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Revision of the genus *Exaeretopus* NEWSTEAD *(Homoptera, Coccidae)*

[With 12 text-figures]

Rewizja rodzaju *Exaeretopus* NEWSTEAD *(Homoptera, Coccidae)*

Abstract. General characteristics of the genus *Exaeretopus* NEWSTEAD, redescriptions of *E. agropyri* (HADZIBEJLI), *E. formiceticola* NEWSTEAD, *E. orientalis* DANZIG, *E. pimpinellae* BORCHSENIUS, *E. tritici* WILLIAMS, and description of *E. dianthi* sp. n. are presented. Four unidentified species are mentioned. A key to ten included species is added.

INTRODUCTION

The investigations on *Exaeretopus* constitute a part of large-scale researches on the tribe *Eriopeltine*. The general plan of these researches and a review of the literature records were presented in an earlier paper (KOTEJA, 1978).

I wish to express my sincere appreciation to Dr. E. M. DANZIG (Institute of Zoology, Academy of Sciences, Leningrad), Mrs L. HUDDLESTON and Dr. D. J. WILLIAMS (British Museum, Natural History, London) for making material available for study as well as for assistance in completing information concerning the genus *Exaeretopus*.

Exaeretopus NEWSTEAD, 1894 a

NEWSTEAD, 1894 a: 204; COCKERELL, 1899 m: 331; EHRHORN, 1902: 139; FERNALD, 1903: 143; GREEN, 1904 d: 175; LINDINGER, 1912 b: 132, 368; GREEN, 1921: 195; MAC GILLIVRAY, 1921: 168, 175; HOLLINGER, 1923: 41; GREEN, 1928: (6); 1928 a: 27; STEINWEDEN, 1929: 228, 243; BALACHOWSKY, 1937 b: 118; GOUX, 1937 a: 95; LINDINGER, 1937: 185; GOUX, 1939: 67; 1943 b: 126; 1949: 27; BORCHSENIUS, 1957: 116; ZAHRADNIK, 1959 a: 542; KOTEJA, 1978. Type species: *Exaeretopus formiceticola* NEWSTEAD, 1894 a: 204

GENERAL CHARACTERISTICS

Adult female

Living specimens: After moulting yellowish, fully grown yellow with two narrow or broad, longitudinal red stripes on the dorsum.

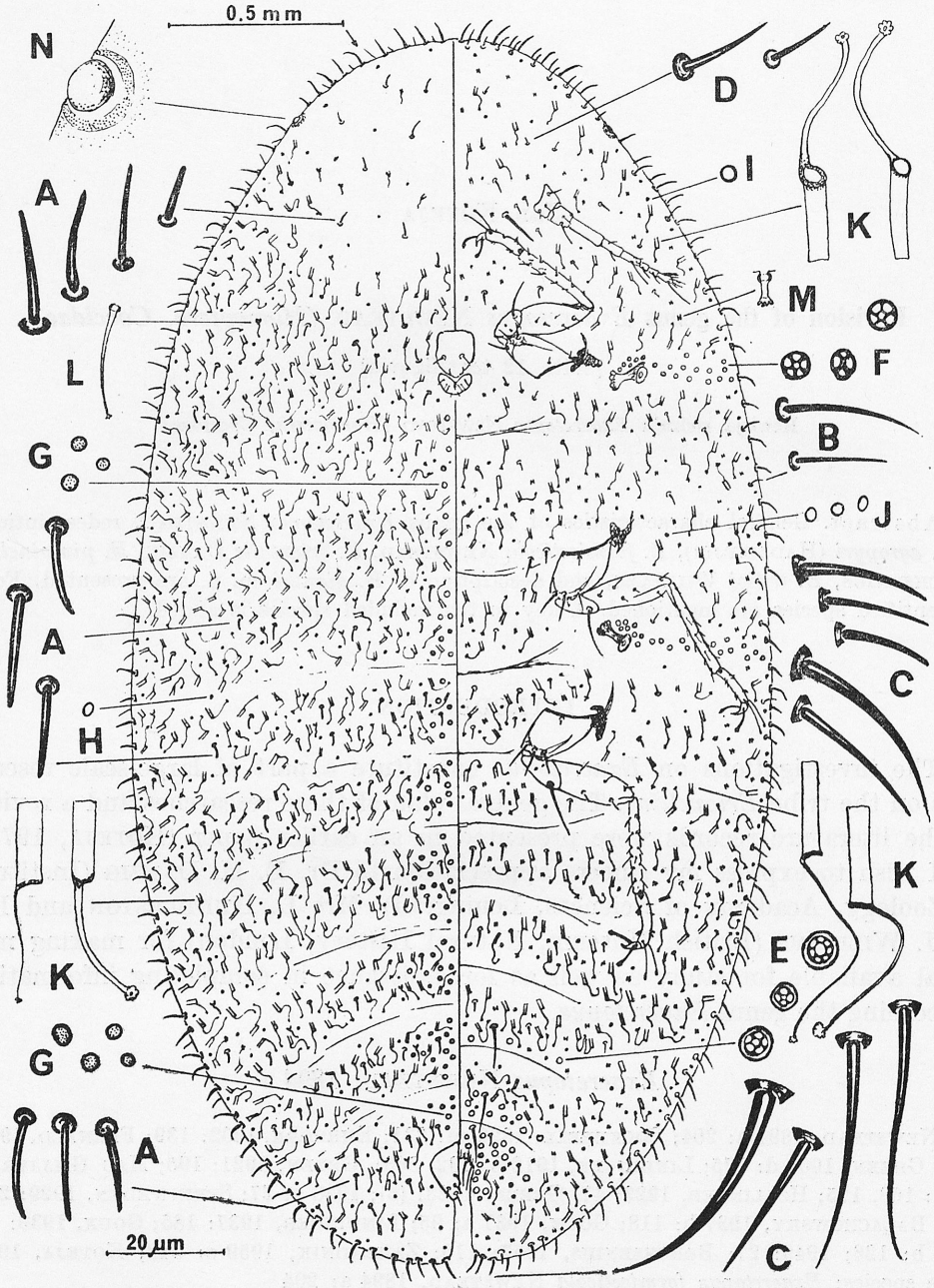

Fig. 1. *Exaeretopus dianthi* sp. n., adult female: A — dorsal setae, B — submarginal setae, C — marginal setae, D — small ventral setae, E — perivulvar pores, F — spiracular pores, G — discoidal pores, H — dorsal simple pores, I — marginal simple pores, J — ventral simple pores, K — tubular ducts, L — dorsal microducts, M — ventral microducts, N — eye

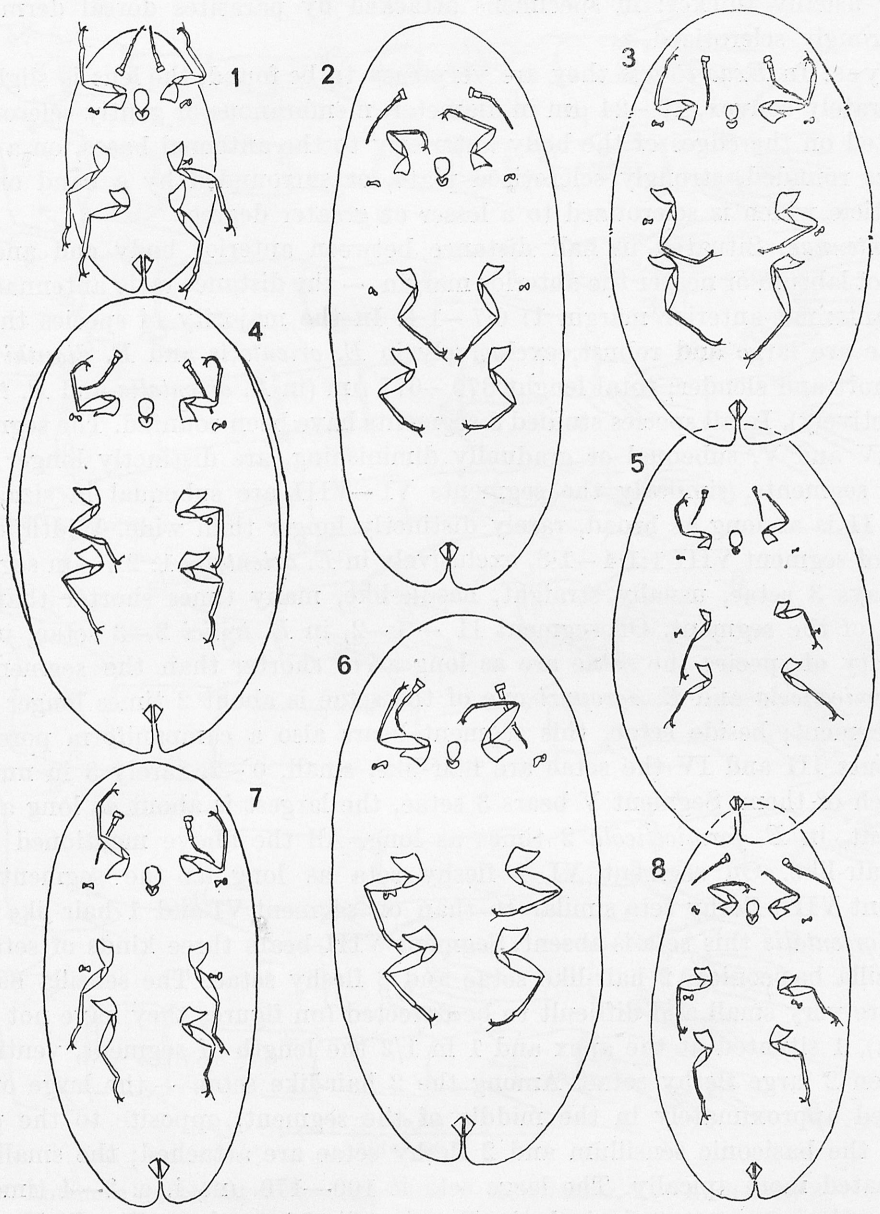

Fig. 2. Outline of the body: 1 — E. sp. c, 2 — *E. pimpinellae*, 3. — *E. agropyri*, 4 — *E. formiceticola*, 5 — *E. orientalis*, 6 — *E. tritici*, 7 — E. sp. d, 8 — *E. dianthi*

Mounted specimens: Body oval or elongate-oval. Length at period of oviposition 3500 –6000 μm, width 1800 –3000 μm, the largest species are *E. pimpinellae* and *E. tritici*, the smallest *E. dianthi*; with/length ratio 1: 1·6 –2·5. Dorsal surface usually flattened, sometimes may be convex (*E. tritici* Williams, 1977). Dorsal and ventral cuticles moderately sclerotized, the former

being usually thicker: in specimens attacked by parasites dorsal derm may be strongly sclerotized.

Eyes: In *Exaeretopus* they are very easy to be found, the lens is slighly or moderately convex, 19 –24 μm in diameter, membranous or gently sclerotized; situated on the edges of the body anteriorly to the antennal bases, on a more or less rounded, strongly sclerotized plate, or surrounded by a band or ring of cuticle which is sclerotized to a lesser or greater degree.

Antennae: Situated in half distance between anterior body end and the apex of labrum or nearer the anterior margin — the distance ratio antennae-labrum/antennae-anterior margin 1: 0·7 –1·1. In the majority of species the antennae are large and robust, exclusively in *E. orientalis* and *E. dianthi* they are short and slender; total lenght 370 –677 μm (in *E. orientalis* and *E. tritici*, respectively). In all species studied 8 segments have been counted. The segments III, IV and V, subequal or gradually diminishing, are distinctly longer than other segments, similarly the segments VI –VIII are subequal in size; segment II is as long as broad, rarely distinctly longer than wide. Width/length ratio of segment VIII 1:1·4 –1·8, exclusively in *E. orientalis* 1: 2·7. On segment I always 3 setae, usually straight, needle-like, many times shorter than the width of the segment. On segment II — 1 –2, in *E. tritici* 2 –3 setae; in the majority of species the setae are as long as, or shorter than the segment; in *E. formiceticola* and *E. agropyri* one of the setae is about 2 times longer than the segment; beside setae, this segment bears also a campaniform pore. On segments III and IV the setae are hair-like, small, 0 –2, rarely 3 in number on each of them. Segment V bears 3 setae, the largest is about as long as the segment, in *E. formiceticola* 2 times as long. All the above mentioned setae are hair-like. On segment VI 1 fleshy seta as long as the segment. On segment VII 1 fleshy seta similar to than on segment VI and 1 hair-like seta, in *E. orientalis* this seta is absent. Segment VIII bears three kinds of setae — 2 sensilla basiconica, 2 hair-like setae and 8 fleshy setae. The sensilla basiconica are very small and difficult to be detected (on figures they have not been shown), 1 situated at the apex and 1 in 1/2 the length of segment, ventrally, between 2 large fleshy setae. Among the 2 hair-like setae — the large one is situated approximately in the middle of the segment, opposite to the place where the basiconic sensillum and 2 fleshy setae are attached; the small one is situated more apically. The large seta is 100—170 μm, i. e. 3—4 times as long as the segment, exclusively in *E. orientalis* 36 μm long. The fleshy setae vary in size and shape, so that it is difficult to trace the given seta from species to species; the size and position of 2 setae situated, together with a basiconic sensillum, in half lenght of the segment, are most constant; 1—3 setae, located apically, are in some species thinner and distinctly longer than the remaining ones, and it is not quite clear whether all the „fleshy setae" possess the same nature. In the fully grown specimens the antennae are 7—10 times shorter than the length of the body; in some specimens of *E. agropyri* and *E.* sp. c they were only 5 times shorter than the body length. The clypeus/antenna

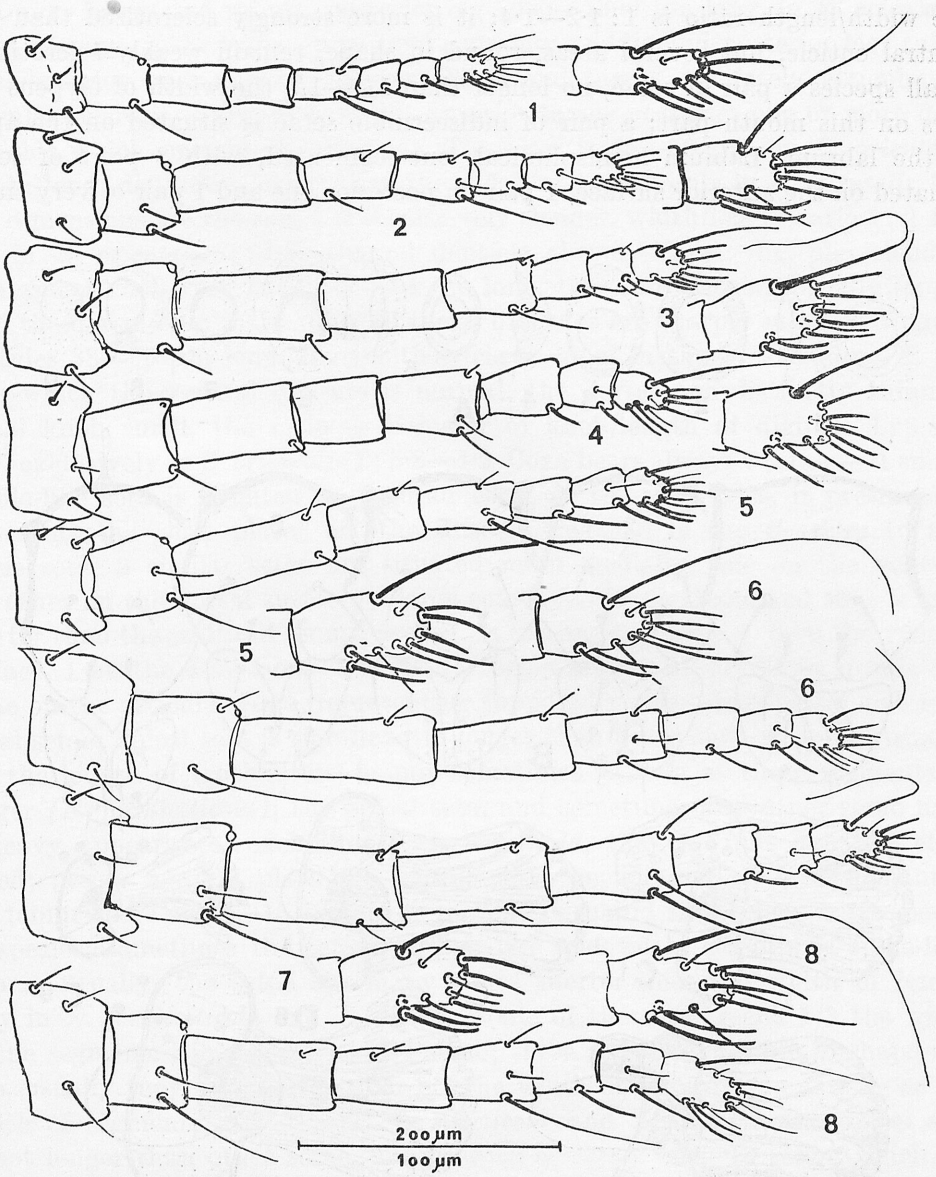

Fig. 3. Antennae (apical segment enlarged); 1 — *E. orientalis*, 2 — *E. dianthi*, 3 — *E.* sp. d, 4 — *E.* sp. c, 5 — *E. pimpinellae*, 6 — *E. agropyri*, 7 — *E. tritici*, 8 — *E. formiceticola*

length ratio is 1 : 3·1—4·3, exclusively in *E. orientalis* 1 : 1·8—2·0. The latter relation is caused by the fact that absolute length of the antennae is in this species very small, and the length of clypeus the greatest in the genus. This and other characters indicate an aberrative nature of *E. orientalis* among the species in *Exaeretopus*. The antennae/legs length ratio is 1 : 2·1—2·6.

Mouth parts: Clypeus 144—156 µm long, in *E. orientalis* 180—200 µm, and 132—165 µm wide, nearly square-shaped, excluding *E. orientalis* in which

the width/length ratio is 1 : 1·2—1·4; it is more strongly sclerotized than the ventral cuticle, but several areas, round in shape, remain weakly sclerotized; in all species a pair of setae, no longer than 1/4—1/3 the width of clypeus occurs on this mouth part; a pair of indiscernible setae is situated on the apex of the labrum. Labium hemispherical, one-segmented, with 3 pairs of setae situated on the anterior surface, 1 pair on posterior one and 1 pair of very small

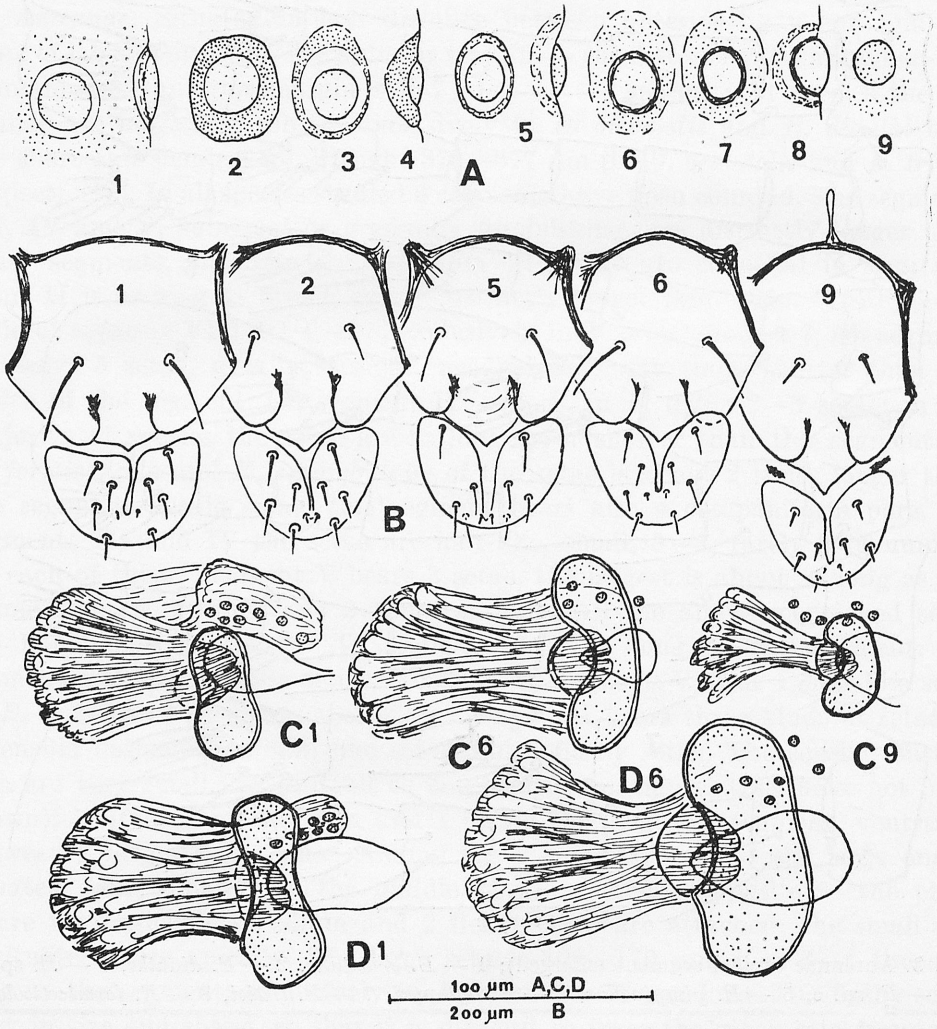

Fig. 4. A — eye, B — clypeolabrum and labium, C — anterior spiracle, D — posterior spiracle; 1 — *E. formiceticola*, 2 — *E. tritici*, 3 — *E.* sp. d, 4 — *E.* sp. c, 5 — *E. agropyri*, 6 — *E. pimpinellae*, 7 — *E.* sp. a, 8 — *E. dianthi*, 9 — *E. orientalis*

apical setae on the very apex; the setae, varying in shape, are usually not longer than 1/3 the length of labium. Piercing stylets very short, their loop slightly longer than the length of labium.

Legs: Large and robust, posterior leg 1000—1300 μm long, in *E. orientalis* about 850 μm, in *E. tritici* up to 1600 μm long; middle and posterior legs subequal, anterior ones slightly shorter. Tibia and tarsus are freely articulated, articular sclerosis is always present. Anterior tarsus possesses one or more dorsal folds which imitate articulations. The claw is 43—50 μm, in *E. orientalis* 26 μm long, distinctly longer than the width of tarsus, only in *E. orientalis* the two dimensions are the same; it is relatively slender, width/length ratio 1 : 2·4—3·6, in *E. orientalis* 1 : 1·9. Ungual denticle absent. Tarsal digitules slender, with apical knob very small, 46—84 μm long, the ventral being usually longer than the dorsal one; in *E.* sp. b all tarsal digitules are sharply pointed. Ungual digitules 38—60 μm long, shorter than claw, equal in shape, excluding *E* sp d in which the ventral digitule is normal, the dorsal one distinctly thinner; apical knob small, the ratio — diameter of knob/length of digitule 1 : 6·0—13·7, exclusively in *E orientalis* 1 : 3·8—4·2 Coxa bears always 7 setae — 1 small, needle-like seta is situated on exterior edge, at the very base, it presumably represents the „hair plate" of other insects, reduced in the *Coccinea* to this single seta; 2 similar setae are situated more medially, one on the ventral, the other on the dorsal surface; 4 large setae, similar in shape and size, a little shorter than the width of femur, are set on the apex of coxa — 3 on the ventral surface, 1 on the dorsal one Trochanter bears always 2 very short needle-like setae on the articular edge (representing supposedly also a hair plate) and 1—4 usual setae; apical seta is significantly longer than the remaining setae, usually 1/2 the length of trochanter+femur, sometimes as long as these segments or longer *(E formiceticola)*; the apical seta, and sometimes also other setae have a heavy appearance; excluding *E formiceticola*, they are not hair-like elongated; beside setae, 4 plate-like sensilla have been found on the trochanter. On femur there are 8 –15 setae; the number, size and shape vary from species to species, sometimes the setae are hair-like and weak, sometimes spine-like, strong, usually, the setae are many times shorter than the width of femur, only in *E. formiceticola* and *E. dianthi* some of the setae reach 1/3 the width of the segment. Tibia bears 12—24 setae; these are also variable in shape and size, usually they are shorter than 1/2 the width of tibia, rarely as long as the width of segment; excluding *E. formiceticola* and *E. dianthi*, the apical seta is not longer than other setae. Tarsus with 8, rarely with 10 setae, which are about as long as the width of segment, hair-like, arranged in four groups, 2 on the dorsal and 2 on the ventral surface. Relative lenghts — posterior leg/body 1 : 3·0—4·0, in *E. orientalis* 1 : 4·3—4·5;

Spiracles: The spiracles in *Exaeretopus* are devoid of distinctive characters. The diameters of anterior and posterior spiracles are 55—72 μm, 65—96 μm; respectively, in *E. orientalis* 38 μm and 48 μm, in *E. tritici* 84 μm and 106 μm, the apodeme of anterior spiracle is 52—96 μm long and 48—72 μm wide.

Anal plates: Triangular in shape, with apex usually rounded, 140—190 μm long, 72—120 μm wide, bearing 4 groups of setae: apical, ventral and fringe setae. All setae are variable in size and, excluding the apical ones, in number;

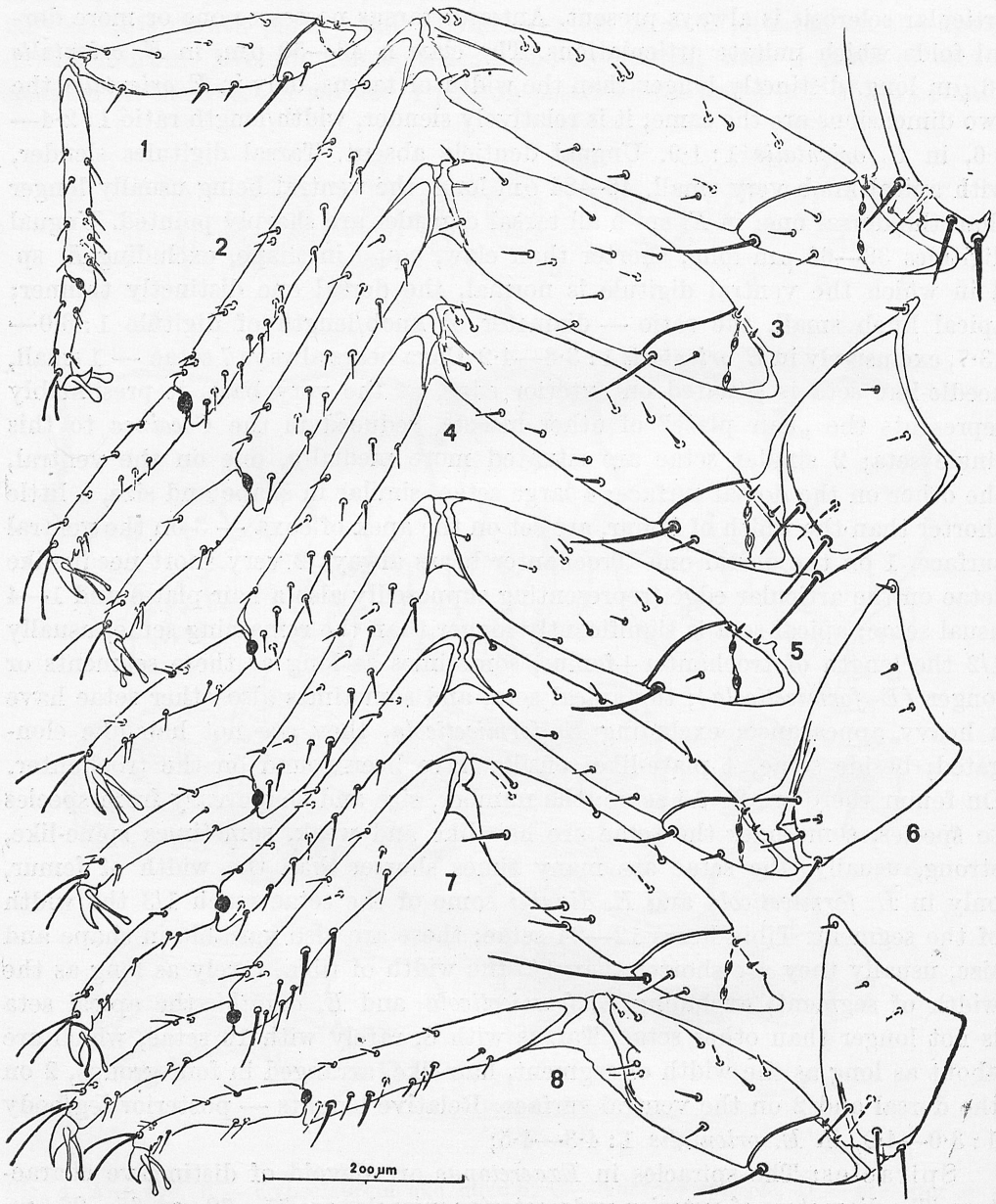

Fig. 5. Posterior leg; 1 — *E. orientalis*, 2 — *E. tritici*, 3 — *E.* sp. c, 4 — *E. agropyri*, 5 — *E.* sp. d, 6 — *E. pimpinellae*, 7 — *E. formiceticola*, 8 — *E. dianthi*

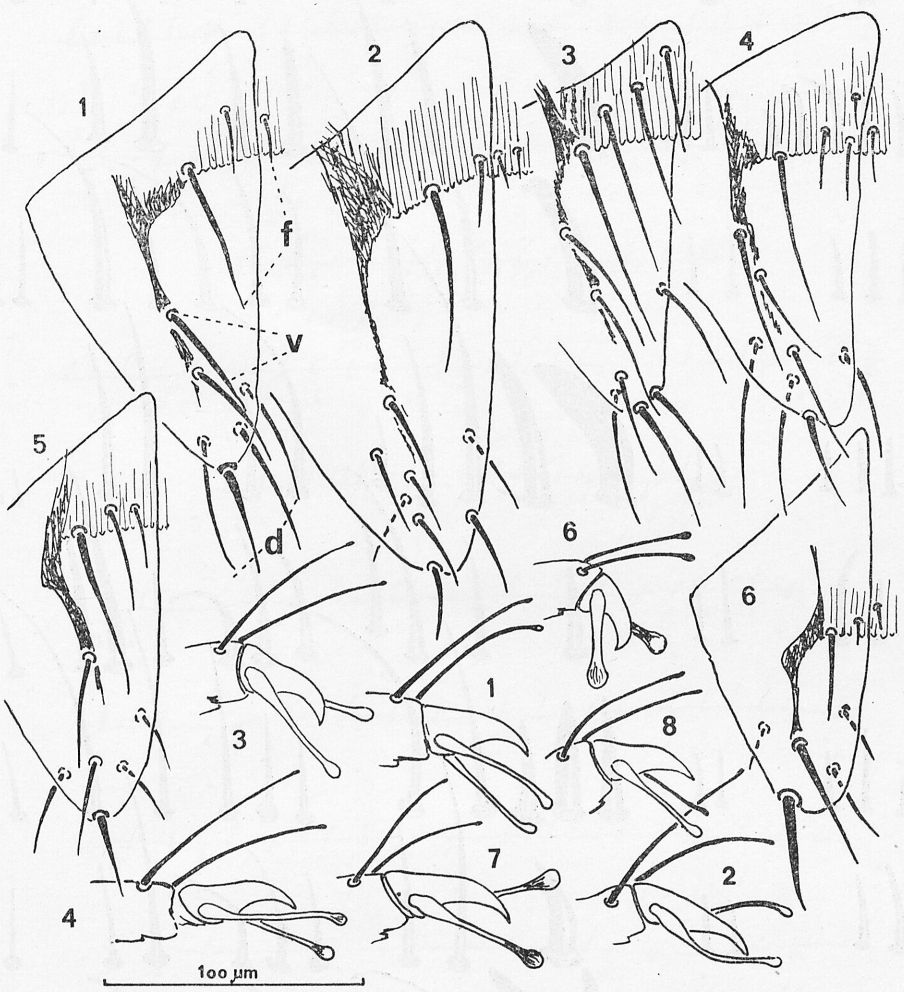

Fig. 6. Posterior claw and digitules; anal plates, ventral view; 1 — *E. pimpinellae*, 2 — *E. tritici*, 3 — *E. formiceticola*, 4 — *E. agropyri*, 5 — *E. dianthi*, 6 — *E. orientalis*, 7 — *E.* sp. c, 8 — *E.* sp. d; f — fringe setae, v — ventral setae, d — dorso-apical setae

the differences are of some value in separating species. One apical seta, being usually the strongest, although not necessarily the longest, is situated on the very tip of the plate, 2 are set dorsally near the apex, and 1, in a greater distance from the tip, at the interior edge of the plate. Ventral setae 1—4 in number, form a row along the medial line of the plate, on the ventral thickening. Fringe setae 4—10 in number (total number considered), the lateral ones are the longest, the medial ones gradually diminish, or are, all, many times shorter than the lateral setae.

Anal ring: 72—96 µm in diameter (in *E. orientalis* 55 µm, in *E. tritici* 108 µm), with 8—9, rarely 7 or 10 setae, 130—170 µm long.

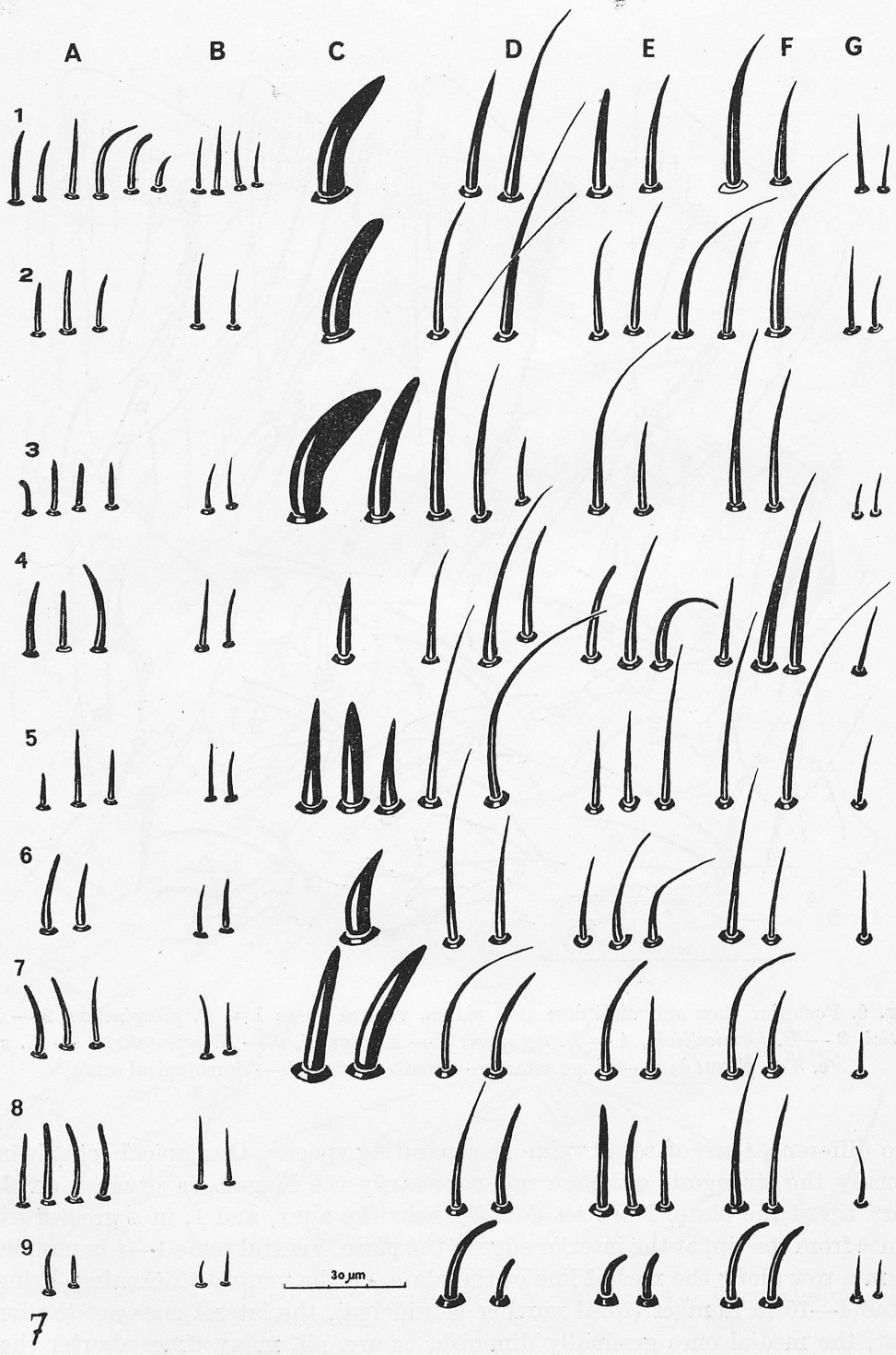

Fig. 7. Dorsal and marginal setae; A — dorsal setae on head, B — dorsal setae on anal lobes, C — spiracular setae, D — anterior marginal setae, E — lateral marginal setae, F — posterior marginal setae, G — ventral submarginal setea; 1 — *E. tritici*, 2 — *E. formiceticola*, 3 — *E. agropyri*, 4 — *E. pimpinellae*, 5 — *E.* sp. c, 6 — *E.* sp. d, 7 — *E.* sp. a, 8 — *E. dianthi*, 9 — *E. orientalis*

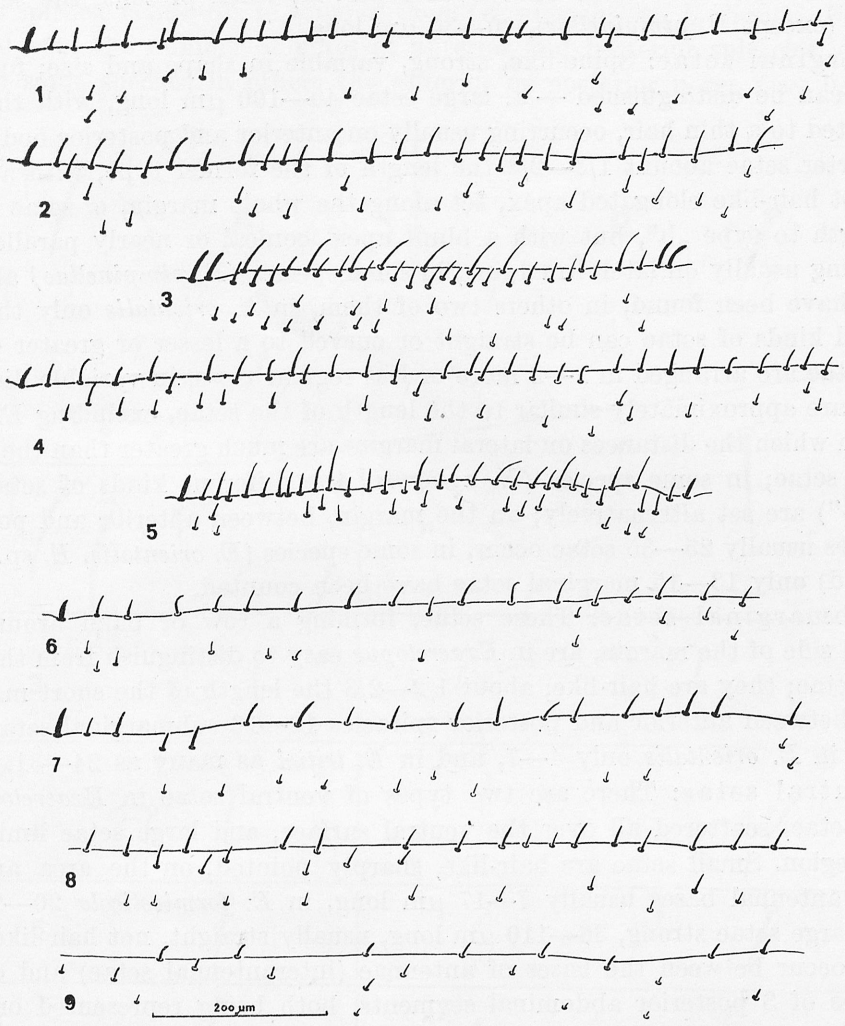

Fig. 8. Arrangement of lateral setae on distance between spiracles; 1 — *E. tritici*, 2 — *E. formiceticola*, 3 — *E. agropyri*, 4 — *E. pimpinellae*, 5 — *E.* sp. c, 6 — *E.* sp. d, 7 — *E.* sp. a, 8 — *E. dianthi*, 9 — *E. orientalis*

Dorsal setae: Variable in shape and size with respect to the species as well as to the body regions. They are spine-like, conical or nearly parallelsided, towards the posterior body end becoming slender and smaller; straight or curved, on head and thorax 10—20 µm long (in *E. orientalis* 8—11 µm), on abdomen shorter; on the area limited by the translucent bases of antennae and anterior legs usually 15 setae, in *E. orientalis* and *E.* sp. d 6—7 setae, in *E. agropyri* about 10, in *E. formiceticola* and *E. tritici* 30—35 setae.

Spiracular setae: In the majority of species there is 1 spiracular seta in each anterior spiracular furrow, and no posterior setae, in *E. agropyri* and *E.* sp. c 1—2 setae have been found at each spiracle, in *E. orientalis* and *E.*

dianthi no spiracular setae have been observed; when present, the setae are strong (except *E. pimpinellae*), 20—30 μm long.

Marginal setae: Spine-like, strong, variable in shape and size; following forms can be distinguished — a. large setae 40—100 μm long, with the apex elongated to a thin hair, occurring usually on anterior and posterior body ends, b. shorter setae abount 1/3—2/3 the length of the former type, with a sharp, but not hair-like elongated apex, set along the whole margin, c. setae similar in length to type „b", but with a blunt apex, conical or nearly parallelsided, occurring usually on lateral margins; in some species *(E. pimpinellae)* all three types have been found, in others two of them, in *E. orientalis* only the type „c"; all kinds of setae can be straight or curved to a lesser or greater degree. The setae are arranged in 1—2 more or less regular rows, in variable distances which are approximately similar to the length of the setae, excluding *E. orientalis*, in which the distances on lateral margins are much greater than the length of the setae; in some species *(E. agropyri)* the different kinds of setae („a" and „b") are set alternatively; on the margin, between anterior and posterior spiracles usually 25—35 setae occur, in some species (*E. orientalis*, *E.* sp. a and *E.* sp. d) only 13—15 marginal setae have been counted.

Submarginal setae: These setae, forming a row or band around the ventral side of the margin, are in *Exaeretopus* easy to distinguish from the marginal setae; they are hair-like, about 1/2—2/3 the length of the short marginal setae; between anterior and posterior spiracles 10—16 submarginal setae were found, in *E. orientalis* only 4—7, and in *E. tritici* as many as 24—31.

Ventral setae: There are two types of ventral setae in *Exaeretopus* — small setae, scattered all over the ventral surface, and large setae limited to some region. Small setae are hair-like, sharply pointed, on the area anterior to the antennal bases usually 7—17 μm long, in *E. formiceticola* 20—24 μm long. Large setae strong, 36—110 μm long, usually straight, not hair-like elongated, occur between the bases of antennae (interantennal setae) and on the sternites of 3 posterior abdominal segments, both being represented only by one pair on each of the mentioned sternites. In this respect, *E. formiceticola* represents a significant exception — the large setae are present on all abdominal segments and their number is greater (2—4 pairs). Such a large number of long sternal setae is characteristic of species in the genus *Luzulaspis*. It should be noticed, however, that among the long sternal setae in *E. formiceticola* only one pair is distinctly larger than the rest. The number of ventral setae, including large and small forms, counted on the area between the antennal bases and anterior coxae is usually 6—10, in *E. formiceticola* 17—24, in *E. tritici* 20—30. The number of setae on VIth abdominal sternite is approximately the same as on the above area, being smaller in *E. formiceticola* and larger in *E. pimpinellae*.

Quinquelocular pores: With 3—7, usually 5 loculi, form groups of 4—12 (1 in *E.* sp. a) pores at each spiracle and bands of 9—53 pores from the spiracles to body margin. In the majority of species the total number of pores

at each spiracle is 30—67; in some of them (*E. pimpinellae*, *E. dianthi*, *E.* sp. a) only 10—26; the number of pores at anterior and posterior spiracles is subequal in some species, in others the anterior or posterior pores may be more

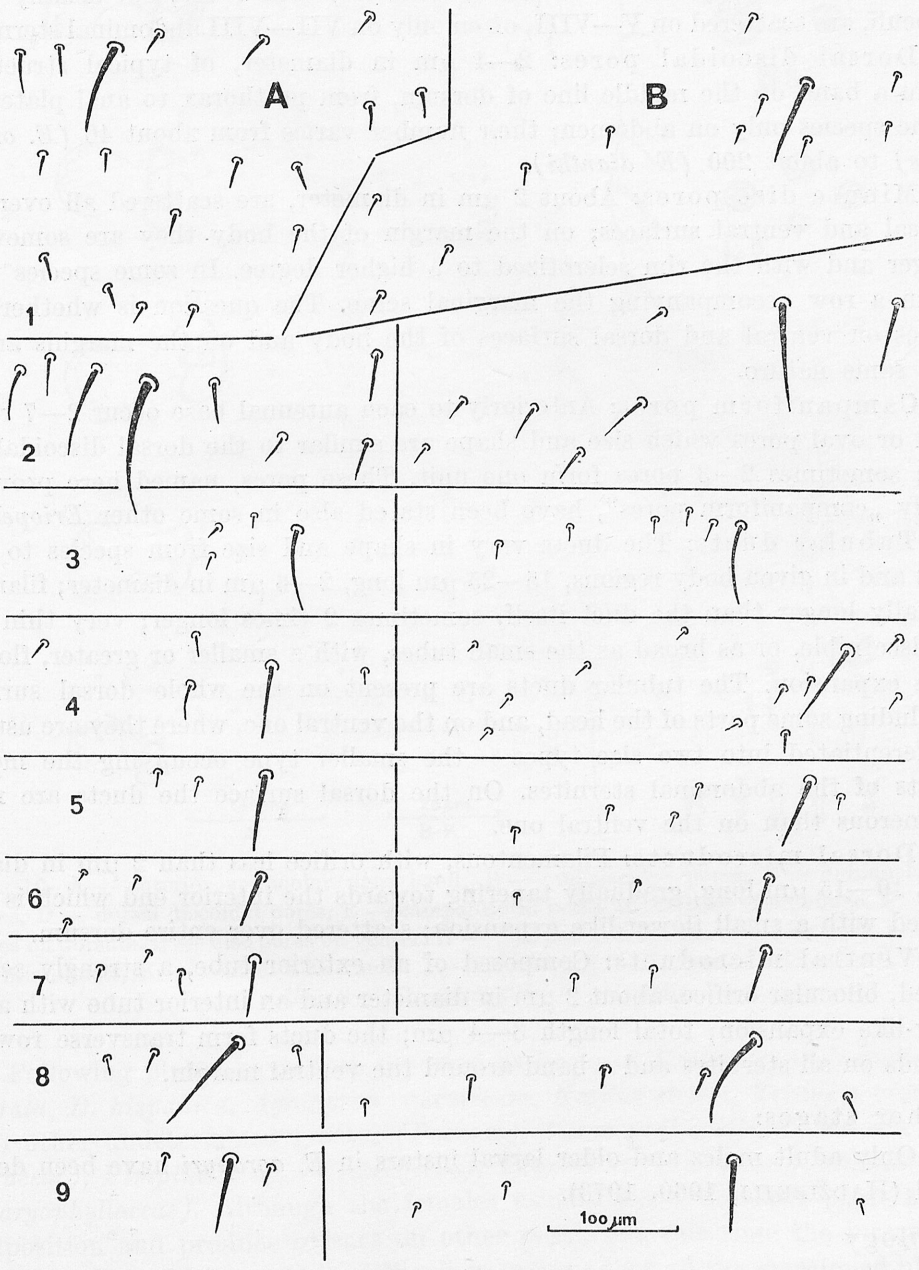

Fig. 9. Ventral setae: A — interantennal setae, B — setae on VIth abdominal sternite (in both only left body half represented); 1 — *E. tritici*, 2 — *E. formiceticola*, 3 — *E. agropyri*, 4 — *E. pimpinellae*, 5 — *E.* sp. c, 6 — *E.* sp. d, 7 — *E.* sp. a, 8 — *E. dianthi*, 9 — *E. orientalis*

numerous. Unordinary conditions have been observed in *E. orientalis* — the bands of quinquelocular pores do not end on the margin of the body but cross the edge and enter the dorsal surface, where about 9—12 pores are situated.

Multilocular pores: 5—6 μm in diameter, with 4—10, but usually with 6 loculi, are scattered on V—VIII, often only on VII—VIII abdominal sternites.

Dorsal discoidal pores: 2—4 μm in diameter, of typical structure, form a band on the middle line of dorsum, from prothorax to anal plates, in some species only on abdomen; their number varies from about 40 *(E. orientalis)* to about 200 *(E. dianthi)*.

Minute disc pores: About 2 μm in diameter, are scattered all over the dorsal and ventral surfaces; on the margin of the body they are somewhat larger and with the rim sclerotized to a higher degree. In some species they form a row accompanying the marginal setae. The question is whether the pores on ventral and dorsal surfaces of the body and on the margins are of the same nature.

Campaniform pores: Anteriorly to each antennal base occur 2—7 rounded or oval pores which size and shape are similar to the dorsal discoidal pores; sometimes 2—3 pores form one unit. These pores, named here provisionally „campaniform pores", have been stated also in some other *Eriopeltini*.

Tubular ducts: The ducts vary in shape and size from species to species and in given body regions, 15—25 μm long, 2—6 μm in diameter; filament usually longer than the duct itself, sometimes 2 times longer; very thin and indiscernible, or as broad as the small tubes, with a smaller or greater, flower-like expansion. The tubular ducts are present on the whole dorsal surface, excluding some parts of the head, and on the ventral one, where they are usually differentiated into two size types — the smaller type occupying the medial parts of the abdominal sternites. On the dorsal surface the ducts are more numerous than on the ventral one.

Dorsal microducts: Filamentous, with orifice less than 2 μm in diameter, 10—15 μm long, gradually tapering towards the interior end which is provided with a small flower-like expansion; scattered over entire dorsum.

Ventral microducts: Composed of an exterior tube, a strongly sclerotized, bilocular orifice, about 2 μm in diameter and an interior tube with a flower-like expansion; total length 3—4 μm; the ducts form transverse rows or bands on all sternites and a band around the ventral margin.

Other stages:

Only adult males and older larval instars in *E. agropyri* have been described (Hadžibejli, 1960, 1973).

Biology

The host plants, life cycle and habitat of *Exaeretopus* are very little known, excluding *E. agropyri* and *E. formiceticola* on which some information concerning the life cycle has been completed (Newstead, 1894; Hadžibejli 1960, 1973; Goux, 1943 b).

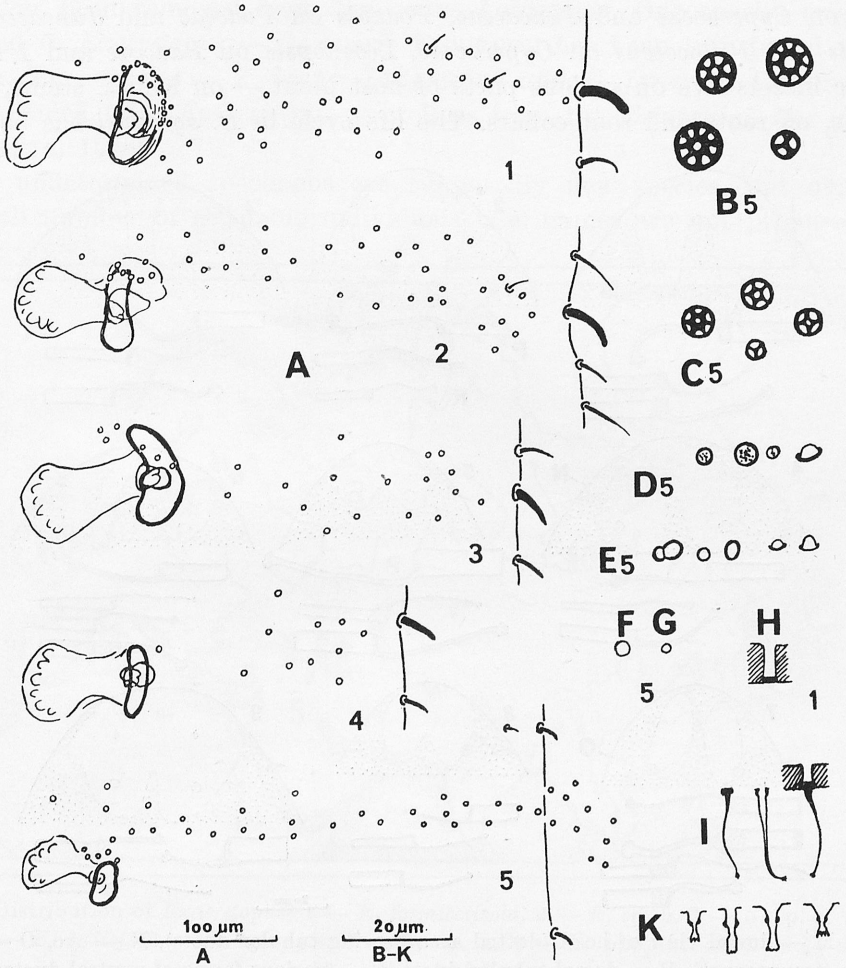

Fig. 10. A — anterior spiracular pore band, B — multilocular pores, C — quinquelocular pores, D — dorsal discoidal pores, E — campaniform pores at the base of antennae, F — disc pores on dorsum, G — disc pores on venter, H — disc pores on margin (cross-section), I — dorsal microducts, K — ventral microducts; 1 — *E. tritici*, 2 — *E. formiceticola*, 3 — *E. pimpinellae*, 4 — *E.* sp. a, 5 — *E. orientalis*

Following plants have been reported as hosts of *Exaeretopus*: *Dactylis glomerata, D. hispanica, Agropyron caucasicum, Nardus stricta, Triticum aestivum* and other undetermined grasses *(Poaceae), Carex pediformis, C. nanella (Cyperaceae), Pimpinella* sp. *(Umbeliferae), Thymus* sp. *(Labiateae), Dianthus* sp. *(Caryophyllaceae)*. Although the females usually leave the host plant before oviposition and produce ovisacs on other plants (at this time the insects are usually collected), it would be difficult to assume that all the mentioned plants, except *Poaceae* and *Cyperaceae*, are only incidental objects on which the ovisacs were produced. But if so, *Exaeretopus* is the only member of the *Eriopeltini* which infests the *Dicotyledones*. *Eripeltis* and *Scythia* live on *Poaceae, Luzu-*

laspis on *Cyperaceae* and *Juncaceae*, *Poaspis* on *Poaceae* and *Juncaceae*, *Vittacoccus* and *Psilococcus* on *Cyperaceae*, *Lecanopsis* on *Paaceae* and *Iridaceae*.

The insects live on various parts of host plant — on leaves, stems, in leaf sheaths, on roots and root collars. The life cycle in *E. agropyri* has been stu-

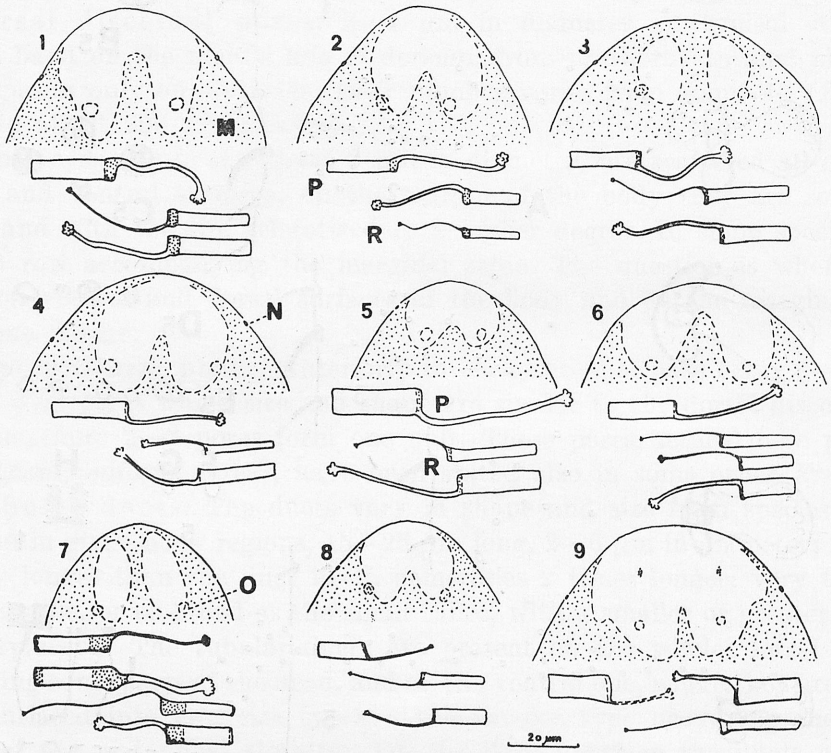

Fig. 11. M — dorsal view of head (dotted area bearing tubular ducts), N — eye, O — antennal base (transparent), P — dorsal tubular ducts, R — various forms of ventral ducts; 1 — *E. tritici*, 2 — *E. formiceticola*, 3 — *E. agropyri*, 4 — *E. pimpinellae*, 5 — *E.* sp. c, 6 — *E.* sp. d, 7 — *E.* sp., a, 8 — *E. dianthi*, 9 — *E. orientalis*

died by HADŽIBEJLI (1973). This author stated one generation per year, with the winter diapause in egg stage. Some species may be of economic importance (WILLIAMS, 1977).

Distribution

The range of *Exaeretopus* represents a very peculiar case. The species occupy a narrow band from southern Primorye in the Far East to western Europe, through Central Asia, Transcaucasion region and Mediterranean Sea.

Taxonomy

Exaeretopus belongs apparently to the tribe *Eriopeltini*, being closely related to *Luzulaspis* and *Poaspis*. Some questions concerning its taxonomic status and relationship have been discussed in an earlier paper (KOTEJA, 1978).

Ten species are included to the genus, one of which being described as a new species and four remained unidentified. One species — *E. agropyri* (HADŽI-

BEJLI) has been removed from the genus *Luzulaspis*. One species originally described in *Exaeretopus* — *E. caricis* EHRHORN, has been transferred to *Luzulaspis*. Two species — *E. boonei* HOLLINGER and *E. farinosus* GREEN, have been excluded from *Exaeretopus*, as well as from the *Eriopeltini* (for details see KOTEJA, 1978).

The undetermined specimens are supposedly new species, but oving to the small number of available individuals new names are not proposed. On

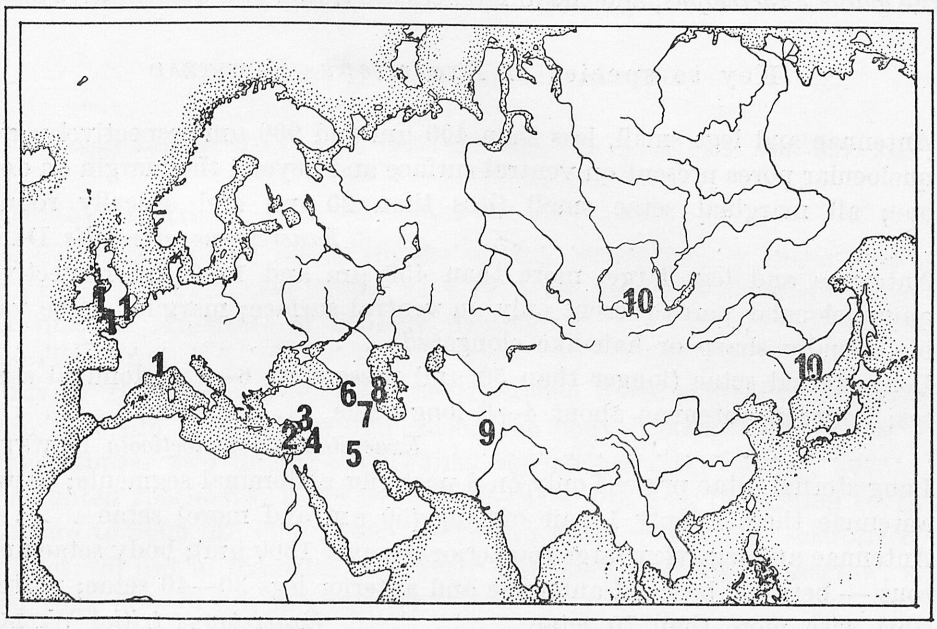

Fig. 12. Distribution of *Exaeretopus*; 1 — *E. formiceticola*, 2 — *E.* sp. b, 3 — *E.* sp. c, 4 — *E.* sp. d, 5 — *E. tritici*, 6 — *E. agropyri*, 7 — *E.* sp. a, 8 — *E. pimpinellae*, 9 — *E. dianthi*, 10 — *E. orientalis*

the other hand, they represent a valuable source of information on the morphology, biology and distribution of the genus and have been included to the revision.

The interrelationship of species within the genus can be characterized as follows:

Exaeretopus agropyri, *E. pimpinellae*, *E. dianthi* and the undetermined species form a comparatively homogenous group. Given pairs of species share 28—41 characters of the 54 under comparison, and each of them exhibits only 1—2 exclusive characters.

Exaeretopus orientalis represents the most aberrative form among the species studied — it possesses as many as 26 exclusive characters, what constitutes nearly half of the considered number, and shares with the above mentioned group of species 15—19 characters and with *E. formiceticola* and *E. tritici* only 8—9.

Exaeretopus formiceticola holds also an extreme position — it possesses 7 exclusive characters and shares with other species (excluding *E. orientalis*) 23—28 characters. The most striking feature of this species is the large number of sternal setae.

Exaeretopus tritici possesses 16 exclusive characters, with *E. orientalis* it shares 8 characters, with *E. pimpinellae* 31, and 18—24 with other species. Although showing numerous exclusive characters, *E. tritici* is a typical member of the genus *Exaeretopus*, and the differences are rather of a quantitative nature.

Key to species of *Exaeretopus* NEWSTEAD

1. Antennae and legs small, less than 400 μm and 900 μm respectively; quinquelocular pores present on ventral surface and beyond the margin on dorsal one; all marginal setae small (less than 20 μm) and apically rounded . . . . . *Exaeretopus orientalis* DANZIG
— Antennae and legs large, more than 450 μm and 1000 μm respectively; quinquelocular pores present only on ventral surface; marginal setae variable, usually sharp or hair-like elongated 2
2. Long sternal setae (longer than 50 μm) present on 6—7 abdominal sternites; between antennae about 4—8 long setae . . . . . *Exaeretopus formiceticola* NEWSTEAD
— Long sternal setae present only on 3 posterior abdominal segments; between antennae there is only 1 pair of long (50 μm and more) setae 3
3. Antennae and legs very large (posterior leg over 1300 μm); body setae numerous — between bases of antennae and anterior legs 30—40 setae; posterior tibia with more than 20 setae . . . . . *Exaeretopus tritici* WILLIAMS
— Antennae and legs shorter; between antennae and anterior legs 6—10 setae; on posterior tibia 12—16 setae 4
4. Spiracular setae entirely absent; long interantennal setae 60—80 μm; at least some of sternal setae on thorax and first adbominal segments 20—30 μm long, being longer than respective dorsal setae; apical antennal segment less than 40 μm long . . . . . *Exaeretopus dianthi* sp. n.
— At least one anterior spiracular seta present; long interantennal setae 40—60 μm long; dorsal and ventral setae on thorax and first abdominal segments subequal, less than 20 μm long; apical antennal segment more than 40 μm long 5
5. Anterior marginal setae with filamentous apex reaching 80—100 μm . . . . . *Exaeretopus agropyri* (HADŽIBEJLI)
— Anterior marginal setae do not exceed 60 μm 6
6. Tarsal digitules on all legs hair-like, with sharp apex . . . . . *Exaeretopus* sp. b
— Tarsal digitules dilated apically to a lesser or greater degree 7
7. Ventral digitules at all legs distinctly stouter than dorsal ones . . . . . *Exaeretopus* sp. d

— Ungual digitules subequal 8
8. Between anterior and posterior spiracular furrows about 15 marginal setae . . . . . *Exaeretopus* sp. a
— Between spiracular furrows about 30 marginal setae . . . . . *Exaeretopus* sp. c

DESCRIPTIONS OF SPECIES *

Exaeretopus agropyri (HADŽIBEJLI)

Luzulaspis agropyri HADŽIBEJLI, 1960: 312—316, Fig. 7—9; 1973: 835—837, Fig. 1—6.

Material studied

5 ♀♀, on *Agropyron repens* (in the original description *A. caucasicum* is given), USSR, Georgia, near Tbilisi, 21.V.1954, leg. et det. Z. HADŽIBEJLI, 28—54, type material, Institute of Zoology, Leningrad.

Description

Living specimens: Young females flattened dorso-ventrally, parallelsided, up to 3500 μm long; before oviposition the body becomes convex, on dorsal surface appear two broad, longitudinal red stripes (HADŽIBEJLI, 1973).

Mounted specimens: Body oval, 2400—4100 μm long (according to HADŽIBEJLI up to 5000 μm long), 1300—2400 μm wide; moderately sclerotized.

Eyes: 20 μm in diameter, relatively flat, surrounded by a narrow, sclerotized ring, 35—40 μm in diameter.

Antennae: Situated slightly nearer anterior margin of the body than the apex of labrum, length of segments in μm — I — 65—90, II — 65—72, III — 96—144, IV — 94—96, V — 72—82, VI — 48—55, VII — 36—46, VIII — 43—48, entire length 520—635 μm; witdh of segments in μm — II — 58, III — 48, VIII — 26; width/length ratio of segment VIII 1: 1·6—1·8; number of setae — II — 2, III — 1—2, IV — 0—1, V — 2—3; longest setae on segments II and V as long as the segments or a little longer; large hair-like seta on segment VIII about 150 μm long; fleshy setae differentiated in size, seta situated near apex, opposite the large hair-like seta is the longest; length ratios antenna/body 1: 4·6—6·5, antenna/posterior leg 1: 2·1—2·3, clypeus/antenna 1: 3·4—4·2.

Mouth parts: Clypeus 151 μm long, 144 μm wide, unevenly sclerotized, with a pair of comparatively long setae. Labium 82 μm long, 100 μm wide, with 5 pairs of setae, the basal ones being distinctly longer and stronger, and the apical ones very small. Surface ratio labium/clypeus 1:2·6. Loop of piercing stylets about as long as labium wide.

* Characters typical of the genus are omitted in the descriptions.

Legs: Large and robust; dimensions of posterior leg in μm — coxa 250 long, 144 wide, trochanter+femur 372—480 long, 80—100 wide, tibia 336 long, 48 wide, tarsus 192—204 long, 36 wide, claw 45 long, 17 wide; number of setae — trochanter 2, femur 10, tibia 14, tarsus 8; setae on femur and tibia subequal, spine-like, shorter than the width of tibia; tarsal digitules 72—77 μm long, length ratio claw/tarsal digitules 1:1·6; ungual digitules 60 μm long, apical knob 7 μm in diameter, ratio — diameter of knob/length of digitule 1:8·6; entire lengths — anterior leg 1050 μm, middle leg 1150—1400 μm, posterior leg 1200—1320 μm; length ratio — leg/body 1:3·1.

Spiracles: Anterior spiracle — apodeme 72 μm long, 60 μm wide, peritreme 72 μm in diameter; posterior peritreme 84 μm in diameter.

Anal plates: 168 μm long, 96 μm wide; apical setae slander, hair-like elongated, 1/3 the length of plate; ventral setae 2—3 in number, slender, about as long as the apical setae; fringe setae 6—9 in number, lateral setae 1/2 the length of plate, medial ones 2—3 times shorter. Anal ring 72 μm in diameter, with 8—10 setae about 170 μm long.

Dorsal setae: Variable in shape — on head nearly parallelsided, with blunt apex, on thorax rather conical, sharply pointed, towards posterior body end becoming slender; short — on head and thorax 10—15 μm long, on anal lobes 9—13 μm long; scarce — on the area limited by the bases of antennae and legs about 10 setae, on anal lobes 3—5 setae on each side.

Spiracular setae: Strong, about 30 μm long, 2 rarely 1, in each group.

Marginal setae: Strong, spine-like, with sharp or hair-like elongated apex; on head 22—100 μm, on sides 16—80 μm, on anal lobes 33—66 μm long; arranged in two irregular rows in distances 17—35 μm; long setae are situated more dorsally, the short ones ventrally; between anterior and posterior spiracles occur 25—36 marginal setae.

Submarginal setae: Hair-like, much shorter than the marginal ones; between spiracular furrows 14—16 submarginal setae.

Ventral setae: Small setae very short — on head 7—10 μm long, on mesothorax and first abdominal sternites 12—17 μm long; large setae slender, 48—58 μm long, present between the antennae and on 3 posterior abdominal sternites; between antennae 2 long and 8 small setae, between posterior coxae 10—12 setae, on VI sternite 2 long and 12 small setae.

Quinquelocular pores: Majority of pores with 5 loculi; 4—6 pores form a group near anterior spiracle, 29—37 pores are arranged in a band from spiracle to spiracular spines (total number 33—44 pores); at posterior spiracle the group is formed of 4—11 pores and the band of 38—43 pores (total number 46—49).

Multilocular pores: With 6—7 loculi, on VII—VIII, scarcely on VI, abdominal sternites.

Other pores: Discoidal pores typical, present on abdomen and supposedly on thorax, not numerous; small disc pores present on both body surfaces and on margins; campaniform pores, 5—7 in number, occur at each antennal base.

Tubular ducts: on dorsal surface about 15 μm long, 4 μm in diameter, fi-

lament 25 μm long, about 1·5 μm in diameter; on ventral surface two types of ducts — the larger ones similar in size to dorsal ducts, the smaller 20 μm long, 2—3 μm in diameter, with inner filament 25—30 μm long and very thin; inner orifice narrowly, strongly sclerotized; on VI tergite about 200 ducts, in VI sternite 140 ducts present.

Microducts: Shape and distribution typical.

Other stages

Exaeretopus agropyri is the only species of the genus in which adult males have been collected and described. From the description presented by HADŽIBEJLI (1960, 1973) in general terms it can be only said that the species in question belongs to the *Eriopeltis* group of males sensu GILIOMEE (1967).

Beside males, HADŽIBEJLI described also female nymphs of the oldest stage, supposedly the third instar.

Biology

Exaeretopus agropyri infests leaves of *Agropyron caucasicum*. The active period lasts from April to July. In this month females leave the host and produce ovisacs on the soil surface. First instar nymphs emerge from ovisacs next year, in April, and attach to leaves of the grass. Males have been observed in May (HADŽIBEJLI, 1973).

Distribution

USSR, Eastern Georgia, near Tbilisi, steppe zone.

Notes

Exaeretopus agropyri, originally described in *Luzulaspis*, is, beside *E. formicetícola*, the best known species of the genus. It demonstrates all typical characters of *Exaeretopus*, being distinct from other species by the very long marginal setae and the presence of spiracular setae at each spiracular furrow (the latter feature shared with *E.* sp. c).

Exaeretopus dianthi sp. n.

Type material

Holotype — ♀ on underground stem of *Dianthus* sp., USSR, Tadjikistan, southern slopes of Hissar Mts, Donbar, 4.VI.1975, leg. M. ŠARIPOV, 5753, deposited in the Institute of Zoology, Academy of Sciences, Leningrad, USSR.

Description

Body: Elongate-oval, 3500 μm long, 1800 μm wide; moderately sclerotized.

Eyes: Distinct, convex, about 22 μm in diameter, surrounded by a comparatively narrow band of more strongly sclerotized cuticle.

Antennae: Situated in half the distance between anterior body margin and apex of labrum. Length of segments in μm — I — 55, II — 52, III — 96, IV — 72, V — 60, VI — 38, VII — 36, VIII — 36; total length 447; width of segments in μm — II — 60, III — 41, VIII — 26, width/length ratio of segment VIII 1:1·4; number of setae — II — 2, III — 0—1, IV — 2, V —

3, largest setae on segments II and V about as long as the segments, other setae as long as the segments wide or shorter; large hair-like seta on apical segment broken, fleshy setae subequal in length; length ratios — antenna/body 1 : 7·8, antenna/posterior leg 1:2·4, clypeus/antenna 1:3·1.

Mouth parts: Clypeolabral shield 144 μm long, 132 μm wide; moderately sclerotized, with a pair of setae. Labium 77 μm long, 108 μm wide, with 4 pairs of short and strong setae and 1 pair of small apical setae; Loop of piercing stylets about as long as the labium.

Legs: Small; dimensions of posterior leg in μm — coxa 240 long, 144 wide, trochanter+femur 330 long, 96 wide, tibia 300 long, 48 wide, tarsus 168 long, 34 wide, claw 43 long, 14 wide; number of setae — trochanter 1—2, femur 9, tibia 13, tarsus 7; setae on femur of strong appearance, 1/4 the width of segment; on tibia 1/2 the width of segment, weak, except apical seta and another one on ventral surface which are strong, spine-like; entire lengths — anterior leg 998 μm, middle leg 1050 μm, posterior leg 1060 μm; length ratio — leg/body 1 : 3·3.

Spiracles: Anterior spiracle — apodeme 77 μm long, 60 μm wide, peritreme 55 μm in diameter, posterior peritreme 65 μm in diameter.

Anal plates: 149 μm long, 86 μm wide; apical setae weak, except terminal one, comparatively short, hair-like elongated; ventral setae, 2—3 in number, similar in shape to the apical ones but longer; 3 pairs of fringe setae, lateral setae are little shorter than length of anal plate, medial setae 1/3—1/2 the length of lateral ones. Anal ring 72 μm in diameter, with 8 setae about 132 μm long.

Dorsal setae: Spine-like, on head nearly parallelsided with rounded apex, towards the posterior end body becoming slender and sharply pointed; on head and thorax 14—19 μm long, on anal lobes 10—16 μm long; on the area limited by the bases of antennae and anterior legs about 16 setae, on anal lobes 3—4 setae on each side.

Spiracular setae: Not differentiated.

Marginal setae: Strong, spine-like, pointed, on posterior margin even elongated into a thin hair, or nearly parallelsided, with rounded apex (some of the setae on lateral margins); on lateral margin 11—29 μm long, on posterior one 22—33 μm long; setae situated in 1—2 rows, in distances 22—60 μm; between spiracular depressions about 23 marginal setae present.

Submarginal setae: Needle-like or hair-like, usually 1/2—3/4 the length of marginal setae, but some of them as long as the later; between spiracular depressions about 10 setae.

Ventral setae: Small setae on head 12—14 μm long, on thorax and first abdominal sternites 12—30 μm long, between antennae 84 μm long, on VI segment 60 μm long; situated on head and on 3 posterior abdominal segments; numbers — between antennae and anterior legs 2 long and 6 small setae, between posterior coxae about 12 setae, on VI abdominal sternite 2 long and 10 small setae.

Quinquelocular pores: With 5 loculi, forming a group of 6 pores near the

anterior spiracle and an irregular band of 12—15 pores to the body margin (total number 18—21 pores); at posterior spiracle 6 pores, in the band 16 pores.

Multilocular pores: With 4—6, rarely with 7 loculi, on VII and VIII, scarcely on VI sternite.

Other pores: Large discoidal pores about 2·5—3·5 μm in diameter, with sieve-like surface, form a band from prothorax to anal plates, the band comprises about 200 pores; small disc pores about 2 μm in diameter, are scattered on both dorsal and ventral surfaces, on margins they are somewhat larger; campaniform pores 2 at each antennal base.

Tubular ducts: On dorsal surface 14—20 μm long, 4—5 μm in diameter, inner filament 14—20 μm long, very thin; on ventral surface ducts variable, the largest are similar to those on the dorsal surface, the smallest are 17 μm long, 2—3 μm in diameter, with a very thin inner filament, about as long as the ducts; inner orifice of all ducts narrowly and weakly sclerotized; arrangement of ducts typical, on ventral surface of abdomen small ducts are situated medially, large ones rather marginally; about 120 ducts on VI tergite and about 80 on VI sternite.

Microducts: Typical, not numerous.

Host plant

Caryophyllaceae: *Dianthus* sp., on underground stem.

Distribution

USSR, Tadjikistan.

Notes

Exaeretopus dianthi shares with *E. orientalis* the lack of spiracular setae; with *E. pimpinellae*, *E.* sp. d the character of marginal setae and the small number of quinquelocular pores, and with *E. formiceticola* the relatively long sternal setae on thorax and first abdominal sternites.

Exaeretopus formiceticola Newstead

Spermacoccus fallax Giard, Newstead, 1893 e: 207 (misidentification); *Exaeretopus formiceticola* Newstead, 1894 a: 204—206, Fig. 1—4; Ehrhorn, 1902: 193; Fernald, 1903: 193: Fernald, 1903: 143; Green, 1921: 195; 1925 b: 527; 1928: (6); 1928 a: 27—30, Fig. 6; Borchsenius, 1957: 116; Zahradnik, 1959: 545; *Luzulaspis (Exaeretopus) formiceticola* Newstead, Goux, 1937 a: 94—95; 1939: 67, 71—76; *Luzulaspis formiceticola* (Newstead), Goux, 1943 b; 1949; *Luzulaspis luzulae* (Dufour), Lindinger, 1912 b: 132, 368; *Lecanopsis formiceticola* (Newstead), Lindinger, 1937: 185.

Material studied:

7 ♀♀, in ant's nests, Guernsey, 8.VI.1893, leg. W. A. Luff, 1945—121, „cotype", 2 ♀♀, *Dactylis glomerata*, Guernsey, C. I. Moulin Huet, 11.IX.1924; 2 ♀♀, *Dactylis glomerata*, Guernsey, C. I., IX. 1925, leg. Tomlin; 2 ♀♀, *Dactylis glomerata*, Isle of Wight, Freshwater, 27.VII.1927, leg. E. E. Green; 2 ♀♀, *Dactylis glomerata*, England, Cheddar, Somerset, VIII. 1926. All specimens from the collection of British Museum (Nat. Hist.), London.

Description

Living specimens: „More or less reddish-brown, margins pale, with two purple lines on the dorsum" (NEWSTEAD, 1894 a).

Mounted specimens: Body oval, 3600—4200 μm long, 2100—2200 μm wide; moderately sclerotized.

Eyes: Lens sclerotized, rather flat, 22 μm in diameter, separated from moderately sclerotized body cuticle by a narrow, membranous band.

Antennae: Situated in half distance between anterior body margin and the apex of labrum; medium-sized; lengths of segments in μm — I — 67—79 II — 55—60, III — 105—120, IV — 84—108, V — 62—77, VI — 45—50, VII — 34—38, VIII — 40, entire length 500—600 μm; widths of segments in μm — II — 55, III — 38, VIII — 24; width/length ratio of segment VIII — 1 : 1·7; number of setae — II — 2, III — 1—2, IV — 1, V — 3; longest setae on segments II and V at least 2 times as long as respective segments, other setae about as long as the width of segments; fleshy setae on segment VIII variable in size — seta situated on apex, on the same side as the large hair-like seta is the thickest, and that situated opposite the large hair-like seta, apically, distinctly longer than the remaining fleshy setae; length ratios antenna/body 1 : 7·0, antenna/posterior leg 1 : 2·1.

Mouth parts: Clypeus 144 μm long, 156 μm wide; unevenly sclerotized, with 2 long setae. Labium 82 μm long, 108 μm wide; with 4 pairs of hair-like setae and short apical setae; loop of piercing stylets as long as the width of labium.

Legs: Medium-sized; dimensions of posterior leg in μm — coxa 220—280 long, 132—180 wide, trochanter+femur 336—390 long, 96—120 wide, tibia 312—370 long, 36—48 wide, tarsus 168—192 long, 34 wide claw 43 long, 14 wide; number of setae — trochanter 2—3, femur 8—9, tibia 14—16, tarsus 8; setae on ventral margin of tibia and femur spine-like, subequal in length — about as long as the width of tibia, other setae on these segments hair-like, shorter; tarsal digitules 60—84 μm long, the ventral one being usually longer than the dorsal; length ratio — claw/tarsal digitules 1:1·4—2·0; ungual digitules 48 μm long, apical knob 8 μm in diameter, ratio — diameter of knob/lenght of digitule 1:6·0; entire lengths — anterior leg 1015—1220 μm, middle leg 1090—1290 μm, posterior leg 1070—1290 μm; length ratio — leg/body 1:3·3—3·5.

Spiracles: Anterior spiracle — apodemy 72 μm long, 60 μm wide, peritreme 50—60 μm in diameter, posterior peritreme 72 μm in diameter.

Anal plates: 144 μm long, 82 μm wide; apical setae hair-like elongated, subequal, long — about 1/3 the length of anal plate; ventral setae, 2 in number about as long as the apical ones, slender; 8 fringe setae, lateral ones longer than 1/2 the length of plate, towards the middle of the fold the setae become, gradually shorter — up to 1/2 the length of the lateral setae. Anal ring 72 μm in diameter, with 10 setae about 160 μm long.

Dorsal setae: Spine-like, conical or nearly parallelsided, with sharp or blunt apex, towards the posterior end of the body more slender with tapering apex; on head 10—15 μm long, on thorax 10—13 μm long, on anal lobes 15—18 μm long; very numerous — 30—35 setae on the area limited by the bases of antennae and legs, 3—4 setae on anal lobes, each side.

Spiracular setae: Strong, about 30 μm long; 1 seta at each anterior spiracle, posterior setae never observed; rarely, the anterior seta at one of the spiracles may also be absent.

Marginal setae: Spine-like, all with sharp or hair-like elongated apex; on head 30—60 μm, on lateral margins 24—49 μm, on anal lobes 27—66 μm long; arranged in two irregular rows, in distances 15—50 μm; long, hair-like elongated setae and curved setae being set alternatively with shorter, sharply pointed and straight ones; on the edge between anterior and posterior spiracle 33—34 marginal setae have been counted.

Submarginal setae: Hair-like, 1/2—3/4 the length of shorter marginal setae; between spiracular depressions 16—19 submarginal setae.

Ventral setae: Small ventral setae relatively strong, on head 20—24 μm long, and very numerous; large setae variable in size, the longest being 96—108 μm, strong, sometimes conical; present between the antennae and on 6—7 posterior abdominal sternites; between antennae 6—8 long (over 50 μm) and 10—12 short setae, between posterior coxae 12—16 setae; on VI sternite 4 long and 6—10 short setae.

Quinquelocular pores: With 5, rarely 3—4 loculi; 5—11 pores form a group near anterior spiracle, 24—33 pores a band from spiracle to body margin (total number 29—44 pores); at posterior spiracle the group contains 6—12 pores and the band 16—26 pores (total number 25—33 pores).

Multilocular pores: With 6—7, rarely with 8—10 loculi, present on VII—VIII abdominal sternites.

Other pores: Discoidal pores present on thorax and abdomen. Small disc pores present on both body surfaces. Campaniform pores, 4—6 in number, at each antennal base.

Tubular ducts: On dorsal surface 15—19 μm long, 3 μm in diameter, filament 20—30 μm long, 0·5—1·5 μm in diameter; large ducts on ventral surface similar to those on the dorsal one, small ducts 17 μm long, about 2·5 μm in diameter, with filament 20 μm long, very thin; inner orifice of all ducts well sclerotized; sclerotization relatively broad, in the small ducts about as broad as their diameter; ducts very numerous — on VI tergite 150—200 ducts, on VI sternite about half of these numbers.

Microducts: Shape and distribution typical.

Other stages

First stage nymphs have been described by NEWSTEAD (1894 a). The author found them very similar to other *Coccidae* nymphs.

Biology

Exaeretopus formiceticola has been observed in the field by A. W. LUFF (NEWSTEAD, 1894 a), GREEN (1925 b) and GOUX (1937 a). From the data presented by the above authors following conclusions can be drawn:

The host plants of *E. formiceticola* belong to the *Poaceae (Nardus stricta, Dactylis glomerata, D. hispanica)*. The parts of the plants on which the nymphs and females feed are not exactly identified. In any case, the oviposition takes place usually outside the host plant — in the soil, under stones, in nests of ants. The coexistence of this scale insect and ants is supposedly only of an incidental nature — „... the ants did not trouble about or carry any of them off..." noticed LUFF (NEWSTEAD, 1894 a). *E. formiceticola* has only one generation per year, the first stage nymphs hatch in spring, oviposition has been observed at the end of May (southern France) and beginning of June (Guernsey). Adult males or male developmental stages have not been noticed. In all localities the coccid has been collected in rocky places.

Distribution

West Europe (Channel Islands, Isle of Wight, England) and Mediterranean territory (southern France, Marseille).

Notes

Exaeretopus formiceticola, demonstrates some aberrative characters — long sternal setae being numerous and present on all abdominal sternites, small ventral setae and dorsal setae comparatively long and very numerous. For this reason it has been regarded as very close, or even congeneric with *Luzulaspis jahandiezi* and related species (GOUX, 1937 a and others).

Exaeretopus orientalis DANZIG

DANZIG, 1975: 137—138, Fig. 2.

Material studied

3 ♀♀, on *Carex pediformis*, USSR, Eastern Saian, Aršan, 23.VII.1970, leg. et det. E. DANZIG, 132—71, type material.

Description

Mounted specimens: Body oval, 3800—4000 μm long, 2100—2500 μm wide; moderately sclerotized.

Eyes: 19 μm in diameter, surrounded by a narrow, weakly sclerotized ring, about 26 μm in diameter.

Antennae: Situated approximately in half distance between anterior end of body and apex of labrum; short and slender; lengths of segments in μm — I — 43, II — 48, III — 67, IV — 53, V — 48, VI — 34, VII — 34, VIII — 46, entire length 370 μm; widths of segments in μm — II — 38, III — 31, VIII — 17; width/length ratio of segment VIII 1:2·7; number of setae — II — 1, III — 0, IV — 0—1, V — 3, VI — only 1 fleshy seta, hair-like seta not found; longest setae on segment II and V about as long as respective segments

large hair-like seta on segment VIII very thin, 36 μm long; fleshy setae differentiated in size, 2 setae situated on the apex on the same side as the larger hair-like seta, being the longest; Length ratios — antenna/body 1:10·3—10·8, antenna/posterior leg 1:2·3.

Mouth parts: Clypeus 185—200 μm long, 140 μm wide, strongly sclerotized, with a pair of short, strong setae. Labium 82 μm long, 96 μm wide, with 4 pairs of short, strong setae and a pair of very small apical setae. Loop of piercing stylets as long as the labium.

Legs: Short and slender; dimensions of posterior leg in μm — coxa 216 long, 108 wide, trochanter+femur 288 long, 67 wide, tibia 210 long, 34 wide, tarsus 108 long, 26 wide, claw 26 long, 14 wide; number of setae — trochanter 2, femur 10, tibia 12, tarsus 7; setae on femur and tibia subequal in length, about as long as width of tibia, on dorsal surface slender, on ventral one spine-like; tarsal digitules subequal, 46 μm long, length ratio claw/tarsal digitules 1:1·8; ungual digitules stout, 38 μm long, apical knob 9—10 μm in diameter, ratio — diameter of knob/length of digitule 1:3·8—4·2; entire lengths — anterior leg 722 μm, middle leg 825 μm, posterior leg 849 μm; length ratio — leg/body 1: 4·3—4·5.

Spiracles: Anterior spiracle — apodeme 52 μm long, 48 μm wide, peritreme 38 μm in diameter, posterior peritreme 48 μm in diameter.

Anal plates: 139 μm long, 72 μm wide; 4 apical setae, differentiated in shape — terminal one strong, spine-like, 1/3 the length of plate, other setae slender, much shorter; 1 ventral seta, strong, nearly 1/2 the length of plate, 4—5 fringe setae, lateral ones slender, about 1/4 the length of plate, medial ones very short. Anal ring 55 μm in diameter with 8 setae 130 μm long.

Dorsal setae: Spine-like, nearly parallelsided, with sharp or blunt apex, towards the posterior end of body more slender; on head and thorax 8—11 μm long, on anal lobes 7—9 μm long; on the area limited by the bases of antennae and anterior legs 6—7 setae, on anal lobes 2—3 setae on each side.

Spiracular setae: Not developed.

Marginal setae: Strong, spine-like, curved, all with blunt or rounded apex; on head 11—22 μm, on lateral margin 10—13 μm, on posterior body end 20—24 μm long; situated in 1 irregular row, in great distances — at lateral margin up to 110 μm long; between anterior and posterior bands of quinquelocular pores 13—14 marginal setae.

Submarginal setae: Needle-like, shorter, or as long as the small marginal setae; between bands of quinquelocular pores 4—7 submarginal setae.

Ventral setae: Small setae on head 9—10 μm long; large setae strong, 56—60 μm long, occurring between antennae and on 3 posterior abdominal sternites; beetween antennae 2 long and 4—5 small setae, on VI abdominal sternite 2 long and 4—5 small setae.

Quinquelocular pores: With 5, rarely with 3—4 loculi; 4—6 pores form a group near anterior spiracle, 33—38 pores a narrow band from the spiracle to body margin, and 9—12 pores are situated beyond the row of marginal

setae, on the dorsal surface; similarly in posterior spiracular furrow 3—4 pores from a group near spiracle, 28—41 a band on ventral surface and 10—12 pores a group on dorsal surface; total number of pores at anterior spiracle — 47—54, at posterior one — 41—55.

Multilocular pores: With 4—7, usually 5—6, exclusively 8 loculi; present on VII—VIII abdominal sternites, on VI segment only 2 pores have been observed.

Other pores: Discoidal pores 2·4—4 μm in diameter, with a sieve-like surface, form two narrow, irregular bands on abdominal tergites near the middle of dorsum, not numerous — total number about 40 pores. Small disc pores on dorsal surface 2 μm in diameter, on margins 2·3—3 μm, on ventral surface 3 μm in diameter; on dorsal and ventral surfaces the rim is weak, on margins strong. Campaniform pores, 3—4 in number, sometimes united in groups, present at each antennal base.

Tubular ducts: On dorsal surface 14—20 μm long, 5—6 μm in diameter, inner filament about as long as the duct, narrow, in the majority of ducts not observed; on the ventral surface ducts differentiated into two distinct types — the large one 18—20 μm long, 5—6 μm in diameter, with filament 17 μm long, 1 μm in diameter, small type 20 μm long, 2—3 μm in diameter, with a very thin filament about 20 μm long; the small type occurs on posterior margins of VI—VIII abdominal sternites, medially, and on anal lobes; large type on anterior margins of mentioned sternites and on their sides as well as on remaining ventral surface; inner orifice narrowly but strongly sclerotized; about 100 ducts occur on VI tergite and about 70—80 on VI sternite.

Microducts: shape and distribution typical.

Biology

Adult females of this species have been collected on the base of stems of *Carex pediformis* and *C. nanella (Cyperaceae)* and in the soil near the plants, on rocks.

Distribution

USSR, Eastern Saian, Mt. Tunkinskij, Aršan; Southern Primorye, Gulf Sjauche, Sudzuchinskij reserve.

Notes

Exaeretopus orientalis shows many aberrative characters concerning almost all morphological structures. It is even questionable whether it should be included to the genus *Exaeretopus*.

Exaeretopus pimpinellae Borchsenius

Borchsenius, 1957: 117—118, Fig. 110; Williams, 1977: 283.

Material studied

2 ♀♀, at the base of stem of *Pimpinella* sp., USSR, Azerbaijan, Apšeronskij region, near Višnevskaja station, 16.V.1974; 338, 367, leg. et det. N. Bor-

CHSENIUS, 185—48, 192—48, type material, Zoological Institute, Academy of Sciences, Leningrad.

Description

Body elongate-oval, 4900—5300 μm long, 2600 μm wide; moderately sclerotized.

Eyes: 24 μm in diameter, situated on a strongly sclerotized, oval plate, with respective diameters 35 and 40 μm.

Antennae: Situated nearer the anterior margin of the body than the apex of the labrum; comparatively slender; lengths of segments in μm — I — 79, II — 65, III — 120, IV — 72, V — 72, VI — 48, VII — 41, VIII — 48, entire lenght 520 μm; width of segments in μm — II — 60, III — 43, VIII — 26; width/length ratio of segment VIII — 1 : 1·8; setae — II — 2, III — 2, IV — 1, V — 3; longest setae on segment II longer than the segment, on segment V about as long as the segment; large hair-like seta on segment VIII — 120 μm long; fleshy setae somewhat differentiated in length — seta situated on apex, opposite the large hair-like seta being the longest; length ratios — antenna/body 1:9·4—10·2, antenna/posterior leg 1:2·5.

Mouth parts: Clypeus 154 μm long, 150 μm wide, unevenly sclerotized, with a pair of comparatively long setae. Labium 60 μm long, 96 μm wide, with 4 pairs of delicate setae and a pair of very small apical setae. Loop of piercing stylets about as long as the labium.

Legs: Large and slender; dimensions of posterior leg in μm — coxa 288 long, 156 wide, trochanter+femur 408 long, 84 wide, tibia 360 long, 48 wide, tarsus 200 long, 36 wide, claw 43 long, 14 wide; number of setae — trochanter — 2, femur — 10, tibia — 14, tarsus — 8; setae on femur and tibia delicate, subequal in length — about as long as width of tibia; tarsal digitules subequal, 65—70 μm long; length ratio — claw/tarsal digitules 1:1·6; ungual digitules weak, about 50 μm long, apical knob 4 μm in diameter, ratio — diameter of knob/length of digitule 1:12·5; entire lengths — anterior leg 1170 μm, middle leg 1290 μm, posterior leg 1300 μm; length ratio — leg/body 1:3·7—4·0.

Spiracles: Anterior spiracle — apodeme 79 μm long, 60 μm wide, peritreme 72 μm in diameter, posterior peritreme 96 μm in diameter.

Anal plates: 158 μm long, 89 μm wide, with 4 strong apical setae longer than 1/3 the plate length, 2 ventral setae similar in length but slender; fringe setae 4—5 in number, lateral setae 1/2 the length of anal plates, medial ones 3 times shorter, weak. Anal ring 96 μm in diameter, with 8 setae 168 μm long.

Dorsal setae: Spine-like, strong, with somewhat blunt apex, mostly curved, towards the posterior body end becoming more slender; on head and thorax 13—19 μm, on anal lobes up to 17 μm long; on the area limited by the bases of antennae and legs 15 setae, on anal lobes 4 setae on each side.

Spiracular setae: Conical, sharp, relatively small — 16—22 μm long; at anterior spiracles 0—1 setae, at posterior ones entirely absent.

Marginal setae: Strong, spine-like, variable in shape and length — on anterior margin blunt, sharp or hair-like elongated, at lateral margins, beside

mentioned forms, also setae with rounded apex; on head 22—44 μm, on sides 22—33 μm, on anal lobes 16—51 μm long; setae situated in 1 row, in distances equal the length of setae; between anterior and posterior spiracles 29—36 marginal setae.

Submarginal setae: Slender, needle-like, 1/3—1/2 the length of marginal setae; 14—15 submarginal setae between spiracular furrows.

Ventral setae: Small setae on head 9—14 μm, on thorax and abdomen 12—20 μm long; large setae slender, 55—60 μm long, present between the antennae and on three posterior abdominal segments; 2 long and 6—8 short setae between antennae, about 20 setae between posterior coxae, 2 long and 16—20 small setae on VI sternite.

Quinquelocular pores: 3—4 pores form a group near anterior spiracle and 11—17 pores a band from spiracle to body margin (total number 16—21 pores); 3—6 pores near posterior spiracle, 15—17 pores in the band (total number 20—21).

Multilocular pores: With 5—7 loculi, on VI—VIII abdominal sternites.

Other pores: Discoidal pores typical, distribution obscure. Small disc pores present on both ventral and dorsal surfaces and on margins. Campaniform pores, 4—6 in number at each antennal base.

Tubular ducts: On dorsal surface 18—20 μm long, 3—4 μm in diameter, filament 24 μm long, 0·5—1·0 μm in diameter; on ventral surface variable — larger form 18—20 μm long, 3—4 μm in diameter, filament 15—20 μm long, 0·5—1·0 μm in diameter, smaller form 19—22 μm long. 2·0—2·5 μm in diameter with filament similar to the former type; about 140 ducts on VI tergite, about 120 ducts on VI sternite.

Microducts: Typical.

Biology

Adult females before and at the beginning of oviposition have been observed on *Pimpinella* sp. *(Umbeliferae)* (BORCHSENIUS, 1957).

Distribution

USSR, Azerbaijan.

Exaeretopus tritici WILLIAMS

WILLIAMS, 1977: 281, Fig. 1.

Material studied

1♀, *Triticum* sp., Iraq, Naynawa, 7.V.1975, leg. JAWAD, Rustem, 1 ♀. *Triticum* sp., Iraq, Arbil, IV.1975, leg. S. MA'ROUF, A 8020, type material.

Description

Mounted specimens: Body elongate-oval, 4700—6000 μm long, 2300—3000 μm wide, moderately sclerotized throughout.

Eyes: Distinct, 19—22 μm in diameter, situated on a strongly sclerotized plate which diameter is 2 times as large as that of the lens.

Antennae: Situated in half distance between anterior body margin and the apex of labrum, or nearer the former; length of segments in μm — I — 48, II — 91, III — 139, IV — 108, V — 101, VI — 58, VII — 48, VIII — 48, total length 520—677 μm; width of segments in μm — II — 77, III — 60, VIII — 29; width/length ratio of segment VIII 1:1·6; number of setae — II — 2—3, III — 2—3, IV — 2, V — 3; largest setae on segments II and V about as long as respective segments, other setae shorter, delicate; large hair-like seta on segment VIII 108 μm long, fleshy setae subequal in length except one situated on the apex, opposite the large hair-like seta which is 2 times longer than remaining fleshy setae; length ratios — antenna/body 1:6·9—7·5, antenna/posterior leg 1:2·4.

Mouth parts: Clypeolabral shield 156 μm long and wide, moderately and unevenly sclerotized, with 2 short setae. Labium globular, 84 μm long, 96 μm wide, with 4 pairs of strong setae and 1 pair of very small apical setae.

Legs: Large; dimensions of posterior leg in μm — coxa 360 long, 240 wide, trochanter+femur 576 long, 120 wide, tibia 440 long, 48 wide, tarsus 216 long, 41 wide, claw 50 long, 14 wide; number of setae — trochanter 4, femur 15, tibia 24, tarsus 10, all setae short, on femur about 1/6 the width of segment, on tibia about 1/3 the width of segment; tarsal digitules broken (according to WILLIAMS, 1977, 80 μm long) ungual digitules equal, 65 μm long, with apical knob 4 μm in diameter, with/length ratio 1:13·7; entire lengths — anterior leg 1460 μm, middle and posterior legs 1350—1650 μm; length ratio — leg/body 1 : 3·0—3·1.

Spiracles: Anterior spiracle — apodeme 96 μm long, 72 μm wide, peritreme 84 μm in diameter, posterior spiracular peritreme 106 μm in diameter;

Anal plates: 191 μm long, 120 μm wide; apical setae, 4 in number, strong, comparatively short, hair-like elongated; 4 ventral setae similar in size and shape to the apical ones; 4 pairs of fringe setae, lateral setae 1/3 the length of plate, medial setae 5—6 times shorter. Anal ring 108 μm in diameter, with 9 setae up to 170 μm long.

Dorsal setae: Variable in shape, usually spine-like, with sharp or blunt apex, sometimes strongly curved, similar on head, thorax and abdomen; on head 16—18 μm, on thorax 15—20 μm, on anal lobes 12—16 μm long; 30—33 setae on the area limited by the bases of antennae and anterior legs, 10—13 on each anal lobe.

Spiracular setae: Strong, about 30 μm long, slightly curved, 1 in each anterior spiracular furrow, posterior setae not found.

Marginal setae: Strong, spine-like, with blunt (short setae) or sharp apex (both short and long forms); on anterior margin 18—46 μm long, on lateral edges 21—31 μm long, on anal lobes 25—38 μm long; situated in one row, in distances 22—60 μm; 29—35 setae occur between spiracular furrows.

Submarginal setae: Needle-like, 1/2—3/4 the length of marginal setae, being easy to distinguish from the marginal setae by their position and shape; 24—31 setae between spiracular furrows.

Ventral setae: Small setae on thorax and abdomen 14—24 μm, on head 12—17 μm long, numerous; large setae strong, between the antennae and on 3 posterior abdominal segments 60—70 μm long; number — 2 long and 20—30 setae between the bases of antennae and anterior legs, 2 long and about 20 short setae on VI sternite.

Quinquelocular pores: With 2—7, usually 5 loculi; forming a group of 10—12 pores near anterior spiracle and a broad band of 47—55 pores from the the spiracle to body margin (total number 59—67 pores); at posterior spiracle 9—12 pores, in the band 41—52 pores (total number 52—64).

Multilocular pores: 5—6 μm in diameter, with 5—6, rarely 4 loculi, scattered on VI—VIII, and rarely on V adbominal sternites.

Other pores: Large discoidal pores, 2—3 μm in diameter, form a band on the middle of dorsum from prothorax to anal plates (according to WILLIAMS, 1977, the pores may be absent in some specimens). Small disc pores are scattered all over the dorsum and venter, on body margins larger, with strongly sclerotized and invaginated rim. Campaniform pores, 6—7 in number, at each antennal base.

Tubular ducts: On dorsal surface 18—22 μm long and 5—6 μm in diameter, inner filament about 25 μm long and 2 μm in diameter; on ventral surface the ducts differentiated into two size types — the larger one 22 μm long, 4—5 μm in diameter, with filament about 25 μm long and 2 μm in diameter, smaller type 22—24 μm long, 3—4 μm in diameter, with filament about 25 μm long and about 1 μm in diameter; inner orifice of all ducts heavily and broadly sclerotized; arrangement typical; about 200 ducts on VI abdominal tergite and the same on VI sternite.

Microducts of typical size, shape and arrangement, very numerous.

Biology

Exaeretopus tritici lives on stems and inner surface of *Triticum aestivum* leaves *(Poaceae)*. According to WILLIAMS (1977), *E. tritici* causes some damage to wheat crops in Iraq.

Distribution

Iraq, Ninevah and Arbil Provinces.

Notes

This species is distinct from all others by its great size, numerous body setae and spiracular pores.

Unidentified species

***Exaeretopus* sp. a** near *pimpinellae* BORCHSENIUS: 1 ♀ labelled „*Exaeretopus formiceticola*", on roots of *Agropyron* sp., USSR, Armenia, Sisian, 23.VI. 1957, leg. TER-GRIGORIAN, 124—62, Institute of Zoology, Academy of Sciences, Leningrad.

This specimen is misidentified. It shows, but few common characters with *E. pimpinellae* — the number of spiracular pores is very small in both the

species (10—14 pores in anterior band in E. sp. a, 14—20 in *E. pimpinellae*); the length of marginal setae is the same, but in *E. pimpinellae* the setae are strong and numerous (29—36 setae between spiracular furrows), in *E.* sp. a weak and few (about 15 setae at this distance); such a small number of setae on the margin has been met only in *E. dianthi* and *E.* sp. d. The species is distinct from all others in the genus by the structure of the tubular ducts which inner end is sclerotized at about 1/3 the length of the duct.

Host plant: Roots of *Agropyron* sp.

Distribution: Armenia (Sisian), USSR.

***Exaeretopus* sp. b** near *pimpinellae* BORCHSENIUS *: 1 ♀ labelled „*Luzulaspis jahandiezi*" on the blade of a grass, Cyprus, Kyrenia, 19.IV.1932, leg. E. E. GREEN, Cyp. coll. 67/162, British Museum (Nat. Hist.), London.

This specimen is obviously misidentified. Generally it is close to *E. pimpinellae*, being different mainly in following characters: the body is more oval and the legs more robust than in *E. pimpinellae*; all marginal setae are sharply pointed; between anterior and posterior spiracular furrows there are only 20—25 setae; in *E. pimpinellae* some of the setae are apically rounded and between spiracular furrows 29—36 setae occur; similarly all the dorsal setae are sharply pointed, but being much more numerous than in *E. pimpinellae*; the latter feature resembles the condition in *E. tritici*; in *E.* sp. b the spiracular pores are more numerous than in *E. pimpinellae* (about 30 pores in anterior and about 40 pores in posterior spiracular band, in *E. pimpinellae* about 20 pores in each band). The character distinguishing this species from all others is the structure of tarsal digitules which are hair-like, apically not dilated. The ungual digitules are also thin, with a very small apical knob.

Host plant: Unidentified grass.

Distribution: Cyprus, Kyrenia.

***Exaeretopus* sp. c** near *agropyri* (HADŽIBEJLI): 1 ♀ labelled „*Exaeretopus hordei*" (name not published), on stem of bearded grass, Cyprus, Famagusta, 9.III.1932, leg E. E. GREEN, Cyp. coll. 65—132, British Museum (Nat. Hist.), London.

The examined specimen, apparently a very young female, is close to *E. agropyri*. The species share the character and number of marginal setae, presence of both anterior and posterior spiracular setae, number of quinquelocular pores (33—53 in each spiracular band). The two species differ mainly by the dorsal setae, sharp in *E.* sp. c, blunt in *E. agropyri*, and the length of marginal setae with filamentous apex — in *E. agropyri* they reach 100 μm

* The specimen was available after the paper had been completed. For this reason it has not been included to the illustrations.

on anterior margin and 80 μm on lateral margin, whereas in *E.* sp. c the setae do not exceed 60 μm on anterior and 40 μm on lateral margin.

Host plant: Unidentified grass.

Distribution: Cyprus, Famagusta.

***Exaeretopus* sp. d** near *agropyri* (HADŽIBEJLI): 1 ♀, labelled *„Exaeretopus thymi"* (name not published), on stem of *Thymus capitatus*, Cyprus, Nicosia, 9.XII. 1931, leg. E. E. GREEN, Cyp. coll. 22/12, British Museum (Nat. Hist.), London.

The specimen, female after oviposition, shows some common characters with *E. agropyri*. The two species may be distinguished by the length of marginal setae with filamentous apex, in *E. agropyri* more than two times longer; number of marginal setae, about 15 setae between anterior and posterior spiracular furrows in E. sp. c, 25—36 in *E. agropyri*; posterior spiracular setae, present in *E. agropyri*, absent in *E.* sp. d. The unevenly developed ungual digitules — the dorsal one being very thin, the ventral normal — make this species distinct from all others in the genus.

Host plant: Adult female collected on *Thymus capitatus*.

Distribution: Cyprus, Nicosia.

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STRESZCZENIE

W pracy podano ogólną charakterystykę rodzaju *Exaeretopus* NEWSTEAD, opartą na morfologii samicy, dane odnośnie do biologii i rozmieszczenia geograficznego, klucz do oznaczania gatunków i ich opisy.

Exaeretopus NEWSTEAD należy do plemienia *Eriopeltini* w rodzinie *Coccidae*. Najbliższe mu rodzaje to *Luzulaspis* COCKERELL, *Poaspis* KOTEJA i *Hadzibejliaspis* KOTEJA.

Do rodzaju *Exaeretopus* włączono 10 gatunków, w tym jeden ustanowiony w niniejszej pracy: *E. agropyri* (HADŽIBEJLI), *E. dianthi* sp. n., *E. formicetícola* NEWSTEAD, *E. orientalis* DANZING, *E. pimpinellae* BORCHSENIUS, *E. tritici* WILLIAMS i cztery gatunki nie oznaczone. Te ostatnie są prawdopodobnie gatunkami nowymi, dla których jednak nie zaproponowano nazw z powodu małej liczby okazów. Uwzględnienie ich w pracy pozwoliło na znaczne poszerzenie wiadomości o morfologii, biologii i rozmieszczeniu rodzaju.

Gatunki należące do rodzaju *Exaeretopus* są grupą morfologicznie zwartą, z wyjątkiem *E. orientalis*, który wykazuje szereg istotnych różnic.

Przedstawiciele rodzaju *Exaeretopus* zamieszkują stosunkowo wąski pas od południowo-wschodnich wybrzeży Syberii, przez Azję Centralną i basen Morza Śródziemnego do Wysp Brytyjskich. Żyją na roślinach zielnych, głównie trawach. Niektóre mogą wyrządzać szkody w uprawach zbóż.

Redaktor pracy: prof. dr W. Szymczakowski