti Richters, 1903, Fig. 1

Length of specimens up to 300 μm. Red eye-spots, in some specimens the eye is absent and in its place is a colourless vacuole. Cuticle covered with sculpture in the form of delicate evenly dispersed points and rather thick granulations concentrated particularly densely on the terminal plate and the central parts of the trunk plates. Distinctly fewer granules on sides and head plate. Terminal plate with lateral indentations, without facets. Absence of third intersegmental plate. Length of hairs "A" (cirri laterali) 210 μm in a specimen 250 μm long. Well-developed spine fringe on fourth pair of legs. Claws on fourth pair of legs 25 μm long. Inner secondary cusps weakly developed and situated lower than described by Richters (1903). *Echiniscus (E.) wendti* has been found in many localities in Europe and America, as well as in the Arctic and Antarctic.

Fig. 5. Anterior section of alimentary tract of Itaquascon pawlowskii sp. n.

*Itaquascon pawlowskii** sp. n. (Figs 2, 3, 5, 6)

Diagnosis: Length of specimens 130—224 μm. Smooth cuticle, absence of eye. Slender body, not very transparent. Stylets delicate, acuminate, set in relation to the mouth tube in a manner characteristic of the genus *Itaquascon*, Fig. 5. Stylet sheaths long and narrow. Pharynx tube very long, rigid, exhibiting no tendency to torsion as in the representatives of the genus *Diphascon* with a long pharynx. Sucking pharynx almost spherical, without placoids. Salivary glands long with a characteristic constriction, Fig. 5. Foot claws of the *Diphascon* type.

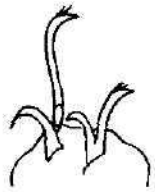

Fig. 6. Claws on fourth pair of legs, *Itaquascon pawlowskii* sp. n.

Holotype, female, length of specimen 164 μm. Elongated head, absence of eye. Small stylets 11.6 μm in length, forked distal ending, Figs 3, 5. Straight mouth tube 10.8 μm long, pharynx tube 41.5 μm long and 1 μm wide. No apophyses. Small sucking pharynx, almost spherical, Figs 3, 5. Length of sucking pharynx 9.4 μm, width 8.3 μm. Shape of salivary glands and their location in relation to the pharynx tube shown in Fig. 5. Shape of claws on all feet uniform. Primary branches of both exterior and interior claws equipped with accessory spines, Fig. 6. Measurements of claws on fourth pair of feet: outer claw, primary branch 5.8 μm, secondary branch 3.3 μm; inner claw, primary branch 4 μm, secondary branch 2.5 μm.

Holotype is in the Museum of the Institute of Zoology in the Jagiellonian University of Cracow, the paratypes come from the author's private collection.

Habitat: In moss gathered from rocks on Polana pod Wołoszynem.

Discussion: Differs from other known representatives of this genus in body size, being the smallest representative of the genus *Itaquascon*, and in the proportions of the individual sections of the stomodaeum. Pharynx tube exceptionally long and slender, and sucking pharynx (buccal) small and almost spherical. As in other representatives of the genus *Itaquascon*, there are neither apophyses or placoids.

Isohybius undulatus (Thulin, 1928), Fig. 4

A few specimens of this species were found in moss gathered on the borders of Jaskina Zimna (Kościelisko Valley). Typical representatives. Length of specimens up to 247 μm. Eggs oval, smooth, deposited in moulted cuticle. Granular macroplacoids can be seen in the sucking pharynx (Fig. 4). No microplacoids. Pedal claws, with accessory spines on the primary branches, formed in the manner characteristic of the genus *Isohypsibius*.

In Europe this species has been reported from Italy, Hungary and Sweden; in Asia from Vietnam.

SUMMARY

Twenty-five species of Tardigrada were found in mosses and lichens collected in the High Tatra Mountains.

*) In honour of Professor Bogumil Pawlowski, the oldest member of the Natural History Society and a great friend and mentor of students.

The following species of the Order Heterotardigrada were found: *Echiniscus (Bryodelphax) parvulus* (Thulin, 1928), *Echiniscus (E.) wendti* Richters, 1903, a species new to the fauna of Poland, *Echiniscus (E.) blumi* Richters, 1903, *Echiniscus (E.) spitsbergensis* Scourfield, 1897, a species new to the fauna of Poland, *Pseudechiniscus suillus* (Ehrenberg, 1853).

Order Eutardigrada: Genus *Macrobiotus: M. hufelandii* Schultze, 1833, *M. coronifer* Richters, 1903, *M. echinogenitus* Richters, 1904, *M. ambiguus* Murray, 1907, *M. Richtersi* Murray, 1911, *M. intermedius* Plate, 1888. Genus *Hypsibius: H. convergens* (Urbanowicz, 1925), *H. dujardini* (Doyère, 1840), *H. pallidus* Thulin, 1911. Genus *Isohypsibius: I. sattleri* (Richters, 1902), *I. undulatus* (Thulin, 1928), species new to the fauna of Poland. Genus *Diphascon: D. spitsbergensis* (Richters, 1903), *D. scoticus* (Murray, 1905), *D. angustatus* (Murray, 1905), *D. oculatus* (Murray, 1906), *D. prorsirostris* (Thulin, 1928). Genus *Calohypsibius: C. ornatus* (Richters, 1900), forma *carpaticus* Bartoš, 1940. Genus *Itaquascon: I. bartoši* Węglarska, 1959, *I. pawlowskii* spec. nov. Genus *Milnesium: M. tardigradum* Doyère, 1840.

The localities in which particular species were found are indicated. It was ascertained that such unfavourable biotopes as rocks bare of snow and undoubtedly exposed to the action of wind and water as well as drastic changes in temperature, may be inhabited by tardigrades, rotifers and nematodes.

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

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Prof. RNDr. Jaroslav Lang

Am 10. April 1972 starb plötzlich RNDr. Jaroslav Lang, ordentlicher Professor der Zoologie, Leiter des Kabinetts für Didaktik der Biologie an der Fakultät der Naturwissenschaften der Karls-Universität zu Prag und Leiter des Lehrstuhls der Biologie unter der Grundlagen der landwirtschaftlichen *Erzeugung an der Pädagogischen Fakultät* der Karls-Universität.

Er wurde am 24. August 1910 in Prag geboren. Nach der Reifeprüfung an der Realschule bezog er die Karls-Universität zu Prag, wo er sich an der Naturwissenschaftlichen Fakultät für die Fächer Naturwissenschaft, Mathematik und Physik einschreiben lies. Sehr bald nach seiner Inskribierung widmete er sich schon aus tiefstem Interesse der Zoologie und arbeitete in der damaligen Zoologischen Institut bei dem Prof. V. Janda Sen., und zwar anfangs als wissenschaftliche Hilfskraft, später als *unbesoldeter Honorarassistent*.

Zum Doktor der Naturwissenschaften wurde er im Jahre 1934 promoviert. Nach Abschluss seiner Universitätsstudien tritt er den Schuldienst als Staatsprofessor an den Realschulen und Gymnasien in Prag an. Während der Kriegsjahre 1943—1945 war er an der Lehrerbildungsanstalt zu Chrudim als Professor tätig. Nach dem Kriegsende kehrte er wieder nach Prag zurück, wo er weiter als Gymnasialprofessor unterrichtete.

Anfangs 1949 gab er seine bisherige Tätigkeit auf, denn er wurde Assistent an der Pädagogischen Fakultät der Karls-Universität, wo er beim Prof. Dr. Hykeš arbeitete; da konnte er sich der Zoologie schon völlig widmen und dabei auch seine umfangreichen und tiefen pädagogischen Erfahrungen geltend machen.

In 1952 zum Dozenten der Zoologie ernannt, wurde er in demselben Jahre Leiter des Zoologischen Instituts der Pädagogischen Fakultät der Prager Karls-Universität. Im Jahre 1959 wurde er zum ordentlichen Professor der Zoologie an der Naturwissenschaftlichen Fakultät der Karls-Universität zu Prag ernannt, wo er das von ihm gegründete Kabinett für Didaktik der Biologie bis zu seinem Tode führte. Während der ganzen letzten Periode widmete er in dieser Funktion seine meiste Energie der Vervollkommnung der Vorbereitung der an der Naturwissenschaftlichen Fakultät studierenden künftigen Gymnasialprofessoren; gleichzeitig wirkte er als Externleiter des Lehrstuhls an der Pädagogischen Fakultät.

Der Literaturnachlass des Prof. Dr. Lang bezeugt, dass darin die zoologischen Arbeiten verherrschen. Schon als Hochschulhörer veröffentlichte er verschiedene Arbeiten aus der Tierphysiologie und aus der systematischen Zoologie, in der er sich immer mehr der Gruppe Diplopoda widmete. Er publizierte eine ganze Reihe von originalen Arbeiten über diese Gruppe, vor allem die umfangreiche Monographie „Diplopoda" in der Fauna ČSR (1954).

Ausser Diplopoden befasste er sich mit verschiedenen Tiergruppen und benützte dabei mannigfaltige Zutritte. Besonders interessierte er sich für Aquaristik und Terraristik, und zwar nicht nur experimentell, sondern auch mit Hinsicht auf deren Ausnützung im Schulunterricht.

Mit seinen Mitarbeitern bereitete er für die Studenten eine Reihe von Lehrbehelfen (Scripten) aus der allgemeinen und systematischen Zoologie, die meistens in mehreren Ausgaben in Bohmen und in der Slowakei erschienen. Ausserdem schrieb er wieder in Zusammenarbeit mit anderen Zoologen mehrere Lehrbücher für Gymnasien, Oberschulen und Hochschulen. Am bekanntesten sind Zoologie 1 (1962) und Zoologie 2 (1965) für die Pädagogischen Fakultäten. Die sehr erforderliche zweite Ausgabe des ersten Teils erschien noch gleich vor dem Tode des Professors.

Eine grosse Hilfe leistete Prof. Lang den Biologielehrern auch dadurch, dass er in den Zeitschriften Akvaristické listy (Aquaristische Blätter), Živa, Vesmír (Universum) und Přírodní

vědy ve škole (Naturwissenschaften in der Schule) die Erfahrungen aus seiner reichen Praxis veroffentlichte. Aus diesen Arbeiten steht an erster Stelle die übersichtliche Publikation „Vivaria v koutku živé přírody" (Vivarien im Winkel der lebendigen Natur) — zusammen mit Prof. O. V. Hykeš 1954, umgearbeitet 1956, das erste Hilfsbuch in diesem Fach für die Lehrer.

In den letzten zehn Jahren stand im Mittelpunkt der Aufmerksamkeit des Prof. Lang die Didaktik der Biologie. Auf Grund von grundlichen Kenntnissen der Ergebnisse des Schulunterrichtes der Biologie, machte er die Öffentlichkeit auch mit den brennenden Fragen bekannt, indem er in 11 umfangreichen Studien zeigte, was im Unterricht zu verbessern wäre, wenn man mehr erfreuliche Ergebnisse haben will.

Ausser der wissenschaftlichen und padagogischen Arbeit war er intensiv in akademischen und anderen professionellen Funktionen tätig.

Prof. RNDr. Lang verschied plotzlich in voller Arbeitsaktivitat. Die tschechoslowakische Zoologie verliert in ihm nicht nur einen guten Zoologen, und ausgezeichneten Pädagogen, sondern auch einen braven und opferwilligen Menschen.

F. Lelláková-Dušková und *J. Stoklasa*

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Karg, W. Die freilebenden Gamasina (Gamasides), Raubmilben. Tierwelt Deutschlands und angrenzenden Meeresteile. 59. Teil. Acari (Acarina), Milben. Unterordnung Anactinochaeta (Parasitiformes) 475 pp. 516 obr. VEB Gustav Fischer Verlag Jena, 1971. Cena brož. 102,60 Mk

Po čtyřiceti letech, které uplynuly od vydání Thorova Úvodu do studia roztočů a Willmannova zpracování paneifníků se ve známé faunistické sbírce „Tierwelt Deutschlands und der angrenzenden Meeresteile" objevuje další svazek věnovaný roztočům — volně žijícím druhům Gamasina. Autor obsáhlé práce je přední znalec ekologie a systematiky této skupiny Dr. Wolfgang Karg.

Podobně jako v ostatních svazcích, je vlastní určovací část uvedena několika obecnými kapitolami, v nichž je podána diagnosa skupiny, její systematické členění, morfologie, oplozování, embryonální a postembryonální vývoj, sběrací technika, preparace, metodika chovu, pozorování a konečně ekologie. Obvyklý informativní rozsah úvodu přesahují zvláště části věnované problematice embryonálnímu vývoji štítků, hypostomu, tekta, chelicer, ochlupení těla a nohou, a dále hodnocení vztahu k prostředí z fylogenetického hlediska.

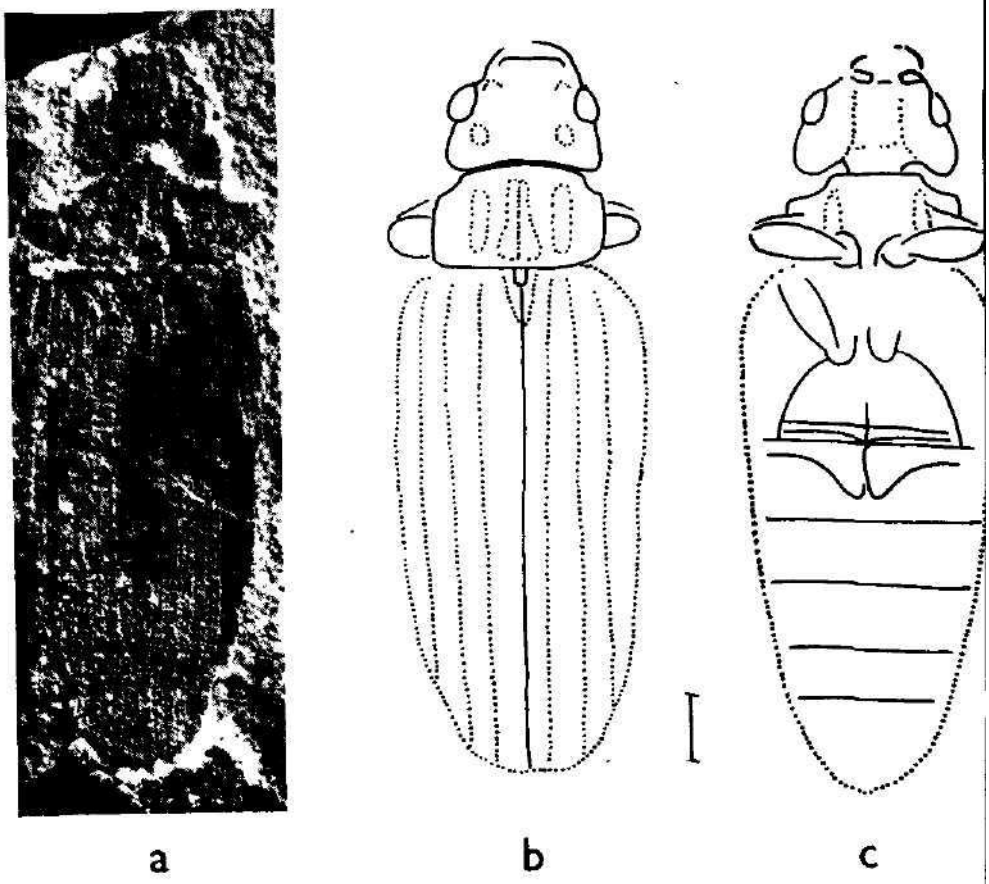
Hlavní část knihy tvoří samozřejmě vlastní systematické zpracování. Méně zkušený pracovník jistě uvítá, že autor vypracoval klíče na určení vyšších systematických kategorií až po podčeledi nejen podle náročnějších diakritických charakteristik, ale i podle snadněji přístupných, jednodušších znaků. Pro půdní zoology a terestrické ekology, kteří se ve svém materiálu často setkávají s nedospělými stadii roztočů, je velmi cenné, že v knize naleznou i klíče na určení protonymf a deutonymf do rodů.

Určovací klíče na rody a druhy obsahují téměř všechny formy známé z území Německa a okolních států. (Je ovšem škoda, že nebyly důsledně uvedeny všechny druhy, které popsala Athiasová, 1967 z území Rakouska a ČSSR). U jednotlivých druhů je uvedena i stručná charakteristika biotopu a rozšíření. Volba diakritických znaků a jejich jasné podání, dané velkou autorovou praktickou zkušeností umožňuje spolehlivé určování. Přispívá k tomu i velké množství obrázků, které byly v díle shromážděny. Z praktických důvodů jsou pokud možno zařazovány k odpovídajícímu textu, což velmi urychluje práci s klíčem. Tato velká výhoda vyvažuje určitý estetický nedostatek grafické úpravy, vyvolaný přílišným nebo nestejným zmenšováním původních předloh, jež vedlo ke zhoršenému podání jemnějších detailů. Jinak má typografická úprava knihy velmi dobrou úroveň.

Naše zoology bude jistě zajímat, do jaké míry odpovídá rencensovaná práce Kargova nově vyšlému 4. dílu Fauny ČSSR, v němž jsou rovněž klíče rodů roztočů této skupiny, ovšem bez rozlišování na volně žijící nebo parasitické formy. Je nutno konstatovat, že práce Kargova je úplnější, poněvadž v našem klíči není uvedena celá řada platných rodů, známých z Evropy, jako např. Crassicheles, Iphidosoma, Pachyseius, Sejus, Protogamasellus, Sessiluncus, Gamasiphis atd.

Závěrem nutno konstatovat, že vydání recensovaného díla představuje nejen významný přínos akarologii, ale vyplňuje i citelnou mezeru v zoologické určovací literatuře, kterou pocítí zvláště půdní biologové, akarologové, zemědělští a lesničtí výzkumníci, dosud odkázaní na základní díla nebo dílčí práce, rozptýlené po různých časopisech.

V. Halaškova



Miocupes rihai gen. n., sp. n.: Aufnahme des Holotypus (a), Zeichnung der Oberseite (b) und der Unterseite (c) des Kafers.

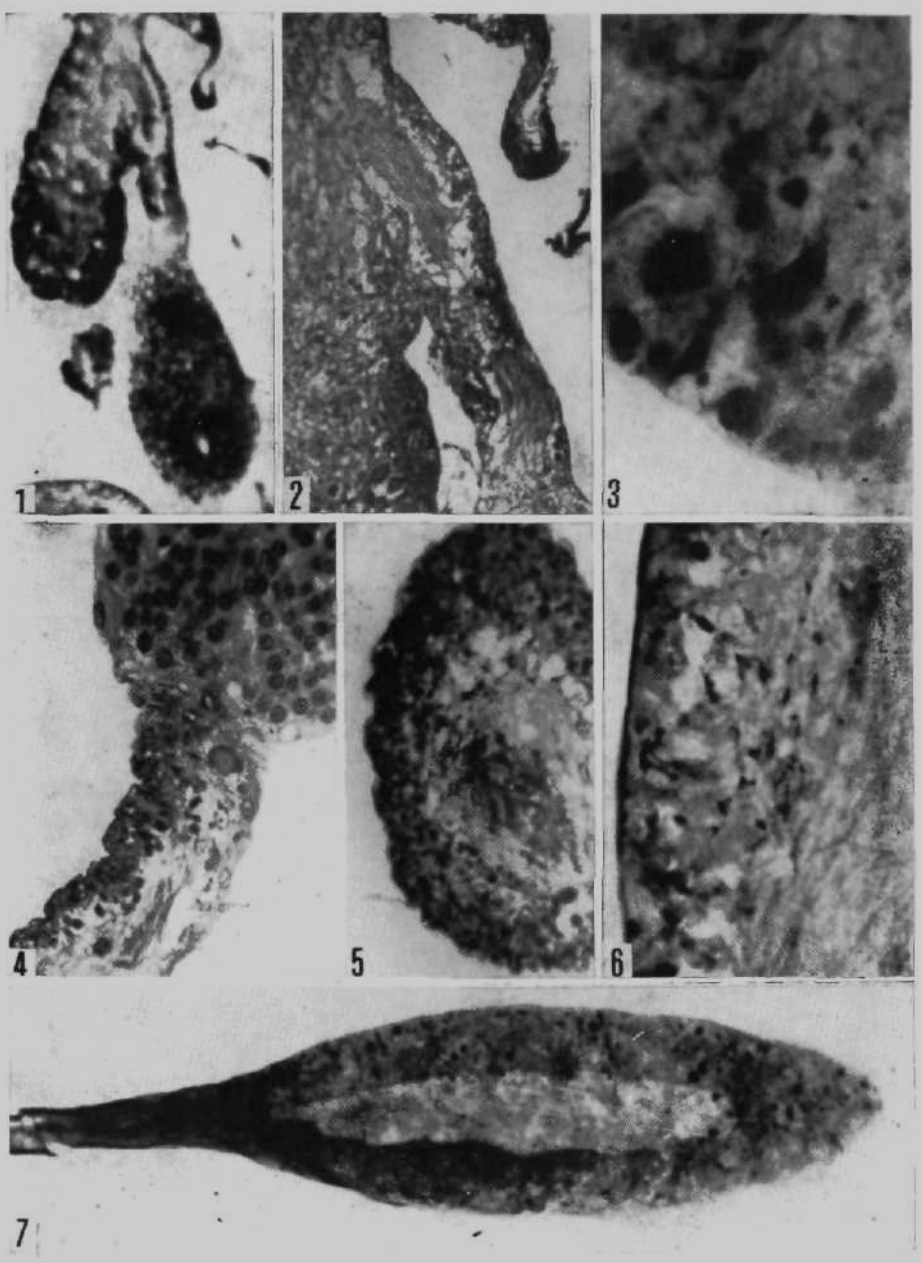


Planche I — Insectes normales. *Gryllus domesticus*, adultes, complex endocriniene rétrocérébral, paraldehide-fucsine (Gabe). 1 — corps cardiaque et allate, coupe frontale, 2 — detaile de même, commencement du nerf allate, 3 — la périférie du corps cardiaque avec la neurosécrétion, 4 — corps allate avec le commencement de nerf allate C, 5 — coupe transversale du nerf allate C, avec la neurosecretion superficiale, 6 — coup longitudinale de l'épaississement avec peu de neurosécrétion et les vacuoles, 7 — l'épaisssissement de n. a. C, coup longitudinale avec plus de neurosécrétion.

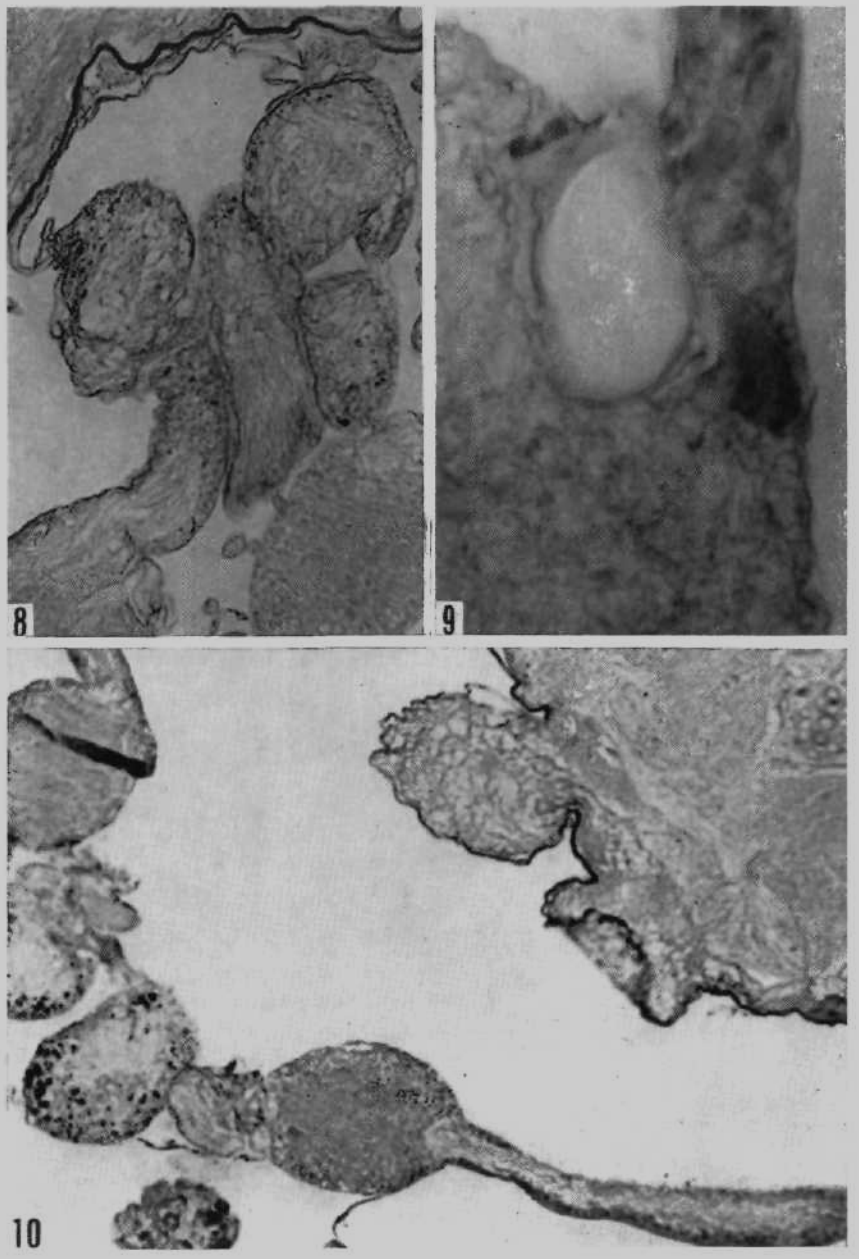


Planche II — Insectes opérés. *Gryllus domesticus*, adultes, complex endocriniene rétrocérébral, paraldéhide-fuesine (Gabe). 8 — Deux corpora cardiaca avec les nerves allates A et les corpora allata, 6 heures après la interromption du nervus allatus D, peu de neurosécrétion, 9 — la gaine superficiale du nervus allatus C, avec peu de neurosécrétion et deux vacuoles, 10 — coup transversal de corpora cardiaca et corpora allata, avec le nervus allatus A et C, 6 heures après l'opération.

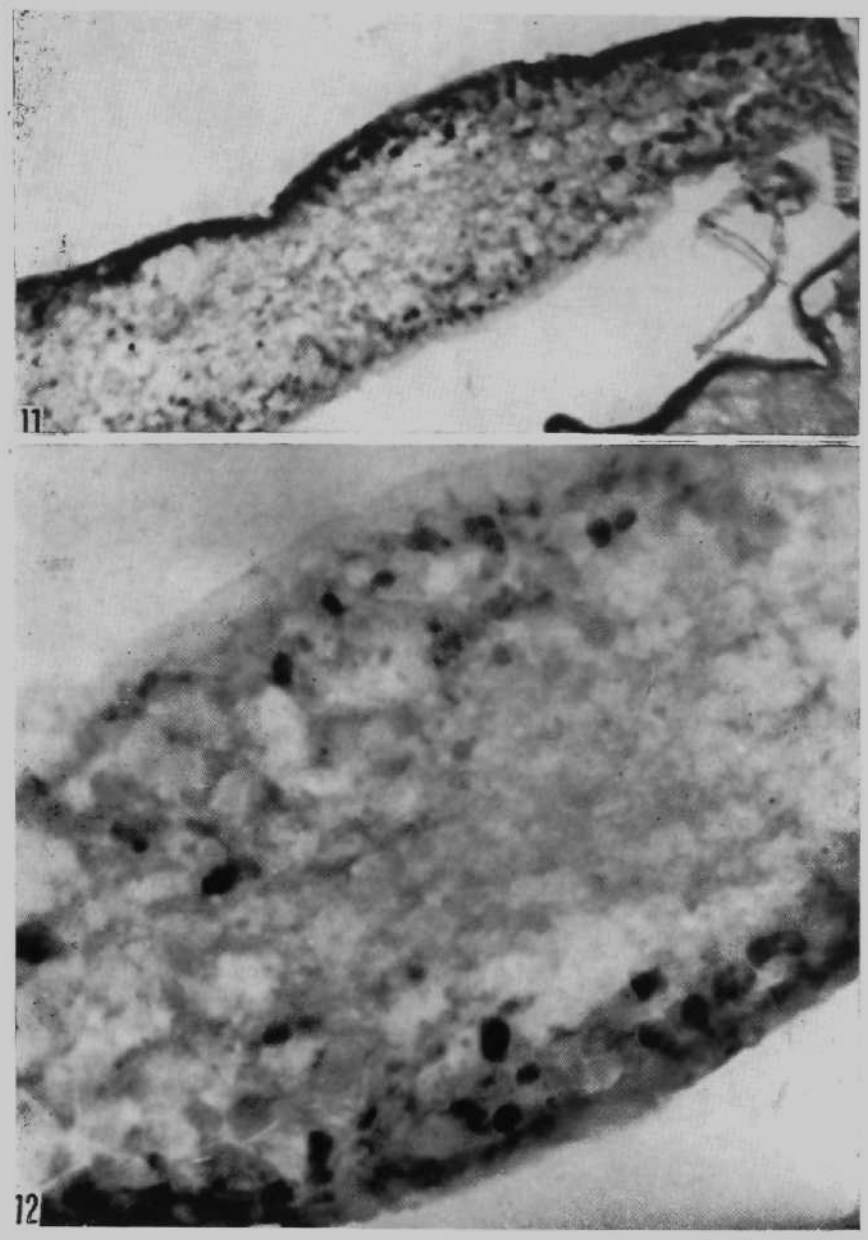


Planche III — Insectes opérés. *Gryllus domesticus*, adultes, l'épaississement du nervus allatus C, 24 heures apres interromption du nervus allatus D. 11 — coup longitudinale, la neurosécrétion commence à apparaître dans la gaine superficiale. 12 — le même, d'autre animal, grossisment plus forte.

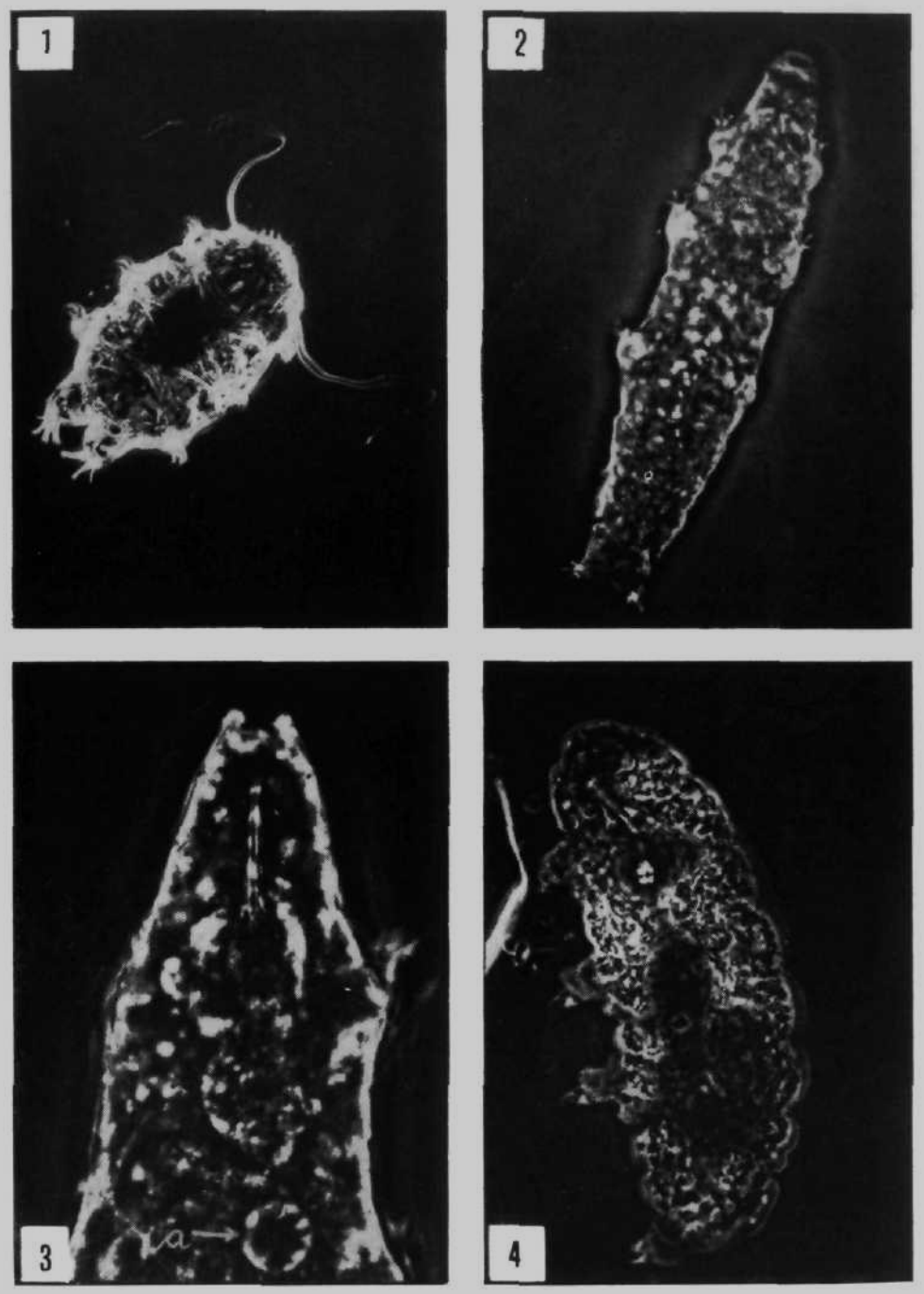


Fig. 1. *Echiniscus (E.) wendti* Richters. type.
Fig. 2. *Itaquascon pawłowskii* sp. n., type.
Fig. 3. *Itaquascon pawłowskii* sp. n., anterior segment of body, with sucking pharynx visible at a.
Fig. 4. *Isohypsibius undulatus* (Thulin), type.

VĚSTNÍK ČESKOSLOVENSKÉ SPOLEČNOSTI ZOOLOGICKÉ

ročník XXXVII

Vydává Čs. společnost zoologická v Academii, nakladatelství ČSAV, Vodičkova 40, 112 29 Praha 1 — Tiskne Státní tiskárna, n. p., závod 4, Sámova 12, 101 46 Praha 10. — Objednávky a předplatné přijímá PNS, admin. odbor. tisku, Jindřišská 14, 125 05 Praha 1. Lze také objednat u každého poštovního úřadu nebo doručovatele. Cena jednoho výtisku Kčs 10,—, roční předplatné (4 čísla ročně) Kčs 40,—. (Tyto ceny jsou platné pouze pro Československo.)

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