

PROBLEMS OF BATHYPHANTES EUMENIS AND ITS OCCURRENCE
IN CZECHOSLOVAKIA (ARANEAE, LINYPHIIDAE)

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In memory of Docent RNDr. Miroslav Kunst, CSc.

Abstract. Both sexes of the new subspecies *Bathypantes eumenis buchari*, which occurs in the rock debris of the Bohemian frontier mountain ranges Šumava and Krkonoše, are described. Furthermore, the finds of the subspecies *Bathypantes eumenis eumenis* in northwestern Bohemia are described. The new subspecies is compared with the nominate subspecies as well as with the species *Bathypantes humilis* and *Bathypantes jeniseicus*.

In the course of the years 1983—84 we collected spiders in the rock debris on the mountain Luč in the Šumava Mountains (= the Bohemian Forest, in German, Böhmerwald). These rock debris lie at the altitude of about 750 m. They are of a very elastic character. They are formed mainly by huge fallen rock boulders, often up to 5 m in size. Among these boulders there are places filled with smaller, transportable stones (size up to 30 cm). The stones are luxuriantly overgrown with mosses and lichens. Trees and shrubs grow sparsely in the whole area of rock debris. To collect the material, we used the modified pitfalls for coarse rock debris (Růžička, 1982). One pitfall was placed at a depth of about 50 cm in a small, dark, against rain and fallen leaves protected cave below a big rock boulder. Into this pitfall no other material than two females of some species of the genus *Bathypantes* fell in the course of the whole year.

This species, however, had been ascertained in the territory of Bohemia before. Buchar (1987) found it in the rock debris of the Krkonoše (= Giant Mountains) and recorded it under the name *Bathypantes humilis* (L. Koch, 1879). He made the determination using the paper by Kulczyński (1916) who, however, gives under the name *B. humilis* the female of another *Bathypantes* species from Siberia. Kulczyński apparently made this female identical with *B. humilis*, because he interpreted the prominent parma in Koch's original picture as an extended tip of the scapus. Holm (1973) pointed to these errors of Kulczyński and Buchar, but he himself informed erroneously that Buchar had found his specimen in Bulgaria. Both Kulczyński's and Buchar's specimens differ considerably from *B. humilis* (see Figs 1F and 2A).

To obtain also the males of the problematic species, we placed in the course of the years 1984—85 further modified pitfalls quite purposely into the rock debris overgrown with forest in the Vydra river valley. In the pitfalls in which the lowest temperatures were measured in summer, two males and four females of the mentioned species were caught. The new species appeared to be closely related to *B. eumenis* (L. Koch, 1879), *B. similimus* (L. Koch, 1879), and *B. eumenoides* Holm,

1967. These species are known from the northern regions of Europe, Asia and America. Wozny & Czajka (1985), basing on their finds in Poland, made a revision of the types as well as of other specimens and came to the conclusion that all specimens belonged to only one species, viz., *Bathyphantes eumenis* (L. Koch, 1879). The Bohemian specimens belong to this species, too.

After a consultation with Dr. Czajka at the First Czechoslovak-Polish Arachnological Symposium at Ostrava in 1986 we set off to the rock towns in the vicinity of the northeastern frontier of Bohemia. They link up to the mountains Góry Stołowe in Poland, where *B. eumenis* was found. Following exactly the instructions given us by Dr. Czajka, we also found *B. eumenis* here.

The description of *B. eumenis* was based originally on a female only, and that of *B. similimus* on a male only. However, the specimens described belong to one species. *B. eumenoides* was described by Holm on the basis of a female only, but its epigyne falls into the variation range of the epigyne of *B. eumenis*. Wozny & Czajka (1985) present the synonymy of this species. To *B. eumenis* probably belongs also the specimen described and pictured by Kuleczyński (1916). On the contrary, the specimen described by Palmgren (1975) as *B. eumenis*, which we had the opportunity to examine, belongs probably to *B. jeniseicus* Jeskov, 1979.

The specimens found in the rock towns of Bohemia conform to the specimens from Poland and belong to *B. eumenis*. The specimens from the rock debris belong in view of the structure of copulation organs, univocally to this species, too; in other respects, however, they are rather different and can be designated as an independent subspecies.

Bathyphantes eumenis buchari ssp. n. (Fig. 1A—G)

Holotypus: ♀ Czechoslovakia, Šumava Mountains, boulder rock debris on the slope of the mountain Luč (750 m a. s. l.), caught in a pitfall trap between 3 to 30 May, 1983, lgt. V. Růžička.

Paratypes: 1 ♂ at the same locality, between 17 June and 28 July, 1983; 2 ♂ 4 ♀ Czechoslovakia, Šumava Mountains, rock debris in the Vydra river valley (900 m a. s. l.), material gathered in a pitfall trap between 4 August, 1984, and 27 July, 1985, lgt. V. Růžička; 1 ♀ Czechoslovakia, Krkonoše Mountains, boulder rock debris on the slope of the mountain Vysoké Kolo (1,450 m a. s. l.), material gathered in a pitfall trap placed at the border of a rock debris field from 29 September till 23 October, 1962, lgt. J. Buchar.

Other material: 1 ♂ 4 ♀ Czechoslovakia, Šumava Mountains, rock debris on the slope of the mountain Obří hrad (850 m a. s. l.), material gathered in a ground pitfall from 26 October, 1985, till 4 October, 1986, lgt. V. Růžička.

Deposition: The holotype and one male of paratype are deposited in the collections of the National Museum in Prague (No. P 6 r - 18786). The paratypes from the Šumava Mountains are deposited in the author's collection, the paratype from the Krkonoše Mountains is preserved in the collection of Docent Dr. J. Buchar at the Faculty of Science of the Charles University in Prague.

Derivatio nominis

I named the subspecies in honour of my teacher, Docent Dr. J. Buchar, CSc., who found it for the first time.

Description

Female (holotype): Total length 2.6 mm. Cephalothorax length 1.08 mm, width 0.83 mm. Cephalothorax brownish-yellow, around the eyes black spots. Both eye rows straight, both the anterior and the posterior middle eyes about half of their diameter distant from each other. Sternum 1.1 times longer than wide, between

Lengths of leg joints (mm)

	fe	pt	ti	mt	ta	total
I	1.72	0.33	1.68	1.63	0.96	6.32
II	1.70	0.33	1.55	1.51	0.86	5.95
III	1.40	0.27	1.06	1.16	0.69	4.58
IV	1.77	0.29	1.53	1.55	0.86	6.00

coxae IV it penetrates by a wide projection. The chelicer groove at the anterior edge with three teeth, at the posterior edge with three denticles.

Legs light brownish-yellow. Fe I—IV with one dorsal spine respectively. Fe I prolaterally on the left leg with 4 spines, on the right leg with 2 spines (in the paratypes always with 2 prolateral spines). Ti I—IV dorsally with two and retrolaterally with one spine respectively. Ti I with two prolateral spines, Ti II—IV with one prolateral spine respectively. Metatarsi without spines.

Epigyne: Epigyne with a large circular pit which is in perpendicular view on the lower side of abdomen almost totally covered with the projecting anterior edge, from which an elongated scapus protrudes backwards (Fig. 1F). The scapus is overgrown with long hairs, 2.5 times longer than wide, reaching behind the epigastral groove. The width of the scapus is equal to half a width of the epigyne pit. In side view the scapus passes continuously into the convex anterior outline of the abdomen; the whole length of it is convex (Fig. 1E). From the posterior edge of epigyne the parmula projects behind the epigastral groove. The scapus and parmula tips touch each other. The lateral sclerites of the posterior edge of epigyne, well visible in the oblique view from behind, are as wide as the half of the middle sclerite (Fig. 1G).

Abdomen very pale, beige, totally without pattern.

Male (paratype): Total length 2.5 mm. Cephalothorax length 1.15 mm, width 0.88 mm. Coloration, dimensions of sternum and distribution of spines on legs the same as in the female.

Lengths of leg joints (mm)

	fe	pt	ti	mt	ta	total
I	1.72	0.33	1.67	1.69	1.08	6.49
II	1.67	0.33	1.55	1.55	0.96	6.06
III	1.36	0.28	1.07	1.17	0.71	4.59
IV	1.75	0.30	1.57	1.63	0.92	6.17

Palpus: Paracymbium overgrown with long bristles. Embolus at the tip wound in a loop. A characteristic lamella along the side (Fig. 1A—D).

Materials for comparison

Bathypantes eumenis (L. Koch, 1879): 35 ♂ 57 ♀ Czechoslovakia, rock town Teplice-Adriapašské skály, 13—14 July, 1986 lgt. A. et V. Růžička; 1 ♀ 23 August, 1986, lgt. J. Kopecký; 2 ♂ 5 ♀ Czechoslovakia, rock town Broumovské stěny, 15 July, 1986, lgt. A. et V. Růžička; 1 ♂, Czechoslovakia, Besedice, rocks, 23 April, 1975, lgt. P. Bílek; 2 ♂ 4 ♀ Poland, Góry Sto-

lowe, 27 June, 1985, lgt. M. Czajka, M. Wozny, J. Buchar; 2 ♀ Poland, Góry Stołowe, September 1984, lgt. M. Czajka, M. Wozny; 2 ♂ 2 ♀ Canada, Kunjjuarapik bog, 20 June till 28 August, 1985, lgt. S. Koponen.

Bathypantes humilis (L. Koch, 1879): 2 ♀ USSR, Mirnoje, Yenisei river bank, 23 June, 1978, lgt. K. Jeskov.

Bathypantes jeniseicus Jeskov, 1979: 2 ♂ 2 ♀ USSR, Mirnoje, Yenisei river bank, 28 July, 1979, lgt. K. Jeskov; 1 ♀ Finland, Lkemi Muonio (Muonionniska), June, 1867, lgt. Palmén et Sahlberg.

Relations to the species *Bathypantes jeniseicus*

B. jeniseicus is related to the North American species *B. orica* and *B. alameda* (see Jeskov, 1979). For these species the hook-like outgrowth on the lamella of the male palpus is characteristic, but it does not occur in *B. eumenis* (cf. Figs 1A, B and 2D)*. The females of *B. eumenis* and *B. jeniseicus* are rather alike, however,

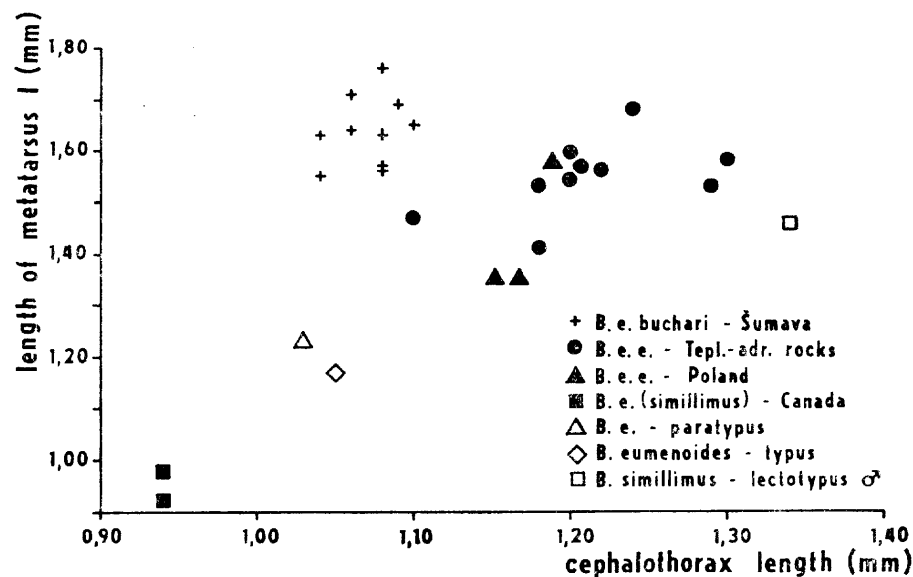


Fig. 3. Relation between the length of metatarsus I and the cephalothorax length in females within the limits of *B. eumenis*. The black symbols indicate the values acquired by the author's own measurements, the white ones indicate the data taken over from the literature.

certain differences are to be found in the structure of epigyne. The lateral epigyne sclerites in *B. jeniseicus* are wider than the middle sclerite and are elongated into tips (Fig. 2B, C)*. The lateral epigyne sclerites in *B. eumenis* are narrower than the middle sclerite.

Intraspecific relations

B. eumenis is a rather variable species. Already Holm (1973) pointed to considerable differences in the size of the North American and Siberian specimens. The cephalothorax of the males from Siberia is 1.26–1.34 mm long, while in the males from the USA (New York State) its length is only 1.08–1.17 mm. In the males

* The figures 1 and 2 will be found at the end of issue.

from Quebec (measured by us) the cephalothorax length was 1.13–1.16 mm. *B. simillimus* was differentiated from *B. eumenis* and *B. eumenoides* mainly by the dark coloration of the abdomen (Holm, 1973, Ivie, 1969). Wozny & Czajka (1985), however, have concluded, basing on the evaluation of an extensive material, that the coloration of abdomen is not a taxonomically usable character in the case of *B. eumenis*. Our observations have confirmed a great variability of this species.

The specimens of the nominate subspecies, though rather different as regards their absolute size, show approximately the same body proportions. The literature data are also in a good coincidence with the dependence ascertained in the set of specimens from the rock town Teplicko-Adršpašské skály (Fig. 3). The specimens of *B. eumenis buchari* possess relatively longer extremities. The ratio of the length of metatarsus I to the cephalothorax length can be used as the diacritical character. In *B. eumenis eumenis* this value amounts in average 1.28 (variation range 1.19 to 1.35, interval $\bar{x} \pm 2s$: 1.16–1.40). In *B. eumenis buchari* this value is in average 1.53 (variation range 1.44–1.63, interval $\bar{x} \pm 2s$: 1.41–1.65).

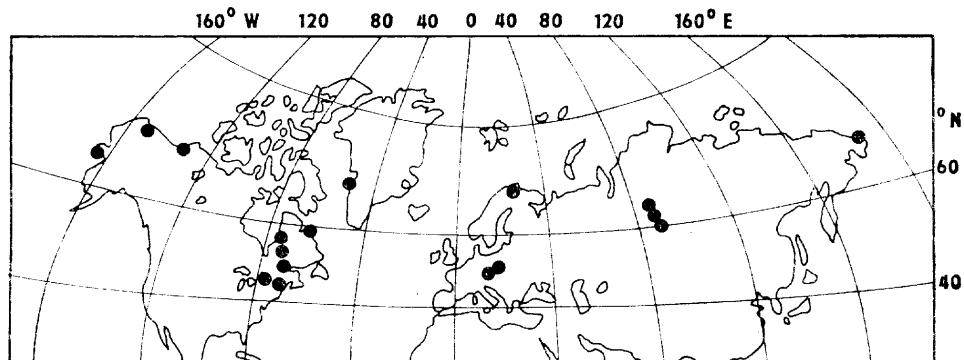


Fig. 4. Worldwide distribution of *B. eumenis*. According to the data given by Holm (1967, 1970, 1973), Ivie (1969), Koponen (1976), unpublished), Wozny & Czajka (1985). The datum from northern Sweden (Koponen, 1974) is erroneous (Koponen, intimation by letter).

Even if the sets of only ten specimens measured are taken for comparison, *B. eumenis eumenis* shows greater dispersion variance in most parameters than *B. eumenis buchari*. The abdomen of *B. eumenis eumenis* is always grey to blackish, sometimes with a developed light pattern. The abdomen of *B. eumenis buchari* is quite lacking in pigment, its colour is light beige. This all is apparently connected with a greater variability of light, temperature and humidity conditions under which *B. eumenis eumenis* occurs in the rock towns. On the contrary, the constant environmental conditions in the depth of mountain rock debris doubtlessly support the uniformity of the populations of *B. eumenis buchari*.

The markedly elongated extremities, elongated spines on extremities, loss of pigmentation in the subspecies *B. eumenis buchari* are the results of adaptation to the cavernicolous way of life. Zacharda (1979) terms these adaptations the troglomorphisms.

The shape of scapus in side view does not present any decisive character. In both subspecies the specimens with arched as well as with sagged scapus are to be found.

A more complex evaluation of variability of the species *B. eumenis* will require further investigations, especially as regards the evaluation of morphology and eco-

logical demands of the North American and Siberian populations. It is not impossible that some of these populations form separate subspecies.

Occurrence

Wozny & Czajka (1985) found *B. eumenis eumenis* in the central parts of the sandstone rock towns. At those localities there are rock fissures which are often tens of meters high and only tens of centimeters wide. In such dark, moist and cold holes lives *B. eumenis eumenis* in masses. The same intensity of occurrence we found in the rock towns Teplicko-Adršpašské skály. Less frequently we met with *B. eu-*

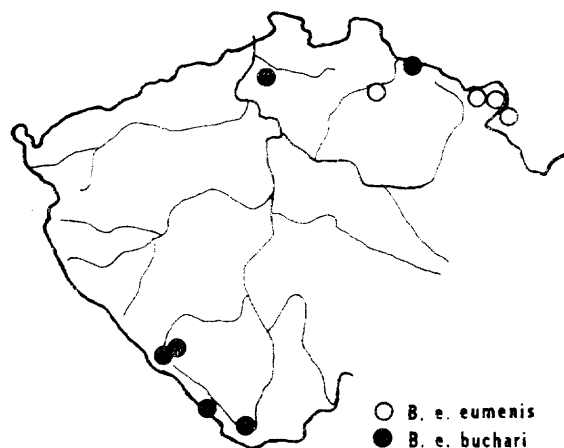


Fig. 5. Distribution of the subspecies *B. e. eumenis* and *B. e. buchari* in the territory of Bohemia and Poland. According to data given by Bílek (unpublished), Buchar (1967), Wozny & Czajka (1985), and according to author's own finds.

menis eumenis in the other rock parts, on the moist rock only several meters high and shaded by forest. An other site of abundant occurrence we found in the underground. Both in the Teplicko-Adršpašské skály and in the rock walls Broumovské stěny there are ravines filled with the material of collapsed rock towers. The boulders accumulated in this way are overgrown with mosses, shrubs and trees. Among the boulders there are hollows often of five or more meters in depth, a kind of pseudo-caves (Vítek, 1979). In these hollows *B. eumenis eumenis* occurs in masses as well.

As regards the environment in which *B. eumenis* occurs in the other regions of its distribution, we have found only one piece of information in the literature: in the northernmost parts of Finland it lives on stone belts and cliffs (Koponen, 1976).

B. eumenis buchari occurs in the depths of the cold mountain rock debris. The finds in the Šumava Mountains, from the mountain Luč and from the Vydra river valley, come from the pitfalls placed in the depth of rock debris in small cave-like hollows below the big rock blocks. Into those places no visible detritus penetrated any more. The stones are clean, and all-year-round darkness, humid air and relatively constant, low temperature rule there. The third find originated from the depth of rock debris on the slope of the mountain Obří hrad. These rock debris lie in the Losenice river valley and, owing to low temperature and high air humidity, they are overgrown with sphagnum without being filled with detritus. In the depths of the rock debris in the Vydra valley in July, at the external temperature of 25° C,

the temperature of only 9° C was measured, i.e. the same temperature which existed in our territory during the summer seasons in the Ice Age (Ložek, 1972).

Distribution

B. eumenis is distributed in Europe, Asia, and America between 40 and 70° N (Fig. 4). In Central Europe it is limited to very few regions with all-year-round low temperatures. This fact indicates that *B. eumenis* is a glacial relict in Central Europe. The occurrence of the nominate subspecies *B. eumenis eumenis* is, according to recent knowledge, known from a small region of sandstone rock towns in Bohemia and Poland. The occurrence of *B. eumenis buchari* is for the present time known from the rock debris of the Bohemian mountain ranges Šumava and Krkonoše (Fig. 5).

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REFERENCES

- Buchar, J., 1967: Pavoučí zvířena Paněické louky a blízkého okolí. Die Spinnenfauna der Paněická louka und der nahen Umgebung. *Opera corcontica*, 4: 79–93 (in Czech).
Holm, A., 1967: Spiders (Araneae) from west Greenland. *Medd. Gronland*, 184 (1): 1–99.
Holm, A., 1970: Notes on Spiders Collected by the "Vega" Expedition 1878–1880. *Ent. scand.*, 1 (3): 188–208.
Holm, A., 1973: On the Spiders Collected during the Swedish Expeditions to Novaya Zemlya and Yenisey in 1875 and 1876. *Zoologica Scripta*, 2: 71–110.
Ivie, W., 1969: North American spiders of genus *Bathypantes* (Araneae, Linyphiidae). *Amer. Mus. Nov.*, 1364: 1–70.
Eskov, K. Yu., 1979: Three new species of spiders of the family Linyphiidae from Siberia (Aranei). In: The fauna and ecology of Arachnida. *Proc. zool. inst. Acad. Sci. USSR*, 85: 65–72 (in Russian).
Koch, L., 1879: Arachniden aus Siberien und Novaja Semlja, eingesammelt von der schwedischen Expedition im Jahre 1875. *Kongl. Svenska Vet.-Acad. Handl.*, 16 (5): 1–136.
Koponen, S., 1974: Spindlar (Araneae) och lackespindlar (Phalangida) i Messaureomradet. Spiders (Araneae) and harvestmen (Phalangida) from Messaure, northern Sweden. *Norrmot-tens Natur smaskrift*, 1: 77–79 (in Swedish).
Koponen, S., 1976: Spider fauna (Araneae) of Kevo area, northernmost Finland. *Rep. Kevo Subarctic Res. Stat.*, 13: 48–62.
Kulezyński, V., 1916: Araneae Sibiriae Occidentalis Areticae. *Mém. Acad. Imp. Sci. Cl. Phys.-Math., Petrograd*, 28 (11): 1–44.
Ložek, V., 1973: Příroda ve čtvrthorách. (Nature in the Quaternary.) Academia Praha, 372 pp. (in Czech).
Palmgren, P., 1975: Die Spinnenfauna Finnlands und ostfennoskandiens VI. Linyphiidae 1. In: *Fauna Fennica* 28, Helsinki, 102 pp.
Růžička, V., 1982: Modification to improve the efficiency of pitfall traps. *Newsl. Brit. Arachnol. soc.*, 34: 2–4.
Vitek, J., 1979: Pseudokrasové tvary v kvádrových pískovcích severovýchodních Čech. (Pseudo, karst phenomena in block sandstones in north-east Bohemia.) *Rozpravy ČSAV, ř. MPV* 89 (4): 1–57.
Wozny, M. & Czajka, M., 1985: *Bathypantes eumenis* (L. Koch, 1879) (Aranei, Linyphiidae) in Poland, and its synonyms. *Polskie pismo entomol.*, 55: 575–582.
Zacharda, M., 1979: The evaluation of the morphological characters in Rhagidiidae. *Recent Advances in Acarology*, 2: 509–514.

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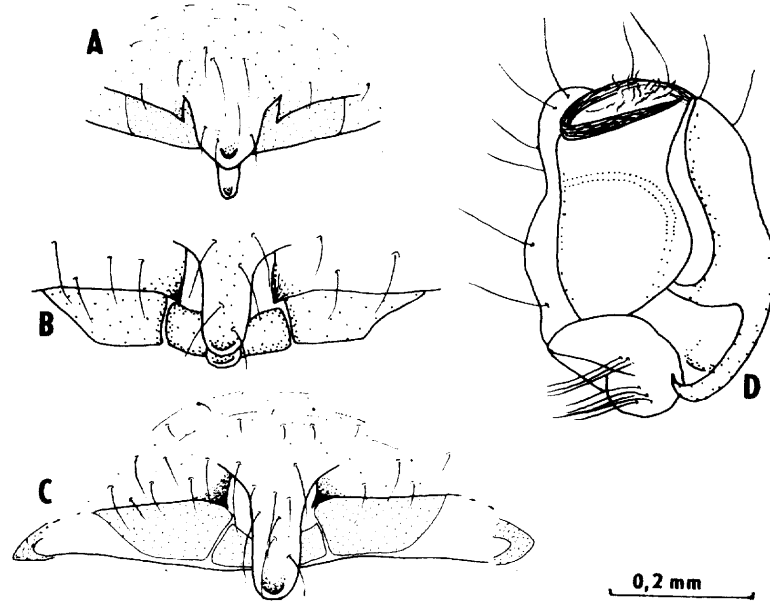


Fig. 2. A — *Bathyphantes humilis*, epigyne, B — *Bathyphantes jeniseicus* (Finland), epigyne in oblique view from behind, C — *Bathyphantes jeniseicus* (USSR), epigyne in oblique view from behind, D — *Bathyphantes jeniseicus* (USSR), palpus.

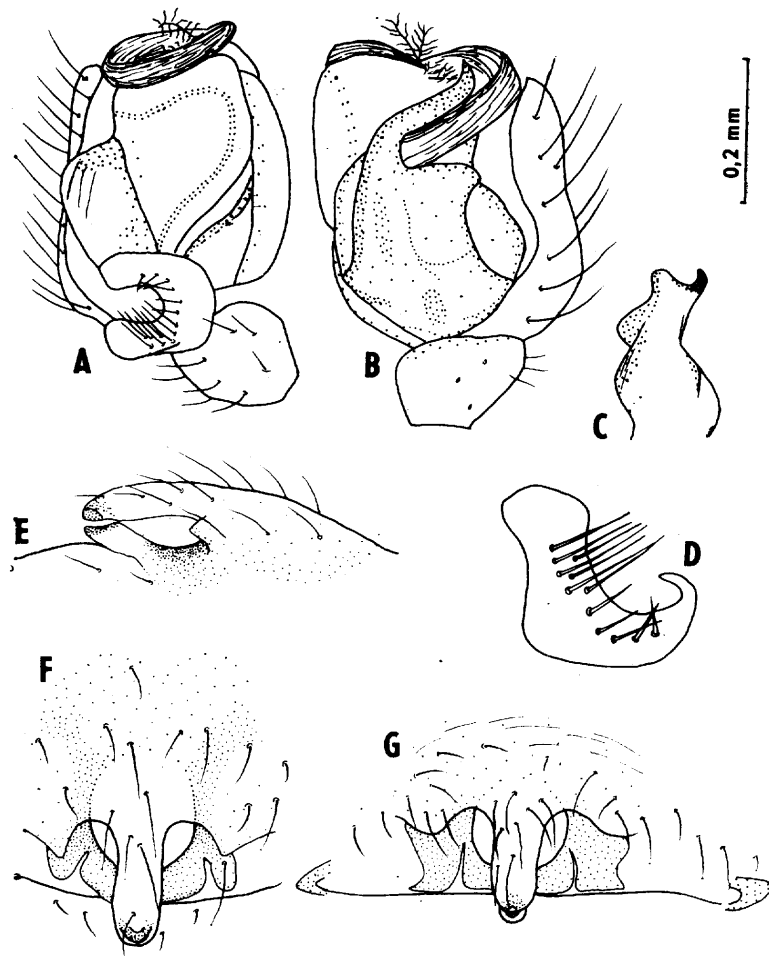


Fig. 1. *Bathyphantes eumenis buchari* ssp. n. A, B — palpus (paratype 1), C — median apophysis (paratype 2), D — paracymbium (paratype 1), E — epigyne, lateral view, F — epigyne, G — epigyne, oblique view from behind (E — G — holotype).